

# Developing higher-order reading skills in mainstream primary schools: a metacognitive approach- a study protocol

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## Abstract

This study protocol outlines a two-part study that will evaluate an evidence-based metacognitive approach to literacy, the Strathclyde Higher Order Thinking Skills programme (SHORS). A pilot (study 1) will inform the main study (study 2). The design of the study is an eight week intervention with pre- and post- measures. This protocol provides the details of the rationale and design of the study and details of the intervention, outcome measures, and the recruitment process. The study will address gaps within current research by evaluating the intervention impact within a Scottish setting.

## Background

In the light of findings from the National Scottish Survey of Literacy and Numeracy (Scottish Government, 2015), North Ayrshire Council has prioritised the improvement of literacy standards in primary schools in response to a widening of the range of attainments in reading comprehension across the Primary 4/5 stages (Sosu & Ellis, 2014). While factors such as self-efficacy (Bandura, 1976; Schunk, 1991), working memory (Chrysochoou, Bablekou, & Tsigilis, 2011; Swanson & Alexander, 1997), attention (Cain & Bignell, 2014; Diamond, 2013; Topping, 2014), motivation (Chan, 1994; Mathewson, 2004), teacher skill (Topping, 2014) and learning environment (Davies et al., 2013) are important determinants of success in learning to read, research evidence highlights the importance of metacognition in the development of higher-order reading skills (Baker, Zeligler-Kandasamy, & DeWyngaert, 2014; Dabarera, Renandya, & Zhang, 2014). Such skills require the development of listening comprehension (Aarnoutse, van Den Bos, & Brand-Gruwel, 1998; Perfetti, Landi, & Oakhill, 2005), together with sensitivity to story structure (Akhondi, Malayeri, & Samad, 2011; Alvermann, 1988; Newby, Caldwell, & Recht, 1989; Spires, Gallini, & Riggsbee, 1992), ability to draw inferences (Currie & Cain, 2015), comprehension monitoring (Armbruster, Lehr, & Osborn, 2001; Berkeley & Riccomini, 2013; Dabarera et al., 2014; Eme, Puustinen, & Coutelet, 2006; Kolić-Vehovec & Bajšanski, 2006; Payne & Manning, 1992), vocabulary (Beck & McKeown, 1983; Lubliner & Smetana, 2005) and topic knowledge (Armbruster et al., 2001).

The present project focuses on a multiple-strand reading comprehension instruction intervention with roots in two large scale studies: the work of James-Burdumy et al.(2009) with grade 5 students in the US and that of Shanahan et al. (2010) with preschool to primary 5 pupils in the UK. These strategies and approaches were investigated in Scotland by McCartney, Boyle and Ellis (2015) as part of the Strathclyde Higher-Order Reading Skills (SHORS) project, but the study design did not incorporate a control group. This project will add to existing literature in the following ways: firstly, it is a controlled study of an innovative approach to reading comprehension to determine the potential of SHORS as an intensive, high impact, short term and feasible intervention at the key primary 5 stage; secondly, it will extend the literature in regard to the effects of self-efficacy, intrinsic motivation, metacognitive knowledge of strategy use and intervention implementation upon reading outcomes; and thirdly, it takes account of the interactive variables of learner, teacher and learning environment (Bohn-Gettler

& Kendeou, 2014) and through measurement of outcomes at each of these levels, will develop our understanding of their relative contributions.

The project consists of two studies designed to add to the evidence base for reading comprehension intervention:

#### Study 1 aims

This is a pilot study to inform the design of the main study with the following aims:

- To investigate the feasibility of implementing a quasi-experimental study with a control group of the SHORS intervention within North Ayrshire
- To identify appropriate procedures for recruitment
- To evaluate the feasibility of measurement tools and implementation support offered to schools
- To determine an intervention effect size to inform the power calculation required to determine the required sample size for Study 2
- To investigate issues relating to dosage and programme duration in the light of McCartney et al. (2015).

#### Study 2 aims

This is the principal intervention study with the following aims:

- Does condition (control or experimental) have differential effects on the children's reading comprehension outcomes?
- Does condition (control or experimental) have differential effects on the children's self-reported use of reading comprehension strategies?
- Does condition (control or experimental) have differential effects on the children's self-efficacy and intrinsic motivation for reading?
- What is the relationship between intrinsic motivation, self-efficacy and self-reported use of reading strategies?
- Would the intervention be more effective as a universal approach for all pupils or as a targeted intervention for pupils with reading difficulties?
- What were the facilitators/barriers to implementing the reading comprehension intervention?
- What were the facilitators/barriers to sustaining the SHORS intervention after the completion of the quasi-experimental study?
- What is the feasibility of capacity building by training teachers to implement the SHORS intervention?

## Methods/design

### Ethical approval

All procedures have been approved by the local authority and the University of Strathclyde School of Psychological Sciences and Health Ethics Committees, and written and informed consent will be obtained from all participants.

## Study design

### Study 1 (Pilot)

This is a mixed-model, 2x2 factorial, quasi-experimental design with group (intervention versus control) and time-point (pre- versus post-intervention) as independent variables. The unit of randomisation will be the school. Instrumentation will consist of the subscales of self-efficacy and intrinsic motivation from the Motivation for Reading Questionnaire (MRQ), children's self-reports of strategy use and the Wechsler Individual Achievement Test - Second UK Edition UK (WIAT II) reading comprehension subtest. These measures will be the dependent variables. ANCOVAs (Robson, 2011), with pre-intervention scores as covariates will be used to adjust the corresponding post-intervention scores.

The SHORS intervention will follow the procedure of the McCartney et al. (2015) study for 8 weeks with 4 sessions of 45 minutes per week (a total of 24 hours). Systematic reviews of reading comprehension instruction for typically developing children (Davis, 2010; Fukkink & De Glopper, 1998; Rosenshine & Meister, 1994; Rosenshine, Meister, & Chapman, 1996) and for non-typical or at risk children (Berkeley, Scruggs, & Mastropieri, 2010; Elbaum, Vaughn, Hughes, & Watson Moody, 2000; Gajria, Jitendra, Sood, & Sacks, 2007; Suggate, 2010; Talbott, Lloyd, & Tankersley, 1994) indicate that a programme of this duration is likely to yield an effect size of 0.50 or greater. If required following the findings from Study 1 (pilot study), the duration of the intervention period for Study 2 (main study) may be extended. Primary 5 classes in participating schools (i.e. where the Head Teachers have agreed to the school taking part and class teachers have given consent) will be randomised to either the intervention or control conditions and parents invited to consent to their child's participation with knowledge of the condition that the child will be allocated to. The procedure will be as follows:

### Study 1 Timeline

Week 1, Teacher selection	Teachers of P5 classes will be identified on the basis of participating schools as agreed by the Head Teacher. Schools with comparable socio-economic demographics will be randomly assigned.
Week 2-3 Getting consent	Active consent will be sought from these teachers, parents/carers and the pupils themselves. These teachers will be requested to complete a teacher survey (based upon James-Burdumy et al, 2009) to provide details of qualifications and experience. Teachers in the intervention group will be asked to complete a pre-intervention questionnaire to ensure sufficient motivation to invest in the programme.  Consent from parents/carers for children's assessment must be received for a minimum of 6 children per class in the case of the pilot study. The P5 teacher's literacy lesson will be observed to gauge baseline literacy practices (based upon James-Burdumy et al, 2009).
Weeks 4-5 Pre-test phase  Assessments and randomisation	For those children for whom parent/carer permission for participation has been granted, pre-tests of dependent variables will be administered, subject to the pupil's verbal consent. This will incorporate the measures described above.  The WIAT II will be administered on an individual basis by the researcher and the children's self-reported scales and MRQ will be administered in groups to avoid any undue intrusion.  If the researcher finds that a pupil has a low score and the teacher is not aware of this, the researcher will ask permission of the pupil to pass this information on to the teacher.
Week 6- Training delivered to intervention	For those in the intervention group, teacher training will take place in the Strathclyde Higher-order Reading Skills Project (SHORS) (McCartney et al., 2015) including an outline of the importance of the core components of the programme. This will be done via a 2 hour training (Continuous

teachers on the intervention	Lifelong Professional Learning, CLPL) session delivered by the researcher, as per guidance from McCartney et al. (2015).
Week 7-14 intervention programme-  (Although it is an 8 week programme the dates show a 10 week period to allow for Easter holidays)	Teachers will then administer the intervention for 45 minutes per day four days per week over 8 weeks (32 sessions). During the intervention period random classroom observations (carried out by the EP) will take place in weeks 9 and 12 during literacy lessons to ensure the implementation of the programme the fidelity schedule to measure implementation (Kelly and Perkins 2012). Teachers will also be asked to complete implementation records (as per McCartney et al., 2015) to record the extent to which the intervention protocol was followed. Teachers of those in the control condition will be asked to run their regular literacy lessons for 45 minutes per day four days per week over 8 weeks (32 sessions).
Weeks 15-17 assessments and implementation assessment	Children's post self-ratings (as per McCartney et al., 2015) and MRQs subscales will be gathered for all children in groups and WIAT II reading comprehension and word reading subtest information will be assessed by the researcher on a 1:1 basis. All children and teachers will be debriefed after assessments. Teacher implementation records will be used to assess implementation effectiveness.
Weeks 18-27 Analysis phase	WIAT II reading comprehension and word reading subtest scores and MRQ data and children's self-reported scales will be analysed using analysis of covariance (ANCOVA). Thematic analysis of observation data, children's strategy use records and teacher implementation records will be undertaken, with checks to ensure reliability of coding and prevent researcher bias (Robson, 2011).

### *Study 2 (main intervention)*

This is a mixed-model, 2x2x2 quasi-experimental design with condition (intervention versus control) and time-point (pre- versus post-intervention) and ability (high versus low word reading ability) as independent variables. The unit of randomisation will be school. Instrumentation, dependent variables and analysis will be as per Study 1. WIAT II word reading scores will be used to identify higher versus lower reading ability by means of a median split. An intention to treat analysis (Hollis & Campbell, 1999) will be undertaken in the event of missing data.

A total sample of around circa 100 children will be recruited to allow for attrition. This is based on the minimal score difference which could be detected by the least reliable of the standardised instruments used as primary outcome measures and equates to a medium effect size, Cohen's *d* of 0.736, with a one-tailed test at 5% level of significance and power of 0.8. The pilot study will provide information regarding how tenable this size of intervention effect will be. The method of recruitment is outlined above. Given the class numbers within the authority, a sample of 100 children equates to approximately 4-6 classes of Primary 5 children who are requested to take part (depending upon class sizes to ensure adequate power). This allows for approximately 2-3 classes (of different schools) of children in the intervention study and 2-3 (classes/schools) for the control. However the final number of participants, schools and also the duration of the programme will be informed by the results of Study 1.

Participating schools will again be matched for socio-economic variables (to minimise possible recruitment bias) and will be randomly assigned to either the experimental (group A) or control conditions (group B). The consent procedures, training for teachers and the delivery of the programme will be as per Study 1.

### **Study 2 Timeline**

This will be the similar to the pilot as described below unless the pilot informs otherwise.

Week 1, Teacher selection	As per Study 1 above
Weeks 2-3 Getting consent	As per Study 1 above
Weeks 4-6 Pre-test Pre-test phase. Assessments and randomisation.  Week 6- In-service training of intervention	As per Study 1 above plus the individual administration of the WIAT II word reading scale subtest during the same session as the reading comprehension scale.
Weeks 7-15 intervention programme  (Although it is an 8 week programme the dates show a longer period to allow for October holidays)	As per Study 1 above
Weeks 16-17 Post-test assessments and implementation assessment	Children’s post self-ratings (as per McCartney et al., 2015) and MRQs will be gathered for all children in groups and WIAT II reading comprehension and word reading subtest information will be assessed by the researcher on a 1:1 basis. All children and teachers will be debriefed after assessments.
Weeks 19-28 Analysis phase	As per Study 1 above.
Weeks 29 onwards	Write up phase

### Recruitment procedures

Methods of recruitment for the investigation are consistent with obtaining active, informed consent from parents and pupils enrolled in primary schools in North Ayrshire Council for which the researcher is the link psychologist. The information sheets and consent forms stipulate that there is no expectation that participants take part and no inducement is offered to participants or proposed participants. Recruitment of primary schools will be through a letter distributed to the Head Teachers of primary schools in North Ayrshire Council. The primary 5 classes from each school will be randomly allocated to either the intervention or control conditions, with schools as the unit of randomisation. Teachers whose classes are allocated to intervention will also be asked to complete a pre-implementation questionnaire. Both intervention and control schools will have comparable catchment areas in regard to SIMD (socio-economic) indicators. Recruitment of participants in primary 5 classes where the Head Teacher has agreed to take part will be initiated by a letter to all the parents/caregivers which will indicate the condition the class has been randomly assigned. No payments, expenses or other incentives are offered.

### Study Sample

Participants will be pupils from primary schools in North Ayrshire Council (two schools in pilot study 1 and around four-six schools in main study 2, depending upon class sizes, to ensure adequate power) where the investigator is employed as an Educational Psychologist. Pupils are from the Primary 5 stage of non-composite classes.

Pupils will be invited to take part on the basis of parental/carer consent and they will also be asked to give verbal consent. All pupils will be asked to complete individual and group pre- and post-assessments.

The number and age (range) of each group of participants will be:

Study 1 (pilot): N=12 children aged 8-10 from two primary 5 non composite class (minimum of 6 per class)

Study 2 (main study): Circa N=100 children aged 8-10 (final sample size to be informed by the pilot) primary 5 non composite class (circa 25 children per class). Each participating class will be from a separate school to avoid contamination effects.

### Primary outcome measures

The following published scales will be used: pre and post self-ratings follows the protocols of McCartney et al. (2015); WIAT II word reading and reading comprehension subscales: the MRQ (Guthrie & Wigfield, 1997): the ERC Observation schedule (James-Burdumy et al, 2009): Observation schedule for programme fidelity (James-Burdumy et al, 2009): Teacher survey (James-Burdumy et al, 2009): and Pre-Implementation Readiness Questionnaire (Kelly & Perkins, 2012).

### Intervention Condition

Teachers of the intervention classes will be offered a 2 hour training session which will provide: details of the SHORS intervention and opportunities for discussion about reading comprehension instruction and how to effectively embed the programme most effectively in the daily routine of the classroom. Following McCartney et al. (2015), information on reading comprehension strategies, videos of exemplar instruction, handouts and classroom reminders including a classroom poster will be provided to the teachers. They will then complete a pre-intervention questionnaire based upon Kelly and Perkins (2012).

The SHORS intervention programme takes place daily in regular classroom literacy sessions (e.g. whole class, small group or individual activities as appropriate) for 4x45 minutes per week over 8 weeks. The intervention asks for text comprehension strategies and illustrative 'key messages' (in italics) to be overtly taught, emphasized and referred to throughout literacy classes. These are:

- Children would actively engage in reading comprehension by consciously accessing their prior knowledge; *'prepare your mind. What is this about?'*
- Children would develop and answer questions about important ideas in the text; *'wonder to yourself. Does this seem likely?'*
- Children would visualize what a text means; *'if this was a film, what would I see?'*
- Children would clarify points of misunderstanding; *'if I don't understand, stop, re-read. If I still don't understand, find the problem word. Does it remind me of other words? If necessary, look it up.'*
- Children would make inferences around the text; *'how does this relate to what I already know? What was new?'*
- Children would summarize; *'what do I know so far? What do I need to know?'*
- Children would retell the main points of the text; *'in my own words, that means . . . .'*

In addition, the children's metacognitive awareness of the use of the strategies will be enhanced by the use of hand gestures when strategies are being used (Courtney & Gleeson, 2010). A further signal will be encouraged for when children hear a voice 'reading aloud' in their head. Post reading reflection will be encouraged by asking children how the story could have ended differently (*'crunch points'*). The McCartney et al. (2015) approaches to vocabulary development for unfamiliar words, text

organizational structures and participation in direct teacher/children discussion will also be encouraged. Finally the texts will carefully be selected to be of high interest thereby promoting maximum motivational engagement. Children in an intervention class who are not participating in the programme will follow a literacy curriculum determined by the school. This will follow the national Curriculum for Excellence requirements.

### Control Condition

In the case of the control condition, teachers and children will not have access to intervention information, additional opportunities for professional dialogue around reading comprehension instruction, SHORS specific information on strategies, videos of exemplar instruction, handouts or classroom reminders/posters. Instead they will continue as per their regular practice in whole class, small group or individual activities, as appropriate. They will also be asked to schedule their literacy lessons of equal time as the intervention class (4 x 45 minutes per week over 8 weeks).

### Discussion

This protocol provides the details of the rationale and design of this two part study. It includes information on the recruitment process, intervention and outcome measures. The effectiveness of the SHORS intervention will be calculated on the bases of effect sizes comparisons between the intervention and control groups. This project will add to existing literature by determining the impact of the SHORS intervention at the primary 5 stage. It will extend our understanding of the effects of self-efficacy, intrinsic motivation, metacognitive knowledge of strategy use and intervention implementation upon reading outcomes. Furthermore it will develop our understanding of the relative contributions of the interactive variables of learner, teacher and learning environment.

3175 words

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