

An Efficacy trial of the Nuffield Early Language Intervention in Preschool (NELI Preschool)



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Executive Summary

The importance of oral language in the Early Years

Oral language skills provide the foundation for the development of literacy skills and for the whole of formal education. They are also vital for children's social and emotional development. Yet many children reach school with language skills that are insufficiently developed to enable them to benefit fully from their education. This is even more of an issue for children from disadvantaged backgrounds and/or those for whom English – the language of instruction in school - is not the language spoken in the home. Preschool, therefore, provides a valuable opportunity to intervene to improve children's language skills before they reach school.

The Nuffield Early Language Intervention in Preschool (NELI Preschool)

NELI Preschool is a 20-week oral language enrichment programme for children in the year before they enter formal education. It is designed around the principles of shared book reading and guided play. It improves vocabulary, develops narrative skills, encourages active listening and builds confidence in speaking. NELI Preschool supports the language development of all children in preschool via daily language enrichment sessions delivered by the preschool teacher (Enrichment). Additionally, children with weak language skills also receive targeted support via small group and individual sessions delivered by preschool teaching assistants (Enrichment + Targeted). The programme includes comprehensive online staff training and support.

The programme trial

A cluster randomised control trial of NELI Preschool in 65 nurseries was conducted. We first assessed the language skills of all 3 – 4 year-old children in these settings (n = 1,586). The six children with the weakest language in each class were allocated to receive the Enrichment + Targeted support elements of NELI Preschool (n = 438). At baseline, these children were individually tested, along with four other children in each class, randomly selected from those allocated to the Enrichment-only element of the programme (n = 288). Preschools were randomised to an intervention and a waiting list control group, with intervention settings delivering the programme over 20 weeks. The same screening and assessment process was followed upon completion.

Results and implications

A pre-registered analysis showed that NELI Preschool improved the language skills of the children who received it. The programme was well-liked by trial settings and staff felt well-prepared to deliver it. These findings have important implications for improving educational attainment for young children, as NELI Preschool is designed to be deliverable at scale. Reliable language screening conducted by settings ensures the right children receive the additional targeted support. Training and support for the programme is asynchronous and completely online, ensuring maximum flexibility for settings without compromising on content.



Introduction

Language skills are the foundation of virtually all aspects of education, including literacy (Hjetland, Brinchman, Scherer, Hulme, & Melby-Lervag, 2020; Hulme, Nash, Gooch, Lervag, & Snowling, 2015) and numeracy development (Chow & Ekholm, 2019; Hornburg, Schmitt, & Purpura, 2018). They are also vital for psycho-social development (van Agt, Verhoeven, van den Brink, & de Koning, 2011; Norbury et al., 2016). Furthermore, it is well established that there is a strong gradient relating social class to language skills; children from less affluent homes are much more likely to enter education with poorly developed language skills (Guo & Harris, 2000; Hart & Risley, 1995; Sampson, Sharkey, & Raudenbush, 2008; Sirin, 2005).

Language skills develop rapidly between the ages of three to six years and this makes preschool an excellent time to begin supporting language development, as well as working to narrow the gap between those with good and poor language skills before the start of formal education. The Nuffield Early Language Intervention – Preschool (NELI Preschool) programme aims to do both of these things. NELI Preschool is a 20-week language enrichment programme for children in the year before they start formal education (aged 3 - 4 years). It is a fully scripted programme built around the principles of shared book reading and guided play, introducing children to richer and more structured language than they would

typically encounter in spoken language (Nation et al., 2022). It features 20 books, published by Nosy Crow, containing a mixture of traditional tales, contemporary stories and non-fiction. Shared reading and dialogical questioning introduces the stories to the children. Activities target the development of vocabulary skills, teaching children the meanings of words they don't know and extending understanding of those they do know. The programme builds children's narrative skills, using scaffolding to support them to use language to retell story elements in their own words. Activities lead children to produce more and more integrated and coherent language of their own, while building their confidence in speaking, standing them in good stead for learning in a Reception classroom (Boudreau, 2008).

NELI Preschool also develops children's active listening skills, enabling them to focus for longer and longer periods of time. This, in turn, supports their use of language for learning, as well as the development of pro-social behaviour suited to a classroom environment (Yew & Kearney, 2013; West et al., 2022).

The combination of whole group language enrichment and additional targeted support for those with weak language skills in NELI Preschool, is designed to narrow the gap between children entering school with poor language and their peers, while also ensuring that all children receive the benefit of the programme. Similarly, the programme is aimed at both monolingual and EAL children. Evidence shows that EAL children benefit from early years oral interventions as much as their monolingual peers (West et al., 2021), and the scaffolded support in NELI Preschool is well-suited to children learning English as a second (or further) language (Bowles et al., 2017).

The programme is combined with the screening of children's progress using LanguageScreen (<https://oxedandassessment.com/languagescreen/>) before and after the programme is delivered. The screening identifies children who will most benefit from additional support, as well as giving settings a reliable way of monitoring children's language development.

Finally, high quality teacher training and support in NELI Preschool ensures that practitioners are ready to deliver the programme as intended, and also serves to develop educators' skills, and draw attention to the critical role of language skills within participating settings.

This cluster randomised control trial evaluates the efficacy of the NELI Preschool programme. The trial included 65 nurseries in England and was completed in July 2022. The trial used the LanguageScreen App to screen over 1,500 children. Implementation of the programme used an online training and support model for school staff, to ensure that the programme would be capable of being delivered at scale. Analyses were conducted to look at the effects of both the Enrichment and the Enrichment + Targeted support strands of the programme. An implementation process evaluation was also undertaken to assess programme acceptability, feasibility and delivery fidelity. Both the Enrichment and Enrichment + Targeted support strands of the programme resulted in improved language skills of the children taking part. The process evaluation revealed the programme was well-liked and generally well-adhered to, in spite of challenging conditions for staff and children in nurseries in the wake of the Covid pandemic.

Method

A cluster randomised controlled trial (RCT) was conducted in school nurseries in England. Schools were randomly allocated to a treatment or waiting control group by an independent trials unit. Only schools in the treatment group delivered the intervention, whilst schools in the control group continued to provide their usual curriculum. The language skills of children in both arms of the trial were assessed before and after intervention delivery. Study design, assessment measures and analysis were pre-registered (<https://doi.org/10.1186/ISRCTN29838552>). To avoid bias, the analysis was completed blind to treatment allocation by one of the authors of the study (AL).

Participants. In total, 65 schools (n = 70 preschool classrooms) from 7 geographical areas in England (Buckinghamshire, Hertfordshire, Liverpool, London South East, London North West, Nottinghamshire, Oxfordshire) agreed to take part in the trial. All children aged 3-4 years, attending preschool 4+ days (or half days) a week were considered eligible for the trial. In total, 1,586 preschool children (773 boys) took part. Of these children, 543 children (34%) were registered as having English as an additional language (EAL).

Design. LanguageScreen was administered to all children in each classroom before the intervention began (*t0*). Scores from LanguageScreen were used to identify the 6 children in each classroom with the weakest language skills who were then allocated to receive the

additional targeted element of the programme (Intervention targeted $n = 229$; control targeted $n = 209$). Nurseries were then randomised to group by the University of York Trials Unit, stratified by size (dichotomised by mean number of children attending). This resulted in 33 intervention and 32 control schools.

The children identified as having the weakest language skills in each class were then tested individually on a battery of standardised assessments by the research team ($t1$). In order to evaluate the enrichment-only element of NELI Preschool, four of the remaining children in each preschool class were randomly allocated to receive individual in-depth testing (intervention enrichment $n = 159$; control enrichment $n = 129$).

Following the completion of pre-testing, all preschool staff delivering NELI Preschool were trained with an intensive asynchronous online training programme. Delivery of the intervention took place between January and July 2022. Observation visits to all intervention schools were conducted in the spring term after the half term break.

At the end of the NELI Preschool programme, all children were once again assessed with LanguageScreen and the battery of in-depth tests were administered to the children who had received them at $t1$. A timeline showing assessment, training and intervention phases are shown in Figure 1 and the flow of participants through the trial is summarised in Figure 2.

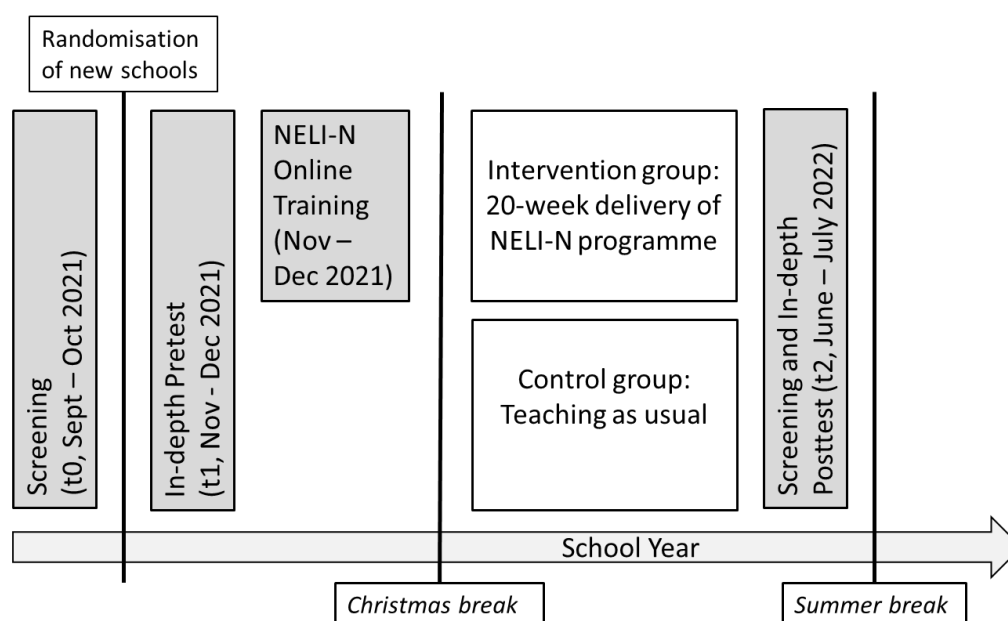


Figure 1. Timeline of randomised controlled trial

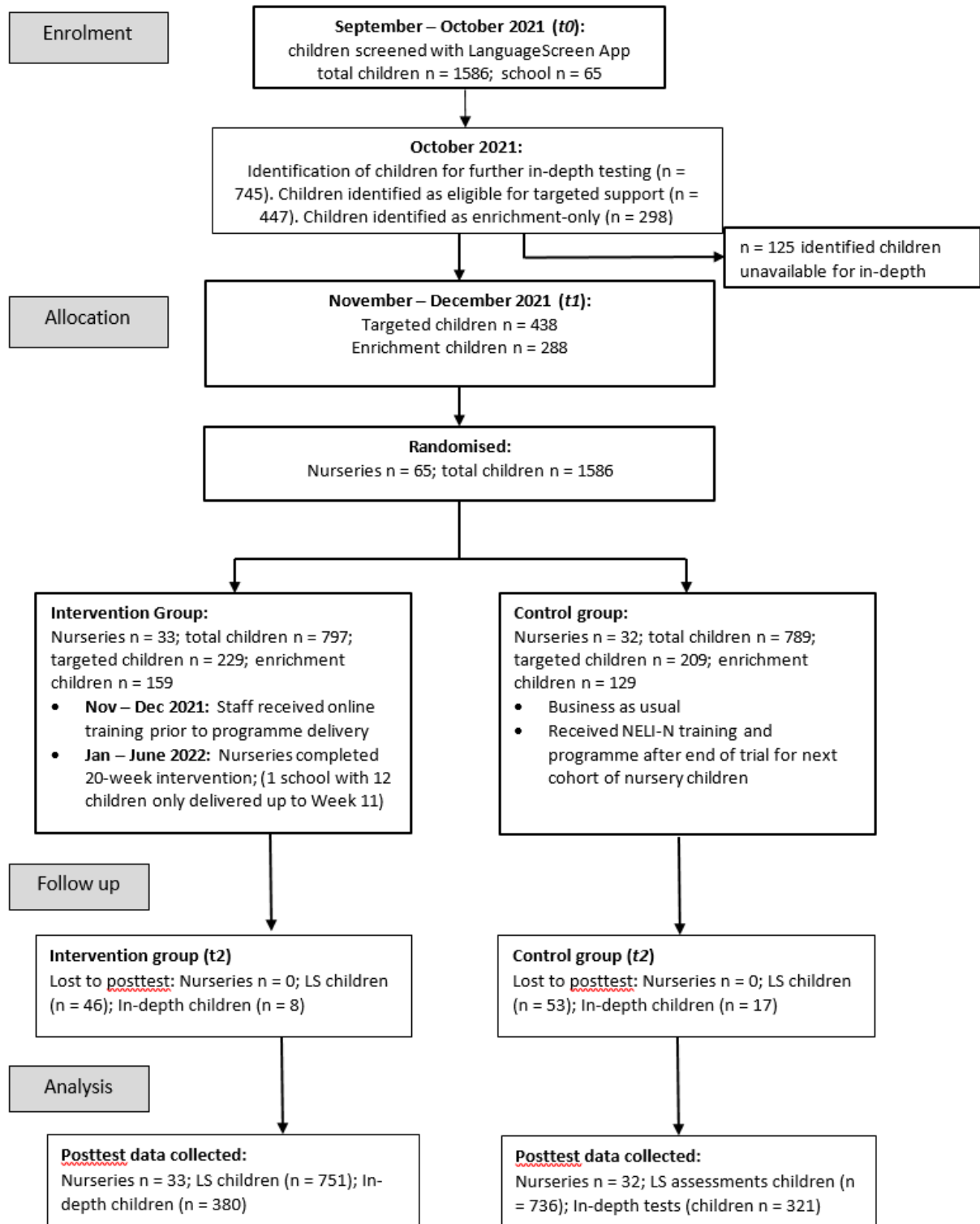


Figure 2. Flow of participants of randomised controlled trial.

Measures

Screening. All children in the trial were screened at t0 and at t2 with LanguageScreen (<https://oxedandassessment.com/languagescreen/>). LanguageScreen is a language screening App on a tablet with four subtests: Expressive vocabulary (24 items) asks children to name pictures; Receptive vocabulary (23 items) asks them to match a word they hear to one of four pictures on the screen; Sentence repetition (14 items) asks children to repeat sentences that they hear verbatim; Listening comprehension (16 items) asks literal and inferential questions about three short stories played to the child.

In-depth language assessments. Children receiving in-depth tests also received two subtests of the Child Evaluation of Language Fundamentals (CELF) Preschool II UK (Semel, Wiig, & Secord, 2006). For the Expressive Vocabulary subtest, the child is shown a picture and asked to name it. For the Recalling Sentences subtest, the child is asked to repeat sentences, which increase in difficulty and length. Children also received the Renfrew Action Picture Test (Renfrew, 2003), answering a short question about each of 10 pictures. Answers are recorded verbatim and scored for information content and grammar.

Additional measures. Knowledge of taught vocabulary was assessed using a task with twenty-nine picture naming vocabulary items which were all words explicitly taught in the NELI Preschool intervention. The measure used in analyses was the total number correct.

Narrative skills were measured using a simplified version of the Renfrew Bus Story, in which children heard a short story about a child failing to catch a bus and then being caught in the rain, while being shown 3 picture prompts representing the key elements of the story. The measure of narrative skill was the total number of words uttered by the child in recounting this story to the assessor.

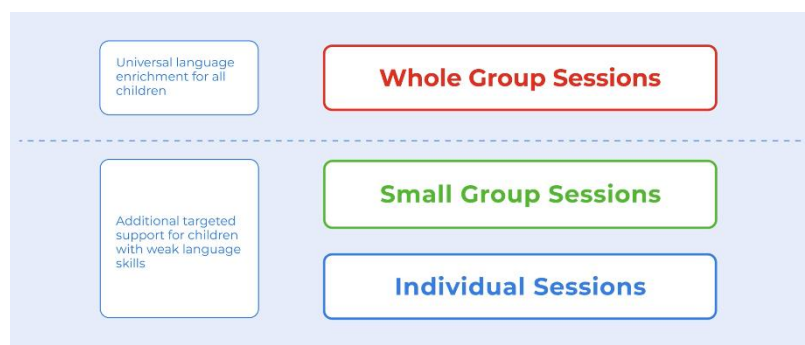
Self-regulation was assessed using the HTKS-R assessment (Gonzales et al., 2021), which is a widely used assessment of indexing inhibitory control, cognitive flexibility and working memory. Children are taught pairs of behavioural commands (e.g., ‘when I say touch your head, you touch your toes’. The task includes 4 blocks of trials (59 items in total), which increase in complexity as the task progresses. Two points are included for correct responses and one point for self-corrections. The measure used in analyses was the total raw score.

Finally, children’s behavioural adjustment to school was measured using the subscale from the Brief Early Skills and Support Index (BESSI; Hughes et al., 2015). This teacher rating of behavioural adjustment has 12 items, each rated on a 4-point scale ranging from strongly agree to strongly disagree. Items were grouped into 3 subsets representing behavioural regulation, attention/hyperactivity and sociability, which were used to construct a behavioural adjustment factor for analysis. See West et al. (2022) for details on construction of this latent variable.

NELI Preschool Programme

The NELI Preschool programme is a 20-week scripted language intervention and consists of a universal and a targeted component. The programme is designed to enrich children’s vocabulary and develop their narrative and active listening skills and combines class-based enrichment for all children in the preschool with additional targeted support in small group and individual sessions for children with weak language skills. Whole class sessions are delivered every day for 15-20 min by the teacher. These daily sessions are displayed on a whiteboard (see examples of printed materials and digital slides in Appendix A1) and engage the children with the book of the week and pursue related activities to support vocabulary learning and speech production. Each new book introduces four carefully selected Special words, which are at the centre of the vocabulary learning activities. Sessions are scripted with flexibility to adapt to the cohort’s ability level. For more advanced children, step up activities provide the opportunity to extend their vocabulary further.

Children who also receive the additional targeted support take part in three Small group sessions (10-15 mins each) and one individual session (10 mins) per week for intensive work on the new vocabulary, to support the children in developing their narrative skills by retelling aspects of the stories and to encourage speech production with related activities.



NELI Preschool Training

Training for preschool staff uses a new online asynchronous training model, following the successful development and rollout of online training for the nationwide scale up of the Nuffield Early Language Intervention in Reception in 2020-21. The online training course for NELI Preschool takes approximately 10 – 12 hours to complete. Following a detailed introduction to children’s oral language development, learners are introduced to the techniques used for shared book reading and teaching in the programme, as well as good practice in encouraging language production and active listening. Partitioned into small learning steps, the training is self-paced. The training includes filmed programme sessions throughout, enabling trainees to watch ‘Best Practice’ for each type of programme session, alongside additional expert commentary. At the end of each training step, learners are invited to reflect and share thoughts or questions with other learners and course mentors, encouraging the development of a community of practice. Each section of the training finishes with a quiz to enable learners to monitor their progress. Learners can revisit previous sections for revision at any time during or after completing training to refresh their memory. On successful completion of the course and a final test, participants receive a NELI Preschool practitioner certificate.

Observation visits

Programme fidelity was assessed via observation visits conducted by members of the research team. Observers observed both a Whole Group and Small Group sessions in each participating classroom and conducted a semi-structured interview with each session’s leader. Observations focussed on adherence to and quality of NELI Preschool delivery, whilst teacher interviews aimed to get an understanding of how far NELI Preschool had been integrated into the general provision (including parental involvement), what the challenges were to delivery, and gauge a general understanding of support structures for programme delivery. The session observations and interviews also provided a valuable platform to support staff with tailored advice to enhance their practice and to give tailored support. In total, 40 Whole group and 38 Small group session were observed, and interviews were conducted with 36 Whole group and 32 Small group leaders, as well as 6 members of staff who delivered both session types.

School support

Intervention schools were supported by the research team in a number of ways to ensure fidelity to the NELI Preschool programme. An online Support Hub provided a forum

for schools to exchange ideas and feedback, continue to build their community of practice and to keep motivation for delivery high. Each week the Hub introduced the new book and a rolling programme of “Special Tips” designed to enhance delivery of the programme. Schools were encouraged to share new activity ideas to enhance the programme even further on a secure picture platform (Padlet). Every 5 weeks, schools were sent a summary newsletter which reported on news from the Hub and reminded schools of any trial-related administration tasks.

Results

The analyses followed the preregistered plan (<https://doi.org/10.1186/ISRCTN29838552>). The primary outcome was a language latent variable defined by loadings from the four LanguageScreen subtests (expressive vocabulary, receptive vocabulary, sentence repetition, and listening comprehension) plus the individually administered language tests (CELF recalling sentences subtest, CELF expressive vocabulary subtest, Renfrew Action Picture test (information and grammar). Oral language is a complex psychological construct that cannot be measured directly; use of a latent variable to represent language has the advantage of correcting for any measurement error in the component language measures that load on to it. The unidimensional language latent variable in this trial thus represents the shared variance in the 8 observed language measures. The measures all display high factor loadings on a single latent variable, which thereby captures individual differences in children’s language skills well (see Hulme et al, 2020 for further explanation). This language latent variable was created for baseline (pretest) and upon completion of the NELI Preschool programme (posttest). Analyses are based on latent variable ANCOVA models implemented in an SEM framework. The pretest latent language variable was the covariate, and the posttest latent variables was the outcome measure. Errors for the language latent variable indicators were correlated to provide an adequate model fit. The effects of the intervention were measured by the γ -standardized regression coefficient for a group dummy variable. The effects of clustering within schools was accounted for by using robust (Huber-White) cluster standard errors.

Separate ANCOVA models were conducted to assess the effects of the language intervention programme on [1] typically developing children (those not identified as having poor language skills); and [2] children identified as having language difficulties (the 6 children in each class with the lowest language composite score who receive the targeted support element of the programme in additions to the whole class language enrichment element).

Descriptive statistics for all measures at baseline and post-test for both groups are shown in Table 1. It is clear that the groups are well equated on language skills at baseline.

Table 1

Language measures at pre- and posttest for enrichment and targeted children (for additional measures see Appendix A2)

	Intervention Arm of trial								Control Arm of trial							
	Enrichment-only children				Targeted children				Enrichment-only children				Targeted children			
	<i>N</i>	<i>t1</i> mean (<i>SD</i>)	<i>N</i>	<i>t2</i> mean (<i>SD</i>)	<i>N</i>	<i>t1</i> mean (<i>SD</i>)	<i>N</i>	<i>t2</i> mean (<i>SD</i>)	<i>N</i>	<i>t1</i> mean (<i>SD</i>)	<i>N</i>	<i>t2</i> mean (<i>SD</i>)	<i>N</i>	<i>t1</i> mean (<i>SD</i>)	<i>N</i>	<i>t2</i> mean (<i>SD</i>)
LanguageScreen subtests																
Expressive Vocab (20)	159	10.33 (4.05)	156	13.88 (4.25)	229	4.72 (3.66)	221	8.54 (4.43)	125	10.46 (4.03)	121	13.27 (3.89)	203	4.84 (3.47)	192	8.47 (4.23)
Receptive Vocab (23)	159	14.39 (3.69)	156	16.95 (3.32)	229	9.23 (4.06)	221	13.48 (4.03)	125	13.91 (3.29)	121	15.92 (3.74)	203	9.04 (3.66)	192	13.01 (3.65)
Sentence Repetition (14)	159	6.16 (3.39)	156	9.35 (2.86)	229	2.34 (2.41)	221	6.10 (3.60)	125	5.97 (3.61)	121	8.91 (3.55)	203	1.99 (2.13)	192	5.71 (3.31)
Listening Comp (16)	159	4.70 (3.59)	156	9.35 (3.99)	229	1.20 (2.09)	221	5.68 (4.20)	125	4.42 (3.58)	121	7.70 (3.95)	203	1.12 (1.79)	192	4.26 (3.63)
Individual standardised measures																
CELF EV (40)	159	13.25 (6.52)	156	19.26 (6.77)	227	6.14 (5.28)	224	10.92 (6.50)	129	13.20 (6.28)	124	17.98 (6.95)	206	6.30 (4.52)	196	10.46 (5.76)
CELF RS (31)	159	9.58 (8.14)	156	15.76 (8.24)	227	3.56 (4.75)	221	7.88 (6.64)	129	10.34 (7.58)	124	15.83 (6.34)	204	3.54 (4.66)	195	6.87 (5.90)
APT-Info (37)	159	18.18 (6.05)	156	24.93 (5.63)	227	10.75 (7.13)	223	17.65 (7.59)	128	19.51 (6.10)	123	24.02 (5.93)	205	11.56 (6.77)	196	17.80 (6/61)
APT-Grammar (40)	159	14.54 (7.15)	156	22.06 (7.00)	227	6.79 (6.69)	223	13.84 (8.07)	128	15.61 (6.34)	123	20.26 (6.30)	205	7.05 (5.77)	196	12.15 (6.59)

Note. Maximum total score for each subtest given in brackets after each item; t1 means (SDs) include the LanguageScreen screening measures (t0) and the individual assessments at t1. All measures were repeated at posttest (t2 means (SD))

Confirmatory factor analyses and Model Modifications

Before assessing the effects of the intervention, Confirmatory Factor Analyses (CFAs) for the targeted and enrichment children were estimated separately to check the dimensionality of the data. The baseline model was a two-factor CFA, with all eight indicators reflecting the latent language construct at each time point, where only correlations between the residuals of the same variable across time were estimated. As expected based on earlier trials, this model did not fit the data well. After that, modification indices were used to identify and change only those misspecifications relating to correlations between residuals that made sense from a theoretical point of view. Only misspecifications that were consistent across time were addressed, as this was needed in order to achieve configural invariance.

Effect size estimates for the pre-registered primary outcome, a latent language variable with eight indicators.

The effect of the intervention was estimated with ANCOVA models, where the latent language variable at t2 was regressed on both the latent language variable at t1 and a dummy variable indicating group membership of either the intervention group (1) or the control group (0). In addition, language at t1 was regressed on the group-membership dummy, in order to take into account a potential difference between the groups at the baseline (no significant differences were found in any of the ANCOVA models). Figure 3 and 4, show that there was a significant effect from the intervention for both the targeted and the enrichment children (the path shown in red, from the group dummy variable to the language outcome). Furthermore, no interaction between Language t1 and the intervention dummy was found either for the targeted children: $\beta = -.017, p = .799$ (β was standardized on y) or for the enrichment children: $\beta = .113, p = .164$ (β was standardized on y).

Additionally, the figures also make clear that the individual language measures administered to the children load well on to the unidimensional language latent variables representing language skill at both time points. They also show that the language latent variable is highly stable overtime, indicating its reliability as a measure of language skill in children taking part in the trial.

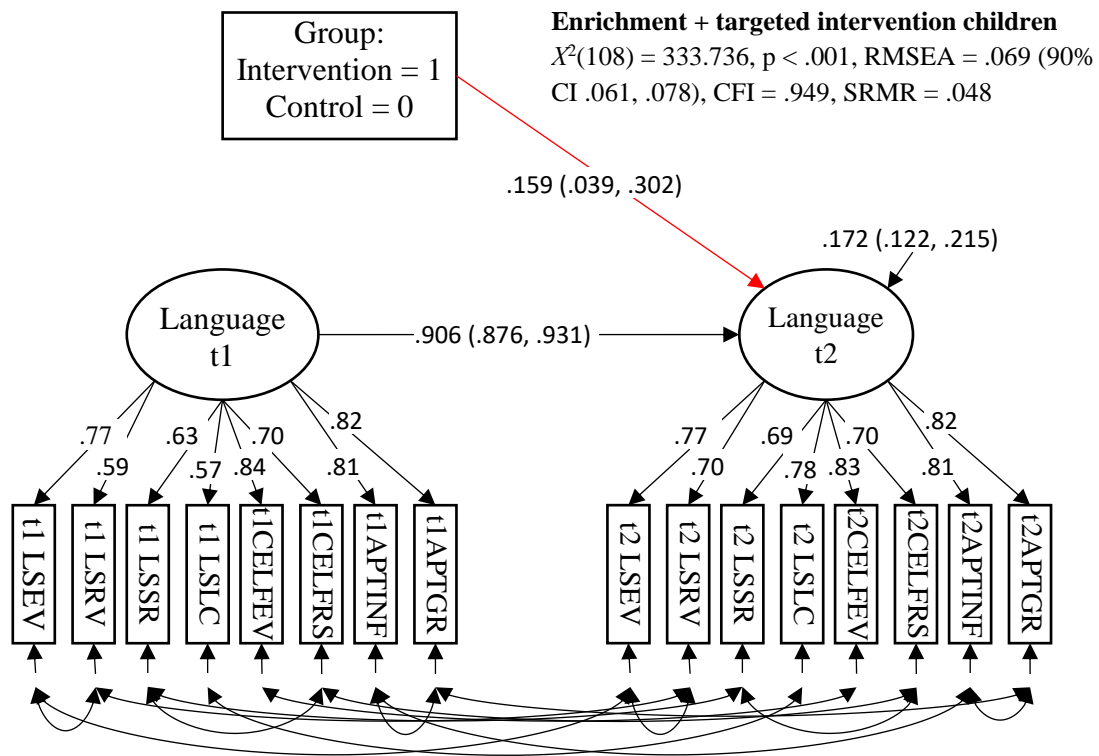


Figure 3. Path diagram for the pre-registered primary outcome for the trial showing the effect of the intervention on children with weak language skills of receiving the Enrichment + Targeted support. The effect of the intervention is shown by the path (in red) from Group (dummy coded) to language at posttest, which is y-standardised and equivalent to Cohen's d , with 95% robust confidence intervals accounting for clustering within schools shown in brackets.

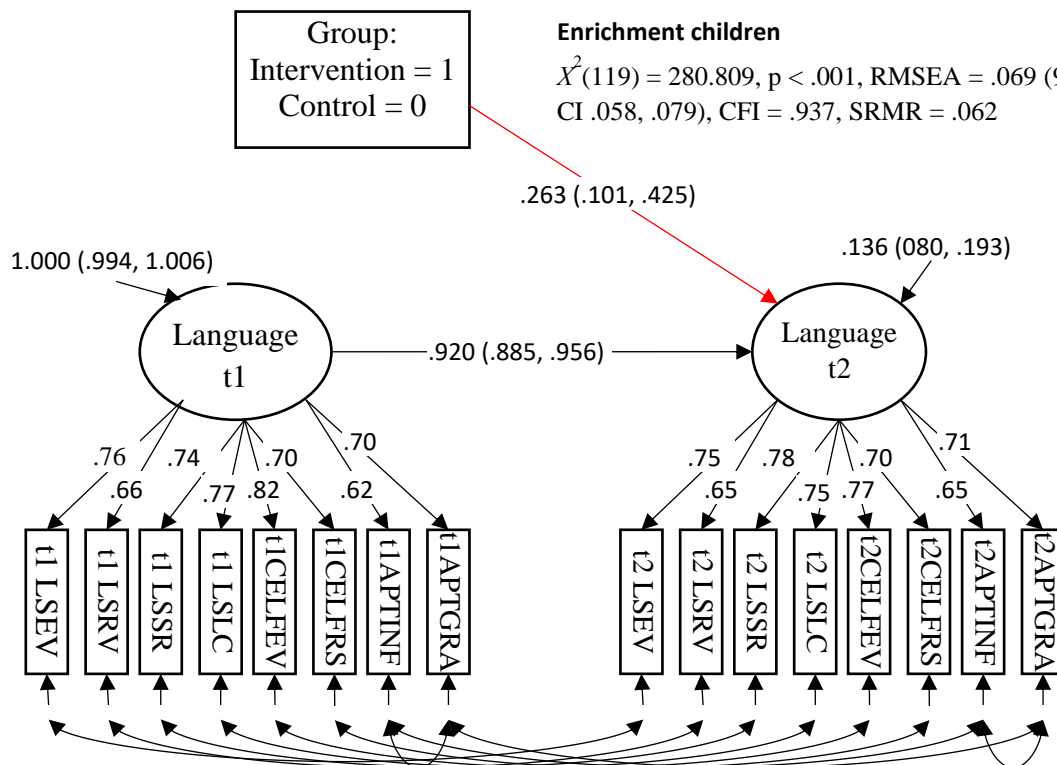


Figure 4. Path diagram for the pre-registered primary outcome for the trial showing the effect of the intervention on children receiving the Enrichment element of the programme. The effect of the intervention is shown by the path (in red) from Group (dummy coded) to language at posttest, which is y-standardised and equivalent to Cohen's d , with 95% robust confidence intervals accounting for clustering within schools shown in brackets.

Additional analyses

The efficacy of the NELI Preschool programme in improving other outcomes for children was also explored, using linear mixed effect models in Stata, with the outcome measures as fixed effects and school as a random effect. These analyses showed that children receiving NELI Preschool improved more than peers in the control group on two further language-related outcomes. First, improvements in narrative skills as measured by the total number of words uttered was assessed. Forty children were at floor on this measure at t1 (all children receiving the additional targeted support element of NELI Preschool). The enrichment children made more progress in developing their narrative skills than children in the control group: (difference in marginal means = 10.95, $z = 3.78$, $p = 0.001$, $d = 0.67$). This effect was smaller and non-significant for the enrichment + targeted intervention group (difference in marginal means = 4.62, $z = 1.93$, $p = 0.053$, $d = 0.37$). However, owing to the floor effects on this measure in the targeted group, the effect size reported here should be regarded with extreme caution. Secondly, knowledge of vocabulary taught in the programme was assessed, with children in the intervention group showing more improvement than those in the control group (Enrichment children: difference in marginal means = 2.23, $z = 5.05$, $p < 0.001$, $d = 0.46$; targeted intervention children (difference in marginal means = 2.23, $z = 4.95$, $p < .001$, $d = 0.34$).

Results were more mixed on two non-language related measures. The measure of self-regulation (HTKS) used in the trial was found to be at floor at t1 in around a third of children receiving the additional targeted support element of NELI Preschool. With so many at floor, the analysis was only conducted for children receiving the enrichment-only aspect of the programme, showing more improvement in executive function in children in the intervention group compared to the control group (difference in marginal means = 6.62, $z = 2.37$, $p = 0.018$, $d = 0.31$).

Finally, behavioural adjustment to school as rated by class teachers was also assessed. Here, there was no significant difference between trial groups for children receiving NELI Preschool ((Enrichment children: difference in marginal means = -0.45, $z = -0.55$, $p = .058$, $d = 0.07$; targeted intervention children (difference in marginal means = 0.13, $z = 0.15$, $p = 0.88$, $d = 0.024$).

Implementation process evaluation

An implementation process evaluation of the trial was conducted, collecting both quantitative and qualitative data from schools in the treatment arm. The evaluation comprised:

1. Four staff surveys (weeks 5, 10, 15 and 20)
 - a. Requesting consistent feedback on sessions across all settings
 - b. Gauging attitudes to the programme and perceptions of professional development
2. A programme of observation visits
 - a. 8 observers visited all 33 intervention schools.
 - b. 40 Whole Group sessions and 38 Small Group sessions were observed.
 - c. Semi-structured interviews were also conducted in each setting
3. Weekly registers requested feedback on high/low points of programme delivery each week alongside child-level dosage data.
4. Training course and Delivery Support Hub interactions were collated and analysed

Observation visits

Fidelity to the programme was evaluated by observation visits to participating schools. Settings were rated according to programme adherence, which involved observing and rating use of a range of teaching techniques used in the programme, such as the CROWD model to encourage discussion during shared reading and activities, multi-contextual vocabulary teaching techniques, modelling and use of Listening Rules to guide session appropriate behaviours (see Table 2). In addition, sessions were also rated for the quality of programme implementation, such as strategies to maintain children's engagement, good teaching practice and session preparedness (see Table 3).

Table 2. Observation ratings for session adherence measures

		Whole Group sessions				Small Group sessions			
		<i>N</i>	not at all	sometimes	often	<i>N</i>	not at all	sometimes	often
CROWD shared-reading techniques	completion	40	25 (10)	20 (8)	55 (22)	38	23.68 (9)	31.58 (12)	44.74 (17)
	recall	40	0	22.5 (9)	77.5 (31)	38	0	28.95 (11)	71.05 (27)
	open-ended	40	2.5 (1)	47.5 (19)	50 (20)	38	7.89 (3)	55.26 (21)	36.84 (14)
	wh-questions	40	2.5 (1)	12.5 (5)	85 (34)	38	0	5.26 (2)	94.74 (36)
	distancing	40	0	27.5 (11)	72.5 (29)	38	13.16 (5)	34.21 (13)	52.63 (20)
Modelling and other programme techniques									
	modelling: adult emphasises correct word	40	7.5 (3)	20 (8)	72.5 (29)	38	5.26 (2)	21.05 (8)	73.68 (28)
	modelling: adult expands what child said with one item	40	7.5 (3)	22.5 (9)	70 (28)	38	7.89 (3)	28.95 (11)	63.16 (24)
	modelling: adult repeats with correct grammar or other detail	40	2.5 (1)	15 (6)	82.5 (33)	38	2.63 (1)	21.05 (8)	76.32 (29)
	commenting & pausing to encourage responses	40	30 (12)	27.5 (11)	42.5 (17)	38	28.95 (11)	34.21 (13)	36.84 (14)
	balance easy/difficult questions	40	7.5 (3)	30 (12)	62.5 (25)	38	2.63 (1)	34.21 (13)	63.16 (24)
Multi-contextual vocabulary teaching techniques									
	reference to Flashcard for the formal definition	40	0	7.5 (3)	92.5 (37)	38	10.53 (4)	0	89.47 (34)
	multiple repetition of Special Word	40	0	2.5 (1)	97.5 (39)	38	0	7.89 (3)	92.11 (35)
	encouragement to say word aloud	40	5 (2)	7.5 (3)	87.5 (35)	38	2.63 (1)	18.42 (7)	78.95 (30)
	opportunities to guess word from context	40	5.13 (2)	23.08 (9)	71.79 (28)	36	5.56 (2)	36.11 (13)	58.33 (21)
	tangible example of Special Word	40	12.5 (5)	10 (4)	77.5 (31)	38	18.42 (7)	5.26 (2)	76.32 (29)
	use of multi-contextual cues for explanations	39	7.69 (3)	30.77 (12)	61.54 (24)	38	7.89 (3)	31.58 (12)	60.53 (23)
	reference to previous Special Words	34	5.88 (2)	29.41 (10)	64.71 (22)				
	Step-up words used	35	20 (7)	14.29 (5)	65.71 (23)				
	recap if children do not comprehend	40	20 (8)	12.5 (5)	67.5 (27)				
Listening Support techniques		<i>N</i>	Not Observed	Observed		<i>N</i>	Not Observed	Observed	
	use of Listening Rules	40	7.5 (3)	92.5 (37)		38	28.95 (11)	71.05 (27)	
	use of Neli puppet	40	10 (4)	90 (36)		38	44.74 (17)	55.26 (21)	
	use of Best Listener Sticker	40	7.5 (3)	92.5 (37)					
	praise/encouragement of turn-taking	40	5 (2)	95 (38)		38	5.26 (2)	94.74 (36)	

Results are percentages (counts in brackets) of treatment adherence Likert scale ratings by observers for Whole Group and Small Group observations.

Table 3. Observation ratings for quality of session delivery

	Whole Group sessions				Small Group sessions			
	<i>N</i>	not at all	sometimes	often	<i>N</i>	not at all	sometimes	often
Engagement								
use of range of strategies to engage children	40	2.5 (1)	20 (8)	77.5 (31)	38	7.89 (3)	23.68 (9)	68.42 (26)
support if child does not know answer	37	0	27.03 (10)	72.97 (27)	37	2.7 (1)	16.22 (6)	81.08 (30)
encourage verbal expression if child uses body language	26	3.85 (1)	23.08 (6)	73.08 (19)	28	3.57 (1)	10.71 (3)	85.71 (24)
teacher re-visits Listening Rules off-script	33	21.21 (7)	36.36 (12)	42.42 (14)	31	35.48 (11)	32.26 (10)	32.26 (10)
praise for active participation	40	5 (2)	7.5 (3)	87.5 (35)	37	2.63 (1)	7.89 (3)	89.47 (34)
encouragement of passive listeners to participate	40	7.5 (3)	22.5 (9)	70 (28)	38	0	23.68 (9)	76.32 (29)
multiple children have opportunity to speak	40	0	7.5 (3)	92.5 (37)				
children given time to process					38	0	31.58 (12)	68.42 (26)
Teacher practice								
good delivery practice	40	2.5 (1)	12.5 (5)	85 (34)	38	2.63 (1)	10.53 (4)	86.84 (33)
wide range of age-appropriate grammatical structures	40	0	10 (4)	90 (36)	38	0	15.79 (6)	84.21 (32)
use of appropriate range of vocabulary	40	0	5 (2)	95 (38)	38	0	10.53 (4)	89.47 (34)
additional ideas, materials to enhance session	39	23.08 (9)	23.08 (9)	53.85 (21)	38	23.68 (9)	10.53 (4)	65.79 (25)
session moves at good pace	40	0	15 (6)	85 (34)	38	2.63 (1)	23.68 (9)	73.68 (28)
session leader relies on script (word for word)	39	25.64 (10)	25.64 (10)	48.72 (19)				
other staff actively support behaviour management	37	2.7 (1)	13.51 (5)	83.78 (31)				
Neli puppet given to shy children for re-assurance					27	70.37 (19)	7.41 (2)	22.22 (6)
Preparedness & Familiarity								
materials were prepared	40	2.5 (1)	20 (8)	77.5 (31)	38	2.63 (1)	21.05 (8)	76.32 (29)
area was prepared	40	2.5 (1)	12.5 (5)	85 (34)	38	5.26 (2)	7.89 (3)	86.84 (33)
session leader is familiar with NELI Preschool	40	2.5 (1)	17.5 (7)	80 (32)	38	2.63 (1)	23.68 (9)	73.68 (28)
children are familiar with NELI Preschool	40	2.5 (1)	10 (4)	87.5 (35)	38	0	21.05 (8)	78.95 (30)

Results are percentages (counts in brackets) of treatment adherence Likert scale ratings by observers for Whole Group and Small Group observations

Attendance Record-keeping

Child-level attendance registers were completed for 368 children receiving NELI Preschool (95.34% of children in the treatment arm of the trial). The registers for just 19 children were incomplete and these children were excluded from any analysis relating to dosage. Registers showed that fidelity to intervention remained high throughout the programme, with settings delivering the majority of sessions across all three types of session (enrichment children: mean number of Whole class sessions = 88.25 (SD = 10.93) out of maximum 100 sessions; targeted children: mean number of Whole class sessions = 84.76 (SD = 13.60), mean number of Small group sessions = 47.87 (SD = 10.20) out of a maximum 60 sessions and mean number of Individual sessions = 15.57 (SD = 4.14) out of a maximum of 20 sessions. This equates to mean dosage of 88% of the programme for enrichment children and 84%, 80% and 78% dosage for targeted children receiving Whole class, Small group and Individual sessions respectively.

Training and Delivery Support feedback

Three main themes related to NELI Preschool emerged from the evaluation, illustrated by the selected NELI Preschool practitioner (and observer) quotations below¹:

[1] Programme Acceptability:

- The programme structure is well-liked
 - *“The routine and structure give children a great environment to take everything in.”*
 - *“The transition between whole class, group, and individual sessions. The children have lots of opportunities to hear, understand and use vocabulary.”*
- Improvements in the children’s language and communication were frequently remarked upon
 - *“I love it - this is by far the best intervention I've done, because of the focus on special words and embedding them so the children can use them - I know how vital that is”*
 - *“Their language has developed immensely throughout this programme.”*
 - *“[she is] impressed when they have consolidation sessions at how much the children can remember”*
 - *“The TA likes NELI-N because she can see the changes in the children, especially the EAL children have already come a long way.”*

¹ Quotations from staff refer to the NELI Preschool programme as ‘NELI-N’, as this was the name used for the programme during the efficacy trial.

- As were other improvements in the children
 - *“Children gain more confidence as they know NELI routines/expectations.”*
 - *“...the parents/families have also made comments about the impact at home.”*
 - *“Behaviour is also much calmer with NELI-N.” “NELI-N supports the expectation of sitting.”*
- **Whole-group sessions** are the most highly praised aspect of NELI-N
 - *“She especially likes the [Whole Group] sessions as they are good for all abilities. She likes that better speakers provide a model for other children, which is natural, and the other children don't notice they are learning.”*
- **Small group sessions** pose logistical challenges, particularly location, but were valued:
 - helped children feel safe and confident to contribute *“... They were talking more in the small group session and seemed to understand what was happening.”*
 - helped practitioners gauge specific children’s understanding, progress and language needs
- **Individual sessions** were commended for enabling targeting of children’s individual needs
 - *“I am with the children in the whole class session, so I gauge their starting point when they work with me. It is different for each child. The individual sessions allow me to hone in on their individual needs.”*
 - *“These are my favourite sessions. I am always amazed at how much new language they use. Sometimes I watch them on the carpet, they fidget a little and I'm unsure if they understand what is happening. I realise that they have taken it all in when they have their individual session - Penelope doesn't stop talking, which is absolutely wonderful!”*
- Book selection: Range and growing complexity were liked. The traditional tales with a twist are the most popular.
 - *“I like them [the books], especially the traditional tales - old stories told in new ways. The illustrations are lovely too, the children are always noticing interesting things in the books”*
- Clear links to EYFS are preferred
 - *“I really like the range of texts. They have predictable interests for EYFS and this makes it easy to link activities. There are new texts to explore, which is great.”*
 - *“Trying to think of activities/small world ideas each week to link in with the story is challenging.”*
- Listening tools were welcomed and their used often extended
 - *They love the rules, stickers, Neli and they even celebrate each other when someone gets the sticker.”*
 - *“when children not listening, you can bring them back in with Neli[.] Neli music also brings them back in. With Neli it is easier to reign them in, to ensure turn-taking, helps them to control themselves”*
 - *“We use the Listening Rules outside of the sessions too”*

- Some schools made NELI-N central to their planning for continuous provision, so all activities were somehow related to the book of the week.
 - *NELI-N is the defining element for their whole curriculum [...] The children have 'free flow' / choosing time and many of the activities are linked to NELI.*
 - *"I would like to weave NELI-N into our long-term planning. I think we will all feel lost when it finishes!"*
- NELI-N was seen to promote team-working:
 - *"The structure works in our classroom and across the setting. The intervention is a shared experience for children and staff alike. Language links are being made outside, in the corridors, in the classrooms - everywhere!"*
 - *"It is a shared learning experience. Everyone is involved in the intervention. The children are interacting so much. Connections are being made across the setting and at home."*
 - *"[NELI-N] was imposed on them but they find it easier to use - they like the set programme and routine, plus all staff are trained on it but only one was trained on Talk Boost."*

[2] Programme Feasibility

- Training was perceived as comprehensive and informative while remaining manageable. Settings valued seeing how other schools taking part in the trial were engaging in the programme and found video sessions especially useful in getting to grips with delivery of the different aspects of the programme.
 - *"All staff found the training helpful and feel it was in depth enough to be able to deliver the programme."*
 - *"Our staff found the padlet very useful as you were able to share ideas and see how other settings were getting on. You felt like you were part of a community, not that you were delivering it alone."*
 - *"The training was useful as you can pick up where you left off."*
- Integrating with continuous provision and linking to EYFS is critical. Schools that mentioned not being able to do this were less likely to report wishing to continue delivery of NELI-N
 - *"E.g. [NELI-N] is the core for the curriculum so on the day of the visit:

 - Maths - putting gems in an egg to count how many when it hatches
 - Fine motor - sticking and cutting; colouring and decorating a dinosaur egg
 - Knowledge - identifying which animals come from an egg
 - Emotions - they use the emotions they've learned from NELI in their 'feelings corner' and link it to the whole school approach on understanding and managing emotions."*
- But *"NELI-N has to be part of whole provision planning rather than a standalone intervention."*; *"If I wasn't an experienced teacher, I wouldn't think of adding other activities."*

- Language levels in settings vary
 - *“...because it's a high deprivation area, a lot of their children come with very low baselines.”*
 - *“Some of the books are quite long and the stories are not too engaging [...] Children come in with very poor language skills, [...] and not speaking at all.”*
 - *“[We] are in high deprivation area which means that some Words/scenarios in flashcards have not been relatable at all.”*
- **Parental engagement** in the programme is an opportunity explored by some settings...
 - *“One child has made Neli part of her bedtime routine. They share the story and then she teaches her mum and dad the special words.”*
 - *“Some parents have recorded their children re-telling the stories on to Tapestry. They have encouraged their children to say the special words. This has been a real delight to watch.”*
 - *“Lots of families are buying the books, and there's been positive feedback about how NELI-N helps them talk to the children about what they are doing at school.”*
 - *...but is a real challenge in others, especially settings in high EAL/deprived communities*
- A similar continuum is seen for **SLT engagement and support**:
 - *“Senior leadership team is aware and very happy that they've joined the programme and hearing about the progress the children have made in the short amount of time.”*
 - *“We do have support but we would like Reception Teachers and our Literacy Lead to come and see the sessions.”*
 - *They're not asking about [NELI-N] or are not interested. [...] which is a shame because the nursery staff really like it. They also haven't been given support to find a quiet space or time for the SG sessions.*

[3] Programme Fidelity

- Staff and pupil absence (frequently covid-related) caused problems across the board
- Schools with more staff trained reported higher dosage
 - *“We have a pattern of delivery that is working and we don't miss sessions because we have all been trained.”*
- Training aided fidelity, although some elements were less well understood/acted upon
 - *“Because everyone has had the training, everyone can input which means that they all have some investment/sense of ownership.”*
- Observation visits were positively viewed as effective additional training/CPD element
 - *“I was nervous about the observation but I found it a really useful exercise. I feel more confident about my delivery and it was nice to talk to a member of the team face-to-face. I feel the team is investing in me and the wider teaching team. I can ask questions and share my views.”*

Discussion

NELI Preschool improves children's language skills. Children receiving the whole class enrichment aspect of the programme made significantly more progress in their language skills than control children ($d = .26$). Children identified with LanguageScreen as having weak oral language, were allocated to receive NELI Preschool's targeted support in addition to the whole class enrichment element. These children also made more progress in their language skills than corresponding children in the control group ($d = .16$). These are substantive effect sizes in an educational context (Kraft, 2019). The Education Endowment Foundation (2018) interprets effect sizes in educational contexts, such that an effect size of $d = .26$ is equivalent to 3 months additional progress in language development, while an effect size of $d = .16$ is equivalent to two months additional progress.

Findings related to self-regulation and behavioural adjustment to schools are less clear cut, while a significant effect size was found for self-regulation for enrichment-only children ($d = .31$), no analysis was conducted for children in the targeted group, owing to floor effects at pretest. Additionally, the significant improvements in behavioural adjustment seen in older children receiving the Nuffield Early Language Intervention in Reception (West et al., 2022) were not replicated in this trial with this younger age group.

It is possible that the measures of self-regulation and behavioural adjustment used in this trial lack sensitivity when used with such young children, in particular those with poor oral language skills. Nevertheless, the results suggest that early language enrichment programmes such as NELI Preschool may serve to improve self-regulation, which can be conceptualised as an indicator of school readiness. Additionally, teacher feedback from the implementation process evaluation widely reported that children receiving NELI Preschool made improvements across many aspects of school readiness from being able to attend to and participate in teacher-led activities to being better able to socialize with peers, with these improvements attributed to the effect of the programme. This is, therefore, an area that should be revisited in future research, selecting measures which are more sensitive to improvements in preschool-aged children and for those with poor language skills.

The implementation process evaluation found that NELI Preschool was well-accepted by preschool staff who felt well-prepared to deliver the intervention as a result of the online training. Staff found LanguageScreen easy to use and reported finding the screening process informative. Moreover, fidelity to the programme remained high throughout delivery,

in spite of challenging circumstances in schools in the wake of the Covid-19 pandemic. These findings are encouraging, indicating NELI Preschool is likely to be well received by settings when delivered at scale.

One noticeable pattern in the results of the statistical analyses deserves further consideration. Although children with the weakest language skills in each classroom received additional language support within NELI Preschool, they made less progress than peers receiving the enrichment-only element of the programme. There are two possible reasons for this finding, both of which have important consequences for language intervention in preschool. [1] Many of the children allocated to receive the additional targeted support element of NELI Preschool have extremely poor language skills. As such, there may be a confound between severity of language problems and intervention, such that simply giving these children more intervention may not counteract the severity of their impairment. If this is the case, then both the intensity and effectiveness of the targeted aspect of the intervention will need to be bolstered substantially for these children to make up any ground in catching up to their peers. [2] An alternative explanation for the smaller effect size in the targeted group is that these children with very poor language skills are not yet developmentally at a stage where they can benefit from intervention. If this is the case, then the time, expense and effort put into remediating their language weaknesses in preschool would be much better spent at a later timepoint when they are developmentally ready.

As an aim of language intervention should be to attempt to narrow the attainment gap between children with poor language skills and their peers before they begin to fall behind at school, the next stage of NELI Preschool research should include an investigation of the both these possible explanations for the discrepancy in effect sizes between enrichment and targeted children by evaluating two versions of the programme, one with and one without the targeted support element.

In summary, the results of this trial showed that children receiving NELI Preschool made more progress in developing their language skills than children in a business-as-usual control group. The positive results of this trial have important implications for improving educational attainments for young children in the UK. Moreover, the programme has been designed from the outset to be scalable. Screening is conducted by schools using an automated app, ensuring the right children receive the targeted aspect of NELI Preschool. Staff training is asynchronous and completely online, analogous to that used in the DfE-funded NELI rollout. The next step for NELI Preschool in the UK is to ascertain effectiveness and practicability at scale.

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Appendices

Appendix A1

Sample printed materials from NELI Preschool programme





Well done, Fox and
well done, you!

It's Tortoise's turn now.
But he's looking a bit worried
and I'm not surprised
— Tiger is **waking up!**


Let's **stroke** Tiger's tummy.
There, nice and gentle.
That will help her sleep.

What is this animal called?
(Point to Tortoise.)

How does Tortoise feel
now?
— Why does Tortoise think
that Tiger is waking up?

Let's help Tiger get back to
sleep again by **STROKING**
her. (Demonstrate
STROKING your own
tummy.)

Special Word Alert!
WORRY



float

When something stays on top of the water,
it **FLOATS**.
When something **FLOATS** in the air,
it moves slowly through it.

The rubber duck **FLOATS** on the water.
Some parts of the flower **FLOAT** through the air.

Day 2: **FLOAT**

Let's look at our flashcard.
The rubber duck stays on top
of the water. It is **FLOATING**.

When something stays on top
of the water or moves slowly
through the air, it **FLOATS**.

Can you remember what the
animals use to **FLOAT** over
Tiger?

Let's do our **FLOATING**
activity.




Day 5: **TOGETHER**

Sometimes, it's nice just to be
TOGETHER with our friends,
but to do different things.

Bella, Anna and Chloe
sometimes enjoyed spending
time **TOGETHER**. Sometimes
they played **TOGETHER**.
Sometimes they played on their
own.

Let's look at some pictures of
children doing things
TOGETHER. What are they
doing **TOGETHER**?

Show the pictures. Ask what the
children are doing.
Do you have to do these
activities with other people
(e.g. sitting on a see saw) or
can you do them on your own,
too (e.g. eating lunch)?

Appendix A2. Means (SDs) of additional trial measures

	Intervention Arm of trial								Control Arm of trial							
	Enrichment-only children				Targeted children				Enrichment-only children				Targeted children			
	<i>N</i>	<i>t1</i> mean (<i>SD</i>)	<i>N</i>	<i>t2</i> mean (<i>SD</i>)	<i>N</i>	<i>t1</i> mean (<i>SD</i>)	<i>N</i>	<i>t2</i> mean (<i>SD</i>)	<i>N</i>	<i>t1</i> mean (<i>SD</i>)	<i>N</i>	<i>t2</i> mean (<i>SD</i>)	<i>N</i>	<i>t1</i> mean (<i>SD</i>)	<i>N</i>	<i>t2</i> mean (<i>SD</i>)
Taught vocabulary (29)	159	18.44 (5.16)	156	23.84 (3.37)	225	11.12 (6.94)	221	18.55 (6.61)	128	18.46 (4.45)	123	21.58 (3.72)	205	11.50 (6.12)	192	16.84 (5.62)
Narrative (total words)	159	25.59 (16.46)	155	42.32 (23.76)	227	12.97 (13.40)	221	30.04 (21.70)	128	27.21 (16.16)	122	31.76 (16.40)	203	13.54 (11.54)	192	25.11 (17.77)
HTKS (118)	159	27.91 (23.03)	156	54.97 (29.04)	229	13.56 (14.95)	221	31.22 (26.32)	128	25.01 (19.33)	124	45.08 (28.86)	196	13.62 (15.88)	192	26.79 (22.09)
BESSI ^a (36)	159	12.25 (6.82)	155	9.52 (6.70)	223	14.41 (7.00)	221	11.28 (6.93)	129	12.50 (6.98)	126	10.37 (6.84)	209	14.81 (6.86)	201	11.63 (7.11)

Note. Maximum total score for each subtest given in brackets after each item; ^a lower scores denote better behavioural adjustment.