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Do family learning phonics courses improve parents' reading-related skills and ability to support their children's reading?

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Background: Parents play a crucial role in supporting children's literacy, especially in the first years of school. However, parents can find this challenging if they struggle with reading themselves. We explore whether family learning phonics courses boost parents' reading-related skills and ability to support their children's reading, in a collaboration between UK academics and the National Family Learning Forum.

Methods: Prior to data collection, academics and course leaders identified key skills for courses to target: phonological awareness, letter-sounds, segmenting and blending, and awareness of irregular words. Family learning teams recruited parents of Reception children (4–5 years old) for the phonics group (N = 50), targeting parents who were likely to need literacy support. Parents received 6 weeks of 1- to 2-hour phonics sessions in groups. Control participants (N = 76) were recruited online and had a Reception-age child (4–5 years old); controls received no training. All participants completed phonics-related tests at weeks 1 and 6.
Results: The phonics group significantly improved on letter-sound knowledge (by 4.64 letters; 51 total items); the control group did not significantly improve on this measure. Both groups showed some improvement in phonological awareness and word reading (likely due to practice effects), and neither group improved on nonword reading. The reading questionnaire showed that the phonics group reported giving their children more regular support with literacy activities and placed a higher level of importance on homework, with no increase for the control group.
Conclusions: We provide evidence that family learning phonics courses can improve crucial reading skills (letter-sound knowledge) and increase parents' confidence to support their children's reading. Some reading skills (phonological awareness, whole word reading, and decoding) may be slower to change and require longer term support. Future work should explore long-term consequences of such courses for parents' and their children's reading habits and skills.

Keywords: child literacy, family learning, parent literacy, phonics

Highlights

What is already known about this topic

- Parents with low literacy skills may struggle to support their children's reading development.
- Phonics training is effective in raising literacy levels for children.
- Adults with low literacy skills can benefit from interventions focused on phonological awareness and decoding, but studies with a control group are lacking.

What this paper adds

- UK academics collaborated with family learning teams to quantitatively evaluate whether phonics intervention programmes improve phonics skills for parents with low literacy, relative to no intervention.
- Findings indicate that family learning phonics courses can improve crucial phonics skills (letter-sound knowledge) and increase the amount parents support their child with reading.
- Some reading-related skills (phonological awareness, whole word reading, and decoding) showed no improvement relative to the control group.

Implications for theory, policy or practice

- Family learning phonics courses are an effective means of increasing parents' phonics skills and confidence in supporting their children's reading and writing. These courses should be available to all parents who may struggle to support their children's literacy development.
- Longer term studies will be key to determining whether raising parents' skills and confidence has a lasting effect on parent and child literacy.
- Some skills, particularly phonological awareness, whole word reading, and decoding, are harder to change and may require longer term support.

Being literate is key to success in the modern world, enabling employment, decreasing dependency on state benefits, and improving participation in the democratic process (Dugdale & Clark, 2008). There is growing awareness of the intergenerational nature of literacy skills – parents' reading-related knowledge (Ladd, Martin-Chang, & Levesque, 2011) and the home literacy environment they provide (Axford et al., 2019; Carroll, Holliman, Weir, & Baroody, 2019; Yeo, Ong, & Ng, 2014) influence children's reading development. Parents with low literacy may therefore need support to help their children with reading. Family learning programmes aim to provide this support and are run by many UK local authorities and other adult education providers in partnership with schools. Parents learn how their children are taught in school and are encouraged to develop their own skills in a supportive peer group environment. Family learning aims to address the literacy needs of both children and adults: parents are motivated to attend courses to support their children, and in turn, they improve their own skills (National Institute of Adult Continuing Education, 2013). This study examined whether phonics courses delivered by family learning teams improve parents' reading-related skills and their confidence to support their children's reading.

There is an extensive body of evidence linking children's home learning environment and their learning outcomes in school (Aram, Korat, & Hassunah-Arafat, 2013; Baharudin & Luster, 1998; Bradley, Caldwell, & Rock, 1988; Li & Tan, 2016; Sammons et al., 2015), particularly with respect to reading activities in the home and children's literacy (Axford et al., 2019; Kim & Quinn, 2013; Yeo et al., 2014). Literacy is a key focus for family learning programmes, which teach parents about the reading skills children need to develop, with the aim of increasing parents' involvement and confidence in helping their children learn to read. Previous research has shown that family literacy intervention programmes can have a positive impact on children's reading attainment (Brooks, Pahl, Pollard, & Rees, 2008; Swain, Cara, Vorhaus, & Litster, 2015; Whitehurst, Epstein, Angell, Payne, Crone, 1994), but less work has looked at the impact on parents' literacy skills. An OFSTED report (OFSTED, 2009) previously highlighted the positive impact of family learning programmes for both parents and children with qualitative evidence including course evaluations and case studies. Furthermore, qualitative interview research by Swain, Brooks and Bosley (2014) demonstrated numerous so-called softer benefits of family literacy programmes for parents, including an increased interest in improving their own literacy skills. However, there is a lack of quantitative evidence on how family learning programmes influence parents' literacy skills (Carpentieri, 2012).

For young children learning to read alphabetic languages, there is strong evidence that instructional approaches that focus on phonics are beneficial (McArthur et al., 2018; Shapiro & Solity, 2008; Torgerson, Brooks, & Hall, 2006; for a review, refer to Castles, Rastle, and Nation, 2018). Phonics involves decoding the letters in a word into their corresponding sounds and blending these together to read the word aloud. Notably, UK population data show that the inclusion of phonics in the English National Curriculum improved children's reading ability with particularly strong effects for those from disadvantaged backgrounds (Machin, McNally, & Viarengo, 2018). However, such children still struggle with phonics relative to their peers (Department for Education, 2018). These children may require additional support, outside of standard classroom teaching, in order to develop strong phonics skills.

There is limited evidence as to whether phonics teaching is also effective for adults. Alamprese, MacArthur, Price and Knight (2011) found that for adults taking literacy classes, additional training on decoding and spelling improved decoding, although not word reading or comprehension. However, Sabatini, Shore, Holtzman and Scarborough (2011) (refer also to Greenberg et al., 2011; Scarborough et al., 2013) found that adults with low literacy skills made small to moderate gains in reading following either a phonics intervention or an intervention focused on reading fluency. Strong conclusions are hard to draw for several reasons, in particular because studies with a control group are lacking. This is problematic as adult literacy skills have been shown to improve even in the absence of participation in an intervention, for example, through learning new skills at work (Reder, 2009). Furthermore, attrition rates are often high, outcome measures may not be directly linked to skills trained in the intervention, and there are very few studies in the UK context (refer to Moss, Duncan, Harmey, & Munoz-Chereau, 2018 for a review).

The current study was carried out as a collaboration between UK academics and the National Family Learning Forum. Recent work has highlighted a potential disconnect between empirical research on reading, and translation of that research into educational practice (Seidenberg, Cooper Borkenhagen, & Kearns, 2020; Solari et al., 2020). In the current study, we aimed to conduct research that can be readily translated into practice by involving both researchers and practitioners from the outset. Our collaboration brings together researchers' scientific expertise with practitioners' expertise in working with parents who struggle with and lack confidence in reading. Together we aimed to refine the content of family learning phonics courses and determine whether they improve parents' reading-related skills and ability to support their children's reading. Our collaboration began with a scoping meeting with members of the National Family Learning Forum in which we presented our broad aims and discussed potential research plans to garner views on their value and practicality. Further meetings were then held with interested local teams where we discussed several issues including (1) how best to measure key skills, (2) appropriate control groups, (3) parent recruitment, and (4) ways to refine the content of the phonics courses to target key skills more precisely. Workshops were held while conducting the research and again once results were analysed to discuss how to interpret the results and utilise the findings to inform future course delivery. There were numerous potential benefits of the collaboration for both the practitioners and the research team. The empirical research was more accessible to the practitioners, as the research team helped translate the science to show how it could be clearly worked into their practice. This is of particular importance concerning phonics and the science of reading where disagreements over the best approaches have historically put barriers in the way of translating research evidence into

educational practice (Castles et al., 2018). Working directly with practitioners meant that the intervention was evaluated under natural, real-world conditions of course delivery and we measured skills relevant to practice, ensuring high ecological validity of the research. The collaboration between UK academics and the National Family Learning Forum therefore made the research stronger, of more practical use, and potentially more effective at delivering change.

In the current study, we examined whether family learning phonics courses improve parents' reading and related skills, relative to parents not enrolled on a phonics course. Courses trained phonological awareness, letter-sound knowledge, decoding and blending, and understanding of spelling-sound regularities. We predicted that, compared with a control group, parents attending the family learning phonics courses (phonics group) would improve on outcome measures assessing the trained skills and would also show increased confidence in their reading and in their ability to support their children's reading.

Method

Participants

Participants were recruited in three groups: the phonics group, the family learning control group and the Prolific control group. Participants in the phonics group and family learning control group were recruited through family learning teams at several locations in England (Barnsley, Doncaster, Birmingham, York, and Leicester). Participants in the phonics group were recruited from 10 different phonics class groups. Teams were invited to take part through the National Family Learning Forum that represents family learning in England and Wales. Parents and guardians of Reception children (4–5 years old) who were enrolled on phonics and non-phonics courses with family learning teams were eligible to participate. Those enrolled on phonics courses self-identified as needing help with supporting their children's literacy, and those enrolled on other courses self-identified as needing help with another skill (e.g. numeracy). Course members were invited to participate, but it was in no way mandated by course enrolment. Family learning teams advised that course members were at an appropriate level to benefit from course content, that they had a good level of spoken English, and no major problems with hearing/vision; there were no exclusion criteria based on literacy skill.

Due to the COVID-19 pandemic, data collection for the family learning control group was halted in March 2020. We therefore recruited the remainder of the control group online through the Prolific recruitment website (Damer & Bradley, 2014). Participants in the Prolific control group were selected using custom prescreening criteria and were invited to participate if they (1) were a current UK resident, (2) had normal hearing, (3) had normal or corrected-to-normal vision, (4) had a Reception-aged child (4–5 years old), and (5) had A-Level (high school qualification) as the highest educational qualification (in an endeavour to match the demographics of participants recruited through the family learning teams).

A total of 126 participants were included in the study (113 female participants; M_{age} = 35.09 years, SD_{age} = 8.03 years). An additional 29 participants (8 in the phonics group; 21 in the control groups) were recruited but failed to complete the post-test. There were 50 participants in the phonics group (47 female participants; M_{age} = 34.88 years,

SD_{age} = 8.58 years), 12 of whom had English as an additional language (EAL) and 7 reported having previously been assessed for learning difficulties. The family learning control group comprised 19 participants (17 female participants; M_{age} = 40.68 years, SD_{age} = 8.42 years), including 3 participants with EAL and 1 participant reported having previously been assessed for learning difficulties. The Prolific control group consisted of 57 participants (49 female participants; M_{age} = 33.40 years, SD_{age} = 6.13 years), including 11 participants with EAL and 3 participants who reported having previously been assessed for learning difficulties. (Further characteristics of the groups, based on a language and education questionnaire, can be found in Table S1: https://osf.io/r4nfb). All participants provided informed consent, and the study was approved by Aston University Health and Life Sciences Ethics Committee.

The family learning and Prolific control groups did not differ in their pre-test scores on any of the reading-related skills (*t*-tests, all $p > .05$); therefore, the two control groups were merged for all analyses (N = 76; results for the two control groups separately are in Figures S1–S5: https://osf.io/r4nfb).

Course development

The research team worked in collaboration with the National Family Learning Forum to refine the content of existing family learning phonics courses. This took the form of a series of meetings with family learning team leaders in which the academic team highlighted skills that are crucial to early literacy development and discussed with the teams how they typically taught each component. These core skills included phonological awareness, letter-sound knowledge, segmenting and blending, and understanding of spelling-sound regularities. Research evidence and course leaders' experience were combined to compile some of the most effective activities according to both research and practice. For example, eye-spy focusing on the beginning, end, and middle sounds of words targets phonological awareness; letter-sound knowledge and segmenting/blending can be improved by asking parents to collect letters to construct spoken words; and understanding of spelling-sound regularities can be taught by identifying tricky words when reading books, trying to sound them out, and identifying what makes them 'tricky'. Several example activities that targeted each skill were shared among the team leads (refer to Table S2: https://osf.io/r4nfb).

The key principles of the family learning phonics courses are to clarify jargon (e.g. what is a phoneme), build parents' confidence, and provide simple activities that parents can adapt to the learning stage of their child. Family learning is not a prescriptive intervention, but rather a model of working with parents to make children's learning strategies more accessible. Course leaders therefore adapted the course components to suit the individual groups of learners depending on factors such as prior experience of the adults taking part, their children's learning stage, and the phonics scheme adopted by the children's school (e.g. Jolly Phonics or Read Write Inc).

Measures

Phoneme deletion task. Items were 27 one- and two-syllable words that were pre-recorded and presented in audio format. Nineteen items were from the Sound Deletion task from the YARC (York Assessment of Reading for Comprehension; Snowling et al., 2009), and 8

items were taken from the Phonological Assessment Battery (Gibbs & Bodman, 2014). The items from the Phonological Assessment Battery all required deletion of the medial phoneme; these additional harder items were added to reduce ceiling effects. Six feedback items appeared in set positions (item numbers: 1, 5, 6, 10, 11, and 16). Each item was presented with a matching picture. Participants were asked to repeat the word aloud (e.g. 'say sheep'), and then say it again but without a particular phoneme (e.g. 'now say it again, but without the /p/'). Items were presented in a fixed order that progressed from syllable, to final, to initial, to medial phoneme deletions. Items could not be repeated, and participants pressed next when ready for the next trial. For feedback items, after participants had given their response, they heard the correct response (e.g. '"sheep" without the /p/ is "shee"') before moving to the next trial. A stop rule was applied so that responses were no longer scored after participants had made three consecutive errors.

Letter-Sound Test. The Letter-Sound Test (Larsen, Kohnen, Nickels, & McArthur, 2015) assessed knowledge of 51 letter–phoneme correspondences. Items were single letters and letter combinations (graphemes) presented one at a time. Participants were asked to say aloud the sound made by each item. Instructions emphasised that they should say the sound that each letter makes and not the name of the letter and gave an example ('if you saw the letter S you'd say "sss" not "ess"'). Items were presented in a fixed order and participants pressed next to move to the next item. There were no feedback/practice items. A stop rule of five consecutive errors was applied.

Test of Word Reading Efficiency. The Test of Word Reading Efficiency (TOWRE-2; Torgesen, Wagner, & Rashotte, 2012) was used to assess word and pseudoword reading fluency. Participants were presented with a set of words/pseudowords in vertical lists and had 45 seconds to read aloud as many as they could. There were two subtests: (1) Sight Word Efficiency comprised of 108 real words and (2) Phonemic Decoding Efficiency comprised of 66 pronounceable nonwords.

Irregular word identification task. Items from the Diagnostic Test of Word Reading Processes (Forum for Research in Literacy and Language, 2012) were used to assess knowledge of regular and irregular words. There were 6 trials, each comprised a set of 10 words (5 regular and 5 irregular) presented in a grid on the screen. Regular and irregular word sets were pairwise matched for number of phonemes, letters, and syllables. On each trial, participants were asked to use the mouse to click on the words they thought were irregular (referred to in the instructions as 'tricky words' and 'words that don't follow the usual rules for how English letters sound'). There was no minimum or maximum number of words that could be selected, and participants were not given corrective feedback. Sets were presented in a fixed order and increased in word length across trials.

Reading questionnaire. Seven items were selected from the Motivation to Read Profile-Revised (Malloy, Marinak, Gambrell, & Mazzoni, 2013), to assess confidence in and enjoyment of reading, with wording adapted to be more appropriate for adults. Six additional items were selected from the Nuffield Family Literacy report to assess parent–child interaction (Swain et al., 2015). This gave a total of 13 items, graded on a four-point scale (e.g. 'Reading a book is something I like to do …', 'Never', 'Almost never', 'Sometimes',

'Often'; refer to Table S3: https://osf.io/r4nfb). Participants could opt out of responding to any item by selecting 'Don't want to answer'.

Procedure

Parents in the phonics group received a weekly 1- to 2-hour group session for 5 or 6 weeks. Groups comprised 6 to 10 adults. Courses were delivered by experienced family learning tutors who used their own materials but with a focus on phonological awareness, letter-sounds, segmenting and blending, and identifying tricky words, as described in the Course Development section. Courses took place in schools and community centres.

In the family learning control group, 7 participants received 5 to 6 weekly group family learning numeracy sessions, whereas 12 participants had not yet begun their course at the time of participation and so did not receive any intervention. Participants in the Prolific control group did not receive any training in the 6 weeks between pre-test and post-test.

All participants completed ~25 minutes of computer-based pre-tests and post-tests. The phonics group, as well as the 7 family learning control group participants who did a numeracy course, completed pre-test in the first week and post-test in the last week of the course, supervised by a member of the research team. They wore a microphone headset through which task instructions and audio stimuli were played, and spoken responses were recorded. The remaining participants in the control group completed the tasks remotely on personal desktop or laptop computers, and checks were employed to ensure speakers and microphone were functioning correctly. Task instructions were provided in audio as well as in written format on the screen. The contact details of members of the research team were provided and participants were encouraged to contact the researchers if they had any questions.

Data analysis

For each measure, participants who had a lot of missing data at pre-test and/or post-test, and those who were at ceiling at pre-test (100% accuracy) were removed from the analysis for that measure only. The numbers of participants included in the analysis for each measure are given in the figure headings in the Results section.

An exploratory factor analysis was conducted with the reading questionnaire data using JASP (Version 0.14.1; JASP Team, 2020) with varimax rotation and principal axis factoring estimation method. The most meaningful solution revealed three factors that comprised most of the questionnaire items (cut-off point of 0.40; items 6 and 13 did not load on to any of the factors and were removed), accounting for 47.7% of the total variance. The three factors identified were competence (items 1, 3, 4, 5, and 12), enjoyment (items 2, 7, 8, and 9) and child interaction (items 8, 10, and 11). Item 8 loaded on to two of the factors and was included in both enjoyment and child interaction; refer to Table S3 (https://osf.io/r4nfb) for details of the reading questionnaire and Table S4 (https://osf.io/r4nfb) for the results of the exploratory factor analysis.

Data for all measures were analysed using R (Version 4.0.0; R Core Team, 2020). Models were fitted using the packages *lme4* (Version 1.1-23; Bates, Mächler, Bolker, & Walker, 2015) and *ordinal* (Version 2019.12-10; Christensen, 2019), and figures were made using *ggplot2* (Version 3.3.2; Wickham, 2016). For each dependent variable, a

mixed effects model was fitted. Logistic regression models were used to model the binary accuracy data for the phoneme deletion task, Letter-Sound Test, and Test of Word Reading Efficiency - words and nonwords, and cumulative link models were used to analyse the ordinal data for the reading questionnaire. The contrasts for the fixed effects were defined using deviation coding for group (phonics: −0.5, control: 0.5) and session (pre-test: −0.5, post-test: 0.5), with the interaction coded by multiplying the contrasts for these two factors. Random effects structures were determined by identifying the maximal model (Barr, Levy, Scheepers, & Tily, 2013), which included by-participant and by-item random intercepts, along with a by-participant random slope for session, and by-item random slopes for group, session, and the interaction. However, for all analyses, the maximal model either failed to converge or resulted in a singular fit, indicating that the model was overparameterised (including when simplified as recommended by Barr et al., 2013). We therefore used a data-driven forward 'best-path' model selection approach (Barr et al., 2013) to identify the most complex model supported by the data. Our analysis scripts and data files used for the analyses are available on the Open Science Framework (https://osf.io/m8tuh). Significance of the fixed effects and interactions was determined using likelihood ratio tests comparing the full model to models with each of the fixed factors/interaction of interest removed in turn (but leaving in any interaction involving a factor of interest that has been removed), and follow-up analyses were carried out in the case of any significant interaction using the same method. The *p* values for the simple effects analyses were compared against a Bonferroni-corrected α of .025, correcting for the two separate analyses of the effect of session (pre-test vs. post-test) within the phonics group and within the control group.

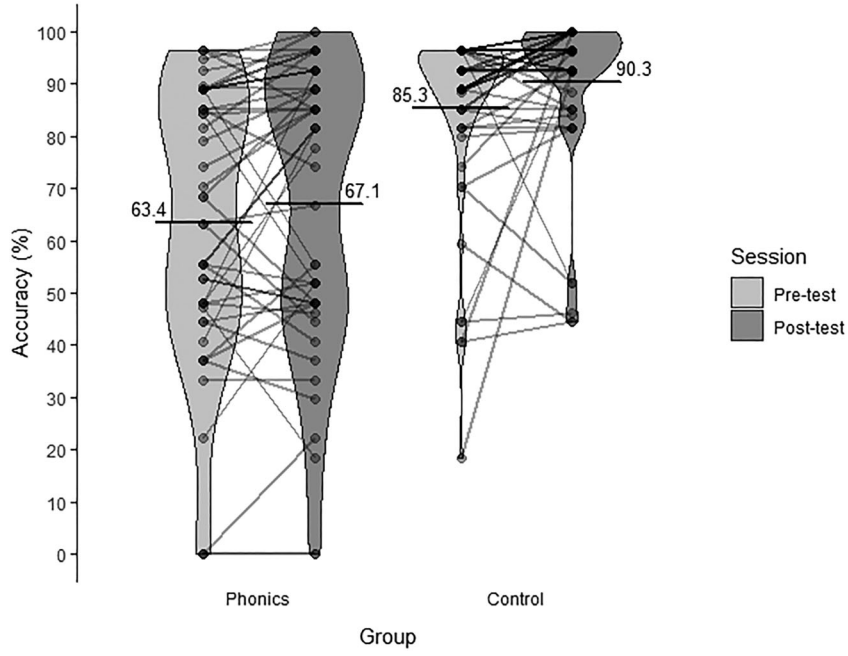

Figure 1. Accuracy (percentage correct) in the phoneme deletion task for participants in the phonics ($N = 48$) and control ($N = 56$) groups at pre-test and post-test. Each point shows a participant's percentage accuracy with lines connecting the pre-test with the post-test for the same participant. Each bar gives the mean across participants in that condition, and the violin shows the distribution of the data.

Results

Phoneme deletion task

The mixed effects logistic regression model of the data for the phoneme deletion task (refer to Figure 1) revealed that the control group had significantly higher accuracy than the phonics group ($\chi^2(1) = 23.50$, $p < .001$), and accuracy was higher overall at the post-test than the pre-test ($\chi^2(1) = 20.28$, $p < .001$), but there was no significant interaction between group and session ($\chi^2(1) = 0.78$, $p = .377$). Results remained the same when the analysis was run without the three participants who scored 0 at pre-test and/or post-test, so these participants were kept in the analysis.

Letter-Sound Test

The mixed effects logistic regression model of the data for the Letter-Sound Test (refer to Figure 2) revealed that the control group had significantly higher accuracy than the phonics group ($\chi^2(1) = 23.93$, $p < .001$), and there was a significant effect of session (pre-test vs. post-test; $\chi^2(1) = 5.14$, $p = .023$). There was also a significant interaction between group and session ($\chi^2(1) = 13.80$, $p < .001$). Follow-up analyses revealed that the effect of session was significant for the phonics group ($\chi^2(1) = 13.99$, $p < .001$) but not for the control group ($\chi^2(1) = 0.04$, $p = .848$). Results remained the same when the analysis was run without the four participants who scored 0 at pre-test and/or post-test, so these participants were kept in the analysis.

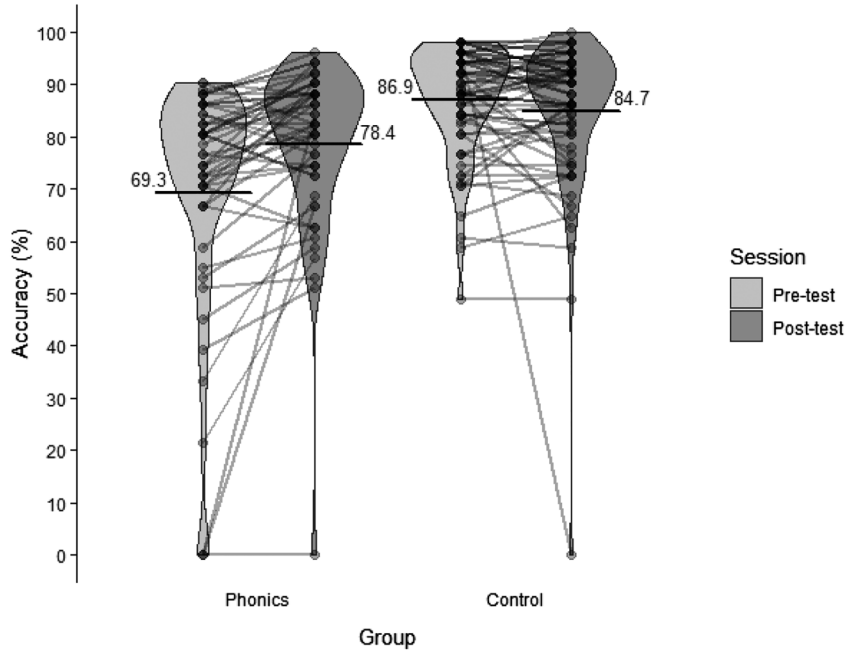

Figure 2. Accuracy (percentage correct) in the Letter-Sound Test for participants in the phonics ($N = 50$) and control ($N = 69$) groups at pre-test and post-test. Each point shows a participant's percentage accuracy with lines connecting the pre-test with the post-test for the same participant. Each bar gives the mean across participants in that condition, and the violin shows the distribution of the data.

Test of Word Reading Efficiency – nonwords

The mixed effects logistic regression model of the data for the TOWRE nonwords test (refer to Figure 3) revealed that the control group had significantly higher accuracy than the phonics group ($\chi^2(1) = 20.67$, $p < .001$). There was no significant main effect of session ($\chi^2(1) = 2.14$, $p = .144$) and no significant interaction ($\chi^2(1) = 0.32$, $p = .569$).

Test of Word Reading Efficiency – words

The mixed effects logistic regression model of the data for the TOWRE words test (refer to Figure 4) revealed that the control group had significantly higher accuracy than the phonics group ($\chi^2(1) = 27.61$, $p < .001$), and accuracy was higher overall at the post-test than the pre-test ($\chi^2(1) = 4.52$, $p = .033$). There was no significant interaction between group and session ($\chi^2(1) = 2.52$, $p = .113$).

Irregular word identification task

We found that participants in the phonics group were at chance performance on the irregular word identification task at both pre-test (53%) and post-test (50%), that is, they did not perform better than guessing at random, and the control group also had much lower accuracy than for the other tasks (refer to Figure S6: https://osf.io/r4nfb). It is therefore likely that participants misunderstood the instructions and results for this measure were not analysed.

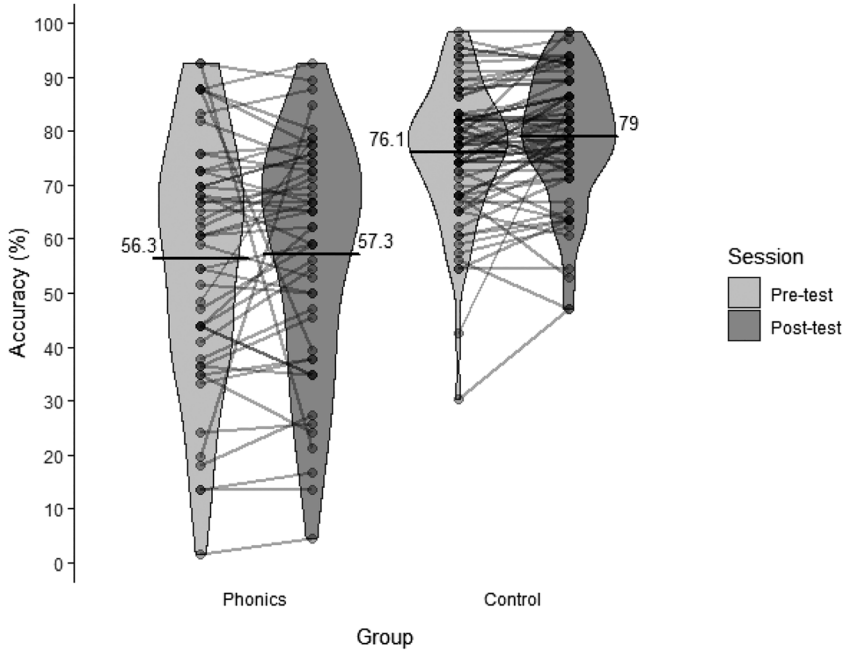

Figure 3. Accuracy (percentage correct) in the TOWRE nonwords test for participants in the phonics ($N = 49$) and control ($N = 72$) groups at pre-test and post-test. Each point shows a participant's percentage accuracy with lines connecting the pre-test with the post-test for the same participant. Each bar gives the mean across participants in that condition, and the violin shows the distribution of the data.

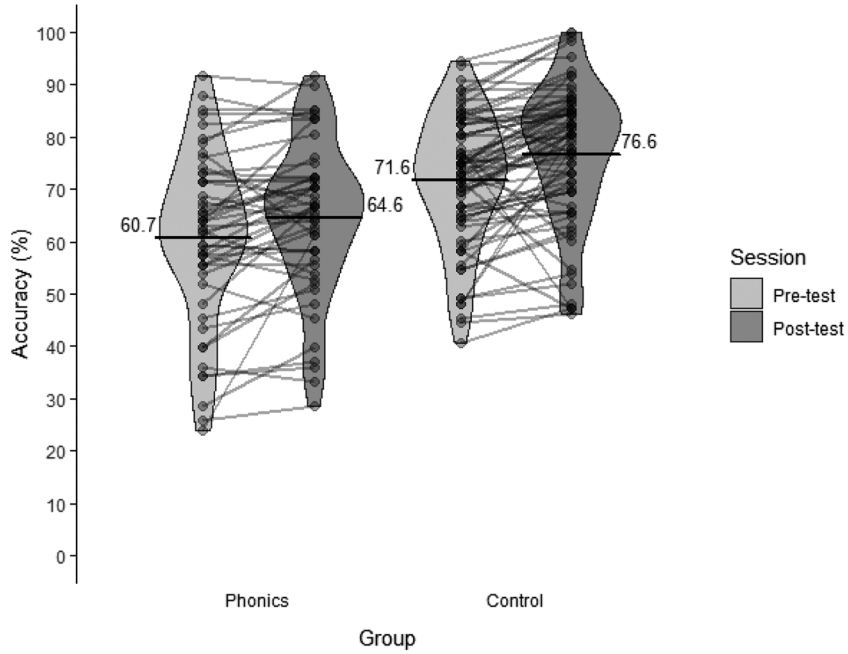

Figure 4. Accuracy (percentage correct) in the TOWRE words test for participants in the phonics (N = 50) and control (N = 72) groups at pre-test and post-test. Each point shows a participant's percentage accuracy with lines connecting the pre-test with the post-test for the same participant. Each bar gives the mean across participants in that condition, and the violin shows the distribution of the data.

Reading questionnaire

Results for all items of the reading questionnaire are shown in Figure 5, with composite scores for the three factors of competence, enjoyment, and child interaction in Table 1, and with mean scores for each item in Table S3 (https://osf.io/r4nfb). Three cumulative link mixed models were used to analyse the ordinal data from the reading questionnaire. Each model included items that loaded onto the competence, enjoyment, or child interaction factor identified in the exploratory factor analysis (refer to the Data Analysis section of the Method and Table S4 for details; https://osf.io/r4nfb).

The cumulative link mixed model for the competence factor revealed that there was a significant main effect of group ($\chi^2(1) = 8.48$, $p = .004$), but no significant effect of session ($\chi^2(1) = 0.03$, $p = .855$), and no significant interaction ($\chi^2(1) = 0.23$, $p = .634$).

The cumulative link mixed model for the enjoyment factor revealed that there was no significant main effect of group ($\chi^2(1) = 2.62$, $p = .105$), no significant effect of session ($\chi^2(1) = 1.07$, $p = .300$), and no significant interaction ($\chi^2(1) = 0.60$, $p = .437$).

The cumulative link mixed model for the child interaction factor revealed that there was no significant main effect of group ($\chi^2(1) = 0.53$, $p = .467$), but there was a significant effect of session ($\chi^2(1) = 5.83$, $p = .016$). The interaction between group and session was marginally significant ($\chi^2(1) = 3.52$, $p = .061$). Follow-up analyses revealed that the effect of session was significant for the phonics group ($\chi^2(1) = 7.09$, $p = .008$), but non-significant for the control group ($\chi^2(1) = 0.19$, $p = .663$).

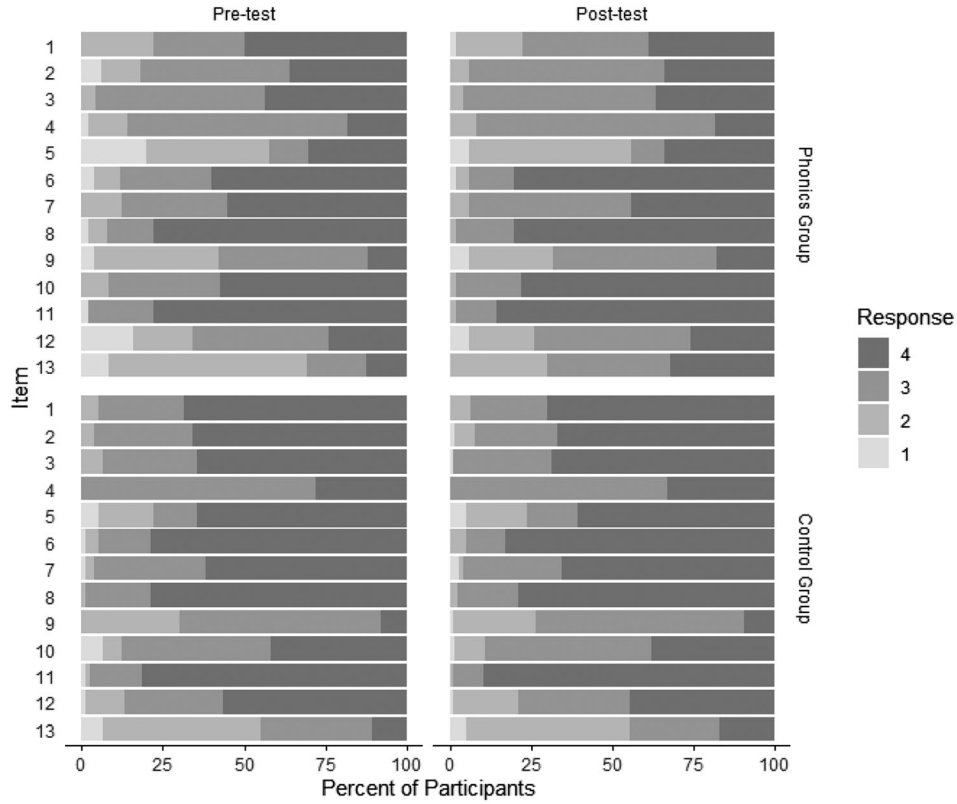

Figure 5. Percentage of participants who selected each response option for each item in the reading questionnaire for participants in the phonics group ($N = 50$; upper panels) and control group ($N = 76$; lower panels) at pre-test and post-test. Items 1, 3, 4, 5, and 12 formed the competence factor; items 2, 7, 8, and 9 the enjoyment factor; and items 8, 10, and 11 the child interaction factor. In general, response 4 represents the most positive response, and response 1 represents the least positive response; refer to Table S3 (https://osf.io/r4nfb) for full descriptions of all items and response options.

Table 1. Composite (mean) scores for the factors of competence, enjoyment, and child interaction in the reading questionnaire for participants in the phonics ($N = 50$) and control ($N = 76$) groups at pre-test and post-test.

	Phonics group		Control group	
Factor	Pre-test	Post-test	Pre-test	Post-test
Competence	2.99	3.05	3.46	3.43
Enjoyment	3.22	3.31	3.44	3.44
Child interaction	3.64	3.79	3.60	3.63

Discussion

We investigated whether family learning phonics courses improve parents' reading-related skills and confidence to support their children's reading. Parents who participated in short

(5–6 weeks) phonics courses showed a significant improvement relative to a control group in their letter-sound knowledge, but not in phonological awareness, word reading, or decoding. Parents in the phonics group also increased in how much they reported supporting their children with reading.

Pre-test scores demonstrated that the phonics group clearly underperformed relative to controls, indicating that the family learning teams effectively recruited parents in need of literacy support. The phonics group knew on average 4 to 5 more letters (51 total items) at the end relative to the beginning of the course: an increase that was statistically significant, whereas no significant change was seen for the control group. Letter-sound knowledge is one of the key reading-related skills (Hatcher, Hulme, & Ellis, 1994; McArthur et al., 2018). This is therefore encouraging evidence that this key literacy skill can be improved following a relatively short period of training in a 6-week phonics course. Although it is possible that progress may be easier to demonstrate for those starting at a lower skill level, the control group were not at ceiling at pre-test (mean score 46/51 letters), the Letter-Sound Test has good reliability (Larsen et al., 2015), and other tests did not show the same improvement. Therefore, it seems more likely that this reflects real change in knowledge as a result of the phonics course.

Both the phonics group and the control group showed some improvement in phonological awareness and word reading, suggesting any improvement was due to practice effects rather than as a result of phonics training for these measures. Neither group showed significant improvement in nonword reading. It is unfortunate although perhaps not altogether surprising that these reading-related skills (phonological awareness, word reading, and decoding) showed little improvement following the 5- to 6-week phonics course. There is evidence that intensive phonics training with a primary focus on letter-sound knowledge may not be sufficient for children with poor phonological awareness (Shapiro & Solity, 2008), and including explicit phonological awareness tasks in interventions can help these children (Hatcher, Hulme, & Snowling, 2004). Therefore, phonological awareness should continue to be a target skill for family learning courses if parents are to develop skills to support their children. It may be the case that phonological awareness as well as the decoding skills that support nonword and word reading require more intensive focus over a longer timeframe.

The reading questionnaire showed that the phonics group significantly improved on the child interaction factor, which was not the case for the control group; neither group showed improvement in terms of competence or enjoyment. The phonics group's improvement in their confidence to support their child with reading is important. Research has shown that parents who feel confident in their parenting roles are more likely to provide their children with support in their learning activities (Bojczyk, Haverback, & Pae, 2018; Bradley & Corwyn, 2001; Jones & Prinz, 2005).

The collaborative nature of this study saw researchers and practitioners working together to develop course components, share expertise in research and practice, and discuss how to interpret the findings. There were a number of additional benefits as a result of this collaboration, besides helping inform practitioners on the efficacy of the programme. For example, the practitioners were able to use the collaboration to attract new parents to the programme, some of whom later continued to participate in follow-on phonics courses as well as other programmes (e.g. maths and English). The collaboration also raised the profile of the family learning courses with schools and head teachers, whose support is essential to the running of the courses. The study also highlighted some possible

improvements that could have strengthened the research, such as further discussion with practitioners of additional means of evaluation beyond assessment of the principal skills. Practitioners suggested that a mixed methods approach may be beneficial to gather qualitative data to capture how parents engage with their children in reading activities, what parents felt they gained from the course, and 'the voice of the child' – whether children felt more supported by their parents.

A limitation of the study is that we were unable to assess whether parents improved in their identification of irregular words. This is a crucial skill for supporting children's reading, because parents need to know which words children can and cannot fully decode. Our irregular word identification task was not effective for assessing knowledge of spelling-sound regularities, despite being similar to activities used to train this skill in family learning phonics courses. Future research could use a more explicit task focused on sounding out irregular words and identifying the parts that make them 'tricky'. Furthermore, non-timed measures would have been a more appropriate way to assess decoding and word reading accuracy, and this would also provide information about which items parents struggle with. Another limitation is that although the academic team worked with the course leaders to develop the course materials before the start of the course, there were no observations of course delivery to confirm fidelity. Family learning programmes are designed to target learners' needs, and course leaders are expected to adjust the pace and content of the course components to suit each particular group. While it is advantageous that courses are adapted to meet the needs of the parents and children, this makes it more difficult to interpret which components are particularly effective. Continuing engagement with course leaders throughout the duration of the course could improve standardisation of course delivery across the sites. Finally, the study would have benefitted from inclusion of an active control group taking a different family learning course (e.g. numeracy) during the same period; it was our original intention to include such a control group, but unfortunately, the COVID-19 pandemic halted data collection. Furthermore, the COVID-19 pandemic is likely to have influenced how parents engage with their children in literacy activities, possibly leading to differences between our participant pools recruited before and during the pandemic. The COVID-19 pandemic has highlighted, under extraordinary circumstances, the importance of parents' involvement in their children's reading development (Bao, Qu, Zhang, & Hogan, 2020). A continuing collaboration between academic researchers and family learning teams would allow for assessment of children's reading activities at school to examine the quantitative effects of family learning courses on both parents' and their children's literacy skills.

We investigated whether family learning phonics courses can help adults with low literacy skills with their reading-related skills and confidence to support their children with reading. We found that the phonics group significantly improved on letter-sound knowledge but showed no improvement in nonword reading, phonological awareness, and word reading relative to the control group. Parents in the phonics group also showed an increase in confidence to support their children's reading activities. Our findings provide evidence that family learning phonics courses provide an effective means of increasing parents' phonics skills and confidence in supporting their children's reading, although some skills may require longer term support. These courses should be available to all parents who may struggle to support their children's literacy development. Longer term studies will be useful for determining whether raising parents' skills and confidence has a long-term effect on parent and child literacy.

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Conflict of interest

The authors declare that they have no competing interests.

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Ethical approval

Aston University Health and Life Sciences Ethics Committee granted ethical approval for the research (Ref: #1448).

Data availability statement

Our data and analysis scripts are available on the Open Science Framework at https://osf.io/m8tuh.

References

Alamprese, J.A., MacArthur, C.A., Price, C. & Knight, D. (2011). Effects of a structured decoding curriculum on adult literacy learners' reading development. *Journal of Research on Educational Effectiveness*, 4(2), 154–172. https://doi.org/10.1080/19345747.2011.555294

Aram, D., Korat, O. & Hassunah-Arafat, S. (2013). The contribution of early home literacy activities to first grade reading and writing achievements in Arabic. *Reading and Writing*, 26(9), 1517–1536. https://doi.org/10.1007/s11145-013-9430-y

Axford, N., Berry, V., Lloyd, J., Moore, D., Rogers, M., Hurst, A. et al. (2019). How can schools support parents' engagement in their children's learning? Evidence from research and practice. Education Endowment Foundation. https://educationendowmentfoundation.org.uk/education-evidence/evidence-reviews/parental-engagement

Baharudin, R. & Luster, T. (1998). Factors related to the quality of the home environment and children's achievement. *Journal of Family Issues*, 19(4), 375–403. https://doi.org/10.1177/019251398019004002

Bao, X., Qu, H., Zhang, R. & Hogan, T.P. (2020). Modeling reading ability gain in kindergarten children during COVID-19 school closures. *International Journal of Environmental Research and Public Health*, 17(17), 6371. https://doi.org/10.3390/ijerph17176371

Barr, D.J., Levy, R., Scheepers, C. & Tily, H.J. (2013). Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of Memory and Language*, 68(3), 255–278. https://doi.org/10.1016/j.jml.2012.11.001

Bates, D., Mächler, M., Bolker, B. & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1), 1–48. https://doi.org/10.18637/jss.v067.i01

Bojczyk, K.E., Haverback, H.R. & Pae, H.K. (2018). Investigating maternal self-efficacy and home learning environment of families enrolled in Head Start. *Early Childhood Education Journal*, 46(2), 169–178. https://doi.org/10.1007/s10643-017-0853-y

Bradley, R.H., Caldwell, B.M. & Rock, S.L. (1988). Home environment and school performance: A ten-year follow-up and examination of three models of environmental action. *Child Development*, 59(4), 852–867. https://doi.org/10.1111/j.1467-8624.1988.tb03239.x

Bradley, R.H. & Corwyn, R.F. (2001). Home environment and behavioral development during early adolescence: The mediating and moderating roles of self-efficacy beliefs. *Merrill-Parlmer Quarterly*, 47(2), 165–187. https://doi.org/10.1353/mpq.2001.0007

Brooks, G., Pahl, K., Pollard, A. & Rees, F. (2008). Effective and inclusive practices in family literacy, language and numeracy: A review of programmes and practice in the UK and internationally. National Research and Development Centre for Adult Literacy and Numeracy. https://lemosandcrane.co.uk/resources/CfBT%20-%20Review%20of%20FLLN.pdf

Carpentieri, J. (2012). Family learning: A review of the research literature. National Research and Development Centre for Adult Literacy and Numeracy. https://learningandwork.org.uk/wp-content/uploads/2020/05/Family-learning-A-review-of-the-research-literature.pdf

Carroll, J.M., Holliman, A.J., Weir, F. & Baroody, A.E. (2019). Literacy interest, home literacy environment and emergent literacy skills in preschoolers. *Journal of Research in Reading*, 42(1), 150–161. https://doi.org/10.1111/1467-9817.12255

Castles, A., Rastle, K. & Nation, K. (2018). Ending the reading wars: Reading acquisition from novice to expert. *Psychological Science in the Public Interest*, 19(1), 5–51. https://doi.org/10.1177/1529100618772271

Christensen, R. H. B. (2019). Regression models for ordinal data. *R Package*. https://cran.r-project.org/web/packages/ordinal/

R Core Team. (2020). R: A language and environment for statistical computing. R Foundation for Statistical Computing. https://www.r-project.org/

Damer, E., & Bradley, P. (2014). Prolific academic [Computer Software]. https://www.prolific.ac/

Department for Education. (2018). Phonics screening check and key stage 1 assessments in England, 2018. Department for Education. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/841951/Phonics_KS1_Text.pdf

Dugdale, G., & Clark, C. (2008). Literacy changes lives: An advocacy resource. National Literacy Trust. http://www.literacytrust.org.uk/assets/0000/0401/Literacy_changes_lives_2008.pdf

Forum for Research in Literacy and Language. (2012). Diagnostic test of word reading processes. GL Assessment.

Gibbs, S. & Bodman, S. (2014). *Phonological assessment battery.* (2nd edn). GL Assessment.

Greenberg, D., Wise, J.C., Morris, R., Fredrick, L.D., Rodrigo, V., Nanda, A.O. et al. (2011). A randomized control study of instructional approaches for struggling adult readers. *Journal of Research on Educational Effectiveness*, 4(2), 101–117. https://doi.org/10.1080/19345747.2011.555288

Hatcher, P.J., Hulme, C. & Ellis, A.W. (1994). Ameliorating early reading failure by integrating the teaching of reading and phonological skills: The phonological linkage hypothesis. *Child Development*, 65(1), 41–57. https://doi.org/10.1111/j.1467-8624.1994.tb00733.x

Hatcher, P.J., Hulme, C. & Snowling, M.J. (2004). Explicit phoneme training combined with phonic reading instruction helps young children at risk of reading failure. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 45(2), 338–358. https://doi.org/10.1111/j.1469-7610.2004.00225.x

JASP Team. (2020). JASP (version 0.14.1) [computer software]. https://jasp-stats.org/

Jones, T.L. & Prinz, R.J. (2005). Potential roles of parental self-efficacy in parent and child adjustment: A review. *Clinical Psychology Review*, 25(3), 341–363. https://doi.org/10.1016/j.cpr.2004.12.004

Kim, J.S. & Quinn, D.M. (2013). The effects of summer reading on low-income children's literacy achievement from kindergarten to Grade 8: A meta-analysis of classroom and home interventions. *Review of Educational Research*, 83(3), 386–431. https://doi.org/10.3102/0034654313483906

Ladd, M., Martin-Chang, S. & Levesque, K. (2011). Parents' reading-related knowledge and children's reading acquisition. *Annals of Dyslexia*, 61(2), 201–222. https://doi.org/10.1007/s11881-011-0053-1

Larsen, L., Kohnen, S., Nickels, L. & McArthur, G. (2015). The Letter-Sound Test (LeST): A reliable and valid comprehensive measure of grapheme–phoneme knowledge. *Australian Journal of Learning Difficulties*, 20(2), 129–142. https://doi.org/10.1080/19404158.2015.1037323

Li, L. & Tan, C.L. (2016). Home literacy environment and its influence on Singaporean children's Chinese oral and written language abilities. *Early Childhood Education Journal*, 44, 381–387. https://doi.org/10.1007/s10643-015-0723-4

Machin, S., McNally, S. & Viarengo, M. (2018). Changing how literacy is taught: Evidence on synthetic phonics. *American Economic Journal: Economic Policy*, 10(2), 217–241. https://doi.org/10.1257/pol.20160514

Malloy, J.A., Marinak, B.A., Gambrell, L.B. & Mazzoni, S.A. (2013). Assessing motivation to read: The motivation to read profile-revised. *Reading Teacher*, 67(4), 273–282. https://doi.org/10.1002/trtr.1215

McArthur, G., Sheehan, Y., Badcock, N., Francis, D., Wang, H., Kohnen, S. et al. (2018). Phonics training for English-speaking poor readers. *Cochrane Database of Systematic Reviews*, (11), CD009115. https://doi.org/10.1002/14651858.CD009115.pub3

Moss, G., Duncan, S., Harmey, S., & Munoz-Chereau, B. (2018). Current practice in using a system of phonics with post-16 learners. Education and Training Foundation. https://www.et-foundation.co.uk/wp-content/uploads/2018/06/ETF18002_PHONICS_REPORT_80PP_FINAL_AW.pdf

National Institute of Adult Continuing Education. (2013). Family learning works: The inquiry into family learning in England and Wales. NIACE. https://learningandwork.org.uk/wp-content/uploads/2020/05/Family-Learning-Works-The-Inquiry-into-Family-Learning-in-England-and-Wales-Full-report.pdf

OFSTED. (2009). Family learning: An evaluation of the benefits of family learning for participants, their families and the wider community. https://dera.ioe.ac.uk/343/1/Family%20learning.pdf

Reder, S. (2009). The development of literacy and numeracy in adult life. In S. Reder & J. Bynner (Eds.), *Tracking adult literacy and numeracy: Findings from longitudinal research*, (pp. 59–84). Routledge.

Sabatini, J.P., Shore, J., Holtzman, S. & Scarborough, H.S. (2011). Relative effectiveness of reading intervention programs for adults with low literacy. *Journal of Research on Educational Effectiveness*, 4(2), 118–133. https://doi.org/10.1080/19345747.2011.555290

Sammons, P., Toth, K., Sylva, K., Melhuish, E., Siraj, I. & Taggart, B. (2015). The long-term role of the home learning environment in shaping students' academic attainment in secondary school. *Journal of Children's Services*, 10(3), 189–201. https://doi.org/10.1108/JCS-02-2015-0007

Scarborough, H.S., Sabatini, J.P., Shore, J., Cutting, L.E., Pugh, K. & Katz, L. (2013). Meaningful reading gains by adult literacy learners. *Reading and Writing*, 26, 593–613. https://doi.org/10.1007/s11145-012-9385-4

Seidenberg, M.S., Cooper Borkenhagen, M. & Kearns, D.M. (2020). Lost in translation? Challenges in connecting reading science and educational practice. *Reading Research Quarterly*, 55(S1), S119–S130. https://doi.org/10.1002/rrq.341

Shapiro, L.R. & Solity, J. (2008). Delivering phonological and phonics training within whole-class teaching. *British Journal of Educational Psychology*, 78(4), 597–620. https://doi.org/10.1348/000709908X293850

Snowling, M. J., Stothard, S. E., Clarke, P., Bowyer-Crane, C., Harrington, A. & Nation, K. et al. (2009). York assessment of reading for comprehension. GL Assessment.

Solari, E.J., Terry, N.P., Gaab, N., Hogan, T.P., Nelson, N.J., Pentimonti, J.M. et al. (2020). Translational science: A road map for the science of reading. *Reading Research Quarterly*, 55(S1), S347–S360. https://doi.org/10.1002/rrq.357

Swain, J., Brooks, G. & Bosley, S. (2014). The benefits of family literacy provision for parents in England. *Journal of Early Childhood Research*, 12(1), 77–91. https://doi.org/10.1177/1476718X13498335

Swain, J., Cara, O., Vorhaus, J. & Litster, J. (2015). The impact of family literacy programmes on children's literacy skills and the home literacy environment. National Research and Development Centre for Adult Literacy and Numeracy. http://www.nrdc.org.uk/wp-content/uploads/2015/11/Nuffield-Family-Literacy-Report.pdf

Torgerson, C. J., Brooks, G. & Hall, J. (2006). A systematic review of the research literature on the use of phonics in the teaching of reading and spelling. (Research Report RR711). U.K. Department for Education and Skills. http://dera.ioe.ac.uk/14791/1/RR711_.pdf

Torgesen, J.K., Wagner, R.K. & Rashotte, C.A. (2012). *Test of word reading efficiency.* (2nd edn). ProEd.

Whitehurst, G.J., Epstein, J.N., Angell, A.L., Payne, A.C., Crone, D.A. & Fischel, J.E. (1994). Outcomes of an emergent literacy intervention in Head Start. *Journal of Educational Psychology*, 86(4), 542–555. https://doi.org/10.1037/0022-0663.86.4.542

Wickham, H. (2016). *Ggplot2: Elegant graphics for data analysis*. Springer-Verlag.

Yeo, L.S., Ong, W.W. & Ng, C.M. (2014). The home literacy environment and preschool children's reading skills and interest. *Early Education and Development*, 25(6), 791–814. https://doi.org/10.1080/10409289.2014.862147

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