DEVELOPING HIGHER-ORDER READING SKILLS IN MAINSTREAM PRIMARY SCHOOLS: A METACOGNITIVE AND SELF-REGULATORY APPROACH

Accepted by the *British Educational Research Journal*
3 October 2019

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Abstract

The ability to read relies upon not just decoding, but also comprehending text. Being a good comprehender requires strategic reading and implies the use of comprehension strategies. Research indicates that readers who are taught several reading comprehension strategies have better reading skills than those only taught a single strategy. One multiple strategy reading comprehension intervention was evaluated using a mixed-model quasi-experimental design. Intervention and control conditions groups were assessed at pre and post test points with standardised reading comprehension abilities, measured as the primary outcome measure. Implementation science principles were observed and evaluated. The schools all served areas of low socio-economic status. 74 pupils (aged 9–10) in 5 classes in 4 primary-level mainstream schools in a Scottish local authority were recruited as participants. Training was provided to participating schools by the first author and the programme was delivered in 4 sessions of 45 minutes per week for 8 weeks.

An ANCOVA revealed a statistically significant effect of condition. Statistically significant scores were also evident in the secondary outcome measures of decoding of target word skills, children's self-reports of their reading strategy use and recreational reading frequency. Implementation tools indicated the intervention was acceptable and feasible to implement. Implications of introducing this multiple strategy reading comprehension programme and of the evaluation of implementation are discussed.

Key words:
Reading comprehension, metacognition, elementary school, implementation science

Higher order reading skills instruction

Reading is a complex process which relies on a range of motor cognitive and perceptual skills, from low-level visual perception to higher-order systems, to generate meaning and comprehend text (Gentry & Ouellette, 2019). Being a good comprehender implies the effective use of lower-order (recall of processes, structures, and settings) and higher-order (evaluating, synthesising and making critical judgements about information) comprehension strategies (Armbruster, 2010; Hall, 1989; Silva & Cain, 2014; Gentry & Ouellette, 2019). However, studies in the USA and UK estimate that 3%–10% of school-age children have difficulties in understanding what they read (Aaron, Joshi, & Williams, 1999; Catts, Compton, Tomblin, & Bridges, 2012; Leach, Scarborough, & Rescorla, 2003; Yuill & Oakhill, 1991). Similar findings have been reported from recent studies carried out in Italy (Cecilia, Vittorini, Cofini, & di Orio, 2014). Further, Swanson's (2008) synthesis of 26 studies of classroom observations of teacher behaviour concluded that little reading comprehension (RC) instruction took place. This was further explored by Ness (2009), whose findings suggest that a lack of teacher confidence may mediate the effectiveness of instruction in RC.

Metacognition, self-regulated learning and reading

The roles of metacognition and self-regulated learning in the development and use of academic skills is widely recognised in research and practice (Ghaith & El-Sanyoura, 2019). Self-regulated action, for example, has been described as a phenomenon comprising of metacognition, self-regulation and self-regulated learning (Kaplan, 2008), and indeed the inter-relatedness of these concepts is widely documented (Lojoie, 2008; Leopold & Leutner, 2015). Early definitions of metacognition emphasise the knowledge aspect which is concerned with our knowledge of cognitive activity (Moore, 1983; Myers & Paris, 1978). Metacognitive experiences focus more upon self-regulatory aspects (Paris et al., 1984). Within the domain of reading, comprehension monitoring is a key strategy which entails metacognition together with the evaluation and self-regulation of comprehension (Garner, 1987; Wagoner, 1983). This is the reflective and self-regulatory skill we require when something (e.g. reading comprehension) fails, and a repair strategy will be needed to understand the written text. It is closely linked with critical thinking and is an ability often lacking in poor readers, who tend to read on regardless of comprehension, yet the skills can be taught explicitly (Perry, Lundie & Golder, 2019).

Implementation Science framework

Within recent years, economic forces have dictated the need for interventions to be effective and economical. This necessitates assurances that money is not wasted on programmes that do not improve outcome. Hopefully, before adopting any new approach, checks have ensured that it has been rigorously evaluated and proven to be beneficial. However, often in schools these apparently effective approaches prove to be ineffective in practice and are cast aside in favour of more fashionable products or procedures (Moir, 2018).

Implementation science is the study of how evidence-based programmes can transfer into organisations (of various disciplines) successfully (Kelly & Perkins, 2012). Key to every new initiative is not only a rigorous evaluation of programme impact but also an equally stringent appraisal of its implementation (Kelly & Perkins, 2012; Moir, 2018).
Core implementation outcomes for the assessment of programmes include fidelity, acceptability, sustainability and feasibility (Proctor, Landsverk, Aarons, Chambers, Glisson, & Mittman, 2009) and the conceptual Implementation Components Framework, (Fixsen, Blase, Naoom, & Wallace, 2009) identifies key aspects or drivers that are necessary for successful implementation.

Rationale for the current study

A range of strategies has been identified as effective in developing RC. Over time, these individual strategies have been amalgamated into various different manifestations of multiple-strategy comprehension instruction (MSCI) approaches (NRP, 2000). One MCSI approach, the Strathclyde Higher Order Reading Skills (SHORS) programme, explicitly teaches metacognitive strategies. Furthermore, it emphasises the quality of the relationship between teacher and pupil, the purpose for reading, awareness of reader stance, understanding of sociocultural values, allows for sharing authority in meaning negotiation and encourages understanding through reflection. The SHORS approach has its roots in two studies: that of James-Burdumy et al. (2010) and that of Shanahan et al. (2010).

The study by James-Burdumy et al. (2010) was large-scale and was conducted with funding from the US Department of Education to assess which of four supplementary RC curricula interventions had the largest impact. The experimental study took place across 10 districts and included over 200 schools and 10,000 Grade 5 children across 2 school years. The results showed that none of the interventions had a significantly positive impact on student outcomes (effect sizes: -0.08 to -0.21) when compared to controls. However, secondary analysis of

observation data using fidelity observation checklists and Expository Reading Comprehension Classroom Observation Forms (James-Burdumy et al., 2010) indicated key messages which when overtly taught and emphasised within the classroom, encouraged metacognitive thinking in children thereby having the largest effects on reading outcomes.

Further, Shanahan et al. (2010) carried out a systematic review of evidence-based approaches for teaching RC in the kindergarten to US Grade 3 age range. Their review included 27 studies, selected based upon the quality of evidence; from this they made five recommendations for effective reading instruction. Shanahan (2010) and James- Burdumy et al. (2010) both drew similar conclusions regarding key MCSI components which informed the present intervention and are described in detail below.

Overview of the present study

Research findings suggest that the literacy attainment gap widens most significantly between the ages of 8 and 11 (Sosu & Ellis, 2014; Chall & Jacobs, 2003; Chall, 1983; Hirsch, 2003) with the term "fourth grade slump" referring to this decrease in reading skills for this population. Children within areas of social deprivation of low socio-economic status are particularly vulnerable to this slump (Chall, Jacobs, & Baldwin, 2009). In line with national priorities (Sosu & Ellis, 2014) the local authority wanted to reduce the literacy gap by targeting this vulnerable age group.

A preliminary investigation and feasibility study this programme, was undertaken by McCartney, Ellis and Boyle, 2015) who took the key strategies and contexts from the two studies outlined above which indicated the need for explicitly taught strategies and their ongoing use made obvious and visible within the classroom and reported a one-sample pre-post-intervention analysis. This small-scale Scottish feasibility study of 47 children (M24; F23) showed a Cohen's *d* effect size (Cohen, 1988) of 0.46 and recommended that the approach be included and routinised within the schools' regular classroom reading curriculum, in whole-class, small-group or individual activities as appropriate.

However, their study had no control condition to determine whether the intervention was more effective than the regular literacy curriculum in schools. Furthermore this study did not investigate the impact of the intervention on decoding skills, reading habits or implementation. Accordingly, the present study measures these elements alongside the measure of children's declarative knowledge, (a component part of metacognition) used in the feasibility study (McCartney et al., 2015).

Therefore, the current study was designed to extend the evidence base for the SHORS approach to RC by the inclusion of a control group, and additional measures of reading skills and habits with the aim of answering the following research questions:

- Does the SHORS programme improve the RC scores of an intervention group of primary-school-aged pupils in a mainstream school relative to a control group receiving the regular literacy curriculum?
- Does the intervention improve children's decoding scores of an intervention group of primary-school-aged pupils in a mainstream school relative to a control group receiving the regular literacy curriculum?
- Does the intervention improve the children's self-reported use of reading comprehension strategies of primary-school-aged pupils in a mainstream school of an intervention group relative to a control group receiving the regular literacy curriculum?
- Does the intervention improve the children's self-reported reading habits, in particular the frequency of children's reading at home of primary-school-aged pupils in a mainstream school of an intervention group relative to a control group receiving the regular literacy curriculum?
- What do the fidelity observations, readiness questionnaires and semi-structured interviews tell us about the facilitators/barriers to implementation of the programme?

Method

Ethics

The study was approved by the ethics committees of the local authority in which the participating schools were located and the School of Psychological Sciences and Health ethics committee.

Participants

A power analysis informed the sample size of the main study and indicated that 66 participants (+10% to allow for possible attrition) were required therefore participants were a sample of 74 children (M = 35; F = 39) aged between 9 and 10, from 5 classes in 4 local authority mainstream primary schools in the West of Scotland. The authority is an Attainment Challenge authority and had established a Professional Learning Academy (PLA) which aims to work across the authority to support learning and teaching and to improve attainment. The PLA were supporting the implementation of many initiatives within schools which potentially created performance or dilution biases

(Torgerson, 2008; Torgerson & Torgerson, 2013) for the current study. Therefore, communication and negotiation with the PLA was necessary to ensure minimisation of these confounding variables. This informed the first phase of school selection, where schools that were not taking part in PLA initiatives could be matched by geographical area, SIMD (as a measure of socio economic status) and of the same ranked quartiles (Scottish Government, 2006). Informed by a pilot, 4 schools with Primary 5 classes were required and therefore potential schools were considered in a second phase of school selection scrutiny. All children within the authority had taken part in national reading comprehension tests using the New Group Reading Test (NGRT) four months prior to the intervention period. This facilitated initial analysis to ensure that reading levels in the candidate intervention and control groups were equivalent. 64 children were White Scottish, 3 White non-Scottish, 2 Asian and 5 not known. Two children spoke English as a second language. The five schools came from areas ranked in the top 15% of most deprived areas in Scotland The study took place in a local authority which contains a number of areas of multiple deprivation, with 35 of the 46 data zones ranked in the top 15% most deprived areas (Scottish Government, 2006).

Teacher sample

Teachers were selected from participating schools based upon the year group they taught and invited to take part. All five teachers of the relevant school classes agreed to take part (3 in the intervention condition and 2 in the control condition). All were female and ages ranged from 24 to 62 with teaching experience ranged from 1- 19 years.

Descriptive information on group allocation can be seen in Table 1 below.

"Table 1 about here"

Measures

Children's reading skills

An initial comparison of standardised reading tests was conducted on two levels. The first level sifted on the basis of UK standardisation, age appropriateness for the population, availability of parallel forms and availability. This reduced the number of potential tools from 8 to 3. As seen in Table 2 below, analysis on the basis of reliability and validity indicated that the Wechsler Individual Achievement Test – Second Edition (WIAT-II^{UK}) RC scale (Wechsler, 2005) be the preferable tool. The WIAT measures literal, inferential and lexical comprehension, reading rate, oral reading accuracy and fluency and word recognition in context. It does through one to one administration by a researcher. The WIAT II is standardised in the UK and has reliability ratings with stability co-efficients

ranging from 0.93-0.98, and a standard error of measurement for reading comprehension varying from 3.00 to 3.67 across age groups. Correlations of the WIAT-II^{UK} scores with other achievement test scores are moderate to high and therefore the tool is considered an adequate measure of the achievement constructs that they were designed to measure.

"Table 2 about here"

Children's declarative knowledge or self-reported record of strategy use

A non-standardised measure of strategy use was used to explore the children's perceptions of their metacognitive knowledge of the strategies overtly captured within the intervention. The same children's self-report of strategy use questionnaires were used as those developed within the McCartney et al.'s study (2015) and allowed children to record what reading strategies they used and how often they used them (appendix 1).

Reading habits

At pre- and post-assessment periods children were asked by the researcher: *How often do you read at home per week*?

Teacher's semi structured post intervention interview

Ten open-ended questions were designed to explore the implementation and feasibility of the intervention. They were designed to explore the interpretative resources; the intervention teacher may have available for making sense of their part in the intervention. Questions were designed to answer qualitative research questions.

Fidelity Observation Schedule

The implementation observation aims to measure the fidelity of implementation for the intervention group only, in a similar fashion to the James-Burdumy et al. (2010) study. This measure was designed to ensure that it reflected the critical elements of the intervention. It takes an event sampling approach, where a tally of events such as types of instruction, was used to organise observational data for subsequent analysis. Fidelity observations took place during week 3 and 6 and lasted for 45 minutes after which a coaching discussion took place if necessary to maximise implementation (appendix 2).

Readiness Questionnaire

Intervention teachers were asked to complete a readiness questionnaire (Kelly, 2012) prior to taking part in the study. The teachers were been identified by the HT of their school. Individual motivations of teachers were not explored. They indicated that they had not previously been taught how to teach reading comprehension in such an explicit way. All participating

teachers indicated they were willing to take part in the project, felt that they had enough information about the intervention and agreed necessary time commitments. Commitment and motivation to the programme and to fidelity to the intervention's core components was agreed. Intervention teachers 2 and 3 taught within a school where the HT requested all staff to attend the training. The readiness questionnaire was also available to further interpret the results in the light of any variation in teachers' implementation of the approach.

Design and procedure

Neither a randomized controlled trial (RCT) with the unit of randomization the individual participant nor a cluster RCT with the unit both of randomisation and of analysis the school class were feasible for the present study for operational reasons in the case of the former, and logistical reasons in the case of the latter. Accordingly the intervention study utilised a mixed-model, quasi-experimental design, with condition (intervention versus control) as the independent variable, pre intervention reading comprehension score as the covariate, and adjusted post-test reading comprehension score as the dependent variable. The unit of randomisation was the school as all teachers in the relevant years participated.

Children were invited to take part after parental agreement had been obtained and gave their own individual consent before participating.

The programme was to run on indefinitely yet the intervention period had to be of optimal length within the study design. However, systematic reviews of reading comprehension instruction for typically developing children (Fukkink & de Glopper, 1998; Rosenshine, Meister, & Chapman, 1996; Rosenshine & Meister, 1994; Davis, 2010) and for non-typical or at-risk children (Berkeley, Scruggs, & Mastropieri, 2009; Elbaum, Vaughn, Tejero, Hughes, & Watson Moody, 2000; Gajria, Jitendra, Sood, & Sacks, 2007; Talbott, Lloyd, & Tankersley, 1994) have found no dose-response relationship between effect size and instructional duration within the range of an estimated 100 minutes of instruction in the shortest and over 4000 minutes in the longest programmes (median = 810 minutes) and a length of 2–36 weeks (median = 5 weeks), in the 98 studies that reported details of dosage. However, studies with SES of 0.50 or greater reported a median duration of 8 weeks (range 2–36 weeks). Accordingly, the SHORS intervention had an 8-week duration.

An intention-to-treat analysis (Hollis & Campbell, 1999) which entailed imputing missing post-intervention scores with the relevant pre-intervention scores was utilised to deal with missing data.

Four schools were recruited and were compared on data from NGRT (Burge et al., 2010) administered to the candidate classes by the local authority four months prior to the intervention period.

A one-way ANOVA revealed no significant between-school effect on standard scores from the ($F(3,108) = 0.60$, $p = .61$). Randomisation procedures allocated Schools A and B to the intervention group, and Schools C and D to the control group. A comparison of standard scores from the NGRT revealed a non-significant between-condition difference of 0.83 standard score points ($t(110) = 0.33$, $p = .37$, one-tailed test), which equates to a Cohen's *d* of 0.06). This confirmed the equivalence of the two conditions in terms of the pupils' reading scores on the NGRT prior to the intervention.

The minimal significant difference (MSD) is the smallest difference which needs to be observed, taking measurement error into account, so that pre-post intervention change scores are of practical significance and cannot be attributed solely to test/retest error (Chapman, Crane, Wiles, Noppert, & McIndoe, 1995). Using the procedures outlined by Weir (2005) and the Standard Error of Measurement (SEM) from the WIAT-II^{UK} Technical Manual, the MSD for the WIAT-II^{UK} Reading Comprehension Scale was calculated as 10.17 standard score points; equivalent to a standardised effect size of 0.67 to ensure that the results would be out with measurement error. For a score change following intervention to be attributed to the intervention and not to measurement error, the observed standardised effect size should thus exceed 0.67 (see also Boyle & Kelly, 2017).

Five teachers, three were in the intervention condition and two in the control condition, also provided qualitative data regarding outcomes, impact and implementation s part of the mixed methods design. All were female, aged from 24 to 62, and with teaching experience ranging from 1 to 19 years.

Details of the Intervention

SHORS is a methodology that allows teachers to blend the approach with their teaching resources in whole-class and group settings. It recommends a flexible, embedded approach, which can be easier for teachers to implement than a more prescriptive approach (Boyle, McCartney, O'Hare, & Law, 2010). Following McCartney et al. (2015), teachers of the classes randomised to intervention were first offered a two-hour training session which provided; a theoretical understanding of reading comprehension, a rationale for the current study, details of the SHORS and its core components, modelled examples of the use of SHORS and opportunities for discussion about reading comprehension instruction, how certain texts lent themselves to some strategies better than others, and how to effectively embed the programme in the daily routine of the classroom. Information on RC strategies, videos of exemplar instruction, handouts and

classroom reminders, including a classroom poster, were provided for the teachers.

The SHORS intensive intervention programme was delivered daily in regular classroom literacy sessions (whole-class, small-group or individual activities as appropriate) for 4 × 45 minutes per week over 8 weeks. Fidelity observations took place twice during the intervention period to ensure that procedures were being adhered to and to offer coaching support as necessary. The intervention entailed the following text comprehension strategies and illustrative 'key messages' being overtly taught, emphasised and referred to throughout literacy classes:

- Children would actively engage in RC 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 visualise 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 summarise: *'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 was enhanced by the use of hand gestures when strategies were being used (Courtney & Gleeson, 2010). Post-reading reflection was encouraged by asking children how the story could have ended differently ('*crunch points'*). The use of McCartney et al.'s (2015) approaches to vocabulary development for unfamiliar words, text organisational structures and participation in direct teacher/children discussion – designed initially for pupils with language learning impairment – was also encouraged. Finally, the texts were carefully selected to be of high interest to the pupils, thereby promoting maximum motivational engagement.

In the case of the control condition, teachers and children did not have access to intervention information. Instead they continued to follow their regular literacy practice in whole-class, small-group or individual activities, as appropriate. They were asked to schedule literacy lessons of equal time to the intervention classes (4 × 45 minutes per week over 8 weeks).

Results

Following an intention-to-treat approach, all participants were included in the analysis regardless of whether or not they were available for post-test assessments with imputation of the appropriate pre-intervention scores for any missing post-intervention scores. There were missing data from 7 of the 74 children (9.46%). Descriptive statistics (means and standard deviations) are shown for the intervention and control groups in Table 3 below. The data met the requirements for parametric statistical analysis.

"Table 3 about here"

Reading comprehension

A one-way, between-subjects analysis of covariance, with the WIAT-II^{UK} pre-test scores as the covariate and the adjusted post-test WIAT-II^{UK} RC scale as the dependent variable, showed a statistically significant main effect of condition (intervention versus control): $F(1,71) = 14.63$, $p < .005$, partial $\eta^2 = .17$, which equates to a Cohen's *d* of +0.81 (95% CI +0.34, +1.29). An effect size of this magnitude exceeds the MSD and provides confidence that the observed score change can be attributed to the intervention and not to measurement error.

Decoding target words.

Descriptive statistics for the WIAT-II^{UK} decoding target word scores are shown for the intervention and control groups in Table 3. Analysis using an ANCOVA with the WIAT-II^{UK} pre-test target words scores as covariate, and the post-test WIAT-II^{UK} target word score as the dependent variable yielded a statistically significant effect of group (intervention versus control): $F(1,71) = 5.59$, $p = .02$, partial $\eta^2 = .07$. The adjusted mean score for the intervention group was 23.35 compared to M = 22.14 for the control group. This equates to a Cohen's *d* of 0.56, a medium effect size.

Children's self-rated scales of Strategies Used (SRSU)

The descriptive statistics for the SRSU are shown in Table 3. A one-way, between-subjects analysis of covariance, with the covariate being the SRSU pre-test scores and the dependant variable the post-test SRSU, resulted in a statistically significant effect of group (intervention versus control): $F(1,71) = 8.48$, $p = .005$, partial $\eta^2 = 0.11$. The adjusted mean score for the intervention group was 28.17 compared to 24.39 for the control group. This equates to a Cohen's *d* of 0.75, again a medium effect size.

Frequency of reading at home as reported by the children.

The descriptive statistics with means and standard deviations for reading at home frequency are shown in Table 3. An ANCOVA, with the covariate being the reported frequency of reading at home pre-test scores and the dependant variable the post-test reported frequency of reading at home, resulted in a statistically significant effect of group (intervention versus control) with $F(1,71) = 11.96$, $p < .001$, partial $\eta^2 = 0.14$. The adjusted mean score for the intervention group was 3.06 (upper and lower bounds with 95% confidence intervals of 2.79-3.34) compared to 2.39 (upper and lower bounds with 95% confidence intervals of 2.12-2.66) for the control group, indicating a large effect size (d=0.88).

It can be seen that the intervention group reported reading more frequently during the intervention period than prior to the intervention period. However, the control group reported reading less frequently during the intervention period than prior to the intervention period.

Readiness Questionnaire

Tentative Observations by the first author indicated that they were motivated to implement the intervention and made use of opportunities to discuss and share ideas regarding implementation both between each other and other colleagues and their HT. They reported valuing the support that the HT and colleagues provided.

At the end of the intervention period, teachers were asked if they had adhered to the agreed time commitments. Intervention teachers 2 and 3 stated that they had adhered to all the intervention criteria.

Fidelity Observations

Each intervention teacher was observed twice during the intervention period (weeks 3 and 6) and scored in relation to their implementation of the core components of the intervention.

The overall reading comprehension strategy references made by each teacher during fidelity observations and the overall number of intervention core components observed during fidelity observations are shown in Table 4.

"Table 4 about here"

There was variation in the level of implementation, but overall, the intervention was implemented as intended. The data suggest that the amount of prompt references increased as the intervention became more embedded.

Post-intervention Teacher Qualitative discussion

The data in Table 4 together with findings from the readiness questionnaire and the semi-structured interviews reveal that

while all teachers implemented the intervention, they did so to different degrees. This supported categorising teachers into one of two groups; higher fidelity to the implementation of the programme and lower fidelity. Two of the teachers stated they had implemented the programme in full, while one said she did so to a lesser extent, noting that she felt that the time commitment was unrealistic and that while she had tried to stay committed to the programme, this had not been without difficulties.

Semi-structured interviews took place with the first author and each of the three intervention teachers following the intervention period. Comments from teachers of the two groups can be seen in Table 5.

"Table 5 about here"

The feedback for the two higher fidelity teachers elicited comments regarding SHORS which were all positive:

"The approach was different in that it was a methodology rather than something that was bought in, another resource"

"It is more explicit in the use of strategies and I found myself asking questions that I wouldn't otherwise have asked."

"It was very child friendly."

"Children throughout the school were better at articulating what they imagined"

"It enabled children to really get in a text where they had never had the opportunities to do that before."

"When the children were working with classroom assistants that the children knew more about strategies that the Classroom Assistants and so X (one of the "intervention" teachers) did some training with them."

"It helped discussion skills for even a short piece of text children can understand it and talk about it with far greater depth".

They reported their school had implemented the intervention at a whole-school level. Furthermore, classroom assistants were trained in the approach by the intervention teachers once a need for this upskilling was identified by the children.

The teacher for whom there was less evidence of implementation fidelity was also positive about SHORS but indicated strongly that many of its core components were already evident in her teaching practice. Comments which illustrate this include:

"I already knew what to do although it did put a new slant on things and perhaps made me more explicit when discussing strategies."

"I would always have talked about things like visualising but perhaps was not as direct in how I taught it."

While both categories of intervention teacher agreed the study had extended their teaching skill to become more explicit in directly teaching reading comprehension strategies, the overarching value and merits of the programme were not equally weighted. Both teacher sub-groups offered comment regarding the children feeling empowered as a result of taking part in the study; however, further analysis showed that this was for quite different reasons. The lower fidelity teacher noted that she felt that the children were empowered as they were a part of the research, while higher fidelity teachers said children became empowered as they became more active in their learning and this developed their resilience given the new bank of metacognitive strategies that they now had.

Discussion

This intervention study yielded several interesting findings. The first is that the intervention had a positive, statistically significant impact upon WIAT-II^{UK} RC Scale scores, with sizeable effect sizes outwith the range of measurement error.

One of the core elements of this intervention was its explicit direct teaching of metacognitive reading strategies, which previous studies have proved to be beneficial (Perry, Lundie & Golder, 2019; Johnson, 2019). The impact of direct teaching cannot be underestimated and further opportunities to extend modelling from teacher/child to children peer groups within this context could be explored in greater depth, given the value of opportunities to talk in consolidating understanding (Johnson, 2019; Zepeda, Hlutkowsky, Partika & Nokes-Malach, 2019). Intervention teachers cited anecdotal instances where the quality of discussion during literacy lessons was of greater depth, and stated that they now asked questions they previously would not have considered. This was also noted during fidelity observations, which highlighted the benefits of conversation (Ketch, 2005). These comments could be indicative of both greater levels of teachers' metacognition (O'Hara, Pritchard & Pitta, 2019)) and the development of attunement with pupils, in that being more in tune with children's answers may have increased the time devoted to text discussion with pupils, thereby improving outcomes (Driscoll & Pianta, 2010).

Implementation

SHORS was deemed feasible to implement, especially given its flexibility of use which was evident in the way that it could be incorporated across the CfE. While time was identified as an issue for the lower fidelity subgroup, the higher fidelity subgroup did not see this as a barrier, especially given the opportunities for literacy across learning.

The data revealed that the main facilitators to implementation, identified here by teachers and observations, were staff traits (readiness, openness to ideas and commitment), practical elements of the intervention (flexibility, enjoyment by pupils, minimal resources requirements, and quality of training given), school ethos (leadership support and positive professional ethos). Perceived barriers were the absence of these facilitators. These are in line with current research on implementation (Fixsen, et al., 2009) and effective teaching practice (Hattie, 2008).

Pupil empowerment

An unexpected theme of the analysis was pupil empowerment. This was attributed to the increase in skills children had learned. By giving the children a new bank of strategies there was an increase in their level of ownership and they became more autonomous learners. As stated, often, when comprehension breaks down, children did not employ "fix up" strategies automatically even when they might know how to do so (García-Rodicio & Sánchez, 2014). However, the direct teaching of strategies and modelling provided within the SHORS methodology encouraged children to become more active in the process of learning. This has the capacity to encourage and develop creativity (Davies et al., 2013).

Best practice teaching and learning

In general the teaching strategies were not considered new, but the emphasis upon how to explicitly teach the strategies, and how to make them more visible in the classroom differed from previous practice. The training was considered by all to be of high quality and consistent with Joyce and Showers (2002) teachers reported their appreciation for the depth of reading research within the session as this offered reassurance that the SHORS approach was best practice and evidence based.

Reading habits

Given that the current study offered statistically significant results regarding the frequency of reading at home, it can be argued that the intervention has the potential to positively change reading habits and perpetuate increased reading ability (Yanti, 2019 ; Leppänen, Aunola, & Nurmi, 2005; Mol & Bus, 2011).

Limitations of the study and implications for future research

While efforts were made to limit confounding variable teachers had varying levels of readiness and years of teaching experience and thus may have had different levels of skill which may have affected results. Also, this was a small-scale study: a larger-scale cluster RCT study with randomisation at the level of the school would further strengthen the evidence base for the intervention. The study also took place with children (aged 9–10) in an area of social disadvantage; further exploration with broader age ranges and populations of more diverse economic status would add to the research base for the SHORS approach. Further research with larger sample sizes could also offer greater insight into gender effects.

The sample size pre-test scores were lower than national averages perhaps due to high levels of economic deprivation (OECD, 2010). However, while the sample may not be representative, the study indicates that the approach is beneficial to those groups who are less able readers and those from areas of high economic deprivation.

The measure used for the children's self-reported record of strategy use was not standardised, but it serves to reinforce the self-efficacy of individuals' reading abilities and provides information about their perception of their reading skills (McCartney et al., 2015).

The question to gauge reading habits was "how often do you read at home per week?" This could have been better phrased for example "how often and for how long do you read per week?" as this would have given more interpretative data.

Given the rationale for teacher observations was to ensure implementation fidelity of the SHORS intervention no observations of the control teachers took place. However, observational data of the control teachers may have offered a deeper understanding around the effect of the intervention.

The current study was concerned with the short-term impact of an intensive intervention. An opportunity to measure long-term impact was not built into the design. Yet, the feedback from children indicate a positive change in reading habits which therefore likely to further develop their reading skills through increased practice (Adams, 1994). Teachers and children reported that they enjoyed the intervention and this will motivate continued practice (Ruddell & Unrau, 2004) wherever optimum implementation indicators exist (Kelly &
Perkins, 2012).

Conclusions

This study has identified a high-impact intensive intervention that can raise RC outcomes for all of the children participating in the intervention group in this sample. The current research reinforces previous works which suggest that explicit instruction in metacognitive strategies significantly benefits pupil RC (Johnson, 2019).

Acknowledgements

This work was undertaken within North Ayrshire, Scotland and with the support of North Ayrshire Council and East Ayrshire Council.

Statements

The data that support the findings of this study are available are available on request from the corresponding author upon reasonable request.

The study was approved by the ethics committees of the local authority in which the participating schools were located and the School of Psychological Sciences and Health ethics committee.

There were no conflicts of interest in the work being reported.

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Table 1: Group allocation data

School Reference	Condition	Teacher Codes	N. of children
A	Intervention	Intervention 2	18
A	Intervention	Intervention 3	9
B	Intervention	Intervention 1	9
C	Control	Control 1	24
D	Control	Control 2	14

Table 2: Comparison of Reading Comprehension assessment measures

Standardised Test	UK/Scotland standardised	Age Appropriate for Population?	Standard error or measurement	Reliability	Validity
Neale Analysis of Reading Ability (NARA-II) (NFER-Nelson, 1997)	Yes/Yes	Yes- 6 years – 12 years 11 months age-range	6.1 for Comprehension (Neale, 1997) (MSD = 16.91 and an ES equivalent of 1.13)	Comprehension, ranging from .65 for age 12-12:11 to .87 for age 6-7:11	The test appears to have content validity for the content area-oral reading skills.
Wechsler Individual Achievement Test – Second Edition (WIAT-II$_{UK}$)	Yes/\yes	Yes- 4 years– 16 years 11 months	RC from 6.54-7.04 and overall reading from 1.50-2.12 (MSD = 10.17 and an ES equivalent of 0.67)	Average stability co-efficients ranging from .0.93-0.98 across the three age groups tested (6 to 9, 10 to 12 and 13 to 19 years). Standard error of measurement for RC varies for age groups from 3.00 to 3.67 Coefficient corrected r0.94 Minimal Significant different therefore requires an effect size of 0.554-0.678	Adequately measures the achievement constructs that they were designed to measure. Correlations of the WIAT-II$_{UK}$ scores with other achievement test scores are moderate to high
York Assessment of Reading for Comprehension (YARC) (2nd. Edition) (GL Assessment, 2011)	Yes /Yes (10.2% from Scotland)	Yes-4 years 6 months – 12 years 4 months	SEM = 7.19 (MSD = 19.93 and an ES equivalent of 1.32)	Internal consistency ranging from 0.48 to 0.77 for RC Reliability of RC pairs passages all desirable at 0.70+	Comprehension questions are dependent on information only contained in the passage

Table 3: Measures of Reading pre and post descriptive statistics

	Control Group		Intervention Group	
	M	*SD*	*M*	*SD*
Pre WIAT-II^{UK} RC SS	89.61	13.23	92.03	12.87
Post WIAT-II^{UK} RC SS	91.97	12.39	102.00	15.17
WIAT-II^{UK} RC SS change	2.37	9.67	9.97	8.97
Pre WIAT-II^{UK} target words	22.55	3.96	22.28	3.45
Post WIAT-II^{UK} target words	22.26	4.50	23.22	3.36
Target Word Change	-0.29	2.38	0.94	2.01
Pre self-reported strategy use	25.47	3.97	23.19	8.53
Post self-reported strategy use	24.79	3.50	27.75	9.11
Self-reported strategy use change	-0.68	3.76	4.56	9.11
Pre-reading frequency	2.66	1.05	2.25	1.25
Post-reading frequency	2.50	0.98	2.94	1.02
Reading Frequency Change score	-0.16	1.03	0.69	0.89

Table 4: Summary of fidelity observations

	Observation 1			Observation 2			Total			
	Strategies Used	Gestures used	Other indicators	Strategies Used	Gestures used	Other indicators	Overall strategies used	Gestures used	Other core component	Effect size
T1	11	0	3	8	0	3	19	0	6	0.52
T2	28	4	6	74	4	5	102	8	11	0.68
T3	37	3	6	24	5	7	61	8	13	0.83

Table 5: Semi structured interview themes

Codes	% of Quotes	
	Higher Fidelity (N=2)	**Lower Fidelity (N=1)**
Intervention could be used across CfE	13	0
Pupils were more empowered	7	8
'Anonymised Programme Name' Enjoyable for all	7	0
Allowed for teacher reflection	7	0
Teacher/ staff felt upskilled	27	23
Additional resources not needed	10	0
Quality training and good support given	7	15
Flexibility	7	0
There was more visible learning	17	0
The literacy knowledge was not new to me	0	38
Evidence of use of alternative teaching methods to that within the intervention	0	8
Time a challenge	0	8

Appendix 1

Reading: Pupil self-assessment Name:…… Class…….	I do this often	I sometimes do this	I never do this
Prepare your mind – What is this text about? What do I already know? What is most likely to happen? Do I need to have an opinion and/or understanding of fact and events?			
Visualise - If this were a film, what would I see? What would this information look like as a diagram/flow chart?			
Hear a voice reading aloud in your head - Can intonation help me make sense? Will accents help me track who's speaking?			
Re-phrase - In my own words, that means….			
Summarise as you go along - What do I know so far? What don't I know yet? What do I need to know?			
Hold your thoughts as you read - Why am I being told this now? How does information link together? What am I assuming that isn't in the text?			
Question - Does this seem likely? Does this ring true?			
If you still don't understand it…. Stop. Re-read			
If you STILL don't understand…. Find the problem words. Does it remind me of other words or parts of words? Can I guess a bit from the context? Who can I ask? If none of these, then LOOK IT UP			
Link to wider experiences - How does this relate to what I already know/have read/ have done? What was new to me? Would I have reacted in the same way?			
Think about the crunch points - At what point(s) could this have gone a different way?			
Wonder to yourself - What could happen in a different context? Why might this person/group behave like this?			

Appendix 2

Tally the amount of times each strategy was mentioned verbally by the teacher or a pupil. *Tally the amount of times teacher or pupils used the strategy's matching gesture*	**Fidelity Observation** **Date:** **Class:**	
	Orally	Gestures
Prepare your mind – What is this text about? What do I already know? What is most likely to happen? Do I need to have an opinion and/or understanding of fact and events?		
Visualise - If this were a film, what would I see? What would this information look like as a diagram/flow chart?		
Hear a voice reading aloud in your head - Can intonation help me make sense? Will accents help me track who's speaking?		
Re-phrase - In my own words, that means….		
Summarise as you go along - What do I know so far? What don't I know yet? What do I need to know?		
Hold your thoughts as you read - Why am I being told this now? How does information link together? What am I assuming that isn't in the text?		
Question - Does this seem likely? Does this ring true?		
If you still don't understand it…. Stop. Re-read		
If you STILL don't understand…. Find the problem words. Does it remind me of other words or parts of words? Can I guess a bit from the context? Who can I ask? If none of these, then LOOK IT UP		
Link to wider experiences - How does this relate to what I already know/have read/ have done? What was new to me? Would I have reacted in the same way?		
Think about the crunch points - At what point(s) could this have gone a different way?		
Wonder to yourself - What could happen in a different context? Why might this person/group behave like this?		
	Please circle	
Was a graphic organiser used?	Yes	No
Direct-teaching of vocabulary *(in line with training- e.g. multi-sensory)*	Yes	No
Focused & quality discussion about the text *(Pupils encouraged to talk, debate, contribute ideas)*	Yes	No
Interesting and varied reading materials	Yes	No
Establish an engaging motivational context and reading opportunities	Yes	No

(children part of selection)		
Poster visible	Yes	No
Pictures of gestures visible	Yes	No
Use of vocabulary audit	Yes	No