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Evaluation of a parent-delivered early language enrichment programme: evidence from a randomised controlled trial

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Background: It is widely believed that increasing parental involvement can improve children's educational outcomes although we lack good evidence for such claims. This study evaluated the effectiveness of a parent-delivered early language enrichment programme. **Methods:** We conducted a randomised controlled trial (RCT) with 208 preschool children and their parents living in socially diverse areas in the United Kingdom. Families were allocated to an oral language programme (N = 103) or an active control programme targeting motor skills (N = 105). Parents delivered the programmes to their child at home in daily 20-min sessions over 30 weeks of teaching. **Results:** Children receiving the language programme made significantly larger gains in language (d = .21) and narrative skills (d = .36) than children receiving the motor skills programme at immediate posttest. Effects on language were maintained 6 months later (d = .34), and at this point, the language group also scored higher on tests of early literacy (d values=.35 and .42). There was no evidence that the movement programme improved motor skills. **Conclusions:** This study provides evidence for the effectiveness of a parent-delivered language enrichment programme. Further large-scale evaluations of the programme are needed to confirm and extend these findings. **Keywords:** Language; parents; motor skills; randomised controlled trial; education; early literacy.

Introduction

Recent educational policy and practice recommendations in the United Kingdom (e.g. Ofsted, 2014; Tickell, 2011) and elsewhere (e.g. US Every Student Succeeds Act, 2015; Australian Department of Education, 2014) emphasise the important role of parents in facilitating children's educational development. Such views imply that increasing the quality or intensity of parental involvement should improve children's academic attainment. However, a recent review of parent-delivered interventions (Huat See & Gorard, 2013) identified major flaws in existing research and concluded that there is insufficient evidence to support a causal link between parental involvement and children's attainment. Here, we report a randomised controlled trial (RCT) evaluating the effects of a parent-delivered language teaching programme on preschool children's language and emerging literacy skills.

Huat See and Gorard's (2013) review of the evidence for parental interventions identified 68 studies; none of which were rated as high quality. The most promising eight studies presented an unclear picture of the effectiveness of parental interventions. Five demonstrated positive effects on broad measures of academic achievement (e.g. educational attainment, completion of high school). However, four studies (Ou, 2005; Ou & Reynolds, 2010; Reynolds, Ou, & Topitzes, 2004; Reynolds, Temple, Ou, Arteaga, & White, 2011) examined the same programme (the Chicago Child-Parent Centre programme which provides a broad range of services to families living in high-poverty areas to support social and cognitive development in children aged 3–9 years) and two used the same data (Ou, 2005 and Ou & Reynolds, 2010). All five studies showing positive effects combined parental involvement with school-based interventions (and in some cases health and economic interventions) making it impossible to isolate the role of parental intervention per se. The other three studies rated as medium quality suggested that parental interventions were ineffective (Bradshaw, Zumda, Kellam, & Ialongo, 2009) or possibly harmful; studies by Herts (1990) and Villiger, Niggli, and Kutzelmann (2012) showed negative effects of parent-supported reading interventions on reading outcomes.

Providing effective programmes to support development in the early years has the potential to reduce inequalities and enhance future life opportunities (Allen, 2011; Field, 2010). A central target for learning and development in the early years is language and communication (e.g. DfE, 2012). Oral language skills play a critical role in learning to read (e.g. Hulme, Nash, Gooch, Lervåg, & Snowling, 2015) and provide the foundation for formal education (Roulstone, Law, Rush, Clegg, & Peters, 2011). Variations in language skills at 2 years of age predict school-age outcomes on a range of measures (e.g. Duff, Reen,

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Plunkett, & Nation, 2015; Roulstone et al., 2011). Language weaknesses in preschool children may, therefore, result in poorer educational outcomes.

A growing body of work demonstrates that language skills can be improved by targeted interventions delivered by trained staff in educational settings (Bianco et al., 2010; Fricke, Bowyer-Crane, Haley, Hulme, & Snowling, 2013; Fricke et al., 2017; Rogde, Melby-Lervag, & Lervag, 2016): such programmes have also been shown to support later reading comprehension (although they do not typically affect word-level literacy; Fricke et al., 2013). Evidence that the child's home environment influences early language development (Roulstone et al., 2011) implies that interventions which help parents to provide language enrichment at home should also be effective (McGillion, Pine, Herbert, & Matthews, 2017).

There is some evidence that parents can support their child's language and emergent literacy in the preschool years (see Reece, Sparks, & Leyva, 2010 for a review). Interventions that show promise include those which train parents to extend their child's language during conversations (e.g. Jordan, Snow, & Porsche, 2000) or aim to increase parent's responsiveness (e.g. Landry, Smith, Swank, & Guttentag, 2008). However, by far the most common approach involves training parents to use dialogic (interactive) book reading. This approach encourages children to be active participants during shared reading, through adult use of questions, prompts and feedback to promote discussion about a book. A meta-analysis of parent–child dialogic reading (Mol, Bus, de Jong, & Smeets, 2008) reports moderate effects on children's expressive vocabulary (d = .59); however, effects on language were smaller for low-income children (d = .13) than their peers (d = .53). There is also some evidence that providing low-income parents with training and resources to encourage dialogic reading and letter-sound games at home can support emergent literacy in the first year of school (Bierman, Welsh, Heinrichs, Nix, & Mathis, 2015). The language programme evaluated here incorporates interactive book reading, supplemented by highly structured vocabulary teaching and narrative instruction as used in other effective early language intervention programmes (e.g. Fricke et al., 2013).

Here, we report an RCT evaluating a novel parent-delivered oral language programme compared to an active treatment control programme targeting motor skills and self-care. Our primary aim was to evaluate whether the oral language programme would lead to gains in early language skills relative to the motor skills programme. A secondary aim was to explore whether the language programme would also produce gains in early reading skills. We recruited families from areas with high levels of social disadvantage in the belief that such a programme is likely to be particularly valuable for such families (McGillion et al., 2017).

Methods

In this randomised controlled trial (RCT), 208 children were allocated to receive one of two parent-delivered teaching programmes targeting early language or motor skills. Both programmes were designed to be delivered by parents 5 days per week in 20-min sessions over 30 weeks. The study was granted ethical approval by UCL's Research Ethics Committee. Informed parental consent was obtained for all children. Details of participant recruitment, allocation and flow through the study are summarised in the CONSORT diagram (Figure 1).

Participants

Twenty-two children's centres in three local authorities in England [10 in Blackpool and 12 in Greater London (Bexley [10], Lambeth [2])] participated in the study. Two of these areas rank highly on indices of deprivation: Blackpool = 4, Lambeth = 22 and Bexley = 195 (where 1 = most deprived and 326 = least deprived; English Indices of Deprivation, 2015). Although the rating is higher for Bexley, the average income is much lower there than the average for London, and there are significant concentrations of deprivation.

Children's centres were asked to recruit parents if (a) they had a child aged approximately 3 years and (b) they were able to read and understand English. Most centres (N = 16) targeted families whose children attended the centre nursery. Six centres advertised the project more widely to families in their catchment area. The number of children recruited from each centre varied between 5 and 17; in total, 208 children (102 boys) entered the study (Blackpool N = 87; Lambeth N = 15; Bexley N = 106). Children were aged between 2 years, 7 months and 3 years, 6 months at pretest (mean age: 3 years, 1 month).

Responses to parent questionnaires (we had complete data for 52% of respondents) and children's centre staff reports indicated that 33 (16%) children were growing up with more than one language at home (N = 15 in the movement group; N = 18 in the language group). A fifth of the sample (N = 42) scored at or below the 10^{th} centile on at least two of the three standardised language measures at pretest (*BPVS* and *CELF Expressive Vocabulary* and *Sentence Structure*) and could therefore be described as having clinically significant language difficulties (seven of these children, however, were learning English as an additional language; for these children, low standard scores on these measures may reflect inexperience with English rather than developmental delays). Further details on sample characteristics can be found in Table S1. It is clear from the information in Table S1 that those parents who completed questionnaires (52% of sample) varied widely in socioeconomic status (SES), but were of lower SES than national averages (e.g. only 9.4% of parents were educated to degree level compared with a national average of 38%, according to 2013 data from the UK Office of National Statistics). However, given the large amount of missing data, it is impossible to draw strong conclusions about the SES levels of our total sample. Importantly, there were no statistically significant differences between the intervention groups in the distribution of parent age on completing education, level of education, or occupational group (with all effect sizes being small; Goodman and Kruskal's gamma 0.07–0.15).

Within each centre, children were allocated to either the oral language programme (N = 103) or the motor skills programme (N = 105). Although in this design (children in conditions nested within centres) there is the theoretical possibility of contamination effects, each programme depended on an

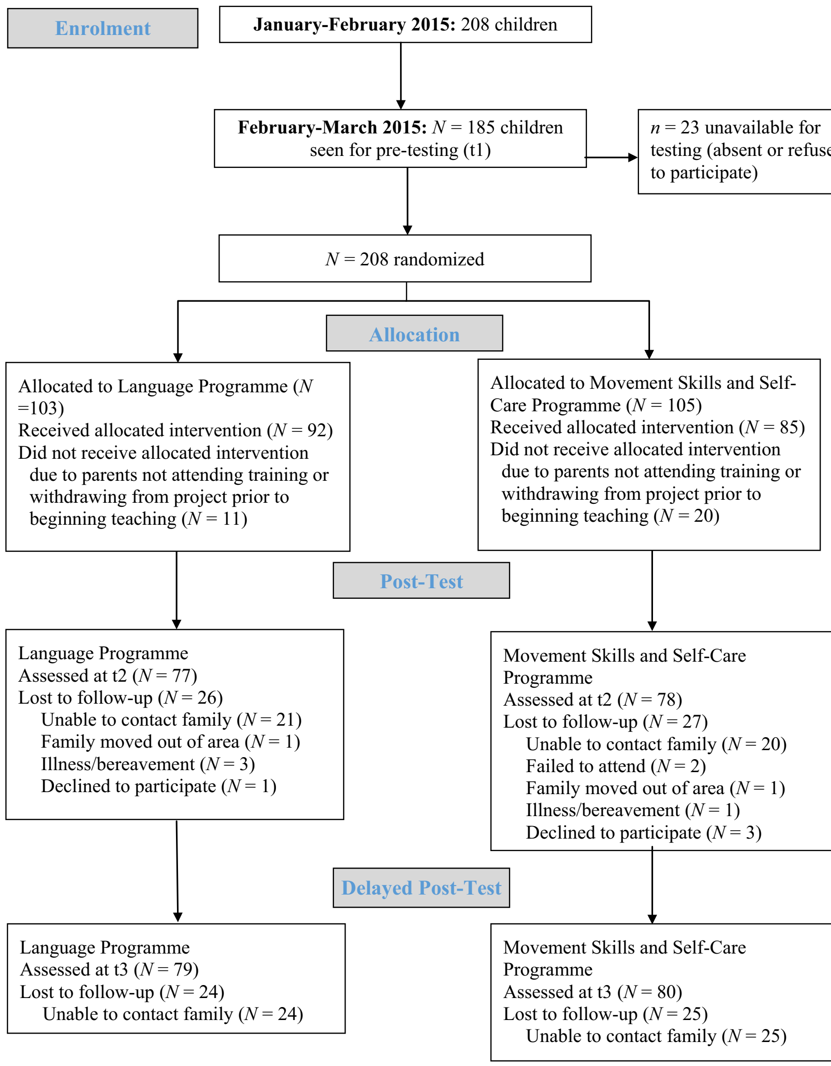

Figure 1 Consort diagram showing flow of participants through RCT study [Colour figure can be viewed at wileyonlinelibrary.com]

extensive set of materials which were provided to families by the centres after completion of each block of teaching, and families only received materials for the programme they were allocated to; this makes contamination highly unlikely. Group allocation was conducted independently by the York Trials Unit and involved minimisation (Altman & Bland, 2005) for age and ability to complete pretests (23 children were not available or refused to participate at pretest). Sample size was determined by a power calculation that showed that with $N = 80$ per arm, using ANCOVA and assuming a correlation between pretest and posttest of $r = .60$, there was better than 80% power to detect a difference between groups equivalent to $d = .36$ ($p < .05$, two-tailed).

Assessments

Children were assessed before the programme started (pretest, *t1*), immediately following the programme (posttest, *t2*) and 6 months after posttest (maintenance test, *t3*). Testing at *t1* and *t2* was conducted in children's centres and at *t3* in children's schools. Testers were blind to group allocation.

Primary outcome measures were standardised and nonstandardised tests of language and motor skills. Early literacy skills (letter-sound knowledge, phoneme awareness, and regular and irregular word reading) were secondary outcomes assessed at *t3* only (children were nonreaders at *t1* and *t2*).

Language skills

Expressive and receptive vocabulary. Expressive vocabulary was measured using the CELF Preschool II[UK] *Expressive Vocabulary* subtest (*t1–t3;* Semel, Wiig, & Secord, 2006) and the *Information Score* from the Renfrew Action Picture Test (APT; Renfrew, 2003; *t1–t3*). Receptive vocabulary skills were assessed using the *BPVS3* (*t1–t3;* Dunn, Dunn, & Styles, 2009).

Expressive and receptive grammar. Receptive grammar was measured using the CELF Preschool II[UK] *Sentence Structure* subtest (*t1–t3*); the *Grammar Score* from the APT (*t1–t3*) provided a measure of expressive grammar.

Listening comprehension. Children listened to one (*t1–t2*) or two (*t3*) short stories adapted from the York Assessment of Reading for Comprehension (YARC; Hulme et al., 2009) and answered eight questions about each story.

Expressive narrative skills (t1–t3). Children listened to a short story while looking at a series of three pictures depicting it. Children were asked to retell the story using the pictures as prompts. Retells were recorded verbatim and scored for Story Grammar and Expressive Language: *Story Grammar.* The number of story grammar units (information relating to character, setting and events) was scored by awarding 1 or 2 points for each unit based on its centrality to the story. *Expressive Language*: Retells were scored for total number of words, number of different words (counting word stems ending in different morphemes once only) and mean length of utterance (MLU).

Motor skills

Fine motor skills: Threading (t1–t3). Children threaded five large beads onto a lace within a time limit (120 s; two trials). Each unthreaded bead was given a penalty of 24 s. Trial completion times were averaged across the two trials.

Pegboard (t1–t3). Children moved five pegs on a pegboard within a time limit (60 s; two trials) using one hand. Each unmoved peg was awarded a penalty of 12 s. Times were averaged across the two trials.

Drawing trails (t1–t3). Children completed drawing trails (two trials) from the Movement Assessment Battery for Children (Henderson, Sugden, & Barnett, 2007). Errors were scored according to test guidelines and averaged across the two trials.

Gross motor skills: Balance (t1–t3). Children balanced on one leg for up to 30 s. Times were averaged across four trials (2 on each leg).

Throwing (t1–t3). Children stood on a small square mat and threw a beanbag onto a target mat positioned 1.8 m away (six trials). At *t1* and *t2*, 1 point was awarded if the beanbag landed on any part of the target mat. At *t3*, throws were scored as 0 (miss), 1 (hit any part of the mat) or 2 (landed in a circle in the middle of the mat).

Early literacy skills

Early literacy (t3). Subtests from the YARC (Hulme et al., 2009) were used to measure letter-sound knowledge, sound deletion and regular and irregular word reading (*Early Word Recognition* subtest).

Training and teaching programmes

The teaching programmes were developed in line with Early Years policy and practice guidelines (e.g. DfE, 2012). Each 30-week programme was organised into six 5-week teaching 'blocks' in which weeks 1–4 introduced new learning material and week 5 consolidated learning and provided extension activities. The programmes were designed to be delivered in 20-min sessions, 5 days per week (i.e. 150 sessions; 50 hr of teaching in total). Each teaching session was divided into five components focusing on short, varied activities to support the child's engagement. Sessions followed a consistent structure and sequence, supported by daily session plans and resources. An overview of both teaching programmes and an example of a teaching session from each programme is provided online.

Oral language programme. The oral language teaching programme was designed to promote language development through interactive book reading and direct teaching of vocabulary and narrative skills. Each teaching block was linked to a theme common in Early Years settings (e.g. animals, the body). *Interactive book reading*: Parents and children read a new book together in each of the first 4 weeks of a 5-week teaching block. Parents supported the child's active participation in shared reading using suggested prompts including wh-questions, sentence starters and by making links between the book and the child's life. Parents were encouraged to follow up children's responses to prompts, model language use and check understanding. *Vocabulary teaching*: One new word was targeted for direct teaching in each session; words were related to the book or the theme and included a range of word types selected to be age appropriate and useful across multiple contexts. Teaching activities and visual resources were provided to support multiple context learning (Beck, McKeown, & Kucan, 2013). *Narrative work*: The narrative work targeted sequencing (ordering pictures from the beginning, middle and end of the story), summarising (describing the event in the story) and retelling the story.

Movement skills programme. This programme consisted of daily activities targeting four key components: gross motor development (balance and co-ordination, visual tracking, ball skills and crossing the midline), fine motor skills (scissor skills, object control and finger differentiation), pencil control and self-care activities. In each component, a skill (e.g. standing on one leg, using scissors to cut along a line) was introduced and developed across the week using specified activities that gradually increased in difficulty.

Parent training. We trained 1 or 2 staff members in each child's centre to support parents. Training comprised an initial 2-day training event before parents started the teaching programmes, and a further 1 day of training after 10 weeks of teaching. Families were invited to a small-group training session at their children's centre; training was delivered by the research team and lasted approximately 1.5 hr. Training covered the background to the project and its design, an overview and rationale for their teaching programme (oral language or motor skills) and a detailed look at the programme materials (further information on parent training and recruitment is given in Appendix S1). Families who did not attend training were followed up and trained by centre staff (using the same training materials). In total, 183 families received training (research team training $N = 154$; centre staff training $N = 29$) and started the teaching programmes. The remaining families ($N = 25$) did not attend training and did not deliver any teaching. Staff in the children's centres provided ongoing support and monitored compliance informally through regular discussions with the parents and the children, and organised events at week 10, 20 and 30 to celebrate success. Parents received a £10 gift voucher on completion of each 10-week block of each programme.

Parents were asked to record whether or not each teaching session had been delivered though we were unable to check on the accuracy of these reports. Parents in the language group reported completing an average of 17.48/30 weeks of the programme ($SD = 11.76$; range = 0–30) and those in the movement group 15.06/30 weeks ($SD = 12.02$; range = 0–30), a nonsignificant difference ($t(206) = -1.47$, $p = .14$, $d = .20$).

Results

All analyses were performed on an intention-to-treat basis. The majority of the analyses were conducted in Stata 14.0 (Stata Corp, College Station, TX). Structural equation models (SEM) were constructed using Mplus 7.4 (Muthen & Muthen, 1998–2016) with full information maximum likelihood estimators to allow for missing data.

At pretest, we obtained data from 185 children, 155 of whom were tested at posttest and 159 were tested at delayed posttest. Critically, rates of attrition were essentially identical between arms (Figure 1). To assess whether attrition was related to language scores at pretest, we computed a language pretest factor score (from CELF *Expressive Vocabulary*, CELF *Sentence Structure*, *BPVS*, *Listening Comprehension*, APT *Information* and *Grammar scores).* There was no difference in language factor scores between children who completed the study and those who dropped out at posttest (t = 1.32; p = 0.19). In short, there is no evidence that attrition will have caused biases in our estimates of the size of the effects reported below.

Descriptive statistics for all outcome measures at pretest, posttest and delayed posttest for both groups are shown in Table 1. It is clear that the groups are approximately equated on all measures at pretest. While the language group show improvements on the majority of language measures, group differences are small on some measures (posttest ds = −.15 to .41; delayed posttest ds = −.06 to .42). The differences between groups on the motor measures are typically smaller (posttest ds = −.07 to .17; delayed posttest ds = .03 to .30).

Effects on standardised language measures

Our principal interest was to examine the extent to which the programmes produced differential improvements on a broad language latent variable defined by our primary outcome measures (i.e. CELF *Expressive Vocabulary*, CELF *Sentence Structure*, *BPVS*, *Listening Comprehension*, APT *Information* and *Grammar scores*). Such a measure assesses an underlying factor that captures the common variance shared by the different language measures. The models used are shown in Figure 2a,b and provide excellent fits to the data (pretest-posttest: χ^2 (59) = 75.213, p = .076; RMSEA (root mean square error of approximation) = .0.037 [90% CI 0.000, 0.060]; CFI = .99; TLI = .98; pretest-delayed posttest: χ^2 (59) = 66.96, p = .22; RMSEA = .0.026 [90% CI 0.000, 0.052]; CFI = .99; TLI = .99). (Values of RMSEA < .06 and CFI > .95 are considered indicative of acceptable model fit).

We should note that for the models in Figure 2a,b, we re-ran a model for the language group only in which the number of sessions completed was used as a predictor of outcome, but in neither case was there any appreciable relationship (standardised slope = .12; p = .18 and .01, p = .89, for the posttest and delayed posttest, respectively).

In these models, variance in the language scores is captured by four latent variables (language pretest, language posttest, APT pretest and APT posttest). The language pretest, posttest and delayed follow-up factors reflect shared variance across all language measures at each time point, while the APT factors account for variance that is shared by APT *Information* and *Grammar* scores but which is not shared with the other language measures. The APT factors were included to improve model fit since the APT measures shared variance with each other which was not accounted for by the language latent variable (it is likely that the APT factor reflects shared measurement variance since both scores come from the same test).

It is notable that the language factor shows considerable longitudinal stability and the APT factor much lower stability. The most critical result from these analyses is that the language group shows a significantly greater increase in their language scores than the motor skills group at posttest (d = .21 [95% CI .024, .397]) and at delayed posttest (d = .34 [95% CI 0.161, .570]). A critical assumption for these analyses is that there are equivalent slopes between language pretest and posttest/delayed posttest factor scores across groups. Analyses which included the interaction term between the language pretest factor and the group dummy code showed no interaction at immediate posttest confirming that the slopes relating pretest to posttest language scores do not differ between groups. In other words, at immediate posttest, children with the weakest language skills responded to the programme to the same degree as children with better language skills. At delayed posttest, however, the interaction between group and the language pretest factor was highly significant (Figure 3) and so was retained in the model (standardised difference in slopes −0.139 [95% CI −0.240, −0.037]; p = .008).

The shallower slope for the language group shows that the effect of the programme is greatest for children with the weakest language skills at pretest, while a minority of children with the best language skills at pretest show no benefit. The effect size for the programme (d = .34) is the difference in means between groups at the mean of the covariate.

Effects on narrative skills

Four measures were derived from the narrative task (number of words produced, number of unique words produced, mean length of utterance and story grammar). These four measures were used to define a latent narrative factor at pretest, posttest and delayed posttest.

The models for pretest–posttest and pretest–delayed posttest are shown in Figure 2c,d and provide excellent fits to the data (pretest-posttest: χ^2 (26) = 36.503, p = .083; RMSEA = .0.047 [90% CI 0.000, 0.080]; CFI = .99; TLI = .99; pretest-delayed posttest: χ^2 (27) = 36.609, p = .10; RMSEA = .0.044 [90% CI 0.000, 0.080]; CFI = .99; TLI = .99). Narrative skills show relatively low stability in these models. The most critical result is that the language group shows a significantly greater increase in their narrative scores at posttest than the motor skills group (d = .36 [95% CI .06, .67]); however, this difference is reduced to nonsignificant levels at delayed posttest (d = .08 [95% CI −0.24, .39]). In both of these models, there was no indication of differences in slope between the groups.

Table 1 Mean raw scores (*SD*) on language and motor outcome measures at Pretest (*t1*), Posttest (*t2*) and Maintenance Test (*t3*; with effect sizes for intervention effects) by group

	Reliability	Language programme n = 103		Movement programme n = 105		Cohen's d for group effect [95% CI] Language vs. movement
		M	*SD*	*M*	*SD*	
Language outcomes						
CELF-EV	.82[a]					
t1 (40)		8.27	5.43	8.88	5.97	
t2 (40)		17.05	6.32	17.17	7.45	0.10 (−0.13, 0.33)[1]
t3 (40)		21.63	5.83	20.80	7.47	0.16 (−0.09, 0.42)[1]
CELF-SS	.78[a]					
t1 (22)		5.59	3.74	6.63	4.24	
t2 (22)		11.99	4.23	11.90	4.36	0.06 (−0.24, 0.37)[1]
t3 (22)		14.89	3.00	14.36	4.13	0.19 (−0.10, 0.48)[1]
Listening comprehension						
t1 (8)	.43[a]	0.69	0.96	0.81	0.93	
t2 (8)	.59[a]	2.14	1.68	2.36	1.79	−0.15 (−0.46, 0.16)[1]
t3 (16)	.78[a]	6.17	3.02	5.81	3.13	0.09 (−0.21, 0.38)[1]
BPVS	.91[a]					
t1 (168)		29.77	11.78	33.30	14.98	
t2 (168)		55.48	15.27	55.24	16.77	0.24 (−0.04, 0.51)[1]
t3 (168)		68.63	13.30	64.26	16.85	0.42 (0.14, 0.71)[1]
APT information						
t1 (40)	.99[b]	16.16	5.87	17.63	5.82	
t2 (40)	.99[b]	24.59	5.13	23.22	6.30	0.38 (0.09, 0.67)[1]
t3 (40)	.99[b]	28.60	4.35	27.86	5.71	0.17 (−0.14, 0.47)[1]
APT grammar						
t1 (38)	.99[b]	10.15	6.09	11.24	5.77	
t2 (38)	.99[b]	18.78	5.52	17.46	6.19	0.41 (0.13, 0.69)[1]
t3 (38)	.98[b]	23.20	4.68	22.48	5.97	0.12 (−0.19, 0.42)[1]
Narrative story grammar						
t1 (16)	.99[b]	4.11	2.17	4.16	2.29	
t2 (16)	.99[b]	6.57	2.35	5.68	2.70	0.30 (−0.06, 0.66)[1]
t3 (16)	.96[b]	7.18	2.54	7.44	2.45	−0.30 (−0.65, 0.06)[1]
Narrative words						
t1	.99[b]	16.60	12.76	15.44	10.63	
t2	.99[b]	32.43	16.94	25.70	12.75	0.42 (0.08, 0.77)[1]
t3	.99[b]	39.25	15.42	36.97	15.78	0.04 (−0.32, 0.40)[1]
Narrative DiffWords						
t1	.99[b]	11.01	6.43	10.87	6.21	
t2	.99[b]	20.11	8.77	17.12	8.01	0.33 (−0.02, 0.67)[1]
t3	.99[b]	24.32	7.76	23.47	8.14	−0.06 (−0.41, 0.29)[1]
Narrative MLU						
t1	.99[b]	3.21	1.62	3.32	1.38	
t2	.98[b]	5.06	1.52	4.93	1.58	0.01 (−0.34, 0.37)[1]
t3	.93[b]	5.63	1.17	5.42	1.27	0.17 (−0.18, 0.52)[1]
Motor outcomes						
Leg balance time						
t1	.76[a]	2.10	1.26	2.39	2.21	
t2	.78[a]	5.54	5.24	5.86	5.82	−0.14 (−0.50, 0.23)[1]
t3	.66[a]	9.08	6.57	9.69	7.91	0.03 (−0.34, 0.39)[1]
Pegboard time						
t1	.64[a]	25.16	10.18	26.13	9.34	
t2	.63[a]	15.47	4.07	16.67	5.50	−0.16 (−0.48, 0.16)[1]
t3	.56[a]	11.64	2.61	12.01	3.32	−0.13 (−0.44, 0.18)[1]
Throwing hits						
t1 (6)	.52[a]	1.44	1.29	1.20	1.29	
t2 (6)	.33[a]	2.63	1.49	2.41	1.34	0.17 (−0.16, 0.51)[1]
t3 (12)	.30[a]	3.35	2.20	3.73	2.08	−0.30 (−0.62, 0.03)[1]
Threading time						
t1	.84[a]	184.87	39.73	187.70	37.16	
t2	.84[a]	129.43	45.07	125.77	38.68	0.13 (−0.21, 0.46)[1]
t3	.77[a]	86.75	27.64	97.41	36.41	−0.22 (−0.58, 0.13)[1]
Drawing errors						
t1	.89[a]	17.90	7.33	17.08	6.68	
t2	.88[a]	7.89	5.07	8.08	5.95	−0.08 (−0.37, 0.24)[1]
t3	.83[a]	5.04	3.64	4.94	4.27	−0.10 (−0.41, 0.22)[1]

(continued)

Table 1 (continued)

	Reliability	Language programme n = 103		Movement programme n = 105		Cohen's d for group effect [95% CI] Language vs. movement
		M	*SD*	*M*	*SD*	
Early literacy (t3)						
LSK (17)	.85[a]	8.70	3.03	7.34	3.37	0.42 (0.11, 0.74)[2]
Sound deletion (12)	.81[a]	2.23	1.83	2.35	1.93	0.07 (−0.25, 0.38)[2]
Regular word reading (15)	.98[a]	2.93	3.80	1.74	2.95	0.35 (0.03, 0.67)[2]
Exception word reading (15)	.98[a]	0.44	1.78	0.38	1.52	0.04 (−0.36, 0.28)[2]

() = maximum raw scores; EV = expressive vocabulary; SS = sentence structure; APT = action picture tests; LSK = letter-sound knowledge.
Reliability: [a]Cronbach's alpha; [b]Interrater reliability.
Cohen's d: 1 = difference in progress between groups divided by pooled initial *SD*; 2 = difference in means at follow-up divided by pooled *SD* at follow-up (pretest scores were not available so could not be used in effect size calculation).

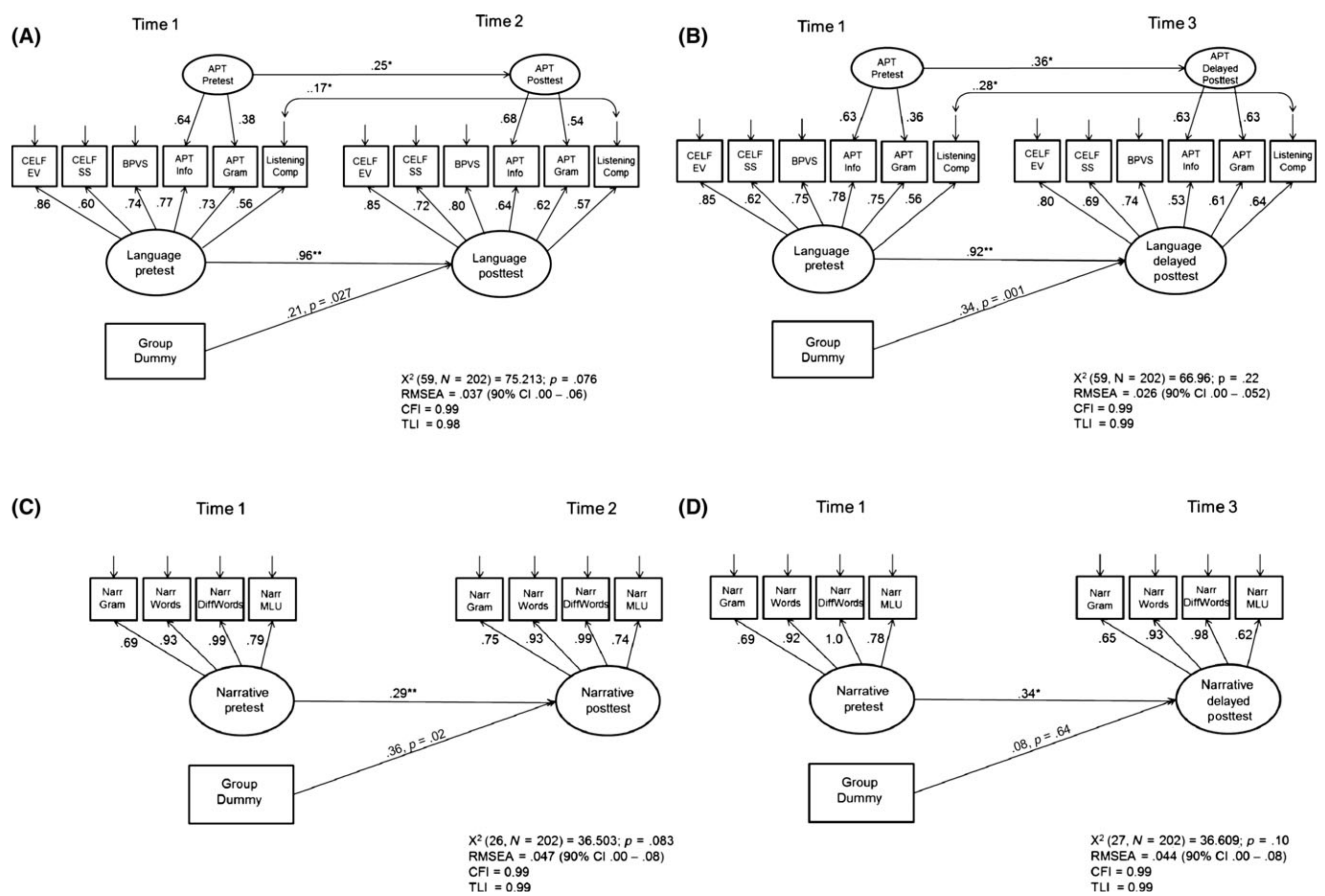

Figure 2 Models showing the effects of the intervention on (a) language skills at immediate posttest (*t2*); (b) language skills at delayed posttest (*t3*); (c) narrative skills at *t2*; and (d) narrative skills at *t3*. Standardised coefficients shown (except for dummy variables where *y*-standardised values are shown). Note. CELF-EV = CELF Expressive Vocabulary; CELF SS = CELF-Sentence Structure; APT Info = Information Score; APT Gram = Grammar Score; NarrGram = Story Grammar; NarrWords = Number of words; NarrDiffWords = Number of unique words; NarrMLU = mean length of utterance

Effects on motor skills

We constructed equivalent latent variable models for pretest–posttest and pretest–delayed posttest on measures of motor skills (Figure 4a,b). In each of these models, the motor skill measures (drawing trails, leg balance, throwing, peg moving and bead threading) define a single common latent variable. The fit indices for both models are excellent (pretest–posttest: χ^2 (40) = 40.015, p = .47; RMSEA = 0.001

[90% CI 0.000, 0.05]; CFI = 1.00; TLI = 1.00; pretest–delayed posttest: χ^2 (40) = 43.131, p = .34; RMSEA = 0.020 [90% CI 0.00, 0.05]; CFI = .98; TLI = .98). In both models, the motor skills latent variable shows fairly high longitudinal stability, confirming that the construct has been measured reliably. The motor skills group show small advantages compared with the language group, but the effect sizes are small (d = −.12 [95% CI −0.42, .19] at posttest, and d = −.16 [95% CI −0.50, .19] at delayed posttest) and not statistically significant.

It should be noted that the models presented above do not display factorial invariance (unstandardised loadings on the factors differ across different testing times). Factorial invariance assesses the extent to which factors retain the same composition (i.e. the extent to which different indicators have the same weighting or importance to the factor) across time. In the models presented here, the composition of each factor varies slightly over time (possibly partly because the different measures show different degrees of improvement as a result of the programmes). Nevertheless, the models give estimates of the size of change in the different factors produced by our programmes when language and motor skills are assessed by latent variables with high reliability.

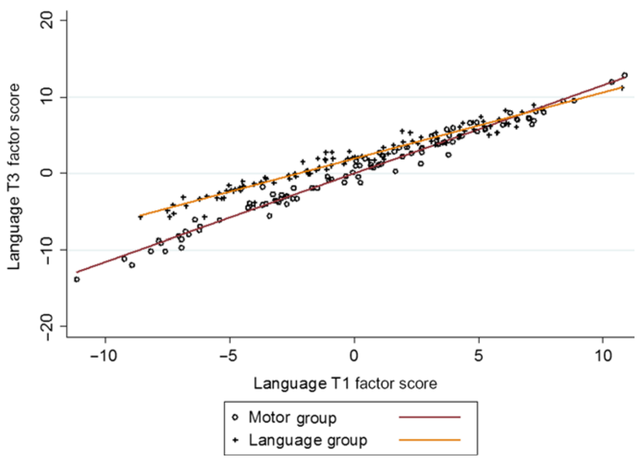

Figure 3 Scatterplot showing the relationship between the outcome variable (delayed posttest language factor score) and the covariate (pretest language factor score) for the language and motor programme groups [Colour figure can be viewed at wileyonlinelibrary.com]

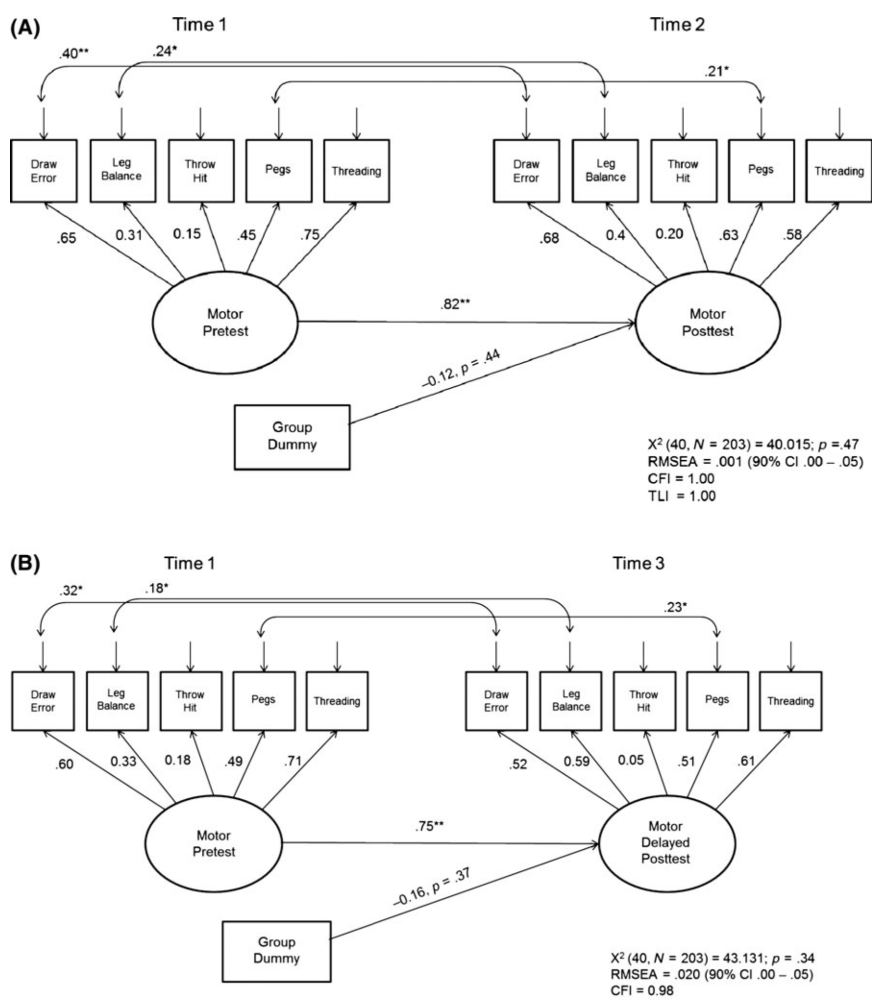

Figure 4 Models showing the effects of the intervention on motor skills at (a) immediate posttest ($t2$) and (b) delayed posttest ($t3$). Standardised coefficients shown (except for dummy variables where y-standardised values are shown)

Effects on literacy skills (secondary outcome measures)

At delayed posttest, the language group performed better on measures of letter-sound knowledge (t (157) = –2.671, p = .008, d = .42) and regular word reading (t (139.26) = –2.138, p = .03, d = .35) but not on sound deletion (t (155) = 0.412, p = .68, d = .06) or irregular word reading (t (147) = –0.23, p = .82, d = .04).

Discussion

We compared the effects of a parent-delivered language or motor skills programme on preschool children's language and emerging reading skills. The language programme produced improvements in children's language (d = .21) and narrative (d = .36) skills at immediate posttest; the effects on language were maintained 6 months later (d = .34) although the effects on narrative had declined (d = .08). The language programme also produced improvements in some early literacy skills (letter-sound knowledge d = .42 and regular word reading d = .35) at delayed follow-up. In contrast, the movement teaching programme produced small and non-significant improvements in motor skills.

Our results provide evidence that a parent-delivered language programme produces statistically significant improvements in children's early language development. Effect sizes on our language measures are in the range which according to rules of thumb are considered to be educationally significant (d = .25; Promising Practices Network, 2007; What Works Clearing House, 2007) and are larger than those from earlier studies of dialogic reading in low-SES populations (d = .13; Mol et al., 2008). We suggest that the addition of highly structured vocabulary and narrative work makes our programme more powerful than conventional dialogic reading for this group, though differences may also be due to the broader range of SES represented in our sample. While effects are clear on our latent variables, it should be noted that group differences were not significant on many of the individual language measures (Table 1) which may, in part, reflect measurement error.

The finding that the language programme also produced improvements in early literacy skills is notable. Bierman et al. (2015) also report an effect (d = .25) on emergent literacy following a programme which provided parents with guided book reading and letter-sound activities. While the language programme evaluated here did not explicitly target literacy, we speculate that the shared book reading activities fostered an awareness of the relationship between sounds and printed letters and words. Longer-term evaluation is needed to evaluate whether such effects are maintained at later stages of reading development.

In contrast, the movement programme had no statistically significant effect on motor skills. In relation to the differences in effectiveness of the programmes, it is plausible that the oral language programme supported parents to engage in more frequent and higher-quality verbal interactions with their child outside of the scripted sessions and so reinforced language learning. We speculate that, in contrast, though the motor programme provided additional practice in a wide range of motor activities which commonly feature in home and preschool settings, it was less likely to bring about changes in everyday interactions between parents and their children beyond the teaching sessions.

Limitations and conclusions

This study provides evidence that a parent-delivered language teaching programme for preschool children can produce modest though arguably educationally significant improvements in children's language skills as well as gains in early literacy skills. It is notable that such effects were seen using a relatively conservative design (i.e. comparing effects against an active treatment control). While this is encouraging, there are limitations that are worth noting here. The programme requires that parents have at least a basic level of literacy (i.e. they need to be able to read simple books with their child). Although the literacy skills required to deliver the programme are not high, future studies could explore whether modifications could make it suitable for delivery by parents with severely limited literacy skills. Lastly, the programme is relatively time consuming and many parents struggled to complete it; further studies could usefully explore the effectiveness of shorter versions of the programme.

In summary, we believe this programme holds promise for supporting language and emergent literacy skills for many children. However, the suitability of the programme for the most impoverished families with high levels of literacy/language difficulties is not yet clear, and it is not possible to conclude that the programme would reduce inequalities for those with the highest levels of social deprivation. Further adaptations and large-scale evaluations of the programme are clearly needed to examine such issues.

Supporting information

Additional Supporting Information may be found in the online version of this article:

Table S1. Sample characteristics (parent questionnaire data).

Table S2. Oral language and motor skills and self-care programmes: session structure.

Table S3. Language programme themes, books and target vocabulary.

Table S4. Movement and self-care programme core skills targeted by week.

Appendix S1. Further information on recruitment and training of parents.
Appendix S2. Language programme session plan.
Appendix S3. Movement programme session plan.
Appendix S4. CONSORT checklist.

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Key points

- There is a lack of evidence for the efficacy of parent-delivered programmes on child educational outcomes.
- Data from an RCT show that a parent-delivered oral language teaching programme produces gains in language and narrative skills immediately following teaching; gains in language are maintained 6 months later and extend to measures of early literacy.
- There was no evidence that an active control teaching programme targeting motor skills led to gains in motor development.
- The findings provide evidence that parent-delivered teaching is causally related to child outcomes but that the form of teaching is critical to the success of such programmes.

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