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Investigating the Impact of the Preschool Intervention Programme on Struggling Learners

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Abstract

Previous research has shown that a Preschool Intervention Programme (PELP) designed and delivered in Singapore based on Orton Gillingham small group support led to significant improvements in early literacy with large effect sizes (Sim et al., 2015). However, it was unclear how much of this improvement was the result of maturation over time, because this earlier study did not include controls. Moreover, it was not clear whether or not satisfactory gains could be achieved with a shorter targeted programme. In order to address this, a controlled short-term study with a repeated measures design investigated the impact of this Programme on children who had been identified as struggling in the early years environment.. Participants (14 control group and 13 intervention group) completed a pre assessment battery followed by post assessment 10 weeks later. The intervention group underwent 20 hours of early literacy intervention over 10 weeks focusing on key aspects of early literacy, while the control group did not attend any form of intervention apart from normal kindergarten attendance. The results indicated that the experimental group outperformed the control group in phonogram knowledge, phonemic awareness, high frequency words, reading and spelling. The control group made significant improvements in spelling and sentence copying only, with all other measures largely unchanged over time. The implications of this study are that we cannot rely on the process of maturation to improve the skills of preschool children who are not keeping pace with their peers, and without explicit intervention they will continue to fall further behind and struggle with ongoing learning. Directions for policy and practice will be considered.

Keywords: intervention, phonics, literacy, controlled

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INTRODUCTION

Research from many countries worldwide has shown that the early years can be critical for children's progress in literacy and learning, with those struggling at this stage continuing to show impaired performance over many years. The development of emergent literacy skills will influence the development of conventional literacy skills. There has been some debate about what comprises emergent literacy, and a recognition that for some children explicit teaching will be needed in order to progress. These issues can be particularly important where children are learning to read bilingually, as they are in Singapore.

LITERATURE REVIEW

Emergent literacy skills are critical for a child's academic success in his formal school years (Lonigan et al., 2013). These include a clear developmental progression from spoken to written language, including alphabet knowledge, linking the phoneme to the grapheme, and phonological awareness including such elements as rhyming and segmentation. This, then provides the foundation and prepares the ground for early reading and spelling. Failure to grasp these early elements of literacy, has a long-term impact on progress, because as the struggling learner strives to catch up with their peers, the rest of the class are developing skills without them. This means that a struggling preschool learner with poor emergent literacy will require intervention to catch up with typically achieving peers.

Research has demonstrated that poor readers, for example will continue to show impaired performance up to 10th grade and beyond (Protopapas et al., 2011; Sparks et al., 2014), based on the Matthew effect originally identified by Stanovich in 1986, and confirmed in recent longitudinal models (Sullivan et al, 2017). Moreover, the older the child is, the longer and more intense intervention he will need, due to the cumulative effect of the skills the child has missed (Torgesen 2001). Learners with poor early literacy skills attained poorer academic achievements compared to their peers with competent early literacy skills (Dennis and Horn 2011). Receiving intervention earlier reduces the literacy gap, thus decreasing the likelihood for the learner to develop severe reading difficulties (See & Koay 2014).

A recognition that early intervention can be effective has inspired a wide range of approaches internationally over the last 40 years. Inevitably there have been clashes between advocates of the whole word approach to learning and advocates of phonology culminating in the reading wars in the USA (Adams, 90). Reading Recover in New Zealand (Clay, 1985) has been amongst the most widely used, focusing on the lowest 20% of achievement. However, there has been criticism from Tunmer and colleagues (2013) of the cost effectiveness of Reading Recovery, based on the moderate impact of the approach and failure to complete the intensive 1 to 1 tuition for 30-40% of

participants. Moreover, initially the programme failed to include important findings coming through on the role of phonological awareness, for example rhyming (Bradley and Bryant, 1983). A consensus has now emerged that phonics training is one of the most important early reading skills, although more recently it has been recognised that a combination of phonics and letter recognition is key (Schneider, Roth and Ennemoser, 2000). A comprehensive recent analysis, (Suggate, 2016) found that most systematic controlled interventions had a positive effect, particularly if they were in addition to mainstream teaching.

A recent major study in Ohio, USA, the Dyslexia Pilot Project (Morrison et al., 2020) examined the impact of a multi-tiered literacy intervention based on universal screening and evidence based literacy support matched to individual levels of need. The impact of this type of support has led to the US Response to Intervention initiative (see for example, Vellutino et al., 2008), which evaluated a range of small group interventions. These included Orton Gillingham approaches delivered for 120-160 minutes spread over 4 days each week, delivered by over 200 teachers across a range of schools, with progress monitored by use of DIBELS (Good and Kaminski, 2002), at pre and post-test. The positive results, with a decrease in students achieving below the norm for their age indicated no need to move towards further intensive individual support, following this small group support. Moreover, the 58-74% of children performing at or above grade level by grade 2 persisted at follow-up indicating lasting improvement.

Early literacy intervention for struggling learners has been found to be effective at an earlier age than previously considered, from the age of 4 years old onwards. Struggling learners between 5 and 7 years old required intensive intervention over a 10 week period to catch up with their peers (Nicolson et a., 1999; Nicolson et al., 2000). Interestingly, these two studies from Nicolson and colleagues produced some of the largest effect sizes found in the literature (Brooks, 2007). A recent study (Fawcett and Jones, 2019) was undertaken with over 600 reception class children in Wales in the UK. These children were screened using the Dyslexia Early screening test (Nicolson and Fawcett, 2004), at the age of 4.5-5 years old. The study found that children at risk of failure made significant improvement following 12 weeks intervention for 1 hour weekly. Moreover, 86.6% showed no risk following a 12 week intervention targeting phonological processing and visual and auditory memory, delivered over 12 hours. By contrast, at 8 years old, struggling learners who have never received any form of intervention would require up to 67.5 hours of intensive individual literacy support to bridge the literacy gap between them and their peers (Torgesen, 2001).

Many of these children will be at risk for diagnosis of dyslexia, and without support at home and school may struggle to succeed. More importantly, early literacy difficulties that were not identified and addressed would continue to persist into adulthood, impacting on both academic success and self-esteem.

THE STUDY CONTEXT - THE SINGAPOREAN BACKGROUND.

Moving to the current study, in Singapore, English is the main medium of instruction in school. In addition Primary 1, children are expected to be equipped with basic English literacy skills. According to the Nurturing Early Learners Framework, this includes reading high frequency words, spelling and writing short sentences (Ministry of Education 2018) hence, learners with poor early literacy skills will not have met the prerequisites needed for success in formal school, placing them at an immediate disadvantage. Although English is the language of instruction in Singapore, the country officially recognises 4 official languages (English, Chinese, Malay and Tamil) with children being exposed to a second language from birth, in kindergarten or part of compulsory education at the age of 7 (Dixon, 2011; Sun, 2019). Second language acquisition literature generally indicates native language skills to be an important predictor of second language proficiency (Borodkin & Faust, 2014). As struggling learners show difficulties in phonological processing (Elbro et al., 2012), this affects their ability to acquire both of the languages they are expected to be able to read and write in. Learners who lack exposure to the English language at home and have poor attendance in school are further handicapped in their learning, given their weak command of English. Children starting school in Singapore will be drawn from a range of backgrounds, including Chinese, Indian and Malay origins, and their experience of English prior to starting their education will be mixed. Recent longitudinal research, (Hjetland et al., 2019) has demonstrated two independent routes through from pre-school to literacy, one based on code-related skills, (letter knowledge and phonological awareness) and the other based on pre-school spoken vocabulary and listening skills. This suggests that there may be particularly intractable problems for children who show difficulties with both routes to success. A number of recent papers have identified the potential problems for children who are learning in school in English, when their home language differs from the language of instruction. A recent study, for example, from Chen and colleagues, (Chen et al., 2020), on the prevalence of disability in pre-school children in Taiwan, showed that speech and language delay or disorder was the predominant issue for over 42% of disabled children identified from the a larger sample of over 3000 pre-schoolers. Moreover, models have shown that when there are delays in either or both the home language and the language of instruction, there are likely to be delays in the acquisition of literacy, (Lonigan et al., 2018). This suggests that it is even more critically important that problems are identified early and support provided in a bilingual society, in order to prevent children falling behind in their literacy, despite catching up with their peers in oral language. While most Singaporean children are bilingual, English is the language of instruction in mainstream schools. All subjects are taught in English. Students learn a second language weekly in a limited classroom capacity (Sun et al, 2018). As this study focuses on English literacy skills, all students recruited in this study were native English language speakers,

DAS Early Literacy Intervention Programme

Earlier research has demonstrated that it is possible to successfully identify and support struggling preschool learners in Singapore (See & Koay, 2014, Sim et al, 2015). The Dyslexia Association of Singapore has been offering the Preschool Early Literacy Programme (PELP) since 2006. The programme has since reached out to more than 1100 struggling learners (Wong & Sathiasilan 2018). The programme caters to 5 and 6 years old Kindergarteners 1, 2 and K2 (Repeat) learners with literacy difficulties or developmental delay in early literacy. The programme provides a 2 hours weekly intervention class outside of regular school hours to struggling learners. It runs with a small class ratio of 1 Educational Therapist with up to 5 struggling learners. The learners are grouped according to their ability. The curriculum is guided by Orton-Gillingham principles and early childhood pedagogy. Components covered within a typical PELP classroom include: alphabet knowledge, letter formation, phonogram knowledge, phonological awareness, high-frequency words, shared reading, early writing and comprehension skills.

The Intervention Approach – Literature review

The Orton-Gillingham (OG) is an effective instructional approach used to teach individuals with literacy difficulties. The OG approach is language based and is taught systematically, sequentially and cumulatively. It moves from simple to complex language skills to help struggling learners acquire mastery and automaticity through cumulative learning to reinforce learned information. It is also prescriptive and diagnostic as teachers assess learners' abilities and customise lessons to meet their needs (Rose & Zirkel 2007). In Singapore, OG-based intervention programmes have been found to improve word recognition, word expression, reading and spelling of learners between the age of 6 to 14 years (Lim & Oei 2015). In addition, Lim and Oei (2015) found early intervention was associated with better intervention outcomes in both reading and spelling among Singaporean struggling preschool learners. Meta-analyses on early literacy intervention have demonstrated intervention effect sizes are greatest in preschool (Wanzek et. al. 2018).

OG-based early literacy intervention often incorporates phonics in its curriculum. A meta-analysis by the National Reading Panel (2000) found struggling learners require explicit and systematic instructions in phonics. Literacy interventions have to be implemented with a broad literacy curriculum that focuses on teaching phonics and phonological awareness, letter-sound correspondence, fluency, vocabulary, comprehension and writing. Moreover, it is important to incorporate listening, speaking, and vocabulary building to know what the word means during reading (Foorman et al., 2015). Programmes that incorporate these components will maximise their effectiveness in remediating struggling learners. In line with research-based findings, the components covered in PELP's curriculum include alphabet knowledge, letter formation, letter-sound

correspondence, phonological awareness, learnt words, shared reading, early writing and spelling.

Study purpose

The PELP programme has previously been found to improve children's early literacy skills. Sim, et al., (2015) found significant differences in a sample of 56 students who averaged 48.7 hours of intervention with large effect sizes. Interestingly, Sim et al (2015) noted that effect sizes of this magnitude were found in only 32% of the programmes evaluated by the National Reading Panel. Similarly Wong and Sathiasilan (2018) also found that in a sample of 294 students with a wide range of intervention hours (average 62 hours) significant improvements were found in all tested areas of early literacy with large effect sizes. However, both studies were unable to establish if students would show marked improvements over a shorter period of time. It was also unclear how much of these improvements were facilitated over time by their attendance of kindergarten and the natural processes of maturation. In order to remove extraneous variable such as literacy knowledge gained in kindergarten and maturation effect, a controlled study with a repeated measures design was undertaken to assess the impact of PELP intervention on struggling learners.

Research design

This investigative study uses a quantitative approach to measure participants' pre-post test scores on measures of their early literacy, with an intervention group and a control group. The study design is represented in figure 1.

It is important to note that all the participants continued to participate throughout the study, with no changes in the participant groups from pre to post-test, ensuring continuity in the study.

Research question and hypothesis

This research aims to investigate the impact of the DAS Preschool Early Literacy Programme (PELP), an early literacy intervention programme for 5 to 7 year olds struggling learners in Singapore. The research questions were:

1. Was the PELP intervention approach effective in significantly helping kindergarteners improve on their early literacy learning outcomes?

2. When compared with similar peers who only attend kindergarten, will children attending PELP significantly outperform them in early literacy outcomes, indicating an additive effect over and above the process of maturation?

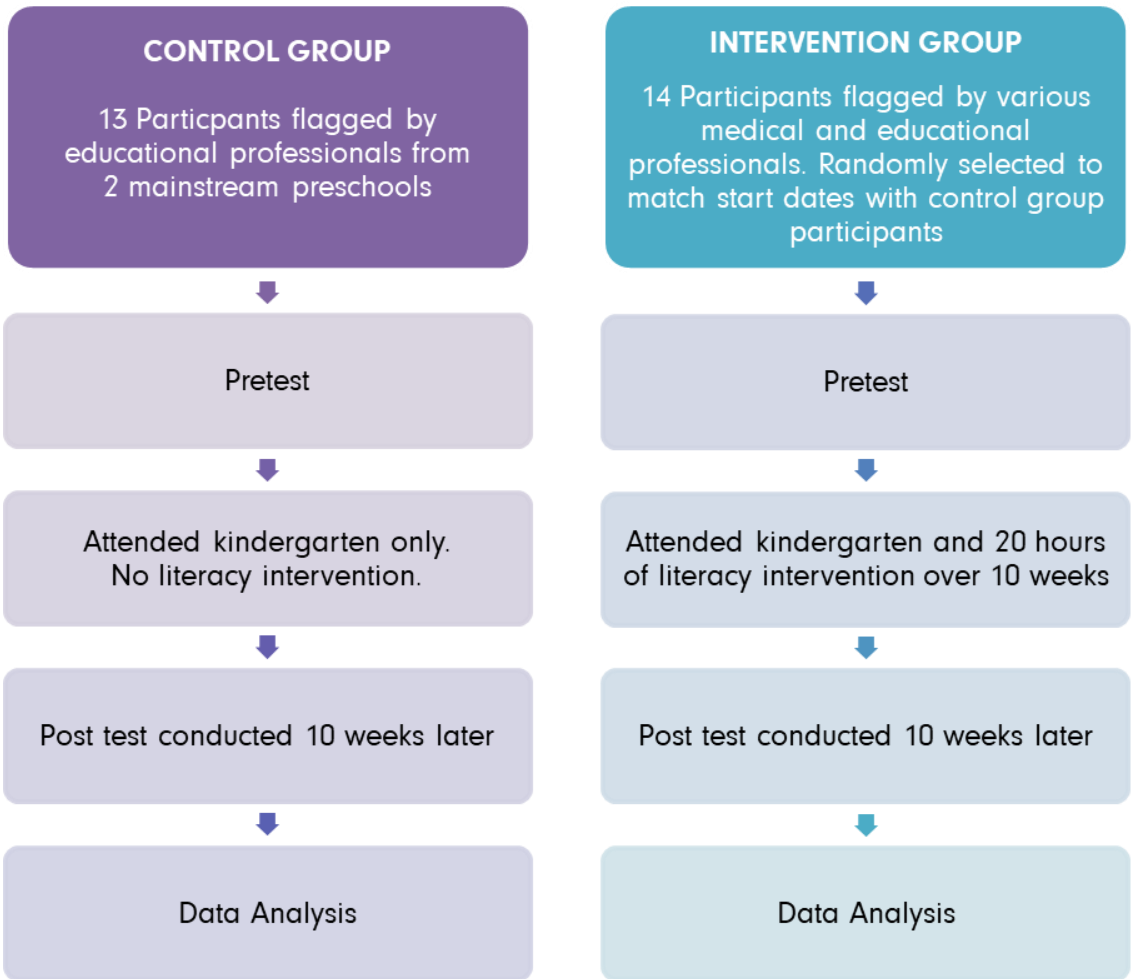

Figure 1. The research design

METHOD

Participants

Data was collected from 27 learners (18 male, 9 female) from Kindergarten 1 and 2 students.

The control group consisted of 14 students (8 male, 6 female). 11 were from Kindergarten 1 and 3 from Kindergarten 2 (Mean age = 5.36,*SD*=0.48). The students were attending school in two regular mainstream kindergartens and were not attending any other phonics based interventions or enrichment classes. They were selected by their teachers on the basis of their ongoing difficulties in the early stages of literacy. These teachers

had attended talks by the Dyslexia Association of Singapore on what to look out for in preschool struggling learners and were well acquainted in identifying struggling learners and referred students yearly for literacy intervention. The control group consisted of children who had been flagged by their teachers as being struggling learners who were not attending other forms of intervention. These children had previously been identified as children who would benefit for the PELP Programme whose parents had declined to join. The control group participants came from two mainstream kindergartens that the PELP programme offers in-house intervention support for after school hours.

The intervention group consisted of 13 students (10 male, 3 female). 11 were from Kindergarten 2 and 2 students were Kindergarten 2 (Repeat) (Mean age =5.67,SD=0.43). These students had been referred for literacy intervention by professionals such as hospitals (pediatricians, psychologists ,educational therapists) or mainstream preschool teachers who noticed that these students displayed significant struggles in learning. Struggling learners in the intervention group attended 20 hours of intervention (2 hours weekly over 10 weeks). Depending on their literacy gap, early literacy interventions were planned and carried out using OG principals guided by early childhood pedagogy. Students from the intervention group were randomly selected from four different centres based on their start date to ensure their data would be collected at approximately the same time as the control group participants.

Ethics permission

Ethics permission for the study was obtained from the research committee of the Dyslexia Association of Singapore.

Procedure

Control group. Information sheets and consent forms were disseminated to the kindergarten parents of the schools that agreed to participate in the study. In order to participate, students must not be attending other intervention programmes or enrichment classes. Parents were informed that they could withdraw their children from the study at any time and all participant details would be anonymised. Anticipating that there might be difficulties in getting mainstream kindergarten parents to agree to allow their children to participate in the control group study, some incentives were introduced. For their participation they were given a 20 dollar voucher upon completion of the study, as well as an individualised update from the authors at the conclusion of the study to inform them of their child's literacy strengths and weaknesses. A pre assessment was completed, followed by a post- assessment ten weeks later by the authors of this paper who are also Educational Therapists and trained yearly to conduct these pre and post assessments.

Intervention group. The intervention group was a sample of children attending DAS PELP for support. The first 13 students who enrolled in the programme at the beginning of the year whose parents had agreed to participate in research were selected. Their pre-assessment was completed followed by 20 hours of intervention over 10 weeks after which a post-informal assessment was administered. Pre and post assessments were conducted by the Educational Therapists who were conducting the intervention. All preschool educational therapists were trained to conduct the pre and post assessment and attended a 45 minute refresher course yearly as part of their compulsory continual professional development.

Materials

DAS Preschool Pre and Post Assessment was used as the pre-test and post-test measure. 5 areas were assessed. They were alphabet knowledge, phonogram knowledge, phonemic awareness, learnt words, reading and spelling in combinations ranging from vc, cvc, ccvc, ccvcc to cccvc (v = vowel, c = consonant) and sentence writing. Further information is detailed below.

Data collection

The DAS Preschool Pre Assessment (an updated version of the test reported in Wong, 2015) was administered to preschool participants from both control and intervention groups. 10 weeks later the DAS Preschool Post Assessment was administered to both control and intervention groups again. The intervention group received 20 hours of literacy intervention in the duration between pre and post-informal. The control group received no intervention during this period, but attended their normal pre-school provision.

Pre and Post-test Assessment

The assessment was divided into 7 areas:

Alphabet knowledge - the ability to name letters, sequence letters and ability to form all lower and upper case letters.

Phonogram knowledge - the ability to identify the letter-sound correspondence of the 26 letters as well as advanced phonograms (e.g.: consonant digraph, trigraphs, magic e). Phonemic awareness the ability to segment words into their individual phonemes. Learnt words - the ability to read 50 common high frequency words.

Reading - the ability to read words of increasing difficulty starting with vc, cvc, ccvc, ccvcc, cccvcc and magic e words. There were 3 words in each category of difficulty. Spelling the ability to spell words of increasing difficulty starting with vc, cvc, ccvc, ccvcc,

cccvcc and magic e words. There were 3 words in each category of difficulty.

Therefore, a student with a score of 3 on reading or spelling would have only been able to manage to read/spell words in the vc category while a student with a score of 11 would have been able to read/spell words in the ccvcc category.

Sentence writing - the ability to copy a sentence, with accuracy in punctuation, letter formation and spacing in between words.

The intervention

Children in the intervention group attended DAS pre-school support sessions for 2 hours weekly in small groups to receive support in the PELP curriculum including alphabet knowledge, letter formation, letter-sound correspondence, phonological awareness, learnt words, shared reading, early writing and spelling. The present intervention is governed by the Orton Gillingham Principles (OG; Orton, 1966). The OG instructional approach is phonics based and relies heavily on the integration of systematic, sequential and multisensory methods to teaching literacy skills. These components are explained in detail in table 1.

Planning for Individual Intervention and Quality

After the Pre-Informal Assessment, the educational therapist makes note of the literacy strengths and weaknesses exhibited by the child and uses it to make an individualised intervention plan. A child who might be competent in alphabet knowledge and phonogram knowledge but who is unable to read will spend a larger portion of the session completing blending and other phonological activities. Using the OG principles, the educational therapist also adjusts the content weekly for each session to focus and revise the areas the child was uncertain of in the previous lesson. (Wong, 2015). Each session consists of a small group of 2 to 4 students who are placed together as they share a similar literacy profile The weekly intervention covers alphabet knowledge, phonogram knowledge, phonemic awareness, reading and spelling tailored to the literacy needs of the group.

Multisensory, tactile and educational technology tools are used to enhance early learning. These are illustrated in Figure 1 below, where letter recognition is reinforced by the use of texture and tracing. All educational therapists are specifically trained to work with pre-schoolers at risk of dyslexia or other learning needs. The educational therapists additionally undergo a minimum 50 hours of continued professional development yearly to refresh and learn new skills relevant to literacy intervention. Each educational therapist is also observed teaching and graded annually to ensure that the intervention standards are met.

Table 1:. The Orton Gillingham Approach

LANGUAGE BASED – Uses phonograms and spelling rules that most of the language abides by to make it easier for the learner to decode and integrates this in reading, spelling and pronunciation
COGNITIVE – The various techniques to learning are derived from a neurological understanding of how learning occurs with regard to reading and writing
STRUCTURED, SEQUENTIAL AND CUMULATIVE – This is also known as the language triangle in which direct instruction is delivered systematically and in a sequential manner. Consistent reviews of this allows for mastery of concepts and good retention. New literacy skills related to these prior concepts that have just been mastered are then taught cumulatively This is especially vital to achieving automaticity.
SIMULTANEOUSLY MULTISENSORY - Integrating visual, auditory, kinaesthetic and tactile exercises in instruction to build strong connections to literacy components.
DIAGNOSTIC-PRESCRIPTIVE - The therapist constantly observes the learner and makes note of both verbal and non-verbal cues to assess the progress made and difficulties the learner might be facing. The therapist then uses this information to reflect and make changes in strategies or lesson delivery to allow the learner to experience a higher degree of success.
EMOTIONALLY-SOUND - This teaching approach aims at looking at existing areas of strengths and capitalises on teaching new concepts using these. In doing so it aims to increase the experience of success and help create a confident student who is motivated to learn further (Joshi,et al., 2002; Orton, 1966 ; Ritchey & Goeke, 2006).

Figure 2 Some examples of multisensory strategies used to teach phonograms and sight words (Wong, 2015)

RESULTS

In order to evaluate the impact of the PELP intervention, and establish whether or not the changes from pre to post were related to the intervention or more directly to the process of maturation, data from pre and post tests were tabulated for the 2 groups of participants, and compared within and between groups. See table 2 for means and standard deviations for the intervention and control groups at pre and post- test. It may be seen from the data below that for all but phonogram knowledge both groups made improvements over the time period. A range of scores were obtained, reflecting the level of complexity of the tasks involved.

Table 2: Within group differences on battery of tasks

Variable	Intervention	N= 13	Control	N= 14
	Pre test mean (*SD*)	Post test mean (*SD*)	Pre test mean (*SD*)	Post test mean (*SD*)
Alphabet Knowledge	87.31	104.08	85.36	87.71
	(26.62)	*(22.71)*	*(25.48)*	*(29.82)*
Phonogram Knowledge	15.46	24.92	18.71	17.43
	(7.11)	*(3.12)*	*(10.06)*	*(9.88)*
Phonemic Awareness	1.85	9.15	4.86	6.00
	(3.41)	*(7.72)*	*(7.48)*	*(7.46)*
Learnt Words	13.69	23.08	20.07	22.29
	(14.69)	*(16.61)*	*(20.78)*	*(21.39)*
Reading	1.08	5.85	3.71	3.50
	(1.66)	*(4.71)*	*(6.59)*	*(4.29)*
Spelling	0.46	4.00	1.00	1.93
	(1.13)	*(4.45)*	*(2.22)*	*(2.59)*
Sentence Copying	20.85	32.23	26.29	33.14
	(13.32)	*(10.48)*	*(13.32)*	*(10.48)*

Quantitative Data From Pre and Post

Data analysis

SPSS Version 20.0 was used for data analysis. To identify the improvements each group made, a 2 factor repeated measures Anova was performed, comparing the pre and post assessment scores.

Between group differences

A 2 factor repeated measures Anova of the scores at pre and post-test between the control and intervention group revealed that the intervention group significantly outperformed the control group in the phonogram knowledge, phonemic awareness, learnt words, reading and spelling tasks as reported below in Table 2 and 3 and figures 3 and 4.

Table 3: Results of Anova table for significant effects intervention

	Sig.	
Variable	Main effect (time)	Interaction effect
Alphabet knowledge	0.023	0.08
Phonogram knowledge	0.002**	0.00***
Phonemic Awareness	0.001***	0.01**
Learnt Words	0.00***	0.002**
Reading	0.007**	0.004**
Spelling	0.00***	0.024*
Sentence copying	0.00***	0.313

** p<.05*
*** p<.01*
**** p<.001*

In order to check the impact of the intervention a Cohen's effect size (1988) was calculated, based on the mean and standard deviation of each group. A small impact effect size is 0.2, a moderate effect size 0.5 and a large effect size, 0.8 or more.

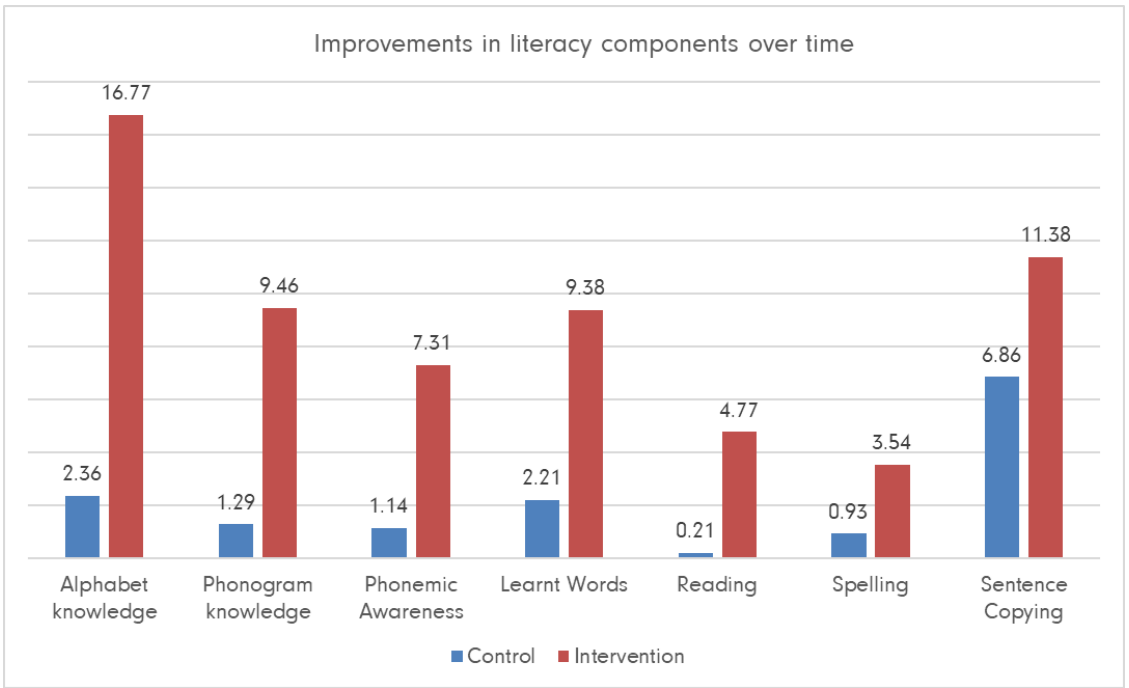

Figure 3. Differences between scores at pre/post for intervention and control

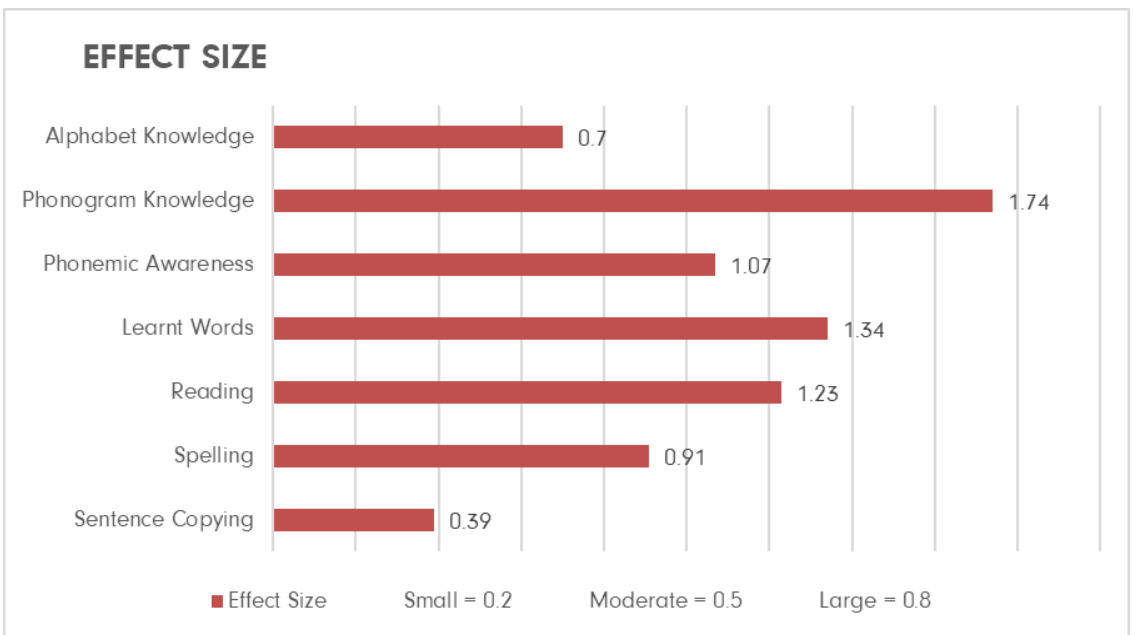

Figure 4. Effect sizes for intervention compared with controls

From figure 4 above it can be seen that most of the effect sizes are large with the exception of sentence copying (small effect) and alphabet knowledge (moderate).

To further investigate, an independent sample t-test of the differences from pre to post between the control and intervention group was conducted to check the hypothesis that the intervention group would show larger margins of improvements.

Alphabet Knowledge - Mean improvement for intervention participants of 16.77 points, which was statistically significant ($t(12) = -2.54$, $p = 0.026$) with a moderate effect size ($d = 0.68$).

Phonogram knowledge Mean improvement for intervention participants of 9.46 points, which was statistically significant ($t(12) = -5.66$, $p < 0.001$) with a large effect size ($d = 1.72$).

Phonemic awareness Mean improvement for intervention participants of 7.31 points, which was statistically significant ($t(12) = -3.95$, $p = 0.002$) with a large effect size ($d = 1.22$).

Learnt words Mean improvement for intervention participants of 9.38 points, which was statistically significant ($t(12) = -6.78$, $p < 0.001$) with a moderate effect size ($d = 0.6$).

Reading ability Mean improvement for intervention participants of 4.77 points, which was statistically significant ($t(12) = -4.36$, $p = 0.001$) with a large effect size ($d = 1.35$).

Spelling ability Mean improvement for intervention participants of 3.54 points, which was statistically significant ($t(12) = -3.40$, $p = 0.005$) with a large effect size ($d = 1.09$).

Sentence copying Mean improvement for intervention participants of 11.38 points, which was statistically significant ($t(12) = -2.90$, $p = 0.013$) with a large effect size ($d = 0.95$).

To further investigate, a paired sample t-test of the differences from pre to post for the control group independently, was conducted to check the alternative hypothesis that maturation would improve performance without the need for explicit intervention.

Pre and post-test within Control group

Spelling ability Mean improvement for control participants of 0.93 points, which was statistically significant ($t(13) = -2.24$, $p = 0.042$) with a small effect size ($d = -0.39$).

Sentence copying Mean improvement for control participants of 6.86 points, which was statistically significant ($t(13) = -3.17$, $p = 0.007$) with a moderate effect size ($d = 0.57$).

All other scores for Alphabet knowledge, Phonogram knowledge, Phonemic awareness, Learnt words and reading ability were not significant.

DISCUSSION

The study aimed to identify if enrolment in PELP intervention over ten weeks would lead to improvement in early literacy areas: alphabet knowledge, phonogram knowledge, phonemic awareness, learnt words, reading, spelling and sentence writing. Data analysis showed that the intervention group made statistically significant gains in all tested early literacy components after 20 hours of intervention. In contrast, struggling learners who did not attend intervention only made significant improvements in spelling and sentence copying over the ten week period. This suggests that without explicit support, children will continue to struggle in most of the important early learning skills which form the foundation for literacy acquisition.

It was notable that the intervention group showed greater difficulty with all subtasks of the assessment battery prior to intervention apart from alphabet knowledge, which was slightly higher than controls. However, there was considerable variability within the group reflected in the high standard deviation scores for most of the subtests. This meant that they had greater potential for improvement over the course of the intervention, and also reflected their greater need for participation in the intervention study than the controls, who were referred for extra support by teachers, rather than by psychologists and speech therapists. The controls, by comparison showed only small impact from attendance at pre-school, with performance deteriorating on two of the subtests, phonemic knowledge and reading. Comparisons between the groups showed significantly greater impact of participation in the intervention then the effects of kindergarten and maturation. Moreover, calculating the effect sizes for improvements in comparison with controls showed that the majority were large, which is interesting in the context of the National Reading Panel findings. Effect sizes of this level were also identified in previous research, with the PELP intervention in Singapore, with intervention covering a longer time-period (Sim et al, 2015, Wong & Sathiasilan, 2018). Short term interventions have previously been found to be highly effective in the UK (Nicolson et al,1999, 2000, Fawcett and Jones, 2019). This suggests (in line with the findings of Suggate (2016), that it is the intensity and breadth of intervention, rather than the time period, which has the major impact.

In terms of the individual subtests evaluated, it is interesting here to compare the results with those in the literature from equivalent research. In PELP, alphabetic knowledge and its corresponding phonograms are explicitly taught in the classroom. Alphabet knowledge enhanced the learning of phonogram knowledge. Puranik and Apel (2010) also proposed alphabet and phonogram knowledge predicted spelling skills in 4 and 5 year old learners. By building the alphabet and phonogram knowledge, struggling learners build their foundation to pick up more advanced phonological awareness skills.

The significant improvement in phonemic awareness was notable, as children at risk of developing literacy difficulties were found to exhibit poor articulatory skills, resulting in

ongoing problems with phonological awareness (Nicolson and Fawcett 2008). Phonemic awareness (PA), a subset of phonological awareness, is also an early predictor of child's reading success (Kaminski and Powell-Smith 2017). Therefore, phonemic awareness instruction was explicitly taught within PELP. Kilpatrick (2015) found basic and advanced phonemic awareness instruction contributed to effective literacy remediation. When struggling learners build their competency in alphabet knowledge, phonogram knowledge and phonemic awareness, they can make the connections between sound, spoken and written language and transfer their knowledge and skills into print form, such as reading, spelling and writing tasks (Terrell and Watson 2018).

This is thought to occur because improvements in phonemic awareness help children to recognise the letters, give corresponding letter sounds and apply these skills to help them blend or read words. Moreover, the intervention group were also able to identify the individuals phonemes in a word and translate the sound into print. Daly, et al., (2005) proposed in the hierarchy of phonemic awareness that a child is first able to isolate the beginning sound, followed by blending phonemes and segmenting the phonemes in a word. This was further supported by Nation and Hulme (1997) who found phoneme segmentation skills were the best predictors in first graders reading and spelling. The current study appears to corroborate these findings from other research groups, as struggling learners in the intervention group showed significant improvements in alphabet knowledge phonogram knowledge, phonemic awareness which converged into improvements in reading and spelling.

A comparison of the differences between the control and intervention group indicated that when their gains were compared, the intervention group significantly outperformed the control group in measures of phonogram knowledge, phonemic awareness, sight word knowledge, reading and spelling. Other interventions have found that with structured phonological based reading interventions, an average growth rate of as much as 130% when compared with a control group over eight months can be achieved (Gray et al., 2017). Shorter interventions have shown mixed results suggesting that typically reading success requires a longer intervention duration (Bedard et al., 2017; Duff et al., 2014). The results of this study indicated that the OG instructional approach and a broad literacy curriculum with emphasis on phonics, phonological awareness and letter-sound correspondence maximises its effectiveness in struggling learners (NRP 2000).

LIMITATIONS, FUTURE DIRECTIONS AND IMPLICATIONS

The small sample size in this study limited the ability to generalise to a wider population and in future research this study could be replicated with a larger sample size. Moreover, this study may suffer from fade out, in common with many intervention studies in the literature, (Bailey et al., 2017). Therefore, it would be useful to follow-up the progress of this sample over time in order to assess the stability of the improvements in the longer-term.

It would also be beneficial if this study is replicated to gather qualitative feedback from educational therapists on individual student progress and the intervention. In addition, in future research it would be good practice to have independent assessors who had not taken part in the intervention itself, evaluating the children in both groups. It would also be interesting to evaluate the confidence and well-being of the children involved in a child-friendly questionnaire.

CONCLUSIONS

The findings in this study are in line with others in demonstrating that the PELP, an OG and phonologically based instructional literacy intervention has positive impacts on struggling learners. More importantly, the emphasis on alphabet knowledge, phonogram knowledge and phonemic awareness contributed significantly to reading and spelling skills. These results have demonstrated, as in Nicolson and colleagues studies in the UK, (1999, 2000) that a short term intervention of just 10 weeks, with 20 hours support can be effective at age 5. Ongoing research is needed to establish how long-lasting the impact of these effects can be.

The findings have demonstrated the importance of providing early intervention for struggling learners. This lays the foundation necessary for the development of conventional literacy skills required for formal schooling. Learners with adequate early literacy have demonstrated better academic achievements, compared to their peers with less competent early literacy skills (Dennis and Horn 2011). Therefore, it is critical to push for early intervention to help struggling learners reduce the gap.

In terms of policy and practice internationally, identifying and supporting early learners who are struggling to progress can ensure that many of these children accelerate and can begin to keep pace with their peers. This will leave a subgroup of more impaired children who will need continued support in order to achieve their potential. It is not enough to conclude that normal classroom experience will be sufficient to bridge the gap between those struggling and their more successful peers. Failure to progress in the early years can impact progress for a lifetime, impacting on self-esteem, fulfilment and life chances. No country can afford to neglect the opportunity to provide this essential support to ensure the future prosperity of their nation.

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