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Title

Developing a universal reading comprehension intervention for mainstream primary schools within areas of social deprivation for children with and without language-learning impairment: a feasibility study

Authors

Dr Elspeth McCartney, Professor James Boyle, School of Psychological Sciences and Health, University of Strathclyde, Glasgow G1

Professor Sue Ellis, School of Education, University of Strathclyde, Glasgow G1

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What is already known on this subject

Larger than expected number of pupils in areas of social deprivation show difficulties in reading comprehension, with or without difficulties in comprehending spoken language. There is a need to develop universal reading comprehension interventions for use in such settings to enhance reading outcomes for all children.

What this paper adds

Validated reading comprehension strategies were introduced in three primary schools in an area of social deprivation. Pre-intervention spoken language comprehension and reading comprehension were measured on standardised tests. Post-intervention, children showed good reading progress with medium effect sizes. 38% of pupils displayed spoken language comprehension below the 10th centile, but their reading progress was as good as other children. This cohort feasibility study suggests potential effectiveness of the reading comprehension intervention for children with or without difficulties in comprehending spoken language, warranting further investigation in a controlled trial.

Introduction

In Scotland, as in other countries, children living in areas of social deprivation as a group attain lower reading outcomes than neighbouring children in more advantaged areas. Sosu and Ellis (2014 p8) report a 17 percentage point difference on the Scottish

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Survey of Literacy between children from the least and most deprived backgrounds in mid-primary school. Developing interventions to increase reading skills for socially disadvantaged children is of interest to educationalists within Scotland, and internationally for services tackling similar issues.

Population studies also show lower scores on standardised measures of spoken language comprehension in areas of social deprivation, that had not always been detected (Law *et al.* 2011, Locke *et al.* 2002; Spencer *et al.* 2012). Socially deprived children are also over-represented in clinical populations with language and communication difficulties (Strand and Lindsay 2012). Relationships between social disadvantage and language are of interest to speech and language therapists (SLTs) who support children with identified language impairments and also contribute to universal interventions for all children and targeted services for vulnerable children (Scottish Government 2010b, Law *et al.* 2013).

The relationship between language and literacy is made explicit in the Simple View of Reading (Gough and Tunmer 1986) where reading comprehension is seen as a product of word-decoding and linguistic processes. Longitudinal studies support the link, with spoken language comprehension predicting reading comprehension in later years (Verhoeven and Van Leeuwe 2008, Adlof *et al.* 2010).

Reading comprehension difficulty occurs with adequate word decoding and good reading accuracy in around 3-10% of children (Nation and Snowling 1997) and concomitant spoken language comprehension difficulties may also be identified in this group. (Stothard and Hulme 1992, Nation *et al.* 2004, Nation *et al.* 2010). Nation *et al.* (2004) found many children with poor reading comprehension with language scores low

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enough to be considered language impaired, albeit previously undetected. Children with identified language impairments may also show later reading comprehension difficulties predicted by their spoken language comprehension scores (Botting et al. 2006).

Given these links, schools in areas of social deprivation seek to use universal interventions that can be successful for children with a range of language skills.

Intervention studies are needed to evaluate outcomes.

Reading comprehension strategies

Effective approaches to teaching reading comprehension have been developed in the U.S. A large-scale study (James-Burdumy *et al.* 2010) found teachers' use of reading comprehension strategies within on-going classroom instruction in secondary schools correlated with pupil reading progress. Strategies encouraged children to reflect on text via questioning; elaborating concepts; providing definitions/explanations; providing multiple meanings; using visuals/pictures; and teaching word knowledge and word learning techniques. Shanahan *et al.* (2010 p11) define such strategies as 'intentional mental actions' undertaken by children during reading to improve reading comprehension, requiring deliberate efforts by a reader to better understand or remember what is being read. They provide an evidence-base supporting the focussed use of strategies in the early primary years, with a detailed research synthesis and suggestions of age-appropriate ways to present and teach them. Similar approaches have been positively evaluated in Ireland (Courtney and Gleeson 2010). But the focussed use of comprehension strategies had not been researched in a Scottish or UK context in areas of social deprivation; nor their potentially differential efficacy for children with and without spoken language comprehension difficulties.

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The feasibility study was a preliminary investigation of the use of focussed reading comprehension strategies as outlined by Shanahan *et al.* (2010) in an area of social deprivation for children with and without spoken language comprehension difficulties. A small-scale cohort study design was used to generate a signal of potential efficacy that would warrant a larger, controlled study. A cohort design with pre- and post-intervention measures aimed to compare standardised scores for reading and spoken language comprehension towards the beginning of the school year (T1) with reading comprehension scores towards the end of the year (T2) as the outcome measure.

Methods

Participants

Three mainstream primary schools from one local authority (LA) took part. LA senior education officers and the schools' management teams elected to participate. English was the language of instruction. Schools 1 and 2 were within post-codes in the lowest quintile of the Scottish Index of Multiple Deprivation, School 3 in the third quintile. The latest inspection reports noted School 1 had 'well above average' uptake of free school meals, and School 3 'above average' uptake. School 2 is a denominational school, recruiting from a wider catchment area, with a school meal uptake just below the Scottish primary school average. Five teachers agreed to participate, three from Primary Three classes in each school, and two from Primary Four in Schools 1 and 3. Pupil ages were 6-plus to 8-plus years.

Ethical permission was granted by the University of Strathclyde School of Education Ethics Committee. Teachers in research schools were provided with participant information sheets and those volunteering to participate contacted the research team. All

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pupils of participating teachers were taught to use reading comprehension strategies as part of their on-going literacy curriculum, but children and parents were provided with participant information sheets and signed consent sheets if willing to undertake research assessments. Forty-seven children returned both parent and child consent forms and completed T1 and T2 assessments.

Measures

Reading comprehension was measured by standard scores (SS) on the Wechsler Individual Achievement Test, Second UK Edition for Teachers Reading Comprehension Scale (WIAT-II^{UK}-T RCS, Wechsler 2006). Pupils read age-appropriate passages and answer questions on their meaning.

Spoken language comprehension was assessed via standard scores (SS) on the Test for Reception of Grammar-2 (TROG-2, Bishop, 2003). TROG-2 assesses comprehension of progressively more complex morphology and syntax (e.g. *'Not only the box but also the flower is yellow.'*; *'The sheep the girl looks at is running.'*) using a picture-pointing task with three distractors and one accurate response. No external inference or knowledge of the world is therefore required. TROG-2 uses vocabulary suitable for four-year-old children and so is relatively immune to word-knowledge which, being dependent upon personal experience and exposure to particular words, may show social-environmental bias (Stockman, 2000). Both assessments have UK standardisations including Scottish children.

Assessments were carried out individually by qualified SLTs not otherwise connected with the study in a quiet room within the child's school. Children took short breaks as necessary. T1 assessments were WIAT-II^{UK}-T RCS and TROG-2, undertaken in one session or within a few days in late September or October. The child selected the

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order of assessments. T2 assessment was a repeat of the WIAT-II^{UK}-T RCS around eight months later in June, towards the end of the Scottish school year. T2 assessments were by a different team of SLTs with no knowledge of T1 scores, and so no preconceptions about the child. Assessments were checked and scored by a member of the research team, with scores entered into SPSS.

Children were considered to have lower spoken language comprehension scores with TROG-2 SS <81, i.e. below the lower 10th centile (-1.25 *SD*), slightly lower than (McCartney et al 2011)'s cut-off for language disorder. They were designated as showing language-learning impairment (LLI), on the basis of their spoken language comprehension results. However, the children were not identified as language disordered, and may or may not have had the functional communication difficulties required for a clinical diagnosis. Eighteen of the 47 children (38%) were designated as showing LLI rather than the <10% expected by the standardisation sample. Descriptive statistics for number; gender; primary class; age; TROG-2 and WIAT-II^{UK}-T RCS SS at T1, and WIAT-II^{UK}-T RCS at T2 by school are shown in Table 1.

INSERT TABLE ONE ABOUT HERE

The intervention

The schools used the Scottish curriculum, the Curriculum for Excellence (CfE: Scottish Government, 2012). CfE provides non-statutory guidance to teachers, who use it to design a broad and balanced curriculum to dovetail with the needs of their school community. Reading comprehension strategies were discussed with classroom teachers from the three research schools near the start of the school year in a brief in-service session attended also by school senior staff. This session explained how reading

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comprehension could be enhanced using strategies, and how these could be incorporated into on-going CfE reading instruction. Informal contact was thereafter maintained to address any issues arising. Information hand-outs and 'reminder' classroom display posters for staff and children were left for each class.

Text comprehension strategies were taken from Shanahan *et al.* (2010)'s 'good practice' guide, and also illustrated by 'key messages' for teachers and pupils to use. Text comprehension strategies and illustrative 'key messages' (in italics) were:

- 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 visualise what a text means; *'if this was a film, what would I see?'*
- children would clarify points of mis-understanding; *'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 re-tell the main points of the text; *'in my own words, that means....'*

Children were also taught hand gestures from Courtney and Gleeson (2010) to indicate when they were using strategies and which one, and encouraged to hear a voice 'reading aloud' in their head. They were asked to reflect after reading texts by thinking where the 'story' could have gone a different way (*'crunch points'*), and to learn unfamiliar

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words by adopting word-learning strategies from McCartney et al. (2010). Children also attended to text organisational structures; engaged in focussed discussion with teachers, and were offered appropriate texts in a motivating context that encouraged engagement with reading.

These strategies and contexts were to be included and routinised within the schools' regular classroom reading curriculum, in whole class, small group or individual activities as appropriate.

Results

A mixed model ANOVA was conducted with Group (LLI versus non-LLI) as the independent variable and pre- and post intervention (T1 versus T2) WIAT-II^{UK}-T RCS SS scores as the dependent variable, collapsed across schools and gender. Preliminary analysis revealed small numbers (N= 9) of males and females in the LLI group and small numbers of participants in the LLI group in each of the schools (ranging from 2-8), which precluded reliable estimates from including schools and gender as independent variables.

There was a significant effect of group, with the non-LLI pupils achieving significantly higher reading comprehension scores overall ($F_{1, 45} = 14.873, p = .0001$ Partial Eta Squared = .248). There was also a significant effect of time-point ($F_{1, 45} = 11.382, p = .002, \text{Partial Eta Squared} = .202$), indicating increases in reading comprehension scores at T2. However, as shown in Figure 1, the group x time-point interaction failed to reach significance ($F_{1, 45} = 1.563, p = .218, \text{Partial Eta Squared} = .034$) indicating that the intervention was equally successful for both LLI and non-LLI groups. The implications of the modest numbers in each of the groups (18 for LLI versus 29 for non-LLI) on statistical power should be noted, however.

INSERT FIGURE ONE ABOUT HERE

The main intervention effect for the 47 pupils collapsed across the two groups on the WIAT-II^{UK}-T RCS was 4.55 standard score points, equivalent to a medium effect size ($d = 0.46$) for a one-sample, pre/post intervention design with correction for dependence between means (Morris and DeShon, 2002). Further analysis revealed the mean intervention effect for reading comprehension for the non-LLI group was 3.14 standard score points (corrected $d = 0.32$). The mean score change for the LLI group was 6.84 (corrected $d = 0.72$), which exceeds the upper-bound of the 95% confidence interval for the standard error of measurement for the WIAT-II^{UK}-T RCS based on test-retest reliability data for the 6-9 years age-group reported in the test manual.

Therefore, in contrast to the non-LLI group, the mean reading comprehension score change for the LLI group cannot be attributed purely to measurement error arising from a practice effect from the re-administration of the test, although in the absence of a control group the possible contribution of regression to the mean cannot be entirely discounted.

While TROG-2 scores were significantly correlated with both pre-intervention and post-intervention WIAT-II^{UK}-T RCS scores ($r = .588$, $p = .0001$ and $r = .400$, $p = .005$ respectively), as the ANOVA reveals they were not predictive of change in reading comprehension scores across the intervention period ($r = -.233$, $p = .116$).

Discussion

The study is small-scale, with no control group, and with schools, teachers and children who volunteered to participate: it does not represent a complete population. No

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observations were made of teacher or child use of text-comprehension strategies, although teachers reported that they were used. No counterfactual evidence was collected, and in the absence of a control group, changes in the reading comprehension scores were evaluated in terms of test-retest measurement error from the standardisation sample of the WIAT-II^{UK}-T RCS. These factors would require to be addressed in future controlled studies.

However, feasibility studies aim to determine the ease of implementation of an intervention with existing research evidence in a new context; its acceptability to participants; the practicability and responsiveness of the research measures, and potential effect sizes, before embarking upon a full-scale randomised controlled trial, which tends to be expensive. A cohort study is appropriate for these purposes.

Results appear sufficiently promising to merit further trials. The intervention was welcomed by teachers and school management, and was reportedly easy to implement within the Scottish curriculum, with low resource costs. By encouraging children to reflect on text actively within classroom reading activities when use of strategies may support their understanding, there is no need to 'transfer' techniques from other learning contexts. The standardised measures were practicable and acceptable to children, and WIAT-II^{UK}-T RCS was responsive to change. Measures detected the larger number of children with lower scores than expected by test standardisations found by previous researchers (Law *et al.* 2011, Locke *et al.* 2002; Sosu and Ellis 2014, Spencer *et. al* 2012). Children in Schools Two and Three, with most evidence of social deprivation as indexed by uptake of free school meals, had WIAT-II^{UK}-T RCS scores at T1 skewed towards the lower end of the normal distribution, and all three schools showed this pattern on TROG-2. 38% of pupils had TROG-2 scores below the 10th %ile.

Participant progress also suggests the intervention should be further researched.

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Children's reading scores at T2 related to their scores at T1, but pupils in all schools made good progress, with a medium effect size on a measure controlled for age-related change.

The intervention therefore appears promising for children in areas of social deprivation.

Children with LLI

Children were not selected for language difficulties, although 18 of the 47 proved to meet the study criterion for LLI. Ethical permission stressed that individual pupil results would not be disclosed, and it is not known if any of the children in the study were already recognised by their school or family as having language difficulties. It is however probable, on the basis of previous research studies cited, that some children with LLI were not recognised.

TROG-2 was not a unique predictor of reading progress, supporting Dockrell *et al.* (2012)'s finding for children with language impairments and autism spectrum disorders. The intervention proved as efficacious for children with LLI as for non-LLI children. As a group children with LLI both began and ended with lower reading attainment scores than children without LLI (albeit with considerable overlap), and did not 'catch-up' with their non-LLI classmates. However, their progress over the year was just as great and they developed their reading comprehension abilities just as rapidly. It is nonetheless also possible that additional support to develop understanding of syntactic structures and morphemes would have been helpful to some children, with SLTs having a role in advising schools on how such vulnerable children's language might be supported in class. Identifying children whose lower language scores impair their social communication, and who require further assessment towards specialised intervention for language disorder, may also be useful. The study identifies a possible unmet need.

Conclusions

Results suggest that a larger, controlled study investigating the intervention is warranted. The ease of implementation and the positive outcomes, including gains for children with LLI, suggest the intervention is feasible, and should be further researched in a controlled study, and if successful in real-life implementation trials.

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Table 1

Number, primary class, gender, age, TROG-2 SS and WIAT-II^{UK}-T Reading Comprehension Scale Standard Scores at T1, and WIAT-II^{UK}-T Reading Comprehension Scale at T2, by school.

School	N (Male/ Female) (Primary 3/4)	Age in months T1 (Mean; SD; Range)	TROG SS (Mean; SD; Range)	WIAT SS T1 (Mean; SD; Range)	WIAT SS T2 (Mean; SD; Range)
School 1	14 (M6; F8) (2P3; 12P4)	97; 6.6; 82 - 105	78.7; 14.8; 55 - 109	92.1; 9.0; 79 - 107	99.4; 5.7; 93 - 114
School 2	7 (M3; F4) (7P3)	85; 3.1; 82 - 90	91.6; 14.9; 67 - 104	106.1; 9.6; 89 - 121	106.4; 9.4; 90 - 117
School 3	26 (M15; F11) (15P3; 11P4)	89; 8.2; 79 - 104	89.5; 17.7; 58 - 113	96.7; 10.8 79 - 117	100.8; 12.0; 76 - 120
Schools Combined	47 (M24; F23) (24P3; 23P4)	91; 8.2; 79 - 105	86.6; 17.0; 55 - 113	96.7; 10.9; 79 - 121	101.2; 10.2; 76 - 120

Figure One

