Evaluating the impact of the Parents and Children Together (PACT) programme on the language skills of 3- to 4-year-old nursery children, a two-armed randomised controlled trial [PACT-3]

Evaluation Protocol

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PROJECT TITLE[1]	Evaluating the impact of the Parents and Children Together (PACT) programme on the language skills of 3- to 4-year-old nursery children, a two-armed randomised controlled trial [PACT-3]
DEVELOPER (INSTITUTION)	University of Manchester
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PROTOCOL AUTHOR(S)	Victoria Menzies, Paivi Eerola, Helen Cramman, Bilal Ashraf, Jochen Einbeck, Helen Gray
TRIAL DESIGN	Two-armed randomised controlled trial with random allocation at the child level within nurseries
TRIAL TYPE	Efficacy
PUPIL AGE RANGE AND KEY STAGE	3-4 years - EYFS
NUMBER OF SCHOOLS	43
NUMBER OF PUPILS	372
PRIMARY OUTCOME MEASURE AND SOURCE	Language skills assessed by LanguageScreen app at immediate post-test
SECONDARY OUTCOME MEASURE AND SOURCE	Language skills assessed by LanguageScreen app at 11 month delayed post-test Language skills assessed by researcher-delivered language assessments (BPVS, APT and CELF – Expressive Vocabulary) at immediate post-test and 11 month delayed post-test Child's home learning environment measured by the parent-reported Home Learning Environment Index at immediate post-test Early literacy skills as measured at 11 month delayed post-test using Early Word Reading, Letter-Sound Knowledge and Sound deletion subtest from YARC

Protocol version history

VERSION	DATE	REASON FOR REVISION
1.2 [*latest*]		
1.1		
1.0 [*original*]	28/6/22	N/A

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Study rationale and background

<u>Background</u>

Vocabulary acquisition is a key element of early infant development and continues to be an important factor throughout childhood. Bergelson and Swingley (2012) reported that babies appear to start learning the sound forms of whole words within the first few months of life and they understand the meanings of several common nouns from the age of six months. At around the age of 18 months, young children's vocabulary begins to expand rapidly and it is estimated that they learn words at a rate of one every two waking hours; a trend that will continue to adolescence (Pinker, 1994). In addition to vocabulary acquisition, infants need to learn about the features of spoken language such as where words begin and end and realise that these units carry a meaning. This phonological knowledge underpins vocabulary acquisition and growth.

Moving on to learning to read, Harrison (2004) suggested that children need different types of knowledge as precursors:

- Knowledge and understanding of the world; Knowledge of how our language works;
- Knowledge of conventions of print; Phonological awareness; Decoding, oral reading fluency and reading comprehension are beginning to be acquired by many children by 5 years of age.

Evidence indicates that parenting and educational environment in the early years have a powerful influence on language development. The quality of the home learning environment and educational resources within the home are important factors (Melhuish *et al.* 2008b) and there is a link between this quality and socio-economic status (Foster *et al.* 2005). We observe children from disadvantaged backgrounds entering school with lower levels of attainment than their more socioeconomically advantaged peers (Tymms *et al.* 2014) and this trend persists throughout primary school (Merrell, Little and Coe, 2014); development and skills at the start of school are predictive of later outcomes (see, for example, Tymms, Merrell and Bailey, 2017).

There have been far-reaching impacts of the Covid-19 pandemic on education with the closure of schools and early years settings and ongoing restrictions and the knock-on effects of this. An interim report commissioned by the EEF has reported that from a sample of 58 schools – 96% of schools reported concerns about children's communication and language development, and 89% were concerned about children's literacy levels (Bowyer-Crane *et al.,* 2021). In the same study 76% of schools felt that pupils needed additional support compared to pre-pandemic cohorts. A Speech link study of 50,000 pupil language assessments of 4- and 5-year-olds starting school in 2020 also found that at least 20% more pupils were arriving at school with the lowest language levels (Speech Link Multimedia, 2021). It seems that there is now a greater need to support the development of language skills in pre-school children. Pre-school children now (during the pandemic) are also less likely to have attended high-quality centre-based childcare during the first three years of their life. During the first lockdown only 5% of the number that usually attend ECEC settings were attending (Department for Education 2020) and, although increasing, this was still only 76% of pre-pandemic levels in September 2021). Thus, children were less likely to have experienced the language and other cognitive benefits which can come from this care (e.g. Davies *et al.*, 2021).

A large-scale multinational study (Kartushina *et al.*, 2020), of 13 countries, including the UK, tested how the home learning environment affected children's vocabulary development during the pandemic. The authors concluded that children whose caregivers read more to them and who had less screen time during the early 2020 lockdown had a boost in their vocabulary development compared to the norms from pre-pandemic times even after controlling for socio-economic status. This suggests that a Home Learning programme which supports parents/carers to read more with their children in an evidence based and structured way could support the development of language skills in pre-schoolers even during a pandemic.

A survey of Canadian parents (Demers *et al.*, 2021) explored the impact Covid-19 had on children's communication from the parental perspective including 40% of the sample with children between ages

0-5-years. Parents reported being unhappy with the activities sent home from schools and commented that they would have appreciated direct support sessions or activities that would have been easily integrated to the day-to-day life at home.

A recent meta-analysis of 48 studies of the effect of home learning literacy programmes on the emergent literacy skills of children aged 0-6 years from low socioeconomic backgrounds found an average effect size of Cohen's=0.50 on immediate post-tests (Fikrat-Wevers *et al.*, 2021). The most promising home reading programmes for low-SES families focussed on a limited set of activities, i.e. shared reading; did not combine home activities with activities at nursery; did not try to have an impact on anything else but literacy skills; and were restricted to one training setting, which was either home or school.

Parents and Children Together (PACT) is a UK-based language teaching programme for pre-school children (aged 3-4) that parents/carers deliver to their child at home, which includes features of shared reading and activities specific to improving language skills. This programme was developed in line with Early Years policy and practice guidelines (e.g. DfE, 2012) and has been shown to support children's early language and emergent literacy skills (Burgoyne *et al.*, 2018a, 2018b). PACT is centred on improving children's language skills through interactive book reading, supplemented with direct teaching of vocabulary and work on narrative skills. The materials are designed to be easy to use, engaging, and motivating for young children. PACT has a training component for both parents and nursery staff. Parents are also offered support from their nursery throughout the 30-week-long programme.

The PACT programme has been trialled twice before; a Nuffield foundation funded project using a randomised controlled trial (RCT) design (reported in Burgoyne *et al.,* 2018b; referred to here as PACT-1); and an EEF funded RCT that was delivered via state funded nurseries during the academic year 2019/20 (referred to here as PACT-2).

PACT-1 took place in 22 children's centres in three local authorities, two of which ranked highly on indices of deprivation. Altogether 208 children were randomly allocated to either the PACT language programme or a motor skills control programme. The effects of the language programme were tested with a large battery of standardised and non-standardised tests on language. At immediate post-test, the language programme produced improvements in language and narrative skills; the former was maintained 6 months later. At the delayed follow-up, the language programme also produced improvements in some early literacy skills: letter-sound knowledge and regular word reading.

PACT-2 aimed to replicate the study in a larger scale (n=450) and drawing participants from state-maintained school nurseries (n=47) using a 'business as usual' control group instead of an active control group. The trial protocol for PACT-2 can be found here (https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/pact-parents-and-children-together). However, due to Covid-19 lockdowns and disruptions, the immediate post-testing was not possible and the test administered in the delayed follow-up was changed. The final report for this study is due for publication in 2022. The study was only able to collect a teacher delivered language outcome 12 months after the completion of the intervention and due to this change in assessment, the delay in collection and the level of attrition it is expected that the results from this study will be difficult to interpret. However, interim findings showed good levels of nursery and parent/carer engagement with the PACT programme.

Retrialling PACT (PACT-3)

This evaluation of the PACT early language programme is the third randomised controlled trial (PACT-3) and was commissioned as a retrial of the ongoing PACT-2 project. PACT-2 was heavily affected by the Covid-19 lockdowns and subsequent ongoing restrictions during the academic year 2019-2020. Due to Covid-19 lockdowns and ongoing restrictions from March 2020, the circumstances under which the programme was being delivered changed significantly (full details can be found in the amended PACT-2 protocol). There were delays to the delivery of the materials to parents/carers, nurseries were closed fully or closed to most children, the home environment where the programme was being delivered was altered due to working from home, the closure of schools, the furlough scheme, and other

ongoing factors. The delivery of the evaluation was also hugely impacted as nursery closures and covid restrictions made it impossible to collect any child assessment data immediately post-intervention and meant that even 12 months on from the end of the PACT delivery period it was still not possible to collect the face-to-face researcher delivered assessment measures originally planned. Instead, the PACT-2 evaluation adapted to have teachers use the LanguageScreen app to collect language assessment data 12 months after the original intervention end date. This disruption both to the evaluation and the delivery of the programme has significant impact on our ability to interpret any data we were able to collect about the effectiveness of the programme. As a result, EEF have funded this PACT-3 retrial evaluation of the PACT programme using a very similar research design as in PACT-2 and working with some of the same settings. PACT-3 is an efficacy trial aiming to run in ideal conditions, recruiting state-maintained school-based nurseries and randomisation of families within the schools to the PACT intervention or a business-as-usual control group.

The PACT programme supported by the nursery staff will stay the same in PACT-3, as will the control condition. However, to mitigate for Covid-19 disruption to the delivery of the trial, there are changes to the delivery of PACT-3 compared to PACT-2 in the training for nursery staff and for parents, which will be delivered online instead of face-to-face. There are also changes for the evaluation – most significantly in regard to the baseline and outcome measures we are using. To mitigate the risk of not being able to have researchers visit nurseries to collect assessment data, we are using LanguageScreen as the baseline and primary outcome. This assessment is administered by a member of staff in the nursery.   Appendix 1 details the changes to PACT-3 from PACT-2 as well as how this compared to the original developer delivered trial.

Intervention

PACT is an early language teaching programme delivered by parents or carers to their pre-school child in the year before they start school (aged 3 to 4 years). It is an intensive programme delivered over a period of thirty weeks with focused language activities based on story books provided by the programme to be completed five days a week, for approximately 20 minutes a day. Table 1 below describes the PACT intervention using the TiDieR framework. There are two levels of delivery in the programme with parents/carers signing up to and accessing the programme and programme support through their child's nursery and then delivering the programme sessions directly to their child at home. Training is provided at both levels for the nursery staff driving the programme (PACT Lead) and for the parents. In this trial the PACT programme will be delivered by families between November 2021 and June 2022. PACT Lead training is provided in May 2021 and Parent/Carer training in November 2021.

Table 1. Description of PACT using TiDieR framework

TIDIER FRAMEWORK	DESCRIPTION
Name of intervention	Parents and Children Together (PACT)
Why? Rationale	Oral language skills provide the foundation for formal education and play a critical role in learning to read (Hulme *et al.*, 2015). Children from low-income backgrounds are at risk of delayed language development and educational disadvantage. Interventions that promote oral language in the early years have considerable potential to enhance children's learning and development, particularly for those from deprived socio-economic backgrounds. PACT is an early language teaching programme (PACT) for parents/carers to deliver to their pre-school child (aged 3-4 years). Results from a within-school randomised controlled trial reported the PACT programme led to significant gains in oral language skills immediately post-test, which were maintained six months later. The trial also reported improvements in some early literacy skills at delayed follow-up (Burgoyne *et al.*, 2018a 2018b).

Who? Recipients	The intervention will be run with nursery children and their parents/carers. Eligible families will have a 3-year old child attending a participating school-based nursery (all based in the North West of England), parents/carers must have a sufficient level of English to access the programme materials, the child should not have suspected or diagnosed developmental or learning difficulties and must not have a sibling or step sibling within the same class. For this PACT-3 trial families must not have participated in the PACT-2 trial. Parents/carers are ultimately responsible for engaging with PACT and delivering the content to their child. Nursery level implementers/providers (known as PACT Leads): 1-2 nursery staff in each setting will be trained to support the project (recruiting, training and supporting families taking part) and will be expected to distribute the PACT materials to parents/carers as required, monitor engagement with the programme informally, support parents/carers with programme delivery and in some cases train parents in the programme if the parents have not been able to access the live training delivered by the developer team.
What? Materials used	PACT is a manualised teaching programme (now published by the Book Trust, The UK's largest reading charity) consisting of 30 weeks of teaching materials organised into 5-week blocks designed for use by parents/carers in the home with their early years children. The sessions are scripted, and parents/carers are provided with all the teaching resources needed to deliver the programme. The programme incorporates three key components designed to promote children's early language development: 1) Shared reading: Parents/carers read books with their child using strategies which support verbal interaction and active engagement. 2) Vocabulary instruction: Selected words are taught using interactive activities to promote new word learning. 3) Narrative (storytelling): Activities include sequencing, summarizing and telling/retelling stories. The programme materials consist of 6 themed PACT Packs each containing five-weeks of teaching materials. Each PACT pack includes four story books including traditional stories (e.g. The Gingerbread Man), well known modern classics (e.g. The Gruffalo), fact-based storybooks (e.g. The Pond) and books that may be new/unfamiliar to families (e.g. 5 Minutes Peace). Each book has a corresponding activity book including all activities and related resources to enable parents/carers to deliver a scripted 20 minute interactive learning session, five times a week. Each pack also contains a 'Bringing it all Together' activity book, which features consolidation and theme-level activities as well as a sticker chart and stickers to track and celebrate progress. In addition the first PACT Pack contains a parent guide to the programme. There are also PACT Lead training Powerpoint slides and a parent recruitment video, as well as Parent/Carer training sessions Powerpoint slides, a recording of the Parent/Carer training and 2 recordings of an adult and child participating in PACT language sessions together.

What? Procedures, activities and/or processes	Training
	Nb. All training for PACT Leads and Parents/Carers was delivered online through live webinars. This was a change from PACT-2 and from the original PACT trial where training was delivered face-to-face. This was due to ongoing Covid restrictions making it difficult to deliver face-to-face in person sessions.
	Nursery PACT Leads
	After signing up to the project one or two members of nursery staff (nominated PACT Leads) attend a 4-hour online training session delivered by the developer team (two people delivering). This training session includes:
	• an initial description of the background to PACT and the overall research project.
	• specific guidance on the structure of the PACT programme and how parents should deliver the sessions (PACT Leads refer to a PACT Pack example sent to them in advance of the session to aid their understanding).
	• recruiting families to the project including eligibility criteria and how to talk to parents about the project
	• the child assessments that form part of the evaluation.
	• parent training.
	• supporting parents to deliver the programme and in monitoring their progress.
	• process evaluation activities that would be led by the evaluator team.
	These training sessions include interactive elements encouraging feedback and questions throughout, break-out rooms for discussion and role-playing elements of the PACT programme with other participants. They also tackle frequently asked questions from parents about the programme.
	Each PACT Lead will receive a full set of the PACT materials (six PACT activity packs) in order to help them support parents/carers completing PACT; they will be informed not to use the PACT pack for within school teaching.
	Parent/Carers
	Parents/carers assigned to the PACT programme group are expected to attend a 1.5-2 hour online training session delivered by one of three trained team members. This session includes:
	• an introduction to the PACT programme and the research design
	• why improving pre-school children's oral language skills and school readiness is important
	• key teaching principles for working with your child
	• the details of the programme and what to do for each of the elements including strategies to support prompting your child
	• recording progress through the PACTapp and record forms
	• PACT programme structure and next steps.
	Parents are given the first PACT pack in advance of the training session and instructed to refer to it during the session.
	If parents/carers are unable to attend a live session, training may be given by the nursery PACT Lead using materials provided by the developer team (recording of the parent training session, key messages document, and slides). If that is not possible, the parent may be trained by watching the recording of the training session and the PACT Lead following up with that parent should they have any questions.
	Parents/carers delivering the programme

	The 30-week programme consists of six 5-week teaching 'blocks' that each encompass a different theme which aligns to common early-years themes including: (1) Animals, (2) The World Around Us, (3) Journeys, (4) The Body, (5) Home, and (6) Places and People.
	PACT sessions, delivered by parents, are the same as in the previous trials and start with a brief introduction to give parents time to settle the child and get them ready to focus on the activities. Parents/carers and children then read the book together. Following the principles of dialogic reading, parents/carers are asked to support their child to play an active role in shared reading by following their child's interest, asking questions, and linking the story to their child's experience. Vocabulary activities focus on learning a new word from the book or theme. New words include a range of word types and are selected to be useful across different contexts. Parents/carers then support children's story knowledge and storytelling skills by helping them to order pictures from the story, describe what is happening in the pictures from the story, and retell stories. The teaching sessions end with a recap of the content, praise for the child and a sticker reward. (Burgoyne *et al.* 2018a, p8.)
	PACT sessions are expected to be delivered 5 days a week with each PACT session lasting around 20 minutes. PACT sessions should include all listed activities and should follow a consistent structure and routine. The content of weeks 1-4 activities focuses on introducing new content, and week five encourages parents/carers and children to revise and build on learning from the previous 4 weeks. Parent/carers are requested to complete a daily record form through a mobile application (or a paper record form) to gauge session completion and whether the pair enjoyed it. In any cases where families are unable to use the mobile app, paper copies of this form will be provided.
	Nursery support for delivering the programme PACT Leads are responsible for distributing the PACT packs to parents throughout the programme. The packs should be distributed so that families can progress straight onto the next pack on completion of the previous pack. PACT Leads are also responsible for providing support and encouragement to families delivering the PACT programme (as they feel is required), answering questions, and encouraging families to continue engaging with the programme for the programme duration.
Who? Providers/implementers	PACT is designed to be delivered by a trained caregiver (e.g. parent/guardian, grandparents, older sibling) in the home. Parents/carers are required to attend an online developer-led training session lasting 1.5-2 hours (detailed above). Trained nursery staff cascade the session to any parents/carers unable to attend the developer-led training. Within each nursery, one or two staff members will be nominated to support parents/carers to deliver the programme. The developer team provide the training to parents/carers and to nursery staff and provide ongoing support to nursery staff and to parents/carers when approached directly.
How? Mode of delivery	PACT provides parents/carers with teaching strategies/activities, materials and resources to support language skills development through the 6 PACT packs and the initial training. Support for families is provided through nurseries, specifically by the trained PACT Lead at their nurseries.
Where? Location of delivery	PACT families will be recruited within school nurseries and Local Authority (LA) maintained school-based nurseries located within

	socially disadvantaged LAs in the North-West of England (Warrington and Lancashire, Rochdale, Tameside, Blackpool, Trafford, Manchester, Calderdale and Bolton) identified by low Indices of Multiple Deprivation (IMD) rankings. Eligible nursery schools are those that are state-funded, with nurseries that have provision for children aged 3 years+. Delivery of the programme will be through the nursery.
When and how much? Duration and dosage	PACT teaching sessions are to be delivered for 20 minutes, five days a week for 30 weeks. In total, there is content for 150 home-based teaching sessions. Parents/carers receive six PACT activity packs at five-weekly intervals across the duration of the 30-week programme. Nb. While most parents/carers will have had the opportunity to deliver 30 weeks of the programme before the post-testing period, those who were trained at the end of November will not complete the 30-week period until the end of June and may only have had the opportunity to complete 29 weeks of the programme before the assessment period commences on the 13th June 2021. We will try to stagger assessment so that those trained later will be assessed later in the assessment period.
Tailoring and adaptation	The PACT materials have been improved and updated since the initial trial (Burgoyne *et al.*, 2018a, 2018b) and have been published for use in the EEF-funded trial by Book Trust (the UK's largest reading charity). They are identical to the PACT-2 trial which was affected by Covid-19. PACT is a manualised teaching programme and optimal treatment fidelity is emphasised. Nonetheless, parents/carers are encouraged to make surface adaptations (e.g., prompts used during book reading) to tailor the programme to individual children. Nursery staff may choose to adapt the level of interaction with parents/carers and children in relation to the PACT programme e.g., prompting their use, talking to parents/carers about engaging with the materials.
How well (planned?): strategies to maximise effectiveness	Strategies to maximise implementation effectiveness include: (a) Nurseries providing sufficient support to PACT families: Nurseries can send more than one staff member to the developer-led training to mitigate issues relating to the continuation of the programme associated with staff absence. PACT Leads will be informed of suggestions and recommendations on how to support nominated caregivers during their training and initial getting started period. PACT Leads will be asked to provide ongoing support to parent/carers in a form that suits their setting and their families, e.g., drop-in sessions, contact via email or text message, and asking parents/carers about it when they drop off their child. PACT Leads will also be the ones who provide a new PACT pack to parent/carers at each 5-week interval. The PACT Lead will be encouraged to use this opportunity to talk with their PACT families to take an interest in their progress. (b) Offering families flexibility for training sessions and delivery of the programme: Nurseries will inform families that more than one caregiver can attend training and administer the programme to their child. Offering to train more than one parent/carer is likely to increase the frequency of programme delivery. Multiple dates/times for training will be offered to encourage parent/carer(s) attendance. Mop-up training will be provided by the setting's trained PACT Lead should parents/carers be unable to attend a developer-led session, and a recording of the training session is provided to all parents so they can revisit this at any time. Two recorded intervention sessions featuring

	an adult and child taking part in PACT language sessions are also provided to families following training, which they can revisit any time as a model of PACT delivery. (c) The developer will periodically monitor the PACT app completion data from parents/carers and where there seems to be a drop in engagement, the developer will contact the PACT Lead and ask them to check in with the parent/carer and offer additional support if needed.

The PACT Theory of Change model is included in Figure 1 below. The overall purpose of the PACT programme is to improve children's language development. The PACT programme is an evidence and research-informed programme based around children's books with specific language focused activities to complete 5 days a week over a thirty-week period which parents/carers complete with their child. It is expected that training for parents/carers and the provision and regular use of the focused learning materials provided by the PACT programme will facilitate improved home-based learning by increasing the frequency and quality of parent/carer-child interaction and communication through the specific programme activities and beyond. It is assumed that the training and support for parents/carers will provide parents/carers with the required knowledge, skills, and confidence to deliver the programme. The programme is scripted and should lead to parents/carers delivering it in a standard way again improving parent/carer confidence. The provision of books and activities provides families with learning resources and the range and variety of the books included should engage children in the activities. The intensity of the programme (20 minutes per day for five days a week) as well as the length of the programme (30 weeks) will lead to more sustained changes in home learning interactions. The support from nursery staff to parents/carers particularly in the early stages of the programme should lead to more sustained use of the programme.

The programme therefore expects to have the following impacts. Firstly, that parents/carers and their children engage with the PACT resources and materials at home. Secondly that families complete the structured learning activities in the home on a regular basis which increases parent/carer-child interaction and communication. The targeted activities provided by PACT which are specifically designed to foster language skills will directly improve the child's language and also foster a language rich communication environment in the home. The impact this has is that the home learning environment is enriched (by the provision of the PACT focused teaching and learning opportunities, the subsequent enriched communication in the home, having more resources, consistent behaviour, and improved parent confidence) and better parent/carer-child relationships. This should lead to the improvement of children's language skills which then allows the child better communication with the parent/carer and feeding back into the home learning activities and environment on offer. Ultimately this increased home learning environment and improved language development leads to improved school readiness for the child (including concentration and self-regulation) as well as improved early literacy skills during the first year of school. These improved school readiness and language skills then support the child's learning more and lead to further improvement in language, literacy, and communication.

The logic model presented in **Error! Reference source not found.** goes into more detail about the timeframe of the different steps of the programme and the associated evaluation activities to capture data to evidence the delivery and impact of each stage of the logic model.
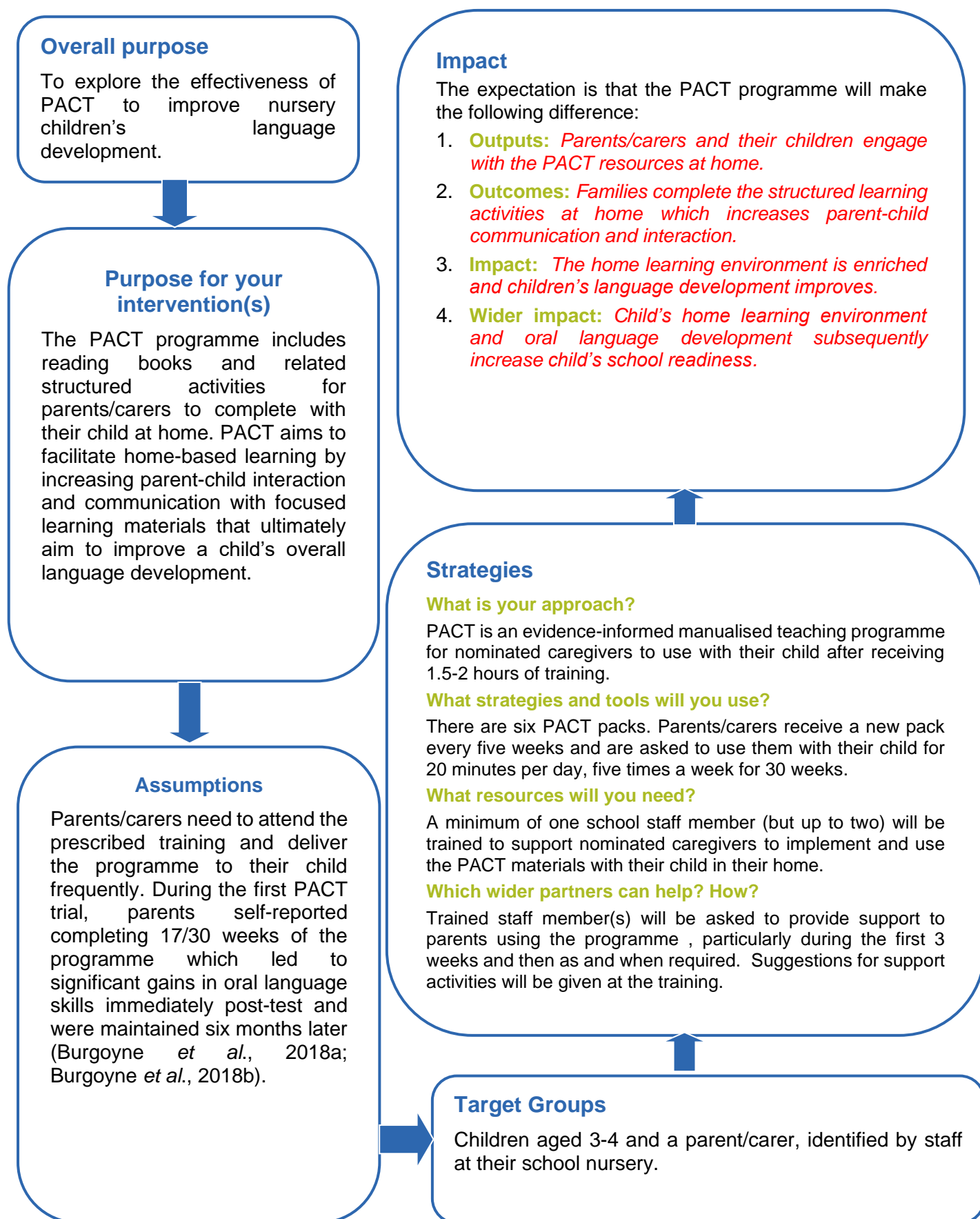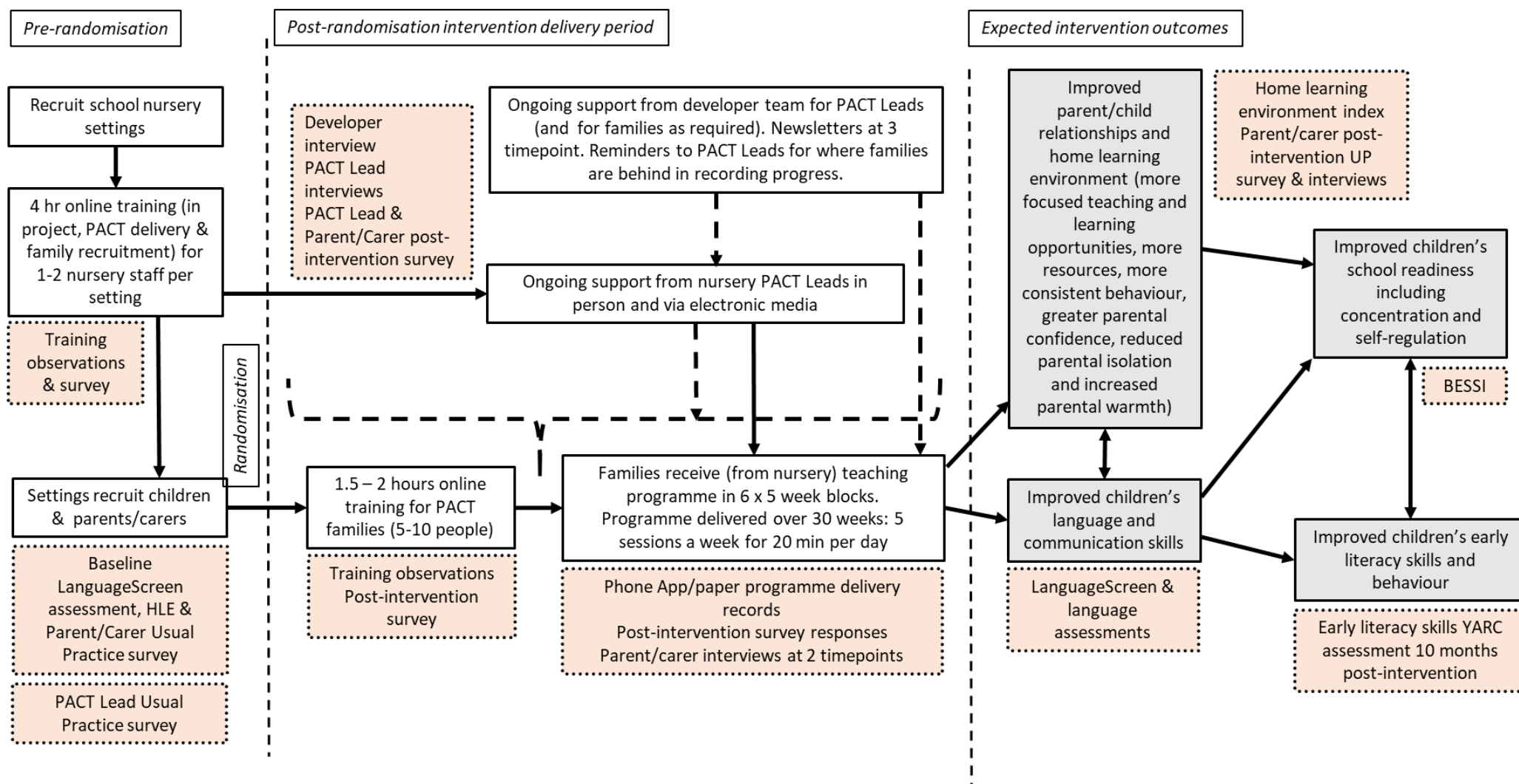
Overall purpose

To explore the effectiveness of PACT to improve nursery children's language development.

Purpose for your intervention(s)

The PACT programme includes reading books and related structured activities for parents/carers to complete with their child at home. PACT aims to facilitate home-based learning by increasing parent-child interaction and communication with focused learning materials that ultimately aim to improve a child's overall language development.

Assumptions

Parents/carers need to attend the prescribed training and deliver the programme to their child frequently. During the first PACT trial, parents self-reported completing 17/30 weeks of the programme which led to significant gains in oral language skills immediately post-test and were maintained six months later (Burgoyne *et al.*, 2018a; Burgoyne *et al.*, 2018b).

Impact

The expectation is that the PACT programme will make the following difference:

1. **Outputs:** *Parents/carers and their children engage with the PACT resources at home.*
2. **Outcomes:** *Families complete the structured learning activities at home which increases parent-child communication and interaction.*
3. **Impact:** *The home learning environment is enriched and children's language development improves.*
4. **Wider impact:** *Child's home learning environment and oral language development subsequently increase child's school readiness.*

Strategies

What is your approach?

PACT is an evidence-informed manualised teaching programme for nominated caregivers to use with their child after receiving 1.5-2 hours of training.

What strategies and tools will you use?

There are six PACT packs. Parents/carers receive a new pack every five weeks and are asked to use them with their child for 20 minutes per day, five times a week for 30 weeks.

What resources will you need?

A minimum of one school staff member (but up to two) will be trained to support nominated caregivers to implement and use the PACT materials with their child in their home.

Which wider partners can help? How?

Trained staff member(s) will be asked to provide support to parents using the programme , particularly during the first 3 weeks and then as and when required. Suggestions for support activities will be given at the training.

Target Groups

Children aged 3-4 and a parent/carer, identified by staff at their school nursery.

Figure 1. PACT Theory of Change Model

Figure 2. Logic model for PACT intervention and evaluation tools (orange boxes).

The figure contains the following elements:

Pre-randomisation

Recruit school nursery settings

↓

4 hr online training (in project, PACT delivery & family recruitment) for 1-2 nursery staff per setting

Training observations & survey

Randomisation

↓

Settings recruit children & parents/carers

Baseline LanguageScreen assessment, HLE & Parent/Carer Usual Practice survey

PACT Lead Usual Practice survey

Post-randomisation intervention delivery period

Developer interview
PACT Lead interviews
PACT Lead & Parent/Carer post-intervention survey

Ongoing support from developer team for PACT Leads (and for families as required). Newsletters at 3 timepoint. Reminders to PACT Leads for where families are behind in recording progress.

Ongoing support from nursery PACT Leads in person and via electronic media

1.5 – 2 hours online training for PACT families (5-10 people)

Training observations
Post-intervention survey

Families receive (from nursery) teaching programme in 6 x 5 week blocks. Programme delivered over 30 weeks: 5 sessions a week for 20 min per day

Phone App/paper programme delivery records
Post-intervention survey responses
Parent/carer interviews at 2 timepoints

Expected intervention outcomes

Improved parent/child relationships and home learning environment (more focused teaching and learning opportunities, more resources, more consistent behaviour, greater parental confidence, reduced parental isolation and increased parental warmth)

Home learning environment index Parent/carer post-intervention UP survey & interviews

Improved children's school readiness including concentration and self-regulation

BESSI

Improved children's language and communication skills

LanguageScreen & language assessments

Improved children's early literacy skills and behaviour

Early literacy skills YARC assessment 10 months post-intervention

Children and their Parents/Carers who are allocated to the control condition are from the same settings as the intervention families and will receive "business as usual" nursery practice and home learning activities as would usually be provided by the nursery if they were not taking part in the programme. Nursery staff are asked not to change their general teaching practice or activities based on the PACT training. Those allocated to the control group are incentivised to take part by receiving a pack of children's books costing roughly the equivalent cost of the PACT materials at the end of the intervention period on completion of the immediate post-testing. Based on the logic model and the underlying assumptions it is not expected that providing books without the associated materials and regular engagement with the books and the activities will impact on the children in the control group and won't affect the 11-month follow-up planned for the project or EEF's longitudinal follow-up.

Impact evaluation

Research questions

The research questions are focused on two time points:

- "Immediate post-testing" which takes place immediately after the intervention period when the children are aged 3-4 and still attending nursery.
- "Delayed post-testing" which takes place 11 months after the end of the intervention period when children are aged 4-5 and towards the end of their first year of formal schooling.

RQ1. What is the impact of the PACT intervention on language skills *immediately after the intervention period*, as measured by the LanguageScreen assessment? [Primary Outcome]

RQ2. What is the impact of the PACT intervention on language skills *11 months after the intervention period*, as measured by the LanguageScreen assessment? [Secondary Outcome]

RQ3. What is the impact of the PACT intervention on the specific language domains of receptive vocabulary measured by the British Picture Vocabulary Scale (BPVS), expressive vocabulary measured by CELF Preschool 2 Expressive Vocabulary subscale (CELF EV) and spoken language information and grammar measured by the Renfrew Action Picture test (APT Information, APT Grammar) *immediately after the intervention period*, using researcher-delivered assessments [Secondary Outcome]?

RQ4. What is the impact of the PACT intervention on the specific language domains of receptive vocabulary (measured by the BPVS)**,** expressive vocabulary (measured by CELF EV) and information and grammar in spoken language (measured by APT Information and APT Grammar) *11 months after the intervention period*, using researcher-delivered assessments [Secondary Outcome]?

RQ5. What is the impact of PACT on **school readiness** *immediately after the intervention period* measured using teacher-completed Brief Early Skills and Support Index (BESSI)? [Secondary Outcome]

RQ6. What is the impact of PACT on the **home learning environment** as measured using the parent/carer-completed Home Learning Environment Index (HLE) *at the end of the intervention period*? [Secondary Outcome]

RQ7. What is the impact of PACT on **early literacy skills** as measured *11 months after the intervention period* using the York Assessment of Reading Comprehension (YARC) assessment? [Secondary Outcome]

Research questions 1, 3, 5 and 6 will be investigated immediately following the intervention period at the end of nursery (immediate post-testing). Eleven months after immediate post-testing and the end of the intervention period, research questions 2,4 and 7 will be investigated while the participants are towards the end of their first year of formal school (delayed post-testing).

Design

Table 2. Trial design

Trial design, including number of arms		Two-armed multi-site randomised controlled efficacy trial
Unit of randomisation		Pupil (within nurseries)
Stratification variables (if applicable)		Pre-test completeness, site
Primary outcome	variable	Language Skills (measured by app)
	measure (instrument, scale, source)	LanguageScreen, latent variable combining raw subscale scores (Expressive vocabulary 0-24, Receptive vocabulary 0-23, Listening comprehension 0-16, and sentence repetition 0-14), school delivered LanguageScreen app
Secondary outcome(s)	variable	Specific language domain skills of expressive vocabulary, receptive vocabulary and spoken language information and grammar (measured by researcher delivered assessments)
	measure (instrument, scale, source)	[1] Clinical Evaluation of Language Fundamentals 2 UK (CELF-Preschool 2 UK) – Expressive vocabulary subscale, 0-20, researcher delivered assessment [2] British Picture Vocabulary Scale – 3 (BPVS-3), 0-168 (raw score), researcher delivered assessment [3] Renfrew Action Picture Test (APT), information score 0 – 29, grammar score 0-38, researcher delivered assessment
	variable	Early literacy skills
	measure (instrument, scale, source)	York Assessment of Reading for Comprehension (YARC) : [A] letter-sound knowledge core test raw score 0-17 researcher delivered assessment [B] early word reading test, raw score 0-30, researcher delivered assessment [C] sound deletion test, raw score 0-12, researcher delivered assessment
	variable	Home Learning Environment
	measure (instrument, scale, source)	Home Learning Environment Index (HLE), 0-49, parent/carer completed survey
	Variable	School Readiness
	Measure (instrument, scale, source)	Brief Early Skills & Support Index (BESSI), 0-30 (total score), survey completed by nursery key worker
	variable	Language Skills (measured by app)

Baseline for primary outcome (and language skills secondary outcome)	measure (instrument, scale, source)	LanguageScreen, latent variable combining raw subscale scores (Expressive vocabulary 0-24, Receptive vocabulary 0-23, Listening comprehension 0-16, and sentence repetition 0-14), school delivered LanguageScreen app at baseline
Baseline for secondary outcome (HLE)	variable	Home Learning Environment
	measure (instrument, scale, source)	Home Learning Environment Index (HLE), 0-49, parent/carer completed survey at baseline

The research design is the same as in the covid-impacted PACT-2 evaluation and is believed to be the best design balancing maximising the chance to detect the impact of PACT should it exist with a manageable intervention delivery model with a number of schools that the developer would be able to train and support. This research therefore uses a two-armed randomised controlled efficacy trial design delivered under ideal conditions with allocation at pupil level but with pupils nested within nurseries. Pupils will be allocated into one of two groups on a 1:1 ratio to:

- Intervention – pupils allocated to receive the PACT programme
- Control – pupils allocated to 'business as usual' plus equivalent incentive cost of materials (approximately £130) in books to parents/carers at the end of nursery

Randomisation will stratify so that there are equal numbers (where possible) of participants within schools as well as equal numbers assigned to intervention and control groups across the full sample. Stratification will also account for completeness of pre-testing so that participants who have not completed the pre-testing at the time of random allocation are balanced between the intervention and control groups.

The within-school randomised design has recognised limitations, particularly relating to the potential risk of contamination between the groups. In the PACT-2 trial we had concerns that the PACT materials could be passed between parents/carers from those in the intervention group to those in the control group or control parents could be given PACT materials through an administration error. However, we have evidence from parent surveys in the PACT-2 trial that it was rare for control parents to have used any PACT materials (5% of 165 control group survey respondents) and unusual for parents to even have seen the PACT materials (14% of 165 control group survey respondents). The accompanying activities and resources that go alongside the books are mostly single use and are therefore not useful to be shared with other parents/carers after completing them. The potential for nursery staff training in the PACT materials and techniques to change their practice and classroom delivery for all children (including control children) thus diluting the effects of the PACT programme was also considered. The developer believes that while the training is needed for the effective running on the research project and the delivery of the materials the training for nursery staff is focused on the theory of the programme and how best to support parents/carers in its delivery, none of which is expected to create new knowledge significant enough to influence classroom-based practice. In fact, in PACT-2 trial, when the PACT Leads after the initial training were asked, whether they were already familiar with the strategies presented at the training, 97% of them replied they were familiar with all or most of them. With the data from PACT-2 and following the discussions and reassurances from the developers and EEF, the evaluation team deemed the risk of contamination to be low and out-weighed by the advantages of the within-setting design providing greater power and a lower minimum detectable effect, than a between-setting design. The evaluation team will work with the developers to make sure that consistent and clear messages are being communicated at both school and parent/carer recruitment stages to mitigate risk of potential contamination between the intervention and control group.

The primary outcome for the trial is language skills as measured by the LanguageScreen app which will be delivered to children by staff in the nursery settings. This measure was used as the primary outcome measure in the PACT-2 trial after covid disruptions meant that researcher delivered face-to-face assessments were not possible. Secondary outcomes in this trial will be language skills as measured by face-to-face researcher delivered standardised assessments as planned in PACT-2 and as used in the Burgoyne *et al* (2018b) initial trial of PACT. This will allow us to investigate whether the LanguageScreen measure is sensitive to picking up the different elements of language skills and also capture grammar scores not measured by LanguageScreen. Secondary outcomes will also include language skills (captured by LanguageScreen and standardised researcher delivered language assessments) and early literacy skills measured 12 months after completion of the intervention delivery period. Further secondary outcomes which explore the expected outcomes specified by the logic model are Home Learning Environment (measured by the Home Learning Environment index completed by parent/carers) and a measure of school readiness completed by nursery staff at the end of nursery.

As in PACT-2, pre-test data will be collected at the start of the project on some of the outcome measures. The collection of pre-test assessment data from pupils will reduce the minimal detectable effect size and increase the power of the trial. The use of the LanguageScreen assessment both before the randomisation and again at the two post-testing time points will provide the strongest pre-post- test correlation (and greatest power to detect an effect). Home Learning Environment data will also be collected pre-test and immediate post-test.

Randomisation

Randomisation will be completed independently by the trial statistician who has no involvement in the recruitment of schools or parents/carers using R and a pre-written code. The statistician shall receive information relevant to the randomisation protocol using only the participant ID codes so will not be able to identify participants.

All participating children will be allocated into one of two groups (intervention or control) on a 1:1 ratio and so that there are equal numbers in the intervention and control groups within each setting. Randomisation will be done in one batch following the pre-testing period. The aim is that all participants will have completed the LanguageScreen assessment in advance of the randomisation date. However, should some participants not have completed the assessment in advance of this date but the school feels they would be able to assess the child in the next few days (before receiving the results of the allocation) or the school has attempted the assessment but the child has been uncooperative, these children will be included in the randomisation but will be stratified based on pre-test status. This will allow there to be a balance of children who haven't completed the pre-test between the intervention and control groups should there be a non-random reason for why these assessments haven't been completed. It was necessary to introduce stratification based on pre-test status rather than delaying randomisation until after assessments had been complete due to the tight timeframe for fitting the 30-week programme into the school year and the pre-specified dates for parent/carer training.

Whilst randomising based on pre-test scores would be desirable, it is not possible due to timing of the pre-test assessments, the required data entry time and delivery of the PACT programme requiring the majority of the academic year (30 weeks). The randomisation strategy will ensure that all the individuals in the study will be split into control and intervention groups of equal size, and that the 1:1 ratio of allocation to intervention and control group will also hold approximately amongst individuals of the same pre-test status within each school. Individuals additional to the original number of pupils have an equal probability of assignment to each group, and the control/intervention assignment cannot influence the choice to recruit additional individuals.

The statistician will return to the evaluation team the spreadsheet of participant IDs with their random allocation results. The team will then match the participant IDs back to the participant names and will inform the developer of participant allocation, who will relay this information to schools and

parents/carers by post in the week following randomisation. They will not inform schools of the allocations until 3 days after receiving the randomisation results to enable schools to finish completing assessments. As the developers are tasked with the collection and entry of some post-test data, best practice would have been to blind them to pupil allocation to reduce the introduction of bias; however, this it is not feasible as it would prevent the delivery of the intervention under ideal conditions. We discuss this further in later sections.

Participants

Schools

For this PACT-3 trial a target of recruiting 50 schools was agreed (an increase from the 400 pupils across 40 schools required to power the analysis in PACT-2). Fifty schools is the maximum number of schools that the developer would be able to support in the delivery of the intervention and recruiting additional schools would help minimise the risk that attrition could have on the trial, particularly in this time of uncertainty for schools and with the high levels of attrition found in the developer's previous trial (24% Burgoyne *et al.*, 2018b) and in other EEF funded early years trials.

At the end of the school recruitment phase (June 2021) the developer team had initially recruited 48 schools to the PACT-3 trial who had completed the Memorandum of Understanding and Data Sharing Agreements as well as the PACT Lead training. However, five schools struggled to meet the minimum family recruitment number of four families and have therefore withdrawn from the project before randomisation. The trial has moved forward with 43 schools participating. We have had feedback from settings about pupil intake into the nursery being lower-than-normal, and difficulties in building up relationships with families prior to the child starting in nursery due to continued Covid-19 restrictions. Both elements have impacted on them being able to recruit families in the tight trial timeframe.

To reduce the burden of recruitment of new settings and deliver to the desired timescale, the trial initially aimed to recruit nurseries from the PACT-2 trial that would like to be involved again with their new 3- to 4-year-old cohort. This is a completely different sample of children but may include the same PACT Lead and school staff. The opportunity to be involved in the new PACT-3 trial was also offered to the nurseries in the new schools we recruited to the PACT-2 project (i.e., those schools where children moved to when transitioning to Reception and where their only previous PACT-2 involvement was in assessing participants at the end of reception). These schools had not had any prior involvement in delivering PACT.

Like in the PACT-2 trial, recruitment focused on areas of higher-than-average deprivation and worked closely with Early Years teams in four Local Authorities with high levels of deprivation who were supportive of the project to recruit additional schools from the area.

For PACT-3, inclusion criteria for schools includes nurseries which are administratively part of a school setting for the new trial to minimise the risk of attrition at delayed post-test. Other inclusion criteria remain the same as PACT-2 with eligible schools being:

   a) State funded
   b) Located in areas with high scores on the Indices of Multiple Deprivation (including Warrington, Bolton, Rochdale, Lancashire, Tameside, and Blackpool)
   c) Schools which agree to all study requirements outlined in the Memorandum of Understanding (MoU) which describe their commitment to the delivery of PACT and participation of a minimum number of families (n=4) to the trial and administration of measures
   d) Agreeing and signing a project specific Data Sharing Agreement (DSA)

Each school is responsible for nominating at least one (but up to two) staff member(s) to become the 'PACT Lead' and manage the school and parent/carer's participation in the trial. The staff member(s) will be required to attend one of two available 4-hour online training sessions run by the developers at Manchester University in May 2021. Staff are not required to cascade training to other staff members within the school, except in circumstances where the staff member leaves during the trial and therefore

needs to handover responsibility to another member of staff in the school. This can also happen in cases where schools have two nominated PACT Leads but only one attends the training. Staff training is considered an integral part of the programme; therefore, if a school does not attend training, they will be withdrawn from the trial prior to randomisation.

Whilst staff time for training will not be reimbursed, all schools will receive £500 as compensation for such expenses incurred to participate in the trial, including resourcing to complete trial paperwork, recruitment of parents/carers, coordinating assessment delivery at pre and post-testing. Schools receive this payment in two instalments, £250 at the end of nursery and £250 at the end of the trial from the developer team. This £500 payment is expected to promote retention of settings throughout the trial, often an issue within early years' trials. Schools will also receive an additional incentive to complete the LanguageScreen assessments based on the number of assessments they complete of £10 CosyDirect vouchers (early years equipment store) per pupil assessed at each time point. This reflects the additional time burden that conducting these assessments has for schools at 20 minutes per pupil.

Schools will be requested to provide specific data on participating pupils including their Unique Pupil Number (UPN), Early Years Pupil Premium (EYPP) status, nursery attendance data and school destination data.

A number of children are expected to move to schools not signed up to the project when they transition from nursery to school (reception). By initially recruiting only nurseries which are part of schools it is aimed to minimise the number of children who move. Where children do move, to incentivise these new schools to allow and facilitate data collection about the participating children, these schools will be offered £100 in vouchers for Early Years School Equipment per child they assess with LanguageScreen.

Children and families

The project targeted at least 10 families (child and a parent/carer) from each nursery setting with a minimum of 4 children recruited per school for the school to stay involved in the trial. Schools were responsible for promoting the project to parents/carers. Schools were asked to aim to recruit families in July 2021. For some families, children may already have been attending the nursery, however it was expected that many children would be attending the setting for the first time in September 2021 and establishing relationships with new families may be difficult. The recruitment period was therefore also extended into September 2021 to allow schools time to communicate with new families. School staff were requested to provide trial information (developed by the evaluation team and the developers) to all parents/carers of children who are three or due to turn three years old by September 2021, are pre-registered to start nursery in September 2021 and meet the inclusion criteria. Schools were advised of the requirements for the project.

Inclusion criteria for families to take part in the project are:

a) The child must be 3 or 4 years old by September 2021 and attending nursery in the year before starting school (reception) and signed up to attend the participating nursery
b) Parent/carer(s) must be able to access the resources by having a basic level of English.
c) that the family does not have more than one child in the target year group
d) that the child does not have a suspected or diagnosed developmental or learning difficulty
e) that the family did not take part in a previous PACT trial

Schools will be asked to provide data on how many eligible parents/carers within each nursery were approached to take part which will be collected by the evaluation team in the PACT Lead usual practice survey. The schools will support the completion and collection of parent/carer participant agreement forms. The parent/carer participation form will request parents/carers to provide their child's personal data, including their name, date of birth, sex, school, address, nursery attendance information and if English is the main language spoken at home (and if not what the main language spoken at home is). Schools will return hardcopies of the participation form to the developers, who will in turn provide scanned copies to the evaluators alongside a spreadsheet of pupil-level information. Nurseries will be requested to aim to recruit around 10 parents/carers to the trial, with no maximum limit assuming

eligibility criteria is met. Nurseries who do not recruit a minimum of four parents/carers will be withdrawn prior to randomisation.

The parents/carers will be informed of their random allocation (intervention or control) by letter given to them by the nursery, sent by the developers. Parents/carers allocated to the control group will be informed when they will receive the equivalent incentive cost of materials (approximately £130) in books (completion of the immediate post-test) and those in the PACT group will be informed about the next steps within the trial. Parents/carers assigned to the PACT group will be required to attend a 1.5-2-hour online developer-led training session. A variety of training dates and times spanning weekday mornings, afternoons, and evenings and weekends will be offered to parents/carers. If caregivers are unable to attend developer-led training, they will receive the training session by the PACT Lead within the nursery or a recording of the online training session followed up by contact by the nursery PACT Lead. Parents/carers who do not attend any form of training will not receive the intervention, but their child will be assessed (assuming parental/carer permission to do so remains in place). Parents/carers will receive a £10 voucher each time their child is assessed.

While the project aimed to recruit at least 10 families from each nursery setting only 372 children have been recruited and randomised in the trial (mean of 8.7 per setting). Settings found recruiting families more difficult than expected and the project extended the recruitment deadline to later in September and worked with settings to encourage greater family recruitment. Although this was significantly short of the target of 500 participants, it was agreed by the EEF, the developer team and the evaluator team that it was still worth proceeding with the trial as the minimal detectable effect size in sample size calculations was still similar to the effect size found in the Burgoyne *et al* (2018b) PACT trial (see sample size section below).

Sample size calculations

Table 3: Sample size calculations

		OVERALL		EYPP
		At Design	**At randomisation**	
Minimum Detectable Effect Size (MDES)		0.18	0.21-0.22	0.72
Pre-test/ post-test correlations	level 1 (pupil)	0.60	0.60	0.60
	level 2 (class)	-	-	-
	level 3 (school)	-	-	-
Intracluster correlations (ICCs)	level 2 (class)	-	-	-
	level 3 (school)	0.1	0.1	0.1
Alpha[2]		0.05	0.05	0.05
Power		0.8	0.8	0.8
One-sided or two-sided?		Two-sided	Two-sided	Two-sided
Average cluster size		10	8 – 9	-
Number of schools[3]	Intervention	-	-	-
	Control	-	-	

[2] Please adjust as necessary for trials with multiple primary outcomes, 3-arm trials, etc., when a Bonferroni correction is used to account for family-wise errors.
[3] Please adjust as necessary, e.g., for trials that are randomised at the class level.

		OVERALL		EYPP
		At Design	**At randomisation**	
	Total	50	43	
Number of pupils	Intervention	250	186	
	Control	250	186	
	Total	500	372	

As described in the participants section above it was originally agreed to aim to recruit 50 settings which was the maximum capacity that the developer team could deliver the PACT programme to and to aim for 10 participants per setting (close to the 9.5 mean participant per setting we had achieved in the PACT-2 trial). Sample size calculations were therefore originally calculated based on these figures. The sample size calculations were done using Optimal Design software and they reflect a within school multi-site randomization design. Our calculations assumed a 5% Type 1 error, 80% Power, 10% intra-school correlation, 60% pre-post-test correlation and used a 2 sided test. The intra-cluster correlation of 10% is based on the average value observed in EEF trials (Xiao *et al.*, 2016). The pre-post-test correlation value is that found in Burgoyne *et al.* (2018b) in a previous trial of the PACT intervention which used very similar language outcome measures to our primary outcome over the same period of time. Based on these assumptions, this sample size would detect a minimum difference of 0.18 standard deviation between the PACT and the control group (scenario 1a in Table 4 below).

However, as it wasn't possible to recruit the target numbers to the trial, investigations into how the minimal detectable effect size (MDES) varied were carried out into varying the recruitment assumptions in table 3 below, in particular the number of participating schools and number of pupils within schools. With 43 schools and a mean of between 8 and 9 participants per school and the same assumptions as above, it should be possible to detect a minimum effect size of between 0.21 and 0.22 (scenario 3a). As these were the numbers randomised, this is the scenario included in table 2. Burgoyne *et al.* (2018b) found an effect size of 0.21 at immediate post-test using a latent language variable measuring similar language skills as proposed in this retrial and a greater effect size at delayed post-test. This trial is powered to detect a very similar effect size at immediate post-test.

Table 4 below also explores varying the pre-post-test correlation to look at the potential impact of not including a baseline assessment (scenario c with Pre-post correlation of 0) or including a less correlated measure in the analysis (scenario b with Pre-post correlation of 0.3). Investigation of these figures led us to the decision that it was necessary to include a well correlated covariate in the analysis and that using the same assessment at pre-test gave the trial the power necessary to detect the level of effect size found in the previous Burgoyne *et al.* (2018b) trial.

Table 4. MDES using a variety of pre-post-test correlation assumptions and varying recruitment levels of schools and pupils

Scenario	Significance level (α)	Power (1—β)	Effect size variability estimate	Pre-post correlation (R²)	ICC	no pupils per school (n)	MDES if 43 schools (J)	MDES if 44 schools (J)	MDES if 45 schools (J)	MDES if 48 schools (J)	MDES if 50 schools (J)
1a	0.05	0.8	0.05	0.6	0.1	10	0.20	0.19	0.19	0.18	0.18
1b	0.05	0.8	0.05	0.3	0.1	10	0.25	0.25	0.24	0.23	0.22
1c	0.05	0.8	0.05	0	0.1	10	0.29	0.29	0.28	0.27	0.26
2a	0.05	0.8	0.05	0.6	0.1	9	0.21	0.20	0.2	0.19	0.19
2b	0.05	0.8	0.05	0.3	0.1	9	0.26	0.26	0.25	0.24	0.23
2c	0.05	0.8	0.05	0	0.1	9	0.31	0.30	0.29	0.28	0.27

3a	0.05	0.8	0.05	0.6	0.1	8	0.22	0.21	0.21	0.2	0.2
3b	0.05	0.8	0.05	0.3	0.1	8	0.28	0.27	0.26	0.25	0.25
3c	0.05	0.8	0.05	0	0.1	8	0.33	0.32	0.31	0.29	0.29
4a	0.05	0.8	0.05	0.6	0.1	7	0.23	0.22	0.22	0.21	0.21
4b	0.05	0.8	0.05	0.3	0.1	7	0.29	0.28	0.26	0.25	0.25
4c	0.05	0.8	0.05	0	0.1	7	0.34	0.34	0.32	0.31	0.31

EYPP

This trial is not powered to detect an effect size on the sample of children who are eligible for Early Years Pupil Premium (EYPP) and schools have not been able to share information on the EYPP of children in the sample so far. It is planned to collect this data in June 2022 at the end of the nursery year. The current figures for the EYPP sample in Table 3 above are anticipated numbers calculated (in optimal design software) based on the assumption of 16% EYPP pupils, as was the percentage of EYPP children in PACT 2. This table will be updated once data will be available.

Outcome measures[4]

Baseline measures

LanguageScreen Assessment

As described in the sample size section, to provide adequate power to the research it is necessary to use a baseline measure which correlates well with the primary outcome. This study is using the same language skills assessment at baseline as for the primary outcome. This gives the best chance for a good correlation between baseline and immediate post-test. The LanguageScreen assessment will therefore be used with all participants in September 2021 before randomisation. The LanguageScreen assessment is delivered in school by a member of school staff using an app. As children will not be allocated to intervention or control groups at the time of this assessment there can be no risk that knowledge of allocation will bias whether this baseline assessment is collected or how the assessment is delivered. Schools will be incentivised to conduct this assessment by receiving a voucher worth £10 per pupil assessed in their school after data collection. Further details on LanguageScreen, the justification for using it within the trial and how the assessment is delivered are included in the Primary Outcome section below.

Home Learning Environment

As described in the logic model the PACT intervention is expected to work by improving the home learning environment of the child participating, helping parents to provide a greater number of home learning opportunities and the confidence and tools to support their child's learning. The **Home Learning Environment Index** (HLE; Melhuish *et al.,* 2008) was developed as part of the EPPE study and has been used in several large studies including the Millennium Cohort Study, National Evaluation of Sure Start (NESS) and a study of the Home Learning Environment by the Scottish Government (Melhuish, 2010). The HLE asks parents/carers to report the frequency of seven routine activities which are conceptually linked to learning (including being read to, going to the library, playing with numbers, painting and drawing, being taught letters, being taught numbers and songs/poems/rhymes). These seven items were positively linked with predicting under and over achievement at aged 5 (Melhuish *et al.*, 2008). Frequency of the seven activities is coded on a 0 to 7 scale and gives a total score of between 0 and 49. Previously, this index was used in surveys conducted over the phone, however, for this PACT trial (and for PACT-2), the questions will be added to the usual practice survey for parents/carers at the beginning of the trial and immediately following the intervention period (i.e., during the immediate post-testing period) as was done for the PACT-2 trial. This data will be collected by an online survey link sent to parents/carers email addresses before randomisation and where no response is returned online (or where no email address is available) a paper copy of the survey will be sent to the home address of the family including a stamped addressed envelope for the return of the survey. The Home Learning

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[4] Please see the Statistical Analysis Guidance.

Environment is a secondary outcome, and the baseline measure will be used as a covariate in the secondary outcome analysis. A copy of the questions used in the HLE are included in appendix 2.

Primary outcome

The primary outcome will be language skills as measured using the LanguageScreen assessment (delivered by OxEd Assessment: https://oxedandassessment.com/language_screen). Improved language skills including improved vocabulary and other language skills is one of the key outcomes that PACT aims to improve, and improvement have been shown to a language skills latent variable outcome in the previous trial of PACT (Burgoyne *et al.,* 2018b). Specific use of LanguageScreen as the primary outcome in this trial is for a number of reasons. Firstly, LanguageScreen measures four aspects of language skills giving a broad measure of language skills and two subscales are specifically aligned to the intervention's particular focus on vocabulary. Secondly, the measure is delivered by school staff in the classroom and doesn't require external researchers to be able to visit the school. With varying and ongoing covid-19 restrictions this seems to give a good likelihood of being able to collect data even if researchers would be unable to visit the schools. Thirdly, as it is delivered by school staff and schools are incentivised to assess children then it is hoped that there may be less attrition due to children being absent on the day of assessment. LanguageScreen has been used to collect assessment data in PACT-2 and in participating schools there has been a high response rate.

LanguageScreen is a standardised app-based assessment which is delivered by a member of school staff. The LanguageScreen assessment (delivered by OxEd assessment: https://oxedandassessment.com/language_screen) is made up of four subtests: Receptive Vocabulary (23 items where the child chooses which of 4 pictures matches a spoken word (raw score range 0-23)), Expressive Vocabulary (24 items asking the child to name pictures (raw score range 0-24)), Listening Comprehension (listening to 3 stories each followed by a series of questions about the story tapping understanding – 16 items (raw score range 0-16)) and Sentence Repetition (14 items repeating verbatim a series of spoken sentences (raw score range 0-14)). It is administered using an app on a tablet by a member of staff in the child's school. Full instructions are included within the app for the delivery of the assessment without the need for training. Verbal instructions and items for the child are played aloud through the app. This should minimise variability in the delivery of the assessments across all the settings. The four assessments are presented in a set order and take around 25 minutes to complete. The assessment administrator marks on the app whether the child answers correctly or not for questions where the child gives a verbal answer. Data from the app is uploaded to the LanguageScreen website automatically and results are generated automatically by LanguageScreen. A standardised and raw score for each subtest as well as overall raw and standardised scores are provided. We will use a latent variable formed from the four subtests standardised scores as described in West *et al.* (2021). The primary outcome measure will therefore be a latent variable created using LanguageScreen subscale scores at immediate post-test.

LanguageScreen assessment scores correlated strongly (r=.95) with a latent variable created from scores on standardised researcher-delivered measures (CELF-Preschool – Expressive Vocabulary subtest and APT information and grammar scores as well as CELF-Preschool Recalling Sentences) in a previous study of more than a thousand participants (West *et al.*, 2021). This gives a strong indication that the LanguageScreen assessment is measuring the same constructs as the latent variable in the West *et al.* study and in the previous PACT trial (Burgoyne *et al.,* 2018b) and should be a good measure for this research given the similarity of assessments.

Schools will deliver LanguageScreen using the LanguageScreen app on a tablet or large phone. The app guides the assessment, reading aloud all the questions and text. The adult in the school supporting the assessment delivery, decides whether the child has responded correctly or incorrectly and presses the appropriate button. There is guidance in each section for the adult delivering the assessment. Assessors using the app will be encouraged to use a practice code to do a run through of the assessment in advance of assessing any children. The assessment takes between 10 and 20 minutes

to complete for each child. It will not be possible to blind the assessor to the intervention allocation of the child, therefore there is the potential for bias in the completion of the assessments. The app delivery of the assessment is very structured and leaves little room for varying the delivery of the assessment, so we expect potential bias to be minimised. A secondary outcome for the trial uses researcher-delivered standardised assessments conducted by researchers who will be blinded to the allocation of the child. Sensitivity analyses will be conducted to investigate differences on language scores through LanguageScreen and those collected by blinded researchers visiting the schools.

For the delivery of LanguageScreen, the developer team will prepare the data for the participating pupils and do initial communication with schools about the upcoming assessment period. The evaluator team will upload all the pupil information into the assessment software and will liaise with schools during the testing period to support their delivery of LanguageScreen. Should schools have difficulties with accessing the LanguageScreen assessment on their hardware the evaluation team will be able to courier tablets to schools for schools to conduct the assessments.

Secondary outcomes

Language skills at delayed post-test
Participants will be assessed again at delayed post-testing 11 months after the intervention delivery period using the LanguageScreen assessment again. The LanguageScreen data will be collected in the same way as in the primary outcome and the same latent variable will be used in the analysis. There is the potential for less bias as the staff delivering the assessment when the child is in reception is less likely to know whether the child received the PACT intervention or not. In the previous Burgoyne *et al.* (2018b) trial of PACT larger effect sizes were found on language skills at delayed post-test, and we are testing the hypothesis that the same will be found in this trial. This would indicate that the PACT intervention has lasting effects on children's language skills if the same finding was found in this trial.

Specific domains of language skills
LanguageScreen subtests scores of Receptive Vocabulary, Expressive Vocabulary, Listening Comprehension and Sentence Repetition as collected at immediate and delayed post-test will be used as individual secondary outcomes. The logic model expects that PACT will impact on the whole language skills of the child however different programme activities are targeted towards specific language domains including listening comprehension, vocabulary, narrative skills and sentence level language skills. The standardised subtest scores of each domain of Language Skill will therefore be used to investigate whether there is a greater improvement in these specific domains of language skill.

Researcher delivered Language Skill Measures
The raw scores on three measures of language skills in the domains of expressive vocabulary, receptive vocabulary and spoken language information and grammar, delivered by researchers face-to-face in schools, will be used to investigate impact in these specific domains of language skill as well as to triangulate with the primary outcome measure and to investigate whether the school delivery of LanguageScreen introduces bias due to knowing the assignment of the child being assessed:

(a) The British Picture Vocabulary Scale – 3 (BPVS-3), is a standardised measure of receptive vocabulary appropriate to 3-year-olds up to adult. The programme activities specifically target vocabulary learning and involve increased exposure to a variety of books and resources. This measure consists of a set of pictures from which the child is asked to point to the picture representing a given word. This assessment gives a raw score between 0 and 168.

(b) The Clinical Evaluation of Language Fundamentals Preschool 2 UK (CELF-Preschool 2 UK) expressive vocabulary subscale score. CELF-Preschool 2 UK provides a measure for expressive and receptive language skills in young children. This is a standardised and validated assessment with the proposed age group and UK sample and has been used in previous studies to look at the impact of PACT (Burgoyne *et al.*,2018b) as well as other EEF

funded Early Years Studies (e.g., https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/easypeasy-learning-through-play). This assessment gives a raw score between 0 and 20.

(c) The Renfrew Action Picture Test (APT) is a standardised test that requires children to give samples of spoken language in response to picture stimuli. The test considers grammatical structures used and the expressive vocabulary used. The test is suitable to use with children between the ages of 3 and 8 and provides normed scores. It is quick and simple to administer and inexpensive to purchase. This assessment provides two scores – information score (range 0-29) and grammar score 0-38. The grammar aspect of this assessment is not captured by the primary outcome LanguageScreen and is another aspect of language skills we feel is important to capture for this trial.

These assessments will be conducted at immediate post-test right after the intervention delivery period and at delayed post-test 11 months later.

The delivery of these researcher delivered measures will be the responsibility of the developer team who will recruit and provide training to a team of Research Assistants (RAs) to collect this assessment data. Training for RAs will consist of an off-site training session day plus additional on-site training where the RA observes the delivery of two assessments by the developer and then the developer observes the delivery of the assessment by the RA. The evaluator team will quality assure the delivery of an audio-recorded practice assessment by each RA before any onsite visits. This will involve assessing the delivery of each assessment according to a pre-agreed protocol and providing feedback to the developer team for each RA on the quality of the assessment delivery. Both the evaluator quality assurance and the onsite observation of each RAs first assessment will quality control delivery and allow immediate feedback to be given to RAs if required.

The RAs will be blinded to the allocation of the child. The assessments will be conducted in the pre-specified order of BPVS, CELF-Preschool 2 UK expressive vocabulary and the Action Picture Test and will take approximately 15-20 minutes to complete per child. Parents/carers will be asked to give permission for the RA delivered assessments to be audio recorded. All RA delivered assessments, where permission has been given, will be audio recorded for the evaluation team to perform quality assurance on 10% of the assessments carried out by the RAs, and all of the assessments carried out by the developer team. Raw data scores will be securely transferred to the evaluation team for independent analysis.

Early literacy skills

Early Literacy Skills (measured at the 11-month post-intervention delayed post-test) will involve measures of letter-sound knowledge, early word recognition and Sound Deletion (from the YARC Early Reading assessment). For the Letter-Sound Knowledge test the child is presented with lower case letters and digraphs, one at a time, and is required to say what sound the letters and digraphs make. The core test of letter-sound knowledge will be used giving a raw score of between 0 and 17. For the Early Word Recognition test the child is shown up to 30 words graded in difficulty and asked to say what the word is, giving a raw score of between 0 and 30. For the Sound Deletion test, the child hears a word (and sees a picture of the word), and is asked to repeat the word with a sound taken away. The test consists of 12 items and the child is given a raw score from 0 to 12.

In the previous trial of PACT the largest effect sizes were found at delayed post-test on these measures which are indicators of early literacy skills rather than the pre-literacy language skills measured by the other outcomes.   The York Assessment of Reading Comprehension (YARC) Early Reading assessment is a standardised and validated measure of alphabetic knowledge, single word reading and phoneme awareness skills and is particularly appropriate for use in the 4 to 6 year old age group. This assessment will only be used at delayed post-test as the assessment material is not relevant before this stage. This measure aligns with the logic model with the expectation that improved language skills and school readiness will lead to improved early literacy skills. These assessments will be conducted

by the same research assistants at the same time as administering the researcher-delivered language skills assessments at delayed post-test. The RAs will be blinded to the trial allocation of the child. This data will be collected by the developer team and transferred to the evaluation team via secure file transfer. The developer team will be responsible for the marking of the data, but this will be conducted blind to the participant and trial allocation.

School Readiness

The Brief Early Skills & Support Index (or BESSI) questionnaire (measured at the immediate post-test) (Hughes *et al.*, 2015) will be used to evaluate school readiness which is expected to improve as a result of the PACT programme. BESSI is a standardised 30 item questionnaire which assesses how well children are making the transition to school. This questionnaire has been developed and validated for reception and nursery children. Questions are to be answered for an individual child to reflect the child's behaviour over the previous week and statements are answered on a four point strongly agree to strongly disagree scale. This scale contains 4 subscales measuring Behavioural Adjustment (12 items), Language and Cognition (6 items), Daily Living Skills (6 items), and Family Support (6 items). This study will use each of these subscales separately.

For the delivery of BESSI, school PACT Leads will be emailed a link to an online survey which should be completed for all the participating students in their settings. They will be asked that a member of staff who knows the child completes the BESSI for that child (ideally the child's keyworker). For settings that have difficulties accessing the online survey, a paper copy will be provided that they can copy for each pupil and return by post. Instructions for completing BESSI will be sent at the same time as those for LanguageScreen at immediate post-test.

Home Learning Environment

The Home Learning Environment Index (HLE; Melhuish *et al.,* 2008) described above in the Baseline Measures section will be collected at immediate post-test as part of the post-intervention usual practice surveys. Surveys will be distributed to parents/carers via email addresses in the first instance or to home addresses if the parent has not provided an email address. A prize draw incentive of four Amazon vouchers will be included to encourage participation in these surveys.

Compliance

Parents/carers in the PACT intervention group will be asked to record their delivery of each of the PACT sessions by completing the PACTApp on their phone/tablet. This app records whether each intervention session was delivered, the date that the sessions are completed and whether they enjoyed the session. If any parents/carers have difficulties with being able to download or use the app they can complete paper record forms. These forms will be returned to the school PACT lead who will return any paper forms to the developer team who will in turn share these forms with the evaluator team. For the CACE analysis we will use the total number of PACT sessions completed by each intervention participant. This will be a figure between 0 and 150.

We will also collect data in the parent/carer post-intervention survey about which PACT books they have read in order to cross-check with the app data. In PACT-2, our survey data suggested that the app/record form data was likely to be an underestimation of the number of sessions completed. Survey respondents in PACT-2 indicated that they often forgot to record their progress on the app and comparing survey data with the app/record form data indicated that participants may have continued with PACT for an average of around 2 more weeks than indicated by the app/record form data.

Analysis

A detailed statistical analysis plan (SAP) will be produced before any analysis of impact evaluation data. The primary outcome and secondary outcomes will be analysed using the principles of intention to treat, meaning that all schools and pupils will be analysed in the group they were randomised to, irrespective

of whether or not they actually get the PACT programme. Statistical significance will be assessed at the 5% level. Point estimates and 95% confidence intervals will be provided as appropriate.

The primary outcome considering a latent language variable derived by combining 4 variables from scores on LanguageScreen sub-tests (1. Expressive vocabulary, 2. Receptive vocabulary, 3. Listening comprehension, 4. Sentence repetition) will be analysed on a continuous scale using a confirmatory factor analysis model. The pre-test LanguageScreen language latent variable (formed from the assessment collected at pre-test) will be used for baseline adjustment using ANCOVA model. The effect size and its confidence/credible intervals will be estimated as standardised factor loadings from confirmatory factor analysis models. The previous PACT trial described in (Burgoyne *et al.*, 2018b) was investigated with a similar approach. This modelling approach enables estimation of impacts of PACT across the different domains of language skills as measured by the latent outcome. It assumes that the language skills may be better assessed as a latent construct that uses shared variance of the sub-tests and can reflect important elements of language skills that may be difficult to measure relying on observed variables. Sensitivity analysis will be performed using multilevel structural equation modelling to test whether the estimated effects of the intervention are constant across schools. Missing data in the pre-test and outcomes measures will be accounted for using full information maximum likelihood estimation techniques (Cham *et al.*, 2017).

All non-latent variable secondary outcomes will be analysed using multilevel models with school and school-by-intervention as random effects. The effect size and the associated confidence/credible intervals will be calculated using conditional variance of the outcome data to ensure consistency of results with the latent variable model, where the confidence/credible interval for the effect of the intervention will be based on conditional variance. The immediate (HLE, BESSI, BPVS, CELF-2 Preschool Expressive Vocabulary, APT) and delayed impacts (HLE, LanguageScreen, BPVS, CELF-2 Preschool Expressive Vocabulary, APT, YARC) of the PACT intervention on the secondary outcomes will be analysed using a multilevel model accounting for intra-school correlation.

All the outcome data will be analysed by Early Years Pupil Premium (EYPP) eligibility using an interaction model. Effect size for pupils eligible for EYPP will be reported in accordance with EEF requirement.

Implementation and process evaluation[5]

Research questions

RQ1. **Implementation: fidelity and adaptation.** To what extent was the PACT programme delivered as intended? What were the barriers and facilitators to delivering the programme with fidelity? To what extent were there adaptations to the programme?

- PACT Lead training
- Parent training
- Sessions delivered by parents
- Materials
- Support for parents

RQ2. **Outcomes: perceived impact and quality of programme.** How was the PACT programme received and what impact of PACT was perceived by parents/carers and nursery staff?

RQ3. **Usual practice: programme differentiation and spill over.** How does PACT differ from usual practice and control group activity?

RQ4. **Contextual factors.** How does the context of the PACT-3 trial affect understanding and interpretation of the evaluation data particularly considering the following aspects: (1) Covid-19, (2) differences for nurseries that have used PACT previously and (3) impact of the trial design on usual delivery of PACT?

Research methods

DESIGN

The Implementation and Process evaluation focuses on tracking and monitoring fidelity, dosage, quality, and responsiveness at each of the different levels of delivery of the intervention:

- Support and training provided by the developer to schools and families
- Schools' targeting and delivering of support and materials to families
- Families' use of the PACT programme materials and programme during the year.

The design of the IPE aims to collect data about each part of the logic model. The data collection tools which capture the different elements of delivery and impact are shown in the orange boxes in the logic model in Figure 2 above. Table 5 below shows further detail of the research and data collection methods.

There is a longitudinal element of the design which involves interviews with PACT Leads and with Parents/Carers conducted at two time-points during intervention delivery to look at any changes in delivery across the period of the intervention. In the PACT-2 trial, Covid-19 interrupted and changed the normal circumstance of the delivery of the intervention so we were not able to look at what may have happened across time during normal delivery.

Table 5. IPE research methods data collection table.

Research methods	Data collection methods	Participants/ data sources (type, number)	Data analysis methods	Research questions addressed	Implementatio n/ logic model relevance
Observation	Observation of PACT Lead training session using semi-structured observation schedule and field notes	2 PACT Lead training sessions)	Deductive using research question as framework	1	Fidelity, quality, responsiveness relating to PACT Lead training
	Observation of parent/carer training sessions using observation schedule	Parent/carer PACT training session (three sessions to be observed, 1 from each deliverer)	Deductive using research question as framework	1	Fidelity, quality, responsiveness relating to Parent/Carer training
Surveys	Survey after PACT Lead training session (May 21)	All **PACT leads** participating in training sessions	Frequencies of responses Analysis by group – school new to PACT/not new to PACT Inductive coding of	1, 3, 4	Fidelity, responsiveness to training, programme differentiation from usual practice

			free text responses		
	Baseline usual practice surveys (Sept 21)	**PACT Leads** in all settings (n=43)	Frequencies of responses Analysis by group – School new to PACT/not new to PACT Inductive coding of free text responses	3, 4	Differentiation from usual practice, understanding counterfactual, Describing sample, understanding recruitment families
	Post-intervention period usual practice surveys (May 22)	**PACT Leads** in all settings (n=43)	Frequencies of responses Analysis by group – School new to PACT/not new to PACT Inductive coding of free text responses	1,2,3,4	Fidelity, quality of delivery, responsiveness, adaptation, perceived impact understanding counterfactual,
	Baseline usual practice survey (Sept 21)	All **parents/carers**	Descriptive statistics Frequencies of responsiveness Analysis by control and intervention group	3	Family context, usual practice in home learning, parental confidence supporting child's learning, usual practice
	Post-intervention period usual practice surveys (June 22)	All control and intervention **parents/carers** (some questions differ for intervention and control)	Descriptive statistics Frequencies of responsiveness Analysis by control and intervention group Inductive coding of free-response answers	1,2,3	Fidelity & quality of delivery, responsiveness to programme, adaptation, understanding counterfactual, perceived impact, barriers to delivery
Semi-structured interviews	Semi-structured interviews at two timepoints with same participants (Jan & April 2022)	**PACT Leads** (From settings new to PACT n=5; settings that delivered PACT previously n=5	Combination of inductive and deductive coding using thematic analysis	1,2,3,4	Fidelity & quality of delivery, adaptations in terms of support provided, programme differentiation, responsiveness, delivery model, cost

					evaluation, barriers to delivery
	Semi-structured interviews at two timepoints with same participants (Feb & May 2022)	**Parents/carers** in settings where PACT Leads are interviews (n=20)	Combination of inductive and deductive coding using thematic analysis	1,2,3,4	Fidelity & quality of delivery, support, barriers to delivery, perceived impact, adaptations, delivery over time
	Semi-structured interview/focus group with developer	**Developer team** (1 interview)	Combination of inductive and deductive coding using thematic analysis	1,4	Fidelity & quality of delivery, support provision, adaptations, delivery model
Administrative data	Training attendance records	Records of attendance at all training sessions	Attendance analysed by percentage of sample trained and type of training received/attended	1	Fidelity, training for PACT Leads, training for parents/carers
	PACT app delivery data/paper record forms	Electronic or paper records from all intervention group parents/carers	Descriptive statistics on number of sessions completed Exploratory analysis of patterns of delivery longitudinally	1	Fidelity, compliance of PACT delivery by families

OBSERVATIONS

Using semi-structured observation schedules, a member of the evaluation team will observe both the online school staff training sessions. They will also conduct three observations of parent/carer developer-led training sessions (one observation for each member of the developer training team). Observations will be looking at the content of the training sessions, the response and level of engagement with the sessions and the consistency of training sessions delivered by different trainers, questions asked and potential issues or misunderstandings.

Analysis of the observation schedules and field notes will be deductive.

COLLECTION OF AVAILABLE ADMINISTRATIVE DATA

Training attendance records

Attendance records for developer-led online training sessions (both nursery PACT Leads and parent/carers) will be collected by the developers and passed to the evaluation team. PACT Leads will be requested to inform the developer team of any instances where they have delivered training to parent/carers themselves. Attendance numbers for developer-delivered training will be reported while

answering RQ1 along with the number of parents/carers who were trained by the PACT lead rather than the developer and those who only received the recording of the training. This gives detail about the extent to which training was delivered and attended as defined by the programme.

Parent/carer delivery records

As part of the PACT intervention, parent/carers are requested to complete a record form after delivering each session indicating whether the session was delivered, the date of completion for each session and whether the child enjoyed the session or not. The collection of this data will be through the PACT app; however, paper copies of the form will also be made available for parents who are unable or unwilling to use the app.

Data collected through the app will be received electronically by the developer team. Paper versions of the record forms will be returned to schools by parents/carers and collected by school staff when new PACT packs are distributed at each 5-week interval. App (and paper record data) will be monitored by the developer team and where there is evidence of a lack of engagement the school will be informed and asked to encourage re-engagement with the programme. This is to ensure that as far as possible the intervention is delivered under ideal conditions. The developers will then send the forms to the evaluation team where they will be used as a measure of compliance for the impact evaluation and to monitor fidelity and dosage in the IPE. The data collected from both the record forms and the app will be matched to the pupil database using Excel. Record data for sessions completed up to the 30th June 2022 will be included in the project.

From this data it will be possible to create a total number of sessions completed for each 5-week PACT Pack and be able to investigate any changes in delivery patterns over the course of the intervention as well as a total number of PACT sessions completed overall. We will use descriptive statistics to analyse and report on the number of PACT sessions completed. The total number of sessions completed will also be used in the CACE analysis.

SURVEYS

PACT Lead post-training survey

At the end of the PACT Lead training session, school staff members will be requested to complete a short post-training online survey (approximately 10 minutes) which will ask about: the usefulness of the training overall and the different elements of the training; confidence in delivering the programme after training; comparing the online training to the PACT-2 in person training (for previous PACT Leads); familiarity of the PACT teaching strategies to PACT Leads (to investigate the extent to which the PACT programme training/materials is new to nursery staff and likely to change their practice in nursery), as well as how to improve the training for the future. The survey link will be shared during the training session and results will be collected directly by the evaluation team. Where not all PACT Leads have completed the survey, follow up reminder emails will be sent for the 2 weeks following the training.

Usual Practice Surveys

PACT Leads

PACT Leads at schools will be requested to complete a 'Usual Practice' survey at baseline and post-test detailing their usual practice for the nursery providing help to parents to support their child's development along with how PACT fits in within current provision. This will help us to understand how PACT is different to usual practice and to understand whether there was any spill-over or compensation rivalry in the control group. At baseline (September 2021) this survey will also capture data about family recruitment to the PACT-3 project, support from the developer during set-up phase, and the time and resourcing required by the school for the set-up phase of the project (for the cost-evaluation). At post-test (May 2022) this survey will also capture information about delivery of the project, perceived impact of the project, support provided to families during the project, as well as the time and resources required by the school throughout the delivery period of the project (for the cost evaluation).

Parents/Carers

Parents/carers will also be asked to complete a 'Usual Practice' survey at baseline and at immediate post-test asking them to detail the types and frequency of home learning activities and confidence to support the child's learning. At baseline this survey will also ask about family context including number of people in the home and education background. At immediate post-test separate surveys will be delivered to the control and intervention groups. Both will include the Home Learning Environment index, and confidence to support the child's learning. The intervention group will be asked to provide feedback on the delivery of the intervention while the control group will be asked about their usual practice to do with reading at home and home learning as well as access to the intervention materials to assess contamination.

An incentive of a prize draw to win one of four £25 Amazon vouchers will be used to encourage parents/carers to complete the surveys at baseline and post-test. Surveys will be delivered online with links emailed directly to the parents/carers. Where email addresses have not been provided surveys will be printed and posted to parents/carers with a stamped addressed envelope to return the surveys. When a response has not been received by the survey closing date after two reminders a paper copy of the survey will be posted to those that have not responded.

Analysis of surveys

Descriptive statistics will be generated from the quantitative responses in surveys and frequencies of responses presented for likert scale questions. For the parent/carer surveys comparisons will be made between the intervention and control group participants to draw out differences both at baseline and changes that may have been caused by the intervention during later surveys. Qualitative free text responses will be coded inductively and analysed thematically along with the interview data to provide evidence of how PACT was delivered at the different levels and the response to PACT.

INTERVIEWS

PACT Lead Interviews

We will conduct semi-structured telephone interviews with ten PACT Leads early in the intervention delivery (January 2022) and again towards the end of delivery (April 2022) expected to last around 30 minutes. We will select five PACT Leads from schools that have been involved in PACT-2 project delivering PACT and five from schools completely new to PACT to explore any differences in project delivery or in how they support families with PACT. Schools which will be invited to interview will be from a range of geographic locations, and those with higher number of participants (so as to be more representative of how the programme would run outside the trial). Interviews will capture resource usefulness and acceptability, delivery of the PACT programme, parental responsiveness, parental support provided and the perceived impact of PACT. Here (as well as in the PACT Lead post-intervention survey) we will also gather details on the costs to schools (e.g., monetary, staff time) associated with implementing the PACT programme. PACT Leads will also be asked to reflect on how they would offer and support the delivery of the PACT programme differently if it wasn't part of a trial.

Parent/Carer Interviews

Semi-structured telephone interviews of 20-30 minutes will be conducted with 20 parents/carers implementing PACT (i.e., parents/carers in the Intervention group) at two time-points over the course of the intervention (February and May/June 2022). We will aim to recruit 10 parents from nurseries involved in the PACT-2 trial and 10 from new schools. We will aim to capture a range of educational backgrounds using the Parent/Carer usual practice survey to ensure we invite a wide range of backgrounds. Where possible we will try to recruit at least one parent from the same school as the PACT Lead interview so that we can triangulate the data collected. The telephone interviews will explore the acceptability and delivery of PACT over the course of the programme, how it was used and adapted in individual circumstances, including any barriers that may have been faced. The interviews will also explore if the programme has had an impact on parents' understanding of child development and parents' attitudes and engagement with their child and their child's learning. For participating in both interviews, parents/carers will receive a £15 Love2Shop voucher.

Developer Interview

A semi-structured interview with the developers will be conducted at the end of the programme to explore their views relating to the delivery of the intervention across both trials and how this compares to normal practice. In particular it will explore how the PACT trial affected the delivery of the programme compared to what would be delivery outside of a trial. It will also explore their views on the impact of the intervention, their views on further development of PACT and future plans.

Interview analysis

With permission, all interviews will be recorded, and transcripts created of each interview. The transcripts will be analysed using NVivo software. A combination of inductive and deductive coding will be used to analyse the data with the first coding being only inductive to ensure the capturing of any unexpected themes and a second coding being done using the IPE research questions as themes.

Cost evaluation

We will collect cost data in accordance with the latest EEF Cost Evaluation guidance (EEF, 2019) collecting detailed and systematic data about the costs of delivery during the intervention. This project also has the advantage of working with settings which have delivered the intervention within the past three years to get a more accurate reflection of what PACT would cost a setting to deliver over multiple years.

Cost data will be collected within the IPE data collection methods detailed above as well as through a cost workshop.

During the setup and recruitment period for PACT-3 we will run a workshop with the developer to explore the logic model in detail to extract all the "ingredients" that form the intervention and discuss their costs. The developer doesn't currently market the programme so we will use this workshop to develop an estimate of the cost of providing the training, materials and support necessary to the delivery of PACT. We will also explore what the programme would require and cost for delivery in the same setting over a 2nd and 3rd year. This workshop will help us develop the questions that we need to ask of nursery staff and parents. The workshop will allow the developer and evaluation team to create a collaborative document describing the intervention components and their costs. This table will be used for the cost evaluation as described below.

Clearly establishing what the counterfactual is for this programme will be explored in the baseline usual practice survey for PACT Leads and in the first PACT Lead survey. As this trial uses a within school design settings are delivering PACT to some pupils whilst some pupils receive the counterfactual. Interviews with PACT Leads will explore what provision is being made for non-PACT pupils and any associated costs.

The costs of attending training including any staff cover required will be included within the PACT Lead usual practice baseline survey as well as the role of staff involved in delivery. We will also explore this in more depth in the 1st PACT Lead interview. The time requirement for PACT Leads in running training for parents and other support needed in the set-up phase and early delivery will be explored in the 1st PACT Lead interview while the time requirement later in intervention delivery will be explored in the 2nd PACT Lead interview. The end point PACT Lead survey will also ask PACT Leads to estimate the time spent supporting the project allowing triangulation with the interview data and getting a wider picture from all schools involved.

Unexpected or "hidden" costs will be explored in the interviews both with PACT Leads and with parents along with any pre-requisites that were felt necessary for delivery of the programme.

We will report separately on the parent/carer time commitment in delivering the intervention and any additional costs parents had in delivering the programme. This will be reported both in terms of the programme expectation and in terms of actual delivery. Parent time and costs will be descriptive and not included in the cost estimate analysis.

Anticipated costs of delivery for delivery over three years and how nurseries would deliver the programme outside of the trial will be explored in interviews with the developer and with PACT Leads exploring this in more depth with the schools that were involved in the PACT-2 trial.

Ethics and registration

Ethical approval for the evaluation and overall project has been received from Durham University's School of Education Ethics Committee on 11/03/21. This approval was logged at the University of Manchester and covers all aspects of the project.

Agreement to participate was sought from schools to take part in the overall trial via a Memorandum of Understanding (see appendix 3) signed by a school's head teacher and the PACT Lead. This was collected by the developer team. Schools also were required to sign a data sharing agreement with the developer and evaluation team in order to take part in the programme. A school's participation in the trial was dependent upon their agreement to participate in the evaluation and subsequent data sharing with the EEF.

Schools invited families to take part in the trial using materials provided by the developer team. These included a recruitment video, information sheets (appendix 4) and participant agreement forms (appendix 5) provided by the project teams. Participation agreements were collected by the school and sent to the developer. Scanned copies were then provided to the evaluation team. As part of the participation agreement form, parents/carers had to agree to the following points in order to take part in the project:

- Information about their child being used and collected as part of the project
- The child's school providing information about their child to the research team
- Their contact details being kept and used to contact and inform them about the project
- Their child to be assessed as part of the project.

Parents/carers were also asked to agree to the following parts of the project but were not excluded if they did not agree:

- Audio recording of their child's assessment
- School providing details of their child's school for 2022
- School providing pupil premium status for their child
- Use of child's assessment data for other research purposes outside of PACT
- Archiving of child's data in the EEF's data archive.

Agreement to participate in interviews will be sought separately using an information sheet and a participation agreement form emailed to selected participants in advance. Agreement to participate in surveys will be sought using an information sheet and agreement statements on the front page of the online survey.

The protocol has been registered with ISRCTN with protocol registration number ISRCTN52533968. This can be accessed via this link: https://www.isrctn.com/ISRCTN52533968

Data protection[6]

Durham University and the University of Manchester will be joint Data Controllers for the project who also process data. Data subjects are the participants in the evaluation, which includes children in participating schools, their parents/carers and staff members in participating schools. OxEd, will be data

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[6] Please see the Data Protection Statement for EEF Evaluations.

processors for the project for the collection and processing of the LanguageScreen data. Once datasets have been archived at the end of the trial the EEF will become the data controller for these datasets.

The legal basis for processing the personal data accessed and generated by the trial is Public Task covered by GDPR Article 6 (1) (e) public task, which states that; "the processing is necessary for you to perform a task in the public interest or for your official functions, and the task or function has a clear basis in law." No special category data will be collected as part of this project.

The roles and responsibilities for the trial for Durham University and the University of Manchester have been identified and a data sharing agreement implemented which includes a description of the nature of the data being collected and how it will be shared, stored, protected and reported by each party. Participating schools will also sign a data sharing agreement agreeing that the data collected can be shared between the developer and evaluator teams.

We have carried out a Data Protection Impact Assessment (DPIA) identifying the privacy risks associated with the processing of personal data and for implementing appropriate controls to manage those risks. A privacy notice has been provided to all parent/carer participants and to all PACT Lead participants in the trial detailing the collecting, processing and storage of data for the project.

All participant personal data will be treated with the strictest confidence and will be collected and stored in accordance with the General Data Protection Regulation (GDPR) and Data Protection Act 2018. For the purpose of this research project, and to see how PACT works beyond the project, some of the information provided will be linked with the National Pupil Database (if parents/carers agree) (held by the Department for Education and managed by ONS), and shared with the Education Endowment Foundation's (EEF) data archive managed by EEF's data contractor FFT Education. Children's names, schools, date of birth and sex will also be shared with LanguageScreen.com to enable the assessment. At the end of the project it will not be possible to share identifiable LanguageScreen data beyond the evaluator team at Durham due to restrictions on how this data can be used from the test provider.

Data quality and protection will be ensured through adherence to a detailed data management plan. Quality assurance checks on data sets along with data minimisation will ensure that only required and up to date information is held by the evaluation team. Wherever possible, project identification codes rather than participant names will be used to improve confidentiality and increase data security. All hard copies of PACT project data will be stored in a locked cabinet in the project office at the School of Environment, Education, and Development at The University of Manchester and the School of Education at Durham University. This information will also be stored electronically on encrypted servers and electronic devices authorised by The University of Manchester and Durham University; including survey software or transcription services approved by Durham University. Audio recordings will be made using an audio recorder or secure computer software. The files will be transferred from any standalone recorder as soon as possible after recording to be stored electronically and the original file deleted. Data will be held for up to five years after the end of the project for quality assurance, additional data analysis and the writing of academic papers. After five years the personal data will be deleted by the Durham University evaluator team and the University of Manchester developer team.

Personnel

Developer and Delivery Team

University of Manchester

Dr Kelly Burgoyne (PI): Kelly is a Lecturer in Psychology and Education at The University of Manchester. Her research is focused on cognitive development, particularly the development of reading and language skills, and the nature and causes of children's learning difficulties. Kelly has particular experience in the development and evaluation of interventions to support children's reading and language development.

Recent projects include a large-scale longitudinal study of Australian school children; the development and evaluation of a parent/carer-delivered early language teaching programme for pre-school children; and studies of the role of pattern understanding in reading and arithmetic development.

Steph Hargreaves (Research Assistant) until August 2021: Steph is a Research Assistant at The University of Manchester. Her qualifications include a BSc and a Masters of Research in Psychology. Steph has good knowledge of randomised controlled trials because of her experience in NHS clinical research. Steph supported many child language acquisition studies during her previous role at the Child Study Centre in Manchester, which is part of the ESRC International Centre for Language and Communicative Development (LuCiD) research collaboration investigating how children learn to communicate using language.

Carla Mason (Research Assistant) from August 2021

Carla is a Research Assistant for The University of Manchester and has been involved in a number of large, school-based, randomised controlled trials and studies for both The University of Manchester and the Anna Freud Centre. She has a keen interest in understanding the factors that predict and affect the implementation of interventions. Prior to her work in research, Carla worked for 9 years in both mainstream and special school settings, then went on to complete a Masters of Psychology of Education at The University of Manchester.

Laura Boundy (Postdoctoral Research Associate) from August 2021
Laura is a Postdoctoral Research Associate at the University of Manchester. Her PhD research focused on how children's early communication skills and interactions with their caregivers may help with language development, with particular focus on their use of gestures. Before joining PACT, Laura worked at the University of Manchester Child Study Centre as part of the LuCiD team and has significant experience working on research projects focused on child language, social and cognitive development.

Durham University

Vic Menzies (PI). Vic is an experienced education trials coordinator and researcher with experience of running large trials in nurseries (EasyPeasy, Maths Champions), primary (Shared Maths Project, Hallé SHINE on Manchester, Peer Tutoring in Maths in Scotland) and secondary schools (Project Based Learning, ICCAMS 2 Project, SHINE in Secondaries). Prior to moving to Durham, Vic's previous research included studies of early number development in Scotland and the effect of phonological awareness and training on children's early reading skills. As PI she will lead the impact, process, and cost evaluation elements, contributing expertise to the design and conduct of this evaluation as well as to the writing of the final report.

Dr Helen Cramman, Research Team Lead, has experience of leading and delivering large-scale evaluation research projects along with managing large trials, including EEF EasyPeasy. Helen has experience of leading studies in the early years with projects including an Innovate UK funded project for teaching computer science to reception pupils. She has published on the development of language and number skills in the early years (Boereboom & Cramman, 2018; Copping *et al*., 2017; Cramman *et al.*, 2018). Helen also has experience of providing CPD to primary educators. Helen will provide high-level advice and support to the PI throughout the project.

Dr Julie Rattray is a lecturer in Education and Psychology. Her research interests include conceptual development, and early development and learning. Julie will support the delivery of the assessments and interpretation of the findings.

Paivi Eerola is a Research Assistant and is experienced in qualitative research methods through running interviews and surveys and analysing qualitative data. Paivi has supported many evaluations

covering a wide age range of pupils. She has published on the social impact of music education in primary school and widening participation in higher education. Paivi will collect and analyse the IPE data and liaise with schools for their delivery of the assessments.

Bilal Ashraf is a statistician with rich experience of analysing large-scale datasets in health and social sciences. He recently worked on an Education Endowment Foundation (EEF) Funded project on Individual Participant Data (IPD) Meta-analysis of the impact of educational interventions on Free School Meal (FSM) pupils. Given the similarities of PACT with his previous projects, he will be able to provide valuable expertise in writing the statistical analysis plan, and he will play a key role in the statistical analysis of this trial's impact analysis data.

Jochen Einbeck is a professor of statistics in the Durham University Mathematics department and is co-director of the Durham Research Methods centre. Jochen will be the senior statistician on the project providing supervision to the project statistician and statistical advice to the project team.

Risks

Risk	Detail	Mitigation	Likelihood	Impact (with mitigation)
It may not be possible to share LanguageScreen data with the EEF archive or the developer team	Current agreement with OxEd excludes the sharing of personal data from LanguageScreen outside of the Durham University team unless completely anonymised. This means that it won't be possible to share this with the EEF archive with personal data attached.	Continue conversations with OxEd about the potential to share the data.

Plan to share a fully anonymised dataset with the EEF archive for further analysis just without an option to link to NPD.

Data for secondary outcome measures could be linked to the NPD. | high | medium |
| Missing LanguageScreen data due to difficulties using app | Some schools reported that their settings have been unable to run the app and updates to the website/app may cause schools to have difficulties in the future. | The evaluation team will purchase 5 tablets with data that can be couriered to schools to use for assessments. | medium | medium |
| Covid-19 restrictions may close schools again leading to not being able to collect outcome data | Closure of schools at post-testing would mean that no outcome data would be able to be collected | Collection of BESSI through online survey which could still be completed by school staff even if schools closed.

Collection of post-testing data in autumn when schools return | low | high |

Covid-19 restrictions may mean visitors not able to attend school to collect outcome data	If covid restrictions prevent external visitors to schools it may not be possible to collect face-to-face researcher delivered assessment data as planned for secondary outcomes.	LanguageScreen as primary outcome measure which doesn't rely on external visitors	High	medium
Attrition leads to high levels of missing data at post-test	Loss of participants (individuals or schools) from sign up to outcome data collection may lead to high levels of attrition.	Regular communication with schools and families regarding the project and the assessment during the year. Specific guidance to recruit families likely to stay. Use of incentives for completion of LanguageScreen assessments with an amount per child for each assessment for parents/carers and schools.	Medium	Medium
Post-intervention data collection	Schools don't engage with post-testing	Regular communication with schools Schools can receive half of the incentive payment (£250) on completion of immediate post-testing. Schools are compensated for each assessment they do.	Medium	Medium
	Selected children are absent on the day of the assessments.	Nursery/school staff will run LS assessments more freely when children are around. Parents are paid a £10 voucher each time their child is assessed. There is two weeks mop-up period to finish all assessments.	Medium	Medium
Analysis of data	Durham staff unable to analyse data, e.g., Long-	Durham will discuss possible extension to	Medium	Medium

	term illness or loss of key staff.	delivery date with EEF. Durham will seek support from Faculty.		
Production of final report	Durham staff unable to produce report, e.g. long-term illness, or loss of key staff.	Durham will discuss possible extension to delivery date with EEF. Durham will aim to assign other staff to the project.	Medium	Medium

Timeline

Table 6. Timeline

Dates	Activity	Staff responsible/ leading
Mar 21	Ethics application	Evaluator
Mar - May 21	Recruit settings	Developer (with support from evaluator)
May - June 21	Train settings Post-training survey	Developer (evaluator observation) Evaluator
May - Sept 21	Recruit parents/carers and children	Developer (with support from evaluator)
Aug 21	Cost workshop	Evaluator and Developer
Sept 21 - Oct 21	Pre-testing – Schools complete LanguageScreen assessments HLE, PACT Lead and Parent/Carer Usual Practice Surveys	Evaluator Evaluator
Oct 21	Randomisation	Evaluator
Oct 21 – Nov 21	Training for parents/carers	Developer (observation by evaluator)
Oct 21 - May 22	Parents/carers deliver programme (30 weeks)	Developer
Dec 21	Share protocol	Evaluator
Jan 22	1st PACT Lead phone interviews	Evaluator
Feb 22	1st Parent/carer phone interviews	Evaluator
Apr 22	2nd PACT Lead phone interviews	Evaluator
May 22	2nd Parent/carer phone interview	Evaluator
May 22	PACT Lead survey	Evaluator
Jun 22	Parent/carer survey including HLE	Evaluator
Jun 22	Share SAP	Evaluator
Jun 22 - Jul 22	Immediate post-testing - Schools complete LanguageScreen assessments and BESSI Immediate post-testing – RAs deliver: BPVS, CELF Expressive Vocabulary, APT	Evaluator Developer
Sept 22	Developer interview	Evaluator
Aug – October 22	Data entry, coding and cleaning of researcher-delivered assessment data	Developer

	Data matching, cleaning, QA of evaluator collected data	Evaluator
Oct 22- Nov 22	QA of researcher-delivered post-test data	Evaluator
Oct 22 – Nov 22	Follow up where children attend school and recruit schools	Developer (with evaluator support)
Nov 22 – Feb 23	Data analysis	Evaluator
Jan 22 to Mar 23	Report writing	Evaluator
Mar 23	Submit draft report	Evaluator
May 23	Agree final report (based on data from immediate post-test)	Evaluator
May 23 – Jun 23	11-month delayed post-test – LanguageScreen	Evaluator
	RA delivered assessments: YARC (Letter Sound Knowledge, Early Word Reading, Sound Deletion), CELF Expressive vocabulary, BPVS, APT	Developer
Jul - Sept 23	Delayed post-test data coding, entry and cleaning	Developer, Evaluator
Sept 23 – Oct 23	QA of RA-delivered delayed post-test data	Evaluator
Nov 23	Delayed post-testing data analysis	Evaluator
Nov 23 - Dec 23	Report addendum writing	Evaluator
	Impact and dissemination activities	Developer, Evaluator
Dec 23	Submission of draft report addendum	Evaluator
Mar 24	Agree final report addendum	Evaluator
Apr 24	Submission of data to FFT archive	Evaluator

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Appendix 1: Changes since the previous EEF evaluation

Appendix table 1: Changes since the previous evaluations

Feature		PACT-2 changes from Burgoyne *et al.* (2018b) study PACT-1 (non-EEF funded)	PACT-3 changes from Covid-affected PACT-2 trial
Intervention	Intervention content	There were some changes in the story books in the programme due to availability. Introduction of PACTapp to record progress through the intervention.	The PACT home reading programme is identical to the PACT-2 study. PACT video to support recruitment. PACT demonstration videos for parents/carers to access.
	Delivery model	The study has been moved from 22 children centres to nurseries (47 in the first EEF trial, 43 in the second). Parents received a £10 gift voucher on completion of each 10-week block of the programme at celebration events. In EEF trials all families (intervention and control) were given £10 for each assessment their child went through.	Delivery of PACT Lead and parent/carer training has changed from face-to-face training to live online or video delivery because of University Ethics' Covid-19 restriction on face-to-face contacts.
	Intervention duration	No change – 30 weeks.	No changes – 30 weeks (which was delayed by Covid-19 in PACT-2 trial).
Evaluation	Eligibility criteria	Change from Children's Centres to delivery through state-maintained nurseries.	Nurseries – should be administratively part of a school rather than standalone – to reduce attrition at delayed post-test. Additional eligibility criteria that families, who took part in PACT-2 study cannot sign up with their younger siblings.
	Level of randomisation	No changes. – individual randomisation	No changes – individual randomisation
	Outcomes and baseline	Originally planned same language and early literacy outcome measures however, covid-19 restrictions meant no	Pre-test has changed into Language Screen from the previous combination of CELF, APT and BPVS. As long as researchers

		immediate post-test and delayed post-test changed to Language Screen latent variable.	cannot enter nurseries/schools to deliver the assessments due to University Ethics' restrictions caused by Covid-19, school personnel will assess the children. LS has also been added to the test battery in the post-test time point in case Covid-19 restrictions are still in place.
Control condition		Change from motor skills programme to 'business as usual' with book bundle incentive at end of intervention period.	No changes – 'business as usual' with book bundle incentive at end of intervention period.

Appendix 2: Home Learning Environment Scale

Home Learning Environment Index (HLE) questions (delivered as part of Usual Practice survey for Parents/Carers as baseline and post-intervention)

Q1	How often does anyone at home read to your child?	☐ More than once a day
		☐ Once a day
		☐ Several times a week
		☐ Once a week
		☐ Occasionally or less than once a week
		☐ Never *[skip part B, go straight to Q13]*
Q2	How often does anyone at home take your child to the library?	☐ Once a week
		☐ Once a fortnight
		☐ Once a month
		☐ On special occasions
		☐ Never
Q3	How often does your child play with letters at home?	☐ 7 or more times a week
		☐ 6 times a week
		☐ 5 times a week
		☐ 4 times a week
		☐ 3 times a week
		☐ Once or twice a week
		☐ Occasionally or less than once a week
		☐ Never
Q4	How often does someone at home help your child to learn the ABC or alphabet?	☐ 7 or more times a week
		☐ 6 times a week
		☐ 5 times a week
		☐ 4 times a week
		☐ 3 times a week
		☐ Once or twice a week
		☐ Occasionally or less than once a week
		☐ Never

Q5	How often does someone at home try to teach your child numbers or counting?	☐ 7 or more times a week
		☐ 6 times a week
		☐ 5 times a week
		☐ 4 times a week
		☐ 3 times a week
		☐ Once or twice a week
		☐ Occasionally or less than once a week
		☐ Never
Q6	How often does someone at home try to teach your child songs, poems or nursery rhymes?	☐ 7 or more times a week
		☐ 6 times a week
		☐ 5 times a week
		☐ 4 times a week
		☐ 3 times a week
		☐ Once or twice a week
		☐ Occasionally or less than once a week
		☐ Never
Q7	How often does your child paint or draw at home?	☐ 7 or more times a week
		☐ 6 times a week
		☐ 5 times a week
		☐ 4 times a week
		☐ 3 times a week
		☐ Once or twice a week
		☐ Occasionally or less than once a week
		☐ Never

Appendix 3: School Memorandum of Understanding

Parents and Children Together 3 (PACT-3) Project: Memorandum of Understanding (MoU)

Please sign *two* copies, retaining one and returning by email a copy to Dr Kelly Burgoyne (Kelly.burgoyne@manchester.ac.uk) or Stephanie Hargreaves (███████████████████).

School Name:_____Tel:_____

Address: _____

The research team will:

Recruitment:
• Provide all consent forms and recruitment materials for the study
• Liaise with and support PACT Leads (school project lead) to recruit parents/carers and children to the study
Testing:
• Provide instructions and access to LanguageScreen assessments, and support schools to deliver LanguageScreen assessments
• Conduct researcher-delivered assessments with children in June-July 2022 and May-June 2023
• Ensure that all research staff carrying out researcher-delivered assessments are fully trained and have received DBS clearance
• Provide schools with a school readiness survey for all children in the project
• Collect and analyse all data from the project
Evaluation
• Collect information from PACT Lead (e.g. surveys, PACT record forms)
• Conduct phone interviews with a selection of PACT Leads and parents/carers at two time points during the project
• Collect children's school destination and pupil's UPN data from the PACT Lead
Training and support:
• Provide online training for PACT Leads
• Provide training for parents/carers in the PACT Programme group
• Provide PACT Leads with access to parent/carer training and resources
• Provide ongoing support for PACT Leads and parents/carers
Resources:
• Provide parents/carers in the PACT Programme group with all materials needed to deliver the PACT teaching programme (delivered to school for distribution)
• Provide book boxes for parents/carers and children in the Comparison group at the end of nursery (delivered to school for distribution)
Communication:
• Send out regular project updates/newsletters to parents/carers and to PACT Leads
• Disseminate research findings on completion of the project
Expenses:
• Provide schools with a payment of £500 (1 x £250 payment on completion of assessments in June-July 2022, and 1 x £250 payment on completion of assessments in May-June 2023)
• Provide schools with a £10 voucher at each time point for each child assessed on LanguageScreen
• Provide parents/carers with a £10 voucher for each assessment completed with their child (delivered to school for distribution)

On behalf of the research team, we commit to the EEF PACT-3 Research Project as detailed above:

Principle Investigator: Dr Kelly Burgoyne   Date: 22nd March 2021

The school will:

Staffing:
• Identify 1-2 staff members to act as PACT Lead throughout the project
• Release PACT Lead to attend online training in May 2021
• Allow PACT Lead time to carry out activities to support the project (see PACT Lead responsibilities on the next page)
• Assign a replacement PACT Lead should the original PACT Lead be unable to continue in their role
• Ensure the project activities outlined in the PACT Lead responsibilities are carried out
Testing:
• Provide equipment (i.e. Tablet/iPad) for school staff to conduct LanguageScreen assessments
• Allow school staff time to complete the LanguageScreen assessments with each child on the project (approx. 10 mins per child) at each assessment point
• Allow school staff time to complete a short (5-min) school readiness questionnaire at the end of nursery for each child taking part in the project
• Provide facilities for the research team to conduct researcher-delivered assessments in June-July 2022 and May-June 2023
Evaluation:
• Provide research team with children's school destination data and pupil's UPN data
Training and support:
• Allow PACT Lead to provide parent/carer support sessions at the nursery as needed
Communication:
• Be a point of information for parents/carers seeking information about the project
• Inform the research team of any changes to staffing or possible problems which may impact on the running of the project at the school

On behalf of the school, we commit to the EEF PACT-3 Research Project as detailed above

Head teacher/EYFS Leader/SENCo Signature:

Name of Signatory:
Date:
Telephone Number:
Email Address:

The PACT Lead will:

Recruitment:
• Work with the research team to recruit 10-20 parents/carers and children to take part in the study
• Obtain the required parental/carer participation agreement forms for the study
PACT materials
• Accept delivery in school of the PACT packs and distribute them to families in the PACT programme group
• Accept delivery in school of the book boxes and distribute them to families in the Comparison group
Testing:
• Liaise with the research team and parents/carers to organise LanguageScreen and researcher-delivered assessments
• Support completion of LanguageScreen and school readiness assessments with children taking part in the project
Evaluation
• Complete background information and 3 surveys during the project
• Participate in two short phone interviews with Durham University Researchers if requested
• Provide research team with children's school destination data and UPNs
• Distribute £10 vouchers to parents/carers on completion of assessments
Training and support:
• Attend online training for PACT Leads (date to be scheduled for May 2021)
• Liaise with the research team to organise parents/carers to attend online PACT Programme group training
• Provide ongoing support for parents/carers in the project
• Access support from the research team as needed
Communication:
• Collect and complete project paperwork and submit it to the research team on time
• Communicate with the research team about the progress and timeline for the project in their school
• Notify the research team of any changes/problems which may impact on the running of the project
• Compile project information requested by research team (e.g. surveys, children's attendance) and information received from parents/carers (e.g. surveys, participation agreements, PACT record forms) and send back to research team.
• Follow up parents/carers for missing project information (e.g. surveys, PACT record forms/PACT App forms)

I commit to the EEF PACT-3 Research project as detailed above

PACT Lead Signature:

PACT Lead Name:
Date:
Telephone Number:
Email Address:
School Name:

Appendix 4: Information sheets

School Information Sheet – page 1

Parents and Children Together 3 (PACT-3): Evaluating a parent delivered early language enrichment programme for pre-school children

School Information Sheet

Researchers at The University of Manchester and Durham University are conducting a research project funded by the Education Endowment Foundation (EEF). This project will evaluate a parent-delivered early language teaching programme for pre-school children called Parents and Children Together (PACT). The research teams are looking for (Local Authority) maintained school-based nursery settings with 3-4 year old children to participate in this research project. This information letter provides an overview of the project and outlines how schools can be involved in this work.

Background

Oral language skills provide the foundation for formal education and play a significant role in learning to read. Children who experience delays in early language and communication development are at risk of problems learning to read, and of broader educational disadvantage. Finding ways to support early language development in the pre-school years has considerable potential to support better educational outcomes for children.

Parents and Children Together (PACT) is a language teaching programme for pre-school children that parents/carers deliver to their child at home. This programme has been shown to support children's early language and emergent literacy skills. This project will further evaluate the benefits of the PACT programme for children and families in schools in your area.
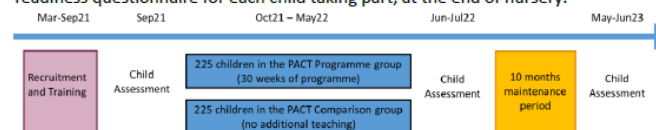
Who will we evaluate the programme with?

We will work with 45-50 schools in Greater Manchester and Lancashire. We aim to recruit 450-500 children and their parents/carers to take part in the project. We are looking for children in nursery schools who will be 3 years old by September 2021, and who will start school in September 2022. Parents/carers taking part need to be able to speak and read English to be able to access the teaching materials.

How will we evaluate the programme?

The teaching programme will be evaluated in a Randomized Controlled Trial (RCT). Children and their parents will be randomly allocated to one of two groups: PACT Programme or Comparison. The PACT Programme group will receive the PACT language teaching programme (described below). The Comparison group will continue as normal and will receive a box of children's storybooks at the end of nursery.

It is important that we randomly assign children to PACT Programme or Comparison groups so that we can objectively assess the effect of the programme on children's development. To test this, we will measure children's early language skills at three time-points during the project: September-October 2021 (pre-test), June-July 2022 (post-test), and May-June 2023 when the children will be in Reception (delayed post-test). At each time-point, a member of school staff will be asked to complete a 10-minute app-based assessment called LanguageScreen (see https://languagescreen.com/ for further details) with each child in the project. At post-test and delayed post-test, a University of Manchester researcher will also visit school to administer other language and early literacy assessments with children in the project. We will also ask schools to complete a short school readiness questionnaire for each child taking part, at the end of nursery.

Mar-Sep21	Sep21	Oct21 – May22	Jun-Jul22	May-Jun23
Recruitment and Training	Child Assessment	225 children in the PACT Programme group (30 weeks of programme) / 225 children in the PACT Comparison group (no additional teaching)	Child Assessment / 10 months maintenance period	Child Assessment

As part of the project evaluation, Durham University will ask nursery school staff to fill in three surveys at different points during the project. They will also

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The University of Manchester

Education Endowment Foundation

Durham University

interview a school staff member in a sample of schools at two points during the project.

What does the teaching programme involve?
The PACT language teaching programme was developed by a team of psychologists who have expertise in language and literacy development, and in developing and evaluating interventions to support language and literacy skills. The programme supports language development by working on 3 key components: Shared reading, Vocabulary and Narrative skills (storytelling).

PACT session: 20 minutes		
Introduction	Settle your child	2 minutes
Reading together	Read the book together and talk about the story	5 minutes
Vocabulary	Talk about new words and what they mean	5 minutes
Stories	Talk about what happens in the story	5 minutes
Reward	Talk about what you did together and give your child a sticker	3 minutes

Parents/carers in the PACT Programme group are trained by the research team to deliver the teaching programme to their child at home, in 20-minute sessions (5 days per week). Families are given all the materials and resources they need to work on the programme for 30 weeks. The materials are published by Book Trust, and are designed to be easy to use, engaging, and motivating for young children.

What would taking part involve for schools?
We will work with schools to: 1) Identify a member of staff in each school to act as the PACT Lead; 2) Recruit and support parents/carers throughout the project; and 3) Organise and complete children's assessments in the school. PACT project leads will be asked to: 1) Attend the online PACT Lead Training; 2) Work with the project team to recruit 10-20 children and their parents to take part; 3) Support PACT Programme group parents to complete their training and to deliver the teaching programme; 4) Liaise with the research team to organise and complete

the assessments with children; and 5) Collect routine information from parents and return this to the research team. PACT Leads will need to communicate regularly with the research team and support them to collect information from parents and deliver assessments.

Schools will not need to pay anything to take part. To reimburse your school for any costs incurred, and as a thank you for your support, your school will receive a £500 payment for taking part (paid as 2 x £250 payments). Schools will also receive a £10 voucher for each child assessed using LanguageScreen at each of the 3 time-points (i.e. up to £30 vouchers for each child).

What are the benefits for schools and families?
Nurseries play a key role in supporting children's development, and in engaging parents in their children's learning. Involvement in this project will require commitment from school staff but will offer considerable potential benefits. There is initial evidence that PACT leads to gains in children's language and early literacy. PACT Leads in each school will receive high-quality training from the research team in the delivery of a theoretically-motivated teaching programme to support language and communication in pre-school children, and in ways to support parents to deliver teaching. The project also has potential benefits for supporting positive relationships with families and empowering them to support their child's learning at home. The techniques used in the programme are drawn from strong research evidence and they complement early years teaching practices.

For more information, please contact:

Dr Kelly Burgoyne (PACT Research Manager)
Email: Kelly.Burgoyne@manchester.ac.uk

Stephanie Hargreaves (PACT Research Assistant)
Email: stephanie.hargreaves@manchester.ac.uk

Thank you. We hope you will take part!

PACT-3 Parent/Carer Information Sheet

You are being invited to take part in the PACT-3 research project. Before you decide whether to take part, please take time to read the following information carefully. Please ask questions if anything is unclear. Thank you.

What is PACT?

Parents and Children Together (PACT) is a language teaching programme that parents/carers work on with their child at home to help their child:

- Learn lots of new words and how they work in sentences
- Listen to and talk about stories
- Understand and tell stories
- Enjoy books and reading

PACT is a 30 week programme that parents and children work on 5 days a week for about 20-minutes. In the programme, parents/carers share storybooks with their child, talk about words and their meanings, and tell stories together.
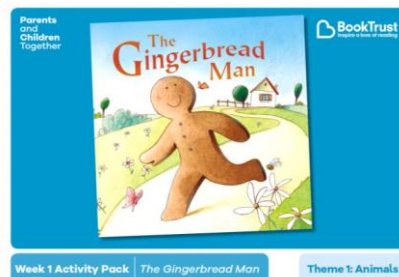
What is the purpose of the research project?

Children's early language and communication skills can make a big difference to how well they learn when they get to school. PACT aims to develop these skills. This research project will test the benefits of the programme and see how parents use it in the year before children start school.

Who will conduct the research?

This research is being conducted by researchers at the University of Manchester and Durham University.

Why have I been chosen?

The research team are working with nursery schools in your local area on this project. We are looking for 450 three-year-old children to take part with their parents.

Who can take part?

Children who will be three years old and in nursery by September 2021, and due to start school in September 2022 can take part in this project. Because the teaching programme is written and delivered in English, parents/carers need to be able to speak and read English to participate. Any adult in the family can be trained to deliver the programme. At this stage, we aren't able to include children who have a diagnosed developmental or learning difficulty. We are also unable to include families with siblings in the same year group in this research project, or families who have taken part in an earlier PACT project.

What happens next?

If you decide to take part in the project, you and your child will be placed in one of two groups: 1) the PACT group OR 2) the comparison group.
The group you are in will be decided randomly, which means that you, the staff in your child's nursery, and the research team, will not be able to choose which group you are in. This is very important because it is the only way we can reliably test whether the programme has any benefits.

If you are in the PACT Programme group, you will be asked to complete an online training session. You will be given the PACT programme materials and will be asked to work on the programme with your child for 20 minutes 5 days a week. You will get a new PACT pack every 5 weeks for 30 weeks in total.

If you are in the comparison group, you will be asked to keep doing what you usually do with your child at home. You will receive a box of children's story books at the end of your child's time at nursery.

We will assess all children taking part in the project by asking them to do some activities that tell us about their language and communication skills. In these activities, we will ask children to look at pictures and talk about them; listen to words and sentences and point to pictures; and listen to a story and answer questions about it. Children will complete some of these activities with a teacher or key worker in school, using an App called LanguageScreen (see https://languagescreen.com/ for further details). Other activities will be completed with a member of the research team, who will visit school to see children in the project. Please be assured that all members of the research team have experience working with young children and all have DBS clearance.

Children will take part in the assessments three times: at the start of the project (September 2021 – assessed by school staff only), at the end of nursery (June-July 2022) and at the end of their reception school year (in May-June 2023). Families will receive a £10 voucher for each child assessment completed (i.e. 3 x child assessment completed = £30 vouchers).

We will ask all parents/carers to complete a short survey at the beginning and end of the project. We will also contact a small number of parents to carry out two short telephone interviews during the course of the project. All parents who complete these telephone interviews will receive a £15 voucher.

What information is needed if I decide to participate?

We would like to collect some information about you and your child including your names and your address. We will also ask your child's nursery for some information about your child including attendance information. Full details are provided in the participation agreement form and project privacy notice.

What happens to my information?

We collect and store personal information in accordance with the General Data Protection Regulation (GDPR) and Data Protection Act 2018 which legislate to protect your personal information. For the purpose of this research project, and to see how PACT works beyond the project, some of the information provided will be linked with the National Pupil Database (held by the Department for Education and managed by ONS), and shared with the Education Endowment Foundation's (EEF) data archive managed by EEF's data contractor FFT Education. Your child's demographic data will be shared with LanguageScreen to enable the assessment.

You can withdraw from part or all of the research project at any time, without giving a reason, by contacting the research team using the details below or speaking to a staff member at your nursery. For more information about the way we process your personal information and comply with data protection law please read our Privacy Notice.

Who do I contact with my questions?

If you have any questions or concerns about the PACT-3 research project, please contact Dr Kelly Burgoyne or Stephanie Hargreaves by email (kelly.burgoyne@manchester.ac.uk or stephanie.hargreaves@manchester.ac.uk).

What should I do next?

If you are happy for you and your child to take part in the PACT-3 Research Project, please complete and return the attached participation agreement form to your child's nursery.

If you do not want to take part, do not complete a participation agreement form.

Thank you. We hope you will take part!

Appendix 5: Participation Agreement Form

Parents and Children Together 3 (PACT-3) Research Project: Participation Agreement

Thank you for your interest in the PACT research project. By completing this form you are confirming that you have understood:

- The parent information sheet and privacy notice provided to you
- That participation is voluntary and you/your child can withdraw at any time
- That if you have any questions, you can contact Kelly Burgoyne or Stephanie Hargreaves by email (Kelly.Burgoyne@manchester.ac.uk or stephanie.hargreaves@manchester.ac.uk). Please tick all the boxes you agree with below. If you do not tick a box we will assume you do not agree to that point.

If you do not agree to points 1-4, unfortunately you/your child will be unable to participate in this research project.

No.	Statement	Please tick if you agree
1	I agree for my child's full name, date of birth, sex, languages spoken, and home address, to be collected and used in this research project as outlined in the information sheet and privacy notice.*	
2	I agree for my child's school to provide the research team with demographic and nursery attendance information about my child as outlined in the information sheet and privacy notice.*	
3	I agree for the research team to keep my contact details in order to contact me during the research project and provide me with a summary of the findings for this study.*	
4	I agree for my child to be assessed as part of this research project.*	
5	I agree for my child's assessments (delivered by the research team) to be audio recorded to ensure they have been carried out properly.	
6	I agree for the school to provide the research team with the name and address of the school my child will be attending in September 2022.	
7	I agree for the school to provide the research team with my child's Early Years Pupil Premium (EYPP) status (i.e. whether your child is entitled to free school meals)	
9	I agree the research team can use my child's (anonymised) assessment data for other research purposes outside of the PACT project	
10	I agree that my child's data can be archived with the Education Endowment Foundation's (EEF) data archive at the end of the project as described in the privacy notice.	

Data Protection

The personal information we collect and use to conduct this research will be processed in accordance with data protection law as explained in the Participant Information Sheet and the Privacy Notice.

Please fully complete the below table.

Your child's details:

First Name:		Last Name:	
Date of Birth: (DD/MM/YY)			
Sex (please circle):	Male Female Prefer not to say		
Home address:			
Post Code:			
Is more than one language used at home with your child? (please circle) Yes No Is English the main language you use with your child at home? (please circle) Yes No If no, what is the main language that you use with your child at home? _____			
Please indicate when your child will be attending nursery: (please circle)	Monday Tuesday Wednesday Thursday Friday	am am am am am	pm all day pm all day pm all day pm all day pm all day

Your details:

Your phone number:		Your email address:	
Details of other Parent/Carer: (if applicable)			
How would you prefer us to contact you? (please circle)	Post Email Phone		

By signing this form, you are agreeing to participate in the PACT research project and the statements you have ticked above.

_____   _____   _____

Name of Parent/Carer   Parent/Carer Signature   Date of signature

You will be given a copy of this participation agreement form to keep and refer to at any time. A second copy of the participation agreement form will be kept by the research team.