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# Protocol: A randomized controlled trial of the Fluency into Comprehension program in primary schools



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## ABSTRACT

This paper presents the research protocol for a Phase 2 randomized controlled trial of the Fluency into Comprehension program in primary schools. The program is a workforce development program that supports teachers and teaching assistants develop and deliver targeted reading fluency and comprehension instruction to children aged 7–9. The protocol outlines a research design to assess whether the program delivered over approximately 12 weeks improves reading outcomes, in a sample of up to 192 children from 12 schools in four English districts with high socio-economic disadvantage. The outcome measures are two reading standardized tests. A process evaluation will measure fidelity and potential for scale-up.

## 1. Background

Reading is recognized as a key skill for success. However in 2019, 27% of students in England did not achieve the expected standard at age 11. The situation is particularly acute for students from socio-economic disadvantage who find it most difficult to succeed. For example, only 51% of disadvantaged English students achieved expected standards in the combined national measure at age 11 (including Reading, writing and maths) compared to 71% of all other students (Department for Education, 2019). Globally, by age 15, about 20% of students in OECD countries do not attain the baseline level of proficiency in reading, considered the level of proficiency at which students begin to demonstrate the reading skills that will enable them to participate effectively and productively in life (Organisation for Economic Co-operation & Development, 2016). There is therefore both national and international interest in improving reading outcomes (United Nations Sustainable Development Goals, 2016).

Reading interventions can make a positive difference for struggling readers (Scammacca, Roberts, Vaughn & Stuebing, 2015). Specifically, the use of guided oral reading (with a focus on fluency or comprehension) can improve reading achievement, based on its positive impact from meta-analysis evidence (effect size +0.41) (National Reading Panel, 2000). A feature of fluent readers is their ability to read orally with appropriate expression, phrasing, appropriate pausing and pacing (Dowhower, 1991; Schrauben, 2010; Schwanenflugel, Hamilton, Kuhn, Wisenbaker, & Stahl, 2004), chunking the text to assist in construct-

ing meaning (Schreiber, 1991) and, combining intonation with appropriate phrasing to comprehension (Kuhn, Schwanenflugel & Meisinger, 2010). Reading fluency approaches are promoted widely in the US (Rasinski, Yildirim & Nageldinger, 2011; Rasinski & Nageldinger, 2016). Meta-analysis evidence suggests reading fluency can be a successful intervention when used with students in Grades 4–12, and reports positive effect sizes of +0.16 for reading fluency and word-reading fluency outcomes (Wanzek, Vaughn, Scammacca, Metz, Murray, Roberts & Danielson, 2013; Stevens, Wlaker & Vaughn, 2016).

Comprehension instruction in classrooms is accepted as a strategy for reading improvement, and existing interventions include Inference Training (Kispaal, 2008) and reciprocal reading (Palincsar, 1982). Reciprocal reading has been implemented mostly in the US and New Zealand, with a range of studies reporting positive outcomes from reciprocal reading training programs (Crawford & Skipp, 2014; Palincsar & Brown, 1984; Palincsar, 1982; Rosenshine & Meister, 1994; Sporer, Brunstein, & Kieschke, 2009). Most recently in the UK a reciprocal reading targeted intervention was tested in two randomized trials, with positive effects of ES between +0.13 and +0.25 when used with 9–13 year olds (O’Hare, Stark, Cockerill, Lloyd, McConnellogue, Gildea, Biggart, Connolly, & Bower, 2019; Thurston, Cockerill, Taylor, Chiang & O’Keeffe, 2020). However, this comprehension intervention is suitable in this format only for students who have the required phonetic awareness to decode, and who are already able to decode independently with fluency. Therefore there is a group of students who although able to decode, require additional fluency instruction before they are ready for a standalone comprehension intervention.

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It is worth noting that reading comprehension interventions are associated with significantly higher effect sizes than fluency interventions on their own (Scammacca et al., 2015). For this reason, in line with recommended research (Scammacca et al., 2015), the Fluency into Comprehension program to be tested in this study is a targeted reading intervention which combines reading fluency with comprehension instruction, suitable for students who require additional support in fluency. The program uses a multi-strategy approach which includes both fluency approaches such as those utilized in the U.S. (Rasinski, 1990; Rasinski et al., 2011; Rasinski & Nageldinger, 2016), with reciprocal reading strategies tested in trials in the UK (O’Hare et al., 2019; Thurston, Cockerill et al., 2020). The purpose of this combined intervention is to improve reading outcomes for children. This is made possible as children refine their fluency skills as a catalyst to using reciprocal reading strategies for improved comprehension. The study will take place within areas of high socio-economic disadvantage in England, in an attempt to address existing barriers in reading in primary-age children in four districts across a wide geographic region.

The main focus of the proposed intervention to be used in this trial is reading fluency instruction combined with an element of comprehension instruction. Fluency instruction is the focus during two thirds of the allocated delivery time weekly (two sessions per week). During this time instruction focuses on reading orally with appropriate expression, phrasing, appropriate pausing and pacing, chunking the text to assist in constructing meaning. Instruction involves directly modelling fluent reading, explaining why and how a text has been read as it has, and providing opportunities for children to practise the skill of fluent reading themselves in a guided and supported context, working collaboratively in small groups. The remaining third of the programme (one session per week) is devoted to comprehension using an adapted version of the Reciprocal Reading program tested in primary schools (O’Hare et al., 2019). Here the dosage is halved to once per week as compared to the Reciprocal Reading program. In addition, the students selected as eligible for the proposed program primarily require a reading fluency intervention with additional support to deepen their understanding of text, as compared with the Reciprocal Reading program which is entirely focused on using specific comprehension strategies (predict, clarify, question, predict). Therefore it is predicted that using this new targeted reading fluency and comprehension intervention approach which combines fluency with comprehension instruction, could result in improved reading outcomes for students who receive it.

The following protocol describes a Medical Research Council Phase 2 randomized controlled trial study (Medical Research Council, 2000) aimed at evaluating the impact of a new fluency and comprehension program on students’ attainment in reading on a targeted basis in primary schools in England. This study has been funded by the Economic Social Research Council Impact Acceleration Account and the School of Social Sciences, Education and Social Work in Queen’s University, Belfast.

## 2. The intervention

The Fluency into Comprehension program was developed in 2020 and built on the Herts for Learning project (Slater, 2018). The Fluency into Comprehension intervention is delivered by teaching assistants, in mainstream UK settings for students aged 7–9 years, and workforce development is an essential part of the program. All teachers and teaching assistants involved in the program receive one and half days’ digital training from Fischer Family Trust Literacy (FFTL) and a support session during delivery of the program (half day).

Training covers the knowledge, skills and understanding that practitioners need to deliver the Fluency into Comprehension program in a targeted format. It introduces practitioners to understandings from research about reading fluency, the impact reading fluency and comprehension difficulties on learning, and a multi strategy approach key to reading fluency and comprehension instruction, example lesson plans, and use of planning and recording formats.

The students chosen for the project are identified by their teachers as being able to decode but with poor fluency (ie. difficulties with processing the text – the surface level of reading) which impact on their ability to comprehend texts (the deeper meaning). This is shown most clearly in their reading comprehension, which is weak.

The Fluency into Comprehension program is designed to address difficulties in fluency and comprehension by training teaching assistants to directly model fluent reading, explaining why and how they chose to read the text as they did, and provide opportunities for children to practise the skill themselves in a guided and supported context, working collaboratively in small groups of four children. The intervention bridges the gap between reading fluency and understanding by including a session weekly focused on comprehension using reciprocal reading.

Teachers and teaching assistants taking part in the targeted Fluency into Comprehension program deliver a 15–20 min lesson to small groups of 4 students aged 7 to 9 (Year 3–4 in primary schools), for approximately 12 weeks (over two terms). The lessons are delivered 3 times per week where sessions 1–2 focus on fluency and session 3 focuses on comprehension. Instruction to the identified small group of students is teacher-facilitated using collaborative reading of texts. All three weekly sessions start by re-reading a known or familiar text. In the first two sessions where reading fluency is the focus, the teaching assistant models effective and expressive reading a number of times, and points out the clues that lead them to read the text that way. The group are given multiple opportunities to practise reading aloud and improve their fluency, expression and phrasing. In the third session, the teaching assistant leads an adapted reciprocal reading session. Using the text that they have previously read aloud with the children, they take them through the clarify, question and summarise sequence to fully understand the meaning of what they have read. On the next section of text, (which the group have not yet read previously), the group make predictions about what they will read, they read the text aloud together and then repeat the clarify, question, summarise sequence. They then read a further section of text, repeating the same sequence as before. The practices are modelled by the teacher and used collaboratively between teacher and students and students and students, to derive meaning from the text.

The Fluency into Comprehension program comprises:

- a) Advice on identifying students with limited fluency and comprehension.
- b) An outline lesson sequence for sessions 1, 2 and 3.
- c) Materials to support the students in both reading fluency and comprehension including book journal activities.
- d) Books for students to use during the program.

The Fluency into Comprehension program is summarized in Table 1. The treatment group students receive the intervention, while the control group students continue with business as usual, comprising their normal literacy practices for students in Year 3-4.

## 3. Program Theory of Change (ToC)

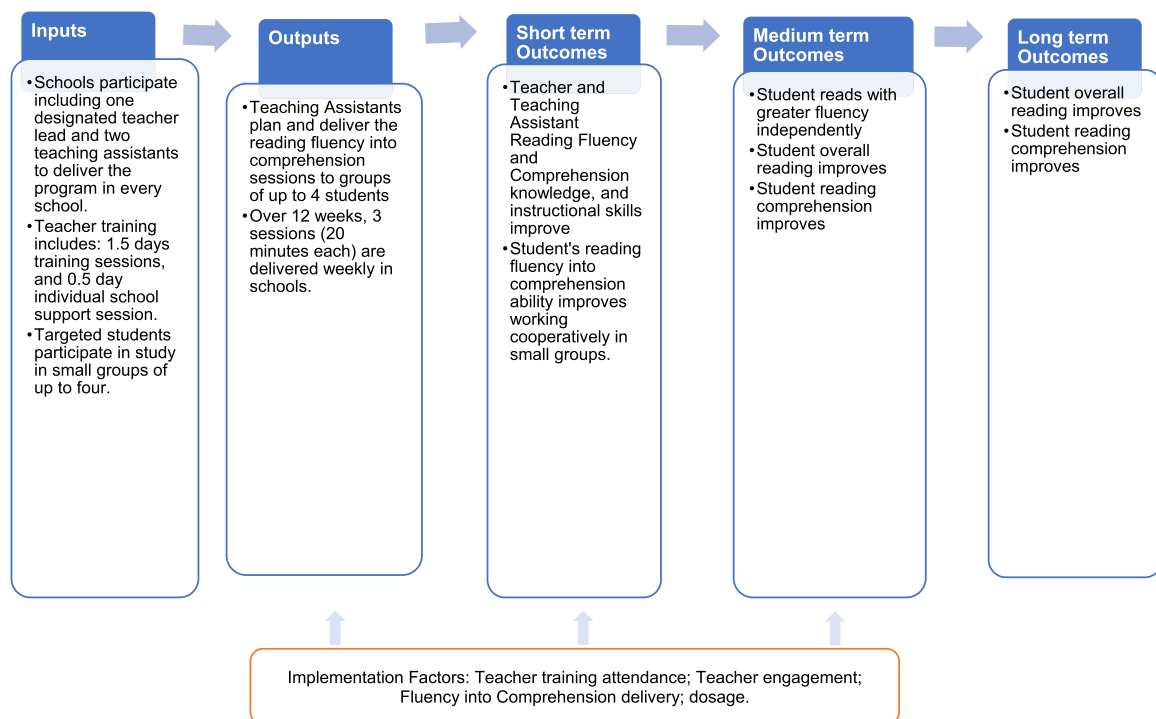
The logic model (Fig. 1) describes the program components (Inputs, outputs, outcomes), including the theory of change, and how implementation factors relate to program outcomes.

The underpinning Theory of Intervention is as follows. As shown in logic model (Fig. 1), the overall aim of the Fluency into Comprehension program is to increase the independent reading fluency (including expression and phrasing) and comprehension ability of young people, resulting in improved overall reading attainment. In order to achieve these outcomes teacher training is necessary to improve teacher knowledge, change professional practice of reading instruction, learn to scaffold student learning, and promote student collaboration during the intervention. Students need to be exposed to using the fluency approaches (mostly focused in delivery sessions 1-2 during each week) and reciprocal reading strategies in adapted form (clarify, question, summarize, predict) mostly practiced in session 3 of the weekly cycle. In this way on

**Table 1**

Reading Fluency into Comprehension Program TIDieR checklist (Hoffmann, Glasziou, Boutron, Milne, Perera, Moher, Altman, Barbour, Macdonald, Johnston, Lamb, Dixon-Wodds, McCulloch, Wyatt, Chan, & Michie, 2014).

ITEM No.	Item
<i>Brief Name</i>	Fluency into Comprehension program (Targeted intervention)
<b>a</b>	
<b>Why</b>	
<b>b</b>	Training program for teachers aimed at improving comprehension ability and reading of students aged 7 to 9 years
<b>What</b>	
<b>c</b>	Materials: A teacher training program delivered by the Fischer Family Trust Literacy (Allinder, Fuchs, & Fuchs, 1998; Crawford & Skipp, 2014; Dowhower, 1991; Hoffmann et al., 2014; Jenkins, Fuchs, van den Broek, Espin, & Deno, 2003; Johnson & Johnson, 2012; Johnson, Johnson, & Roseth, 2010; Johnson, Johnson, & Stanne, 2000; Kuhn, Schwanenflugel, & Meisinger, 2010; McCarty & Ruttle, 2016; Medical Research Council, 2000; Moore et al., 2015; O’Connor et al., 2002; Palincsar, 1982; Palincsar & Brown, 1984, 1986; Pinnel et al., 1995; Rasinski, 1990; Rasinski & Nageldinger, 2016; Rasinski, Yildirim, & Nageldinger, 2011; Rosenshine & Meister, 1994; Rupley, Willson, & Nichols, 1998; Schrauben, 2010; Schreiber, 1991; Schwanenflugel, Hamilton, Kuhn, Wisenbaker, & Stahl, 2004; Sporer, Brunstein, & Kieschke, 2009; Stevens, Walker, & Vaughn, 2016; Swanson & Connor, 2009; Van de Pol, Volman, & Beishuizen, 2010a,b; Vygotsky, 1978; Wanzek et al., 2013; Coe et al., 2014; Department For Education 2019; GL Assessment 2018; Kispal, 2008; National Reading Panel 2000; O’Hare et al., 2019; Organisation for Economic Co-operation & Development 2016; Thurston et al., 2020; SPIRIT 2015; SPIRIT 2015; United Nations Sustainable Development Goals 2016), which includes digital school training (for teachers and teaching assistants) interspersed with individual school follow up support/training. Resources: including teacher manual, diagnostic tool, and teaching resources.
<b>d</b>	Procedures: Digital school training for the Fluency into Comprehension program teacher lead, and designated teaching assistants. Internal follow up training/support sessions to support a balanced instructional approach to reading fluency into comprehension teaching.
<b>Who Provided</b>	
<b>e</b>	Fluency into Comprehension trainer provides teacher and teaching assistant with digital training and school support. Teachers and teaching assistants provide instructional activities to students based on their training
<b>How</b>	
<b>f</b>	Initial training sessions provided to groups of teachers
<b>Where</b>	
<b>g</b>	External training provided digitally. Bespoke school support sessions provided in school setting including classroom where possible and digitally.
<b>When and how much</b>	
<b>h</b>	There are two training sessions and one follow up support session over the 12 week program delivery period. Teachers are utilizing their training over the course of the program.
<b>Tailoring</b>	
<b>i</b>	The program logic model was not changed during the research and is included in Fig. 1.
<b>Modifications</b>	
<b>j</b>	No program modifications are being made during the trial.
<b>How well</b>	
<b>k</b>	Planned: This will be assessed through the research process evaluation
<b>l</b>	Actual: This will be assessed through the program pragmatic Randomized Controlled Trial evaluation.



**Fig. 1.** The Fluency into Comprehension program logic model.

a weekly basis, students practice their fluency twice per week working cooperatively in small groups, chunking text, focusing on expression and phrasing. Students also practice interrogating text passages using reciprocal reading strategies during one session per week, to develop their metacognitive ability to read with greater understanding. Training and materials for this program are based on the following underpinning theories and evidence:

An important element of the Fluency into Comprehension intervention is high quality professional development based on evidence-informed theory (Coe et al., 2014). In this case this includes cooperative learning, and learning using a multi-strategy approach including both fluency instruction and reciprocal reading instruction, delivered over three sessions weekly over 12 weeks. The training for the program is delivered through external training for groups of staff from different schools to learn together (delivered online), combined with bespoke school support of staff by program trainers. Staff are trained on both how to deliver the program, and how to identify children who may require the program.

The program is designed to address the needs of children who have acquired reading decoding skills and can understand a text when it is read to them, but whose independent understanding is hindered by their limited fluency.

An important feature of fluent readers is their ability to read orally with appropriate expression or prosody, including intonation, stress, phrasing, appropriate pausing and pacing, and phrase lengthening (Dowhower, 1987, 1991; Schrauben, 2010; Schwanenflugel, Hamilton, Kuhn, Wisenbaker, & Stahl, 2004). Expression in reading helps readers chunk the text to assist them in constructing meaning (Schreiber, 1991) and, combining intonation with appropriate phrasing aids readers in their comprehension (Kuhn, Schwanenflugel & Meisinger, 2010). Reading too slowly or, conversely, too quickly impacts on the reader's ability to take meaning from a text and becomes a barrier to full understanding (Rasinski et al, 2011). Research indicates high correlations between oral reading fluency and performance on comprehension tests (Allinder, Fuchs, & Fuchs, 1998; Jenkins, Fuchs, van den Broek, Espin, & Deno, 2003; O'Connor et al., 2002; Pinnel et al., 1995; Rupley, Willson, & Nichols, 1998), including a randomised controlled trial of Grade 2 and 4 students in the US which found that fluency practice can increase text comprehension (Swanson and Connor, 2009). The reading fluency instruction during session one and two of each weekly cycle of three sessions, in the Fluency into Comprehension program combines modelling and practising expression with appropriate phrasing, which research indicates helps readers to comprehend what is being read (Kuhn, Schwanenflugel & Meisinger, 2010). The reciprocal reading instruction element of the Fluency into Comprehension program, during the third session of each weekly cycle of sessions, focuses on the use of comprehension strategies (clarifying, questioning, summarizing, predicting), which when modelled explicitly and applied flexibly in a scaffolded manner, promote a slow pace of reading for deeper understanding and thinking about the text. Reciprocal reading has been implemented successfully as a targeted intervention in English schools, improving young people's comprehension skills (O'Hare et al, 2019; Thurston, Cockerill et al, 2020).

The need for scaffolding during the modelling process in the Fluency into Comprehension program is underpinned by Vygotsky's theory (1978) of learning within the 'zone of proximal development' which requires mediation and carefully directed support, which also includes structured delivery in small groups of approximately four children working together with teacher support to make this scaffolded learning possible. This approach is in line with research which suggests scaffolding is effective (Van de Pol, Volman & Beishuizen, 2010).

The Fluency into Comprehension program uses cooperative learning pedagogy to promote interactions between members of the group working together, to enable the practice of fluency including phrasing, pausing, pacing and expression (Kuhn et al., 2010), and the practice of comprehension through construction of meaning whilst reading a

text (Palincsar & Brown 1986). Cooperative learning can be defined as a learning situation in which two or more students learn together to achieve a common goal or solve the task at hand, commonly through peer directed interactions where learners actively participate in group activities, while teachers usually serve as facilitators. Research shows that cooperative learning can work well for all ages if activities are suitably structured for learners' capabilities, and positive evidence has been found across the curriculum. Theories underpinning social interaction during cooperative learning have been substantively developed and described by Social Interdependence Theory (Johnson, Johnson & Roseth, 2010; Johnson & Johnson 2012). A meta-analysis undertaken some years ago by Johnson, Johnson & Stanne (2000) finds positive effects (ES +0.19 - +0.91) and more recently the Education Endowment Foundation toolkit recommends collaborative learning as a very low-cost approach with moderate impact (ES +0.5) based on extensive evidence.

This multi-strategy approach to reading development, which combines both fluency and comprehension instruction, is hypothesized to improve reading skills and to have an impact on reading attainment and reading comprehension outcomes of the selected students who decode but with poor fluency (ie. difficulties with processing the text – the surface level of reading) which impact on their ability to comprehend texts (the deeper meaning). The impact of the Fluency into Comprehension program on reading attainment of students will be investigated using two online standardized reading measures.

### 3.1. Theory of Change (ToC)

Fig. 1 also illustrates the ToC. It is proposed that by providing the structured Fluency into Comprehension program, including appropriate training to teachers and teaching assistants, the processes underpinning the teaching of reading fluency and comprehension can be changed. This assumes that the training will impact on the professional action of teaching staff, resulting in use of alternative pedagogies, both in respect of reading fluency instruction which represents two thirds of the instruction time, and reading comprehension instruction using a reciprocal reading approach which represents one third of the instruction time in this programme. As a result, it is projected that students' use of working in small groups cooperatively, focused on fluency practice as well as their use of comprehension strategies such as predicting, questioning, clarifying and summarising will improve their ability to read fluently with independence, comprehend text with greater meaning and lead to improved reading attainment.

Teacher surveys and attendance at training, in addition to Fluency into Comprehension teacher instruction dosage will be analysed as implementation factors/mediators for outcome change.

### 3.2. Criteria for recommendation that the Fluency into Comprehension program is ready for a Phase 3 Definitive RCT

The following criteria were developed to determine whether the Fluency into Comprehension program is ready for a Phase 3 Definitive RCT:

Professional development in use of the program is able to be delivered in line with specification to elementary/primary school teachers. Criteria will be met if 100% of schools engage in training to deliver the program.

That the program is able to be delivered in line with specification to students in elementary/primary school. Criteria will be met if over 80% of schools deliver the program in line with specification as measured by the dosage record of student sessions delivered.

That school teachers/teaching assistants evaluate their use of the program positively enough to conclude that it could be scaled up. Criteria will be met if over 50% of teachers report fidelity to treatment in online questionnaire.

That use of the program, when compared to a control group not using the technique, can result in a positive effect size for students using the

technique. Criteria will be met if a positive effect size is detected using the New Group Reading Test standardized reading measure.

#### 4. Research plan

##### Research questions

The Fluency into Comprehension program study will be a Phase 2 trial (randomized at the individual pupil level, using block randomization to ensure even numbers of intervention and control students in each arm of the trial within each of the 12 schools) complemented by a process evaluation. The study will primarily look at the effect of the program on the reading ability of children in primary schools. Pre and post-test measures of up to 192 children in 12 schools will assess the efficacy of the program in optimal conditions on a small scale.

The study will address the following questions:

- a) Can the program be delivered in primary schools?
- b) What is the impact of the program on children's reading ability?
- c) Does the impact of the program differ significantly according to variations in implementation fidelity? (Process evaluation)
- d) Is the program scalable?

Answers to the research questions above questions will be answered aligned to the criteria identified in section 3.3 above and whether these are met. If these criteria are met the program will be recommended as ready to be scaled to a Phase 3 trial.

#### 5. Design summary of the randomized controlled trial (RCT) and process evaluation

##### 5.1. Logic model

A logic model has been developed for the Fluency into Comprehension program intervention (Fig. 1). The logic model will help guide the process evaluation and enable us to interpret the findings of the RCT. The SPIRIT guidelines have been consulted to help structure the protocol for this trial (SPIRIT, 2015).

##### 5.2. RCT evaluation

The main outcomes will be evaluated by establishing an effect size for the intervention and undertaking within condition paired sample t-test analysis. The RCT will test for changes in children's reading abilities. The magnitude of any changes in the intervention group receiving the 12-week Fluency into Comprehension program will be measured against the control group who do not receive the treatment.

##### 5.3. Process evaluation

A process evaluation will supplement the RCT to measure the fidelity to implementation of the program. Guided by the MRC Framework (Moore, Audrey, Barker, Bond, Bonell, Hardeman, Moore, O'Cathcain, Tinati, Wight & Bair, 2015) the process evaluation will seek to assess whether the Fluency into Comprehension training was attended, teacher engagement, and dosage of implementation. To help assess this, the trainer will provide naturally occurring training attendance data, and teacher leads and teaching assistants will complete a post-program online survey, including questions about learning for the control group during the program.

#### 6. Assessment procedures

All children in both intervention and control groups will be tested before and after the intervention. Schools will be provided by the trainers with guidance to select up to 16 children from years 3 and 4 combined (aged 7 to 9), who can decode, but read very slowly resulting in poor reading fluency and comprehension.

##### Pre and post-test measures

The selected children, up to 8 from years 3 and 4 respectively, will be tested twice, once prior to teacher training and program intervention and a second time approximately 5 months after the program has started.

• Reading tests - The selected children from each school will complete two online standardized reading tests:

- New Group Reading Test (NGRT digital version) from GL-Assessment. This is an adaptive test which has high reliability (Alpha values 0.9) (GL-Assessment, 2018).
- Progress in Reading Assessment (PiRA digital version) from RS Assessment, Hodder Education. This is an adaptive test which has high reliability (Alpha values 0.94) (McCarty & Ruttle, 2016).

All children will be tested under exam conditions by schools prior to teacher training and program intervention. These will assess children's reading ability, including sentence completion and reading comprehension.

The differential effects of the program on children's reading attainment level will be determined using the post test data obtained from the NGRT and PiRA tests. The NGRT has two sub-scales, sentence completion and passage comprehension. These combine to give an overall reading score. Analysis will be undertaken on both sub-scales and the combined overall reading score.

PiRA has three sub-scales: comprehension, making inference including prediction and language structure and presentation. These combine to give an overall reading score. Analysis will be undertaken on the three sub-scales and the combined overall reading score.

##### 6.1. Dosage record

A 12-week teacher implementation session delivery plan (recommended 3 weekly sessions of 20 minutes each in small groups of up to 4 children) will be used by teachers to record weekly delivery data and will be collected at post-test to help measure the program's implementation fidelity.

##### 6.2. Teacher questionnaire at post-test

The teachers and teaching assistants will be asked to fill in a questionnaire at post-test for their feedback regarding the Fluency into Comprehension program and the implementation process. All questionnaires will be completed online using Lime Survey. The teacher questionnaire will consist of 19 questions to include 11 questions measured on a 4-point scale ranging from 'strongly agree' to 'strongly disagree'. In addition, the questionnaire will include 5 open questions and three closed questions with menu of options about session delivery.

##### 6.3. Training delivery naturally occurring data

Training attendance records will be collected by FFTL program trainers and will be used to assess school staff engagement in training.

Instruments and measures are summarized in Table 2.

#### 7. Sample

Up to 192 students in Years 3 and 4 (students aged 7-9 years), from 12 schools in the North East of England will be recruited to the trial from districts with above national average levels of socio-economic disadvantage. The trial will recruit up to 8 students from year group (up to 4 to act as intervention and up to 4 to act as control) across 2 year groups, up to 16 from each school. Students are eligible to take part in this trial if the school selects them as being able to decode, but very slow readers with limited fluency and with poor comprehension, using the guidance provided to them.

**Table 2**  
Measurement tools.

Outcome	Instrument	Completed by	Alpha values
Reading Comprehension	New Group Reading Test – Passage Comprehension subtest	Pupil	>0.9 (GL Assessment, 2018)
Overall reading	New Group Reading Test	Pupil	>0.9 (GL Assessment, 2018)
Reading accuracy	New Group Reading Test – Sentence completion subtest	Pupil	>0.9 (GL Assessment, 2018)
Overall reading Comprehension	Progress in Reading Assessment	Pupil	>0.94 (McCarty & Ruttle, 2016)
Making inference including prediction	Progress in Reading Assessment	Pupil	>0.94 (McCarty & Ruttle, 2016)
Language structure and presentation	Progress in Reading Assessment	Pupil	>0.94 (McCarty & Ruttle, 2016)
<b>Implementation factors</b>			
Dosage	12-week implementation (60 minutes weekly)	Teacher	n/a
Teacher engagement	Training attendance	Trainer	n/a
Teacher engagement	Teacher online survey	Teacher	n/a

**Table 3**  
Gantt Chart of timescales.

Activities	Mth 1	Mth 2	Mth 3	Mth 4	Mth 5	Mth 6	Mth 7	Mth 8	Mth 9	Mth 10	Mth 11	Mth 12	Mth 13
Develop logic model	█												
Recruit schools	█												
NGRT / PIRA pretest data			█	█									
Develop survey measures			█	█									
Training day 1 (1.0)				█									
School program delivery (12 weeks)				█	█	█	█	█	█				
Training day 2 (0.5)					█								
School support session						█	█						
NGRT / PIRA post test										█	█		
Teacher survey										█	█		
Session delivery data											█		
Data analysis												█	█
Write-up includes process evaluation												█	█
Final report													█

**8. Analysis plan**

The planned analysis will be to calculate Effect Size of the intervention (as Cohen’s *d*) with 95% confidence intervals. We will undertake within sample paired t-test analysis to look for gains within condition, in line with CONSORT advice for Phase 2 trials (MRC, 2000). However, we do not intend to undertake a between sample comparison as the design is not powered to do this. We really wish to establish what the likely effect of this intervention is, to help plan a properly powered trial, given that average effect sizes range between +0.13–+0.25 in previous implementations of similar interventions (O’Hare et al, 2019; Thurston, Cockerill et al, 2020).

**9. Randomization**

Students will be individually randomized to condition. This will be undertaken by listing the students alphabetically within their year group and school. A random number generator (Random Number Generator for iPhone version 5.0 by Nicolas Dean) will be used to generate a whole number between 0 (control) and 1 (intervention). Once the first class of four students from a year group is assigned to condition the other four students are randomized sequentially to condition in Year 3 and Year 4 respectively. This will ensure even numbers of intervention and control

students in each arm of the trial. This will use true randomization and no minimization will be used. Pre-test reading data will be used to undertake ANOVA to establish whether pre-test differences are significant. Pre-test differences should also be taken into account in the calculation of Cohen’s *d* effect size as this is calculated using means pre and post test scores for the two conditions. As we are not looking to undertake between sample statistical analysis (beyond establishing the effect size) then do not anticipate risk of sampling error.

**10. Personnel**

- Dr Maria Cockerill, Queens University Belfast.
- Professor Allen Thurston, Queen’s University Belfast & Zhengzhou University.
- Dr Joanne O’Keeffe, Queens University Belfast.
- Andy Taylor, Fischer Family Trust Literacy (program developer and trainer).

**11. Timescales**

The planned timescale for the research is 13 months. Table 3 below outlines a summary of the key milestones.

## 12. Cost

The cost of implementing the program will include training and resources and personnel time spent on training. The cost of the Fluency into Comprehension program implementation will be estimated per pupil over a one-year period, although it is accepted that school training is valid to continue implementation over at least a 3 year period. Costs include: Teacher training 1.5 days (digital sessions); teacher support sessions 0.5 days; teacher manual, instruction resources for session delivery, and reading books.

## 13. Ethics

The trial was approved through two ethics procedures. The intervention of the trial and testing was approved by the Headteachers who took part in the trial. The subsequent matching, combining and analysis of data was approved by the School of Social Sciences, Education and Social Work Ethics Committee from Queen's University Belfast.

## Declaration of Competing Interest

The authors have no competing interests to declare.

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