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# *Asia Pacific Journal of Developmental Differences*

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# *Editorial Comment*

Angela J. Fawcett

It is a very great pleasure to publish the 4th issue of this new journal, the Asian Pacific Journal of Developmental Differences, which is published by the Dyslexia Association of Singapore. The response to the previous three issues has been extremely gratifying, and we intend to maintain these high standards in this issue and forthcoming issues. We have now amassed an even stronger editorial board, and I am grateful for the support of the academics and professionals involved.

In this issue we present seven articles, the majority of which are drawn from the Asian context. The majority of articles in this issue are experimental studies that investigate the impact of a range of manipulations on outcomes for children at risk of dyslexia.

In the paper from Abir Al-Sharan and John Everatt from New Zealand, a controlled study is presented evaluating the impact of behavioural interventions on dyslexic children in Kuwait. The interventions contrasted a positive self affirmation approach with relaxation techniques, and found that there was a role for this type of support within schools, but that they worked most effectively when combined with multisensory teaching.

The second article by Dr Ong Hoon and colleagues from Sarawak describes the improvements achieved during a 3-week summer school with dyslexic children, using ubiquitous bottle tops as an aid to learning. This clever approach shows what can be achieved using everyday objects, even within a system where there may not be more formal methods of support and there can be shortages of equipment for intervention use.

The article from Yeo, Bunn and colleagues from the Dyslexia Association of Singapore, focuses on the important topic of Maths. The team present an analysis of performance pre/post a 6 months intervention for 39 dyslexic children. They show that targeted support can make statistically significant improvements for this group in addition, subtraction, multiplication, division, time, fractions, geometry, decimals, percentages and ratio.

The approach adopted by Professor Piero Crispiani and his colleague Eleanora Palmieri from Italy focuses on building the fluidity of motor skill and reading performance in children with dyslexia and dyspraxia. Following a case study of a 10 year old girl with severe problems undertaking an intense support regime, an experimental study is presented which

shows significant improvements in fluency of reading for the participants.

A second article from the Dyslexia Association of Singapore by Edmen Leong focuses on improving study skills in children prior to the important PSLE exam on leaving primary school. The results of this exam dictate the type of secondary schooling children receive and can be particularly problematic for children with dyslexia. Evaluating the design of the curriculum to impact on English study skills, and the success of the children undertaking the intervention over 4 terms showed almost 100% improvement across the groups, with significant improvements in all areas targeted.

The next article in this issue by Alexander-Passe addresses the important issue of stigma and disclosure in dyslexic adults. This forms part of a series contributed by this author, using mixed methods, the article considers perceptions of stigma in 29 dyslexic adults, a percentage of whom have suffered from depression. Following a strong empirical review of the area, the author demonstrates that, the majority of dyslexic adults have encountered discrimination and stigma based on their disabilities, although many feel that dyslexia itself is a gift. They recognised the need to work harder to achieve what others can achieve with less effort, and attribute problems in recognition of dyslexia to lack of knowledge across society. This research was undertaken in the UK, and it is likely that this stigma will be even more pronounced in Asian countries.

The final article by Landolfo and colleagues from the National University of Singapore critiques the provision for dyslexia in Singapore. The report concludes that despite the efforts of the Dyslexia Association of Singapore in conjunction with the Ministry of Education, Dyslexia is currently under-identified and under supported in Singapore. This article calls for further investment in providing this support for children with dyslexia, including the further training and the provision of a specialist school for severe dyslexia, as well as raising levels of public awareness and tackling issues of bullying.

We hope that you find the current issue interesting and that you will consider the APJDD as an appropriate vehicle for submitting your own research. The journal continues to be available for free access and can be downloaded from http://www.das.org.sg/publications/research-journal

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# Behavioural interventions and developmental learning difficulties: Factors influencing effectiveness in a Kuwaiti school context

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*Abstract*

*This paper presents findings investigating the effectiveness of behavioural interventions for children with developmental learning difficulties/disabilities (such as dyslexia) under different educational conditions. The primary focus of the behavioural intervention work was a self-management technique involving positive self-statements. This was compared with another behavioural intervention that involved a relaxation technique. The usefulness of the behavioural interventions for teaching English spellings to Arabic children with learning disabilities (LD) was compared using multisensory learning versus simple copying. These LD-based educational contexts were contrasted with a mainstream group of children who underwent normal teaching conditions but also practiced the two behavioural interventions. Findings indicated positive effects from pre to post intervention spelling scores in comparison to baseline groups of children (one LD and one non-LD) who did not undergo any intervention. The findings argue for the potential usefulness of behavioural interventions with children with educational learning problems. However, for the positive self-statements intervention, positive effects were evident only when combined with multisensory learning, suggesting that behavioural interventions need to be assessed for the conditions under which they will be effective versus those where they may not. An understanding of such moderating factors should improve recommendations and procedures for optimal intervention effectiveness.*

Keywords: Arabic speaking/culture students; Learning Disabilities; behavioural interventions; English spelling learning; educational moderators

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## Introduction

The research reported in this paper aimed to inform the support of Kuwaiti students with a diagnosis of a developmental learning disability (in Kuwait often reduce to LD). In Kuwait, a person is said to have a learning disability when his/her intelligence (IQ) is within the average range or above (i.e. IQ=85 or above) while at the same time they are performing below curriculum levels in school subjects of literacy and/or mathematics; this is the primary criterion of legislation in the country and, despite arguments against the use of IQ in identifying educational learning difficulties, it is consistent with many different contexts around the world (Elbeheri & Everatt, 2009). Of the potentially different types of education-based learning disabilities, developmental dyslexia (often shortened to dyslexia) has been the one that has been most researched within Kuwait. With this in mind, outcomes in literacy were the target for the current research.

Despite the emphasis on educational outcomes, learning disabilities, such as dyslexia, have also been found to be associated with a higher than expected prevalence of behavioural, emotional and/or social problems (McConaughy, Mattison & Peterson, 1994; Mckinney, 1989, Michaels & Lewandowski, 1990; Swanson & Malone, 1992). In the Kuwaiti context, relationships between negative (off-task) behaviours and education achievement have been found in mainstream populations (Everatt, Al-Sharhan, Al-Azmi, Al-Menaye & Elbeheri, 2011), and there is evidence for higher than expected incidence of dyslexia-related problems among adolescents in offender institutions (Elbeheri, Everatt & Al-Malki, 2009). Such psychosocial problems may interfere with the child's ability to fully attend to and engage in instructional activities. For example, Miles (2004) has argued that a child who does not overcome his/her difficulties with learning early in school will experience higher stress levels, causing an undermining of motivation and negative consequences in educational development. Lindquist & Vicky (1989) argued that some children with literacy learning problems might disrupt a class and become the class clown because they believe the class work is too difficult for them and so will use attention seeking to protect their self-esteem. Furthermore, Edwards (1994) suggested that the feelings of frustration and isolation caused by the individual's educational problems led to negative consequences, with individuals potentially being bullied or isolated by peers, parents and teachers. A range of findings, therefore, argue for such behavioural consequences to be an important area in which to develop appropriate support procedures, including those aimed at reducing negative behaviours – the focus of the current research. Approaches aimed at improving school and classroom environments, including reducing the negative effects of disruptive or distracting behaviours, can enhance the chances that effective teaching and learning will occur, both for the students exhibiting problem behaviours and for their classmates (Adams & Christenson, 2000; Kern, Mantegna, Vorndran, Bailin & Hilt, 2001; Lee, Sugai & Horner, 1999; Umbreit, Lane & Dejud, 2004).

The most widely used interventions to

decrease unwanted behaviour in students are medication-based or cognitive-behavioural (the MTA Cooperative Group, 1999). The focus of the present research was on the latter type given that they can be implemented by educators in learning contexts rather than by medical practitioners. Assessment of the factors influencing the effectiveness of such education-based interventions is particularly important given that medication alone has been found to have fewer long-term positive effects than educational or combined interventions. Medication also has been reported to have potential side effects (Adelman & Compas, 1977; Winterstein, Gerhard, Shuster, Johnson, Zito & Saidi, 2007) which also argue for the need to develop effective alternatives. Furthermore, previous research on cognitive-behavioural intervention methods has indicated that they can help children and older students behave positively (Baer & Nietzel, 1999). Such methods include parent training, peer tutoring and teacher interventions, as well as self-monitoring and strategy training, and psychosocial interventions (see Cobb, Sample, Alwell & Johns 2006; Hoofdakker, Veen-Mulders, Sytema, Emmelkamp, Minderra & Nauta 2007; Pelham & Fabiano 2008; Raggi & Chronis 2006).

The current research focussed on self-regulation methods that are concerned with self-management and self-monitoring. Previous research has suggested that such self-regulation methods, where the student is taught how to control certain behaviours and thoughts, has the potential to increase academic performance (Mooney, Ryan, Uhing, Reid & Epstein, 2005). For example, Barry & Messer (2003) looked at self-management (a form of self-monitoring) and its effect on the academic performance of children with ADHD. The researchers taught a sample of sixth grade boys diagnosed with ADHD, and on medication, self-management strategies, such as self-assessment and self-recording of the targeted behaviours. The self-management strategies increased academic performance and decreased unwanted behaviours. In another study by Shimabukuro, Prater, Jenkins & Edelen-Smith (1999), children were taught to self-manage by self-monitoring and self-graphing their own academic activities. Findings suggested that the students increased their academic performance, including accuracy in reading comprehension, mathematics, and writing, as well as reduced off-task behaviours. Harris, Friedlander, Saddler, Frizzelle & Graham (2005) also found that self-monitoring of attention and self-monitoring of academic performance increased on-task and spelling behaviour in children with ADHD.

Another type of self-monitoring is self-talk; in the present research, the term positive self-statements will be used to refer to the type of intervention implemented. This was targeted in the current research since it has been used previously with children with learning disabilities. For example, Kamann & Wong (1993) used a cognitive behaviour strategy with children with learning disabilities in which the researcher modelled solving a mathematical problem by thinking aloud (one type of self-talk). Children were also taught positive self-statements, such as "I am doing just fine". The researchers concluded that these procedures

improved the students' performance in the mathematical tasks. In a review of the use of cue cards to support self-regulation in students with learning disabilities, Conderman & Hedin (2011) argued that such cards can be used to assist students to learn and organize academic tasks, simplify challenging materials and support the development of independence in learning. These authors argued that such aids could enable teachers to streamline the school's curriculum, thereby making tasks and procedures easier for their students to follow.

In addition to positive effects reported in the literature, self-monitoring techniques, such as positive self-talk, have the advantage that they are relatively cost-effective and easily learnt and practised. They can also be taught (and supported) by teachers and/or parents, as there is no requirement for large numbers of rules and procedures that the student must follow. Additionally, some of these interventions can be generalized to other aspects of a student's life, potentially influencing social and emotional issues. Once learned, students can practise on their own, independent of outside assistance, especially in the case of self-talk. Such independence has the potential to promote positive outcomes for the student, fostering a sense of self-worth and self-reinforcement. The student may not have to wait for external praise from a teacher or parent, but rather comes to internalize abilities and control.

The effectiveness of such a self-monitoring method (positive self-statements) under different teaching conditions was the focus of the current work. In addition, the research aimed to contrast the positive self-statements method with an alternative behavioural intervention that has been found to reduce negative behaviours but which was different enough from the self-monitoring procedures to allow comparison. A relaxation technique was chosen for this purpose. Such relaxation methods have been used, and argued to be effective, across different contexts (Amerikaner & Summerlin, 1982; Collins, Dansereau, Garland, Holly & McDonald, 1981; Paul, Elam & Verhulst, 2007; Stuck & Gloeckner, 2005). The rationale for relaxation methods is that, particularly at certain points (such as at examination time), school life can be considered stressful – and, for the student with a learning difficulty, such stresses can be aggravated by difficulties related to their disability. Relaxation techniques are argued to reduce such stresses, and the negative behaviours associated with stress, potentially improving academic performance. For example, Omizo & Michael (1982) examined the effects of biofeedback relaxation training on a sample of hyperactive boys. During treatment sessions, the boys listened to audiotapes that emphasized relaxation and stress management, as well as the importance of self-control. In comparison to a control group that listened to audio taped stories which neither encouraged relaxation nor arousal, the relaxation training reduced impulsive behaviours and increased attention. In a study by Amerikaner & Summerlin (1982), social skills training and relaxation training were contrasted with a no treatment control condition and their effects on the self-concept and in-class behaviour of

children with learning disabilities measured. Consistent with the target of the training, students in the social skills training treatment condition scored higher than the other two groups on a social self-concept measure, whereas those in the relaxation-training group demonstrated reduced excitable behaviour and distractibility. Given the focus of the current work, and their difference in activity compared to positive self-statements, such relaxation techniques seem an ideal contrast against which to compare self-monitoring procedures.

The current study considered the effectiveness of self-monitoring procedures in combination with several teaching methods. The research was part of work investigating ways to support the learning of LD students in Kuwait. Hence, the behavioural interventions were combined with a multisensory learning strategy often used with children with education-related learning difficulties. This strategy was based on simultaneous oral spelling, and the teaching of English words was the chosen skill for intervention. Word spelling was chosen as it is an area with which many students with developmental learning difficulties (particularly dyslexia) have problems – and targeting English with the young Arabic children in the research meant that this would provide a large number of relatively unfamiliar words for teaching. This more targeted teaching strategy was contrasted with a more rote-learning procedure that simply expected students to copy spellings. The number of times that words were copied was matched with the number of processes in the multisensory learning procedures to enable a contrast between the two methods. Such rote-learning procedures were chosen because they were considered more typical of the mainstream teaching methods that students would experience in their mainstream Kuwaiti schools. Teaching practices in Kuwait often focus more on simple rote-learning and memorization. Indeed, primary school practices, typically, are more based on getting through the curriculum rather than delivering the lesson or involving the students, leading to students' learning differences rarely been taken into consideration. In order to assess the impact of the behavioural interventions when combined with these typical mainstream teaching methods, a group of children in a Kuwaiti government mainstream school was also include in the research.

## Method

### Participants

Children with identified learning disabilities from a special school in Kuwait comprised the first cohort of participants. To be attending this special school, children had been assessed as having a learning disability by trained psychologists based on evidence of problems in literacy or mathematics, but an IQ equal to or over 85. Children in the special school followed the normal Kuwaiti Ministry of Education curriculum but in classes of typically no more than six students and individualised tutorials with teachers trained to support children with education-related learning difficulties. Students at the school were from generally middle class

socioeconomic backgrounds and were aged between 7 to 15 years. Although the school supported both boys and girls, there were two to three times as many boys than girls. The samples for the current research reflected these special school population characteristics.

Children for the present study were selected following parental consent for their child to participate in the study and the agreement of the students themselves. Selection ensured that all participating children were Kuwaiti, spoke Arabic as a first language and were learning English as a foreign language. Students for the intervention work were then selected based on scores on the parent version of the Attention Hyperactivity Questionnaire in Arabic (Al-Sharhan, 2012). This scale provided an indication of attention or behavioural problems that the target behavioural intervention aimed to reduce. Children were selected if they had a score of 12 or more on the scale; in normative data, less than 7% of the Kuwait mainstream population were given a score of 6 or more on the attention scale and less than 17% were given a score of 6 or more on the hyperactivity scale (as reported in Al-Sharhan, 2012). Children were assigned to intervention groups and an additional group producing baseline improvement data. The latter group of children simply experienced their normal special school teaching methods with no behavioural intervention. They comprised 37 children who were tested on their English spelling at the start and end of the intervention period so that a baseline of improvement produced by the special school methods could be determined for comparison with any improvements obtained under the intervention conditions. Intervention groups comprised those undergoing the positive self-statements or the relaxation technique behavioural interventions coupled either with multisensory learning or with copying. One group of students were taught English spellings through the recognised literacy intervention method (multisensory learning) combined with one of the behavioural interventions (the positive self-statements or the relaxation technique): ten of these multisensory learning taught students experienced the positive self-statements and nine the relaxation technique. Another group underwent the same behavioural interventions but simply practiced English spellings by copying: nine experienced the positive self-statements and nine the relaxation technique – although the latter groups reduced to five and eight respectively by the end of the period of intervention (this rate of attrition is considered in the discussion of this paper). All students were tested on their English spelling levels pre- and post-intervention, or for the baseline group, over the same period as the interventions.

The non-LD students in the study were all Kuwaiti male students (note that Kuwaiti schools are segregated by sex of child) in the fifth grade of a mainstream government run school. Most of the students came from middle class socio-economic backgrounds. These students had Arabic as a first language with English learnt as a foreign language. The particular school included in this study was an opportunity sample based on contacts of the researchers, but was

selected as it comprised student from a similar background to the special school cohort – and a boys school was used as most of the LD students were male. Another factor in using this school was that the school principal was interested in the work and, therefore, supported the process of conducting the research by ensuring that staff and students were available as much as was possible given the timing of the research: the study was undertaken near to the end of the school year, which led to time pressures from end-of-year exams and the need to finish the Ministry of Education curriculum, factors that would be expected to increase the potential for stress-related negative behaviours which were the target of the present work. Fifth grade classes were chosen for intervention since they comprised a transition period between primary and middle school, potentially leading to increased pressure on children that may manifest through negative behaviour – the period leading up to the end of the primary school years (grades 4 and 5) has often been considered in Kuwait as the point where students show evidence of falling behind in their education and is often the point when processes targeted at detecting an education-based learning disability would be implemented. Dependent on the class that they were in, students were assigned to two different interventions, one involving positive self-statements and one the relaxation technique. An independent baseline group was also used to assess expected levels of improvement without intervention. All these students experienced normal English literacy teaching methods used in Kuwaiti mainstream schools. Class sizes in the school where the research took place were slightly smaller than normally reported for a Kuwaiti school (which are typically 18 to 25 students or more); however, it is not unusual for students to miss classes at the end of the school year and this tendency meant that the numbers of children in each class varied over the course of the study. Therefore, only those for whom data were available at the start and finish of the study were included in the present data analyses. This meant that there were 18 students in the positive self-statements class and 15 students in the relaxation technique group, and that baseline data were obtained from 23 students. Participation in the research was conditional on parental consent and the agreement of the students themselves. All students were tested on their spelling levels pre- and post-intervention, or for the baseline group, over the same period as the interventions.

**Materials**

All students underwent a spelling task comprising English words during the first and last session of the study – or an equivalent period of time for the baseline groups. Words were selected from the Ministry of Education's English curriculum: at the end of each chapter of the curriculum text there are a number of words (i.e., vocabulary) that all students need to learn for that chapter. Words were selected from these end-of-chapter lists to match each student's grade level. The words were read out to the students allowing enough time for the students to write the word. Students were asked to write clearly. Repetitions of words were

allowed and only the pace of pronunciation determined the timing of the task, which lasted only about 5 minutes and the number of words spelt correctly was the measure. The same lists of words (20 for the LD children and 30 for the non-LD children to allow for potential differential improvements over time) were used for pre and post testing.

**Intervention/teaching strategies**

**Positive self-statements**

Students learnt a set of positive self-statements aimed at boosting self-esteem and self regulation of thoughts, feelings and behaviour at the beginning of each teaching session. Statements were introduced by their teacher and comprised 15 positive self-statements printed on cards with pictures that could be associated with that statement. Teachers were trained to help the students verbalize the statements as well as discuss what the statements mean and give examples for some of the statements when possible. This occurred at the beginning of each class, with 5-7 minutes in total being used for this procedure. The intervention was not aimed directly at changing the behaviour, rather to change students' way of thinking about themselves and their abilities. Hence, some cards contained a positive message about the students' concentration and/or attention, whereas other dealt with the students' own feelings towards themselves: for example, "I can solve spelling and other problems when I am calm", "I am capable of spelling many words", "I can stay in my seat for 15 minutes", "I am worthy and capable". Principles for creating these positive self-statements materials were based on ideas of developing affirmations by Bloch (2003) and recommendations of Conderman & Hedin (2011).

**Relaxation technique**

Students were taught to concentrate on breathing from their diaphragm at the beginning of each teaching session. They were asked to put one hand on their chest and the other on their stomach and to concentrate on making the hand on the stomach rise higher than the one on their chests when they inhale and lower when they exhaled. For the relaxation part of the intervention, the students were asked to focus their attention on certain parts of the body (particularly their head, neck, shoulder, arms, hands, stomach, back, legs, and lastly their feet). They were asked to notice whether those parts were tense and to try to relax them by paying attention to each part. If the students did not understand the meaning of tense, they were asked to squeeze their hands and then to let go and relax to demonstrate the meaning of tense versus relaxed. The whole intervention took about 5-7 minutes of the beginning of each session. (These methods were similar to the relaxation methods used by Murdoch, 1987.)

**Multisensory learning**

For the LD-specific educational intervention, a multisensory method of learning how to spell was used (based on Simultaneous Oral Spelling by Broomfield, 2004). Students were given words from the Ministry of Education

English curriculum on 12 sheets. There were five words per sheet making 60 words in total. During the sessions, the students were asked to learn as many words as they could by going through the sheet. On each sheet, each word was to be seen (look), pronounced (say), spelt (name), and traced twice (trace); the student then was required to hide the word and to spell it (write), after which they were to check whether the spelling was correct (check). If the spelling was wrong, they repeated the exercise.

**Copying**

In this condition, students were given several sheets with five words on each sheet. As in the previous condition, a total of 60 words was used. The students were asked to copy each word seven times. This was to match with the seven steps in the multisensory learning condition.

**Procedures**

**Baseline**

The students in the baseline group were chosen from the same special school or mainstream school as the intervention children. They were given the same spelling tests as the intervention groups, with tests being given three weeks apart. During the three-week period between the spelling tests, they had normal classes taught by their usual teachers and nothing else.

**Special school intervention conditions**

The students in the LD intervention groups spent the first 5 to 7 minutes of each session going through either the positive self-statements or the body relaxation technique with the teacher. After this behavioural intervention, the student then practiced English spellings using either the multisensory learning or the copying procedures for about 15 minutes.

**Mainstream intervention conditions**

The mainstream students spent the first 5 to 7 minutes of their lesson going through either the positive self-statements or the body relaxation technique with the teacher. This was followed by a normal 30 minute lesson that focussed on English language, of which at least half covered spelling English.

**Results**

For each participant, the number of correct spellings was calculated for the pre and post intervention measures; averages per group, with standard deviations, can be found in table 1 and figure 1.

For both cohorts of participants, two-way analyses of variance were performed to investigate any evidence for a differential effect of intervention on spelling improvements: with a between subjects factor of teaching method (the groups in the positive self-statements and relaxation technique interventions versus baseline for the non-LD groups; the groups in the four intervention combinations versus baseline for the LD groups) and a repeated measures factor of pre versus post intervention period

Table 1. Average number of English words spelt correctly (with standard deviations in brackets) for each intervention combination and the baseline for LD and non-LD students

| | Pre-scores | | Post-scores | |
|---|---|---|---|---|
| | Positive Self-statements | Relaxation Techniques | Positive Self-Statements | Relaxation Techniques |
| LD Multisensory learning | 1.40 (1.26) | 3.56 (2.46) | 4.85 (2.39) | 9.17 (4.89) |
| LD Copying | 1.60 (1.51) | 2.63 (2.39) | 2.20 (3.01) | 7.00 (2.56) |
| Non LD Mainstream teaching | 6.50 (5.40) | 8.47 (6.99) | 7.33 (6.81) | 13.53 (7.61) |
| LD Baseline | 3.68 (2.46) | | 4.95 (3.33) | |
| Non LD Baseline | 7.09 (5.38) | | 9.48 (6.79) | |

spelling score. For both the LD and non-LD students, the interaction between intervention methods and repeated measures spelling scores were significant (for the non-LD groups, $F(2,53) = 5.88$, $p < .01$; for the LD groups, $F(4,64) = 7.84$, $p < .01$). There were also significant main effects of the repeated measures factor in both analyses (for the non-LD groups, $F(1,53) = 32.87$, $p < .01$; for the LD groups, $F(1,64) = 65.83$, $p < .01$), which were further analysed using paired t-tests that indicated significant improvements in all LD and non-LD groups except for the positive self-statement non-LD group and the combined positive self-statement and copying LD group (Non-LD baseline, $t(22) = 3.43$, $p < .01$; Non-LD positive self-statements, $t(17) = 1.14$, $p = .27$; Non-LD relaxation technique, $t(14) = 4.56$, $p < .01$; LD baseline $t(36) = 4.02$, $p < .01$; LD positive self-statements + multisensory learning, $t(9) = 5.11$, $p < .01$; LD positive self-statements + copying, $t(4) = 0.70$, $p = .52$; LD relaxation technique + multisensory learning, $t(8) = 4.44$, $p < .01$; LD relaxation technique + copying, $t(7) = 3.12$, $p = .02$).

To investigate specific improvements provided by the interventions in contrast to expected baseline improvements, differences between pre and post scores were calculated for each group of children and one-way analyses of variance were performed, one comparing each non-LD group and a second each LD group. A significant analysis of variance was followed by Dunnett post-hoc comparisons comparing each intervention method against baseline. Results indicated significant analyses of variance for both groups (non-LD, $F(2, 53) = 5.88$, $p < .01$; LD, $F(4, 64) = 7.40$, $p < .01$). Dunnett's post-hoc

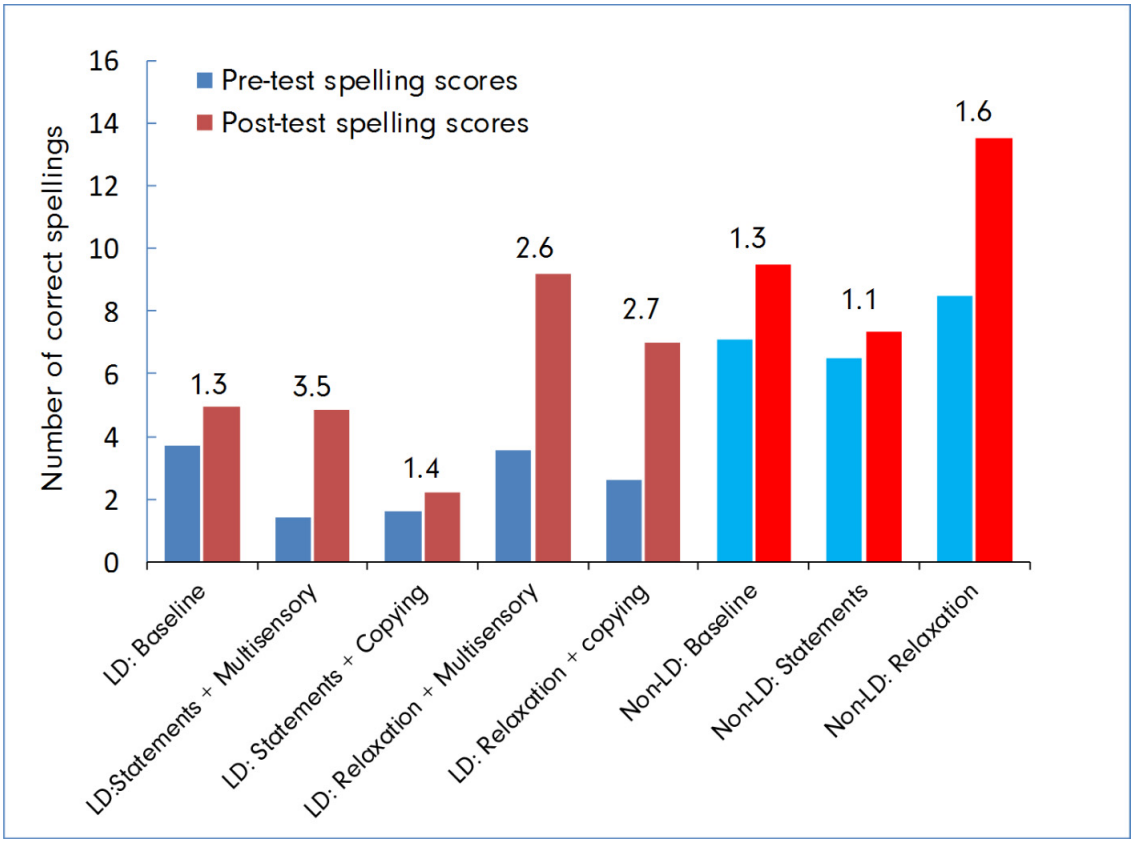


*Figure 1. Pre (blue) and post (red) test scores in English spelling across the intervention and baseline conditions*

*Note: non-LD groups are on the right of the graph with slightly brighter colours; figures above bars are post scores divided by pre scores, which indicate proportional increase, whereas differences between red and blue bars in vertical axis values indicate the number of extra spelling learnt over the intervention period*

comparisons of the non-LD data indicated significant effects for the relaxation technique compared to baseline ($p$=.03, one-tailed), but not for positive self-statements compared to baseline. The same comparisons against baseline for the LD intervention combinations indicate significant effects for positive self-statements plus multisensory learning ($p$<.05, one-tailed), the relaxation technique plus positive self-statements ($p$<.01, one-tailed), and the relaxation technique plus copying ($p$<.01, one-tailed), but not for the positive self-statements plus copying combination.

## Discussion

The findings indicated that there were significant improvements in spelling scores found in most intervention

conditions compared to baseline. Specifically, there were significant improvements in spelling under the relaxation techniques, whether combined with multisensory learning, copying or mainstream teaching compared to baseline. In addition, compared to baseline, there were improvements in spelling scores in the positive self-statements condition but only when it was coupled with a multisensory method of learning. These improvements argue that targeting behavioural problems will improve educational achievement, but that some types of behavioural intervention may have to be combined with an appropriate educational method. For the positive self-statements intervention, improvements were evident only with one of the teaching conditions included in the study. Simple rote learning, be it copying or in general oral teaching of class material, may not be effectively combined with a behavioural intervention technique that focuses on internalising outcome: indeed, when these self-focused methods were combined with more rote learning methods (i.e., mainstream teaching methods and the copying method used with the special school students), changes in the targeted outcome were potentially worse than under conditions of no intervention at all. However, when combined with multisensory learning, the positive self-statements intervention showed reasonable gains in spelling, which were proportionally as good, if not better, than those found in the relaxation technique condition: i.e., post intervention spelling scores were just less than three times those of pre-intervention scores for the relaxation technique LD groups, but more than three times for the LD children who experienced multisensory learning and positive self-statements (see values in figure 1). These findings suggest that behavioural interventions, such as those training self-monitoring, need to be combined with appropriate educational methods (we will return to a discussion of this point below).

The effects identified with the multisensory learning technique are worthy of further consideration and additional research. Multisensory learning has been used for many years in schools across numerous countries (primarily in the USA and UK). However, despite its popularity among practitioners, there are relatively few research studies that have confirmed its usefulness as an educational intervention (see discussion of this point in Joshi, Dahlgren & Boulware-Gooden, 2002; though see also the work of Chia & Houghton, 2011, in Singapore, Guyer & Sabatino, 1989, with adult students in the USA, and Oakland, Black, Stanford, Nussbaum & Balise, 1998, with children in the USA). The current data do argue for the effectiveness of multisensory learning when combined with behavioural interventions, at least in terms of increases in spelling performance. Furthermore, the dropout levels evident in the copying condition could be construed as the students with learning difficulties feeling uninterested or bored, in contrast to the multisensory learning condition in which all students continued to the end of the intervention period. Therefore, one interpretation of the effectiveness of the multisensory learning condition is that it engaged

these students despite the need to produce the same spelling repeatedly.

Also noteworthy were the effects identified with the relaxation technique. This had a positive effect on spelling scores with both cohorts of students. One interpretation of these effects is that relaxation achieves a reduction in stress levels (Beauchemin, Hutchins & Patterson, 2008; Paul et al., 2007), which may be particularly high in students with literacy-related learning problems when faced with spelling tasks and also with mainstream students around examination times. Such relaxation techniques may have led to the students feeling calmer than usual allowing them to concentrate on learning; consistent with those studies that have found that breathing and relaxation techniques can aid concentration, improving both memory and on-task behaviour (Amerikaner & Summerlin, 1982). Also, relaxation techniques can work to lower anxiety levels (Malinski & Todaro-Franceschi, 2011; Paul et al., 2007) which may have been experienced in tests of spelling – and reducing test anxiety has been seen as positive for both LD and non-LD children (see Russel & Sipich, 1974). Whether these techniques show similar levels of effectiveness when stress/anxiety is low may be a further area for future research. The present findings, though, do indicate that targeted relaxation also has the potential to support learning in children under specific learning conditions. There is also evidence that they may be effectively applied in combination with self-monitoring methods. A study by Collins et al. (1981) looked at the effects of self-initiated relaxation, positive self-talk, and a combination of the relaxation technique and positive self-talk. The results showed that the students in the combined strategy performed better than the control group in measures of reading comprehension and retention. Hence, a combination of self-monitoring and relaxation training (which might also form part of the self-monitoring methods) may provide further insights for intervention development.

The general conclusion, therefore, from the work reported in this paper is that behavioural interventions can be effective when applied appropriately, at least in certain educational contexts or circumstances. Further work is clearly necessary to determine the conditions for effectiveness and develop theories that will allow predictions of when such methods will be useful and when they may not. The evidence of the current research suggests that self-monitoring methods, such as positive self-statements, may need to be combined with educational methods that are successful and/or engaging. When such self-monitoring methods are paired with teaching methods that seem to be less engaging, improvements in achievement may not be evident. Note that copying and mainstream teaching methods can be paired successfully with a behavioural intervention (in this case, the relaxation technique), at least in the learning contexts of the present work; rather the data indicate a specific detrimental influence on the positive self-statements method. One interpretation of the specific effects of self-monitoring is that the positive self-statements method may require positive experiences to lead to positive internalisation. For many

children with developmental learning difficulties, educational achievement has probably been seen as external to their own control – no matter how hard they try, they still fail. Externalising control may have the advantage of protecting self-esteem, but the disadvantage of leading to feelings akin to learnt helplessness. Consistent with this, in a study of the relationship between self-esteem and educational achievement among Kuwaiti mainstream children, Al-Azmi (2010) found that poor scores on measures of educational achievement (particularly spelling) were associated with low self-esteem, but that this relationship was influenced by scores on a locus of control scale; i.e., the child's view on whether they had control over events related to them, which may of course include their achievement in literacy. Those with high external locus of control did not show this relationship between self-esteem and educational achievement.

The effectiveness of a psychological-based intervention is that it changes the child's view, leading to achievement being perceived as an attribute of the self. This would be associated with internalizing locus of control and, hence, improvements in self-esteem through positive experiences and achievement. However, if experiences are negative, as in tasks that are seen as boring and not engaging, or where gains in achievement are short-lived or perceived as external to the individual, then there is likely to be little effect on self-concept. Such an interpretation may also explain contradictory findings in the literature about the benefits derived from counselling interventions related to changes in self-esteem: some have found positive effects (Omizo & Omizo, 1988; Ozimo, Ozimo & D'Andrea, 1992), whereas others have not (Stafford & Hill, 1989). A prolonged period of positive achievement and engagement, combined with counselling that leads to a more internal locus of control, should lead to improvements in self-concept. This viewpoint argues for the need to implement counselling-based strategies along-side educational interventions that are likely to be engaging and show gains in achievement. If gains in achievement are short-lived or perceived as external to the individual, there will be little effect on self-belief or on the child's view that they have some control over their educational achievement. Under such circumstances, psychological -based strategies, such as positive self-statements, probably will not be effective optimally.

Although further research is needed, the improvements identified give cause for optimism regarding such combined behavioural/educational interventions (see also findings in Everatt et al., 2011). The methods used were for a relatively short period (only three weeks) and further gains may have been apparent if a longer period of training and support had been available. This may be the case particularly for positive self-statements intervention, where a longer period of training might be needed to ensure that the strategies associated with this technique are fully understood and appropriately used by the student. Such techniques may also require a certain level of maturity from the child to be able to implement strategies that require control over thoughts and

behaviours – though the evidence that these were effective in both cohorts from late primary years (from about age 10 onwards) suggests that they can be used effectively with fairly young children, but further research should help identify potential critical periods for the effectiveness of these methods. Finally, further research considering strategies that build on strengths of the individual with a learning difficulty may be worthwhile. Many children with LD show abilities in certain areas while showing weaknesses in others, and some research has shown positive effects on educational achievement when using these abilities, particularly in older children, in contrasts to attempts to remediate areas of weakness (see Weeks, Brooks & Everatt, 2002). If a focus upon the child's strengths increases achievement for some period of time, then targeting locus of control together with self-management counselling strategies should lead to the achievements being internalized. This will lead to an increased likelihood of self-esteem improvements, and a reduction in learned helplessness that should increase motivation to learn, even if literacy-based interventions shift to a focus on areas of relative weakness. Clearly, further research is necessary, but this strategic combined approach may prove useful particularly for older children who have experienced a prolonged period of failure during their education and it may provide one way of counteracting the reduction in success found for current intervention programmes as the child grows older.

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# The use of ubiquitous bottle caps as concrete aids to learn to read and spell for struggling readers

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*Abstract*

*Humans were never born to read (Wolf, 2008), and yet the ability to read has become a critical skill to lead a functional life in the modern society. Children with dyslexia and other learning disabilities often struggle to learn to read due to the differences in brain neurology or function (Shaywitz, 2005). There have been various evidences that children with learning difficulties learn best through multisensory activities (Logsdon, 2014).*

*This paper describes the use of ubiquitous bottle caps as concrete learning aids to read and spell CVC (C – consonant, V – vowel) words in English by struggling readers attending remedial education in their primary schools. The project took place during a summer camp, in Malaysia and progress was followed up 2 months after the camp had finished. Significant improvements were found and these improvements were maintained after the intervention finished. The impact of the use of this learning tool in a literacy camp with 13 struggling readers will be discussed.*

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**Introduction**

Humans were never born to read (Wolf, 2008), and yet the ability to read has become a critical skill to lead a functional life in the modern society. The UNESCO-led 'Education for All' movement, launched in 1990, is a global commitment (including by Malaysia) to provide quality basic education for all children, youth and adults (UNESCO, 2014). All children, regardless of who they are, where they come from, where they live and whether they have or have no disabilities, have a right to quality education that provides them with literacy and/or vocational skills so as to be skilled or professional human capital in the future.

In Malaysia, the issue of students who dropped out of school due to various reasons including economic factors, home background, teacher factors or poor literacy and numeracy skills has existed since the early formulation of the Malaysian education system and became more critical in the 1960's (Murad, 1972). Between 1956 to 1970, more than 40% of primary school students dropped out without joining any secondary schools (UNESCO, 1973). The National Education Blueprint 2006-2010 (MOE Malaysia, 2006, p. 28) reports that for the 1999-2004 cohort of primary school students, drop-out rates were 1.9% for urban and 1.2% for rural schools. Among secondary students of the 2000-2004 cohort, 9.3% in urban and 16.7% in rural schools have dropped out without completion of their secondary school education. Recently, the National Education Blueprint 2013-2020 reports that out of 509,329 students in Primary 1 in 2000, 8% of them (40,747 students) did not complete Form 5 secondary education. A total of 142,612 of this cohort failed at least one core subject (Bahasa Malaysia, English, Mathematics, Science, History, Moral/Islamic Education) in the Form 5 national examination, thus failing to achieve the minimum academic standard. Similar trends were observed in the earlier cohort of Primary 1 students in 1999 (MOE Malaysia, 2013).

Initial difficulties in learning to read and write can condemn a child to failure in school and possible early abandonment of education. The Cabinet Committee then declared for primary education to emphasise on mastering the basic skills of reading, 'riting, and 'rithmetic (3Rs) (Cabinet Report, 1979). The National Education Blueprint 2006-2010 (MOE Malaysia, 2006) states that in the year 2004, there were more than 115,000 students (7.7%) in Primary 1-3 who had not mastered the basic 3R's – reading, writing and arithmetic. For the year 2005, 4.4% of primary school students had not acquired these basic literacy skills. Later research reports that 80,000 primary school children had problems in the acquisition of basic skills, which include reading (Rahil & Habibah, 2008). A study undertaken in conjunction with the Educational mandate called National Key Result Area (NKRA) found that as many as 14% (54,000) Primary 1 students had not mastered the 2R's skills of reading and writing (Norliza Zakuan, 2010). Many of these students remained unable to read, write and do mathematics when they entered Primary 4. This data also showed that students who had not acquired these basic literacy skills contributed to an increase in dropout rate from school besides increasing cases of indiscipline. Children with learning difficulties seem to

have their primary difficulties rooted in learning to read. Lyon (1996) estimated this percentage to be as much as 80%.

As many students still do not master these skills, the Ministry of Education (MOE) Malaysia introduced the Early Intervention Reading and Writing Class (KIA2M) program in 2006 that identifies children with reading and writing difficulties in the first year of primary education and provides them with additional intensive tutoring by teachers trained in special education. In 2010, through the NKRA Educational mandate, the MOE implemented the Literacy and Numeracy Screening (LINUS) program that aims to ensure that each student will master the basic skills after the first three years of primary education (Norliza Zakuan, 2010).

Children with dyslexia and other learning disabilities often struggle to learn to read due to the differences in brain neurology or function (Shaywitz, 2005). As these children have a right to quality education that will enable them to read and write, it is essential that appropriate and effective methods are used by teachers in cognizance of their learning styles and capabilities that are different from other typical children. Anecdotal evidence from observations of remedial classes in schools and conversations with both teachers and parents show that many teachers employ the same methods to teach children with learning disabilities as with their other typical students, albeit in smaller groups and higher intensity. Needless to say, as such methods have not worked for learning-disabled students while they were in mainstream classes, surely they will not work even when they are in smaller remedial classes. Instead, the ineffectiveness of these methods compounds the feelings of failure and frustration among these children.

**Use of a physical and manipulative tool as aid to learn to read**

There has been a range of evidence indicating that children with learning difficulties learn best through multisensory activities (Logsdon, 2014). The use of caps of mineral and drinking water bottles as a physical aid might be effective for many children with dyslexia and other learning disabilities as they allow easy and convenient manipulation to sequence letters, form or segment syllables, construct words and practice activities on word building, phonemic segmentation and auditory processing. In addition, they are very easily available in various colours, at no cost and are very light and easily packed to be carried by the children and easily kept in the classroom.

A permanent red marker pen is used to write the letters in small caps on the tops of the bottle caps. While light-colored bottle caps (for example, light blue or green) are used for the vowels *a, e, i, o, u*, white-colored caps are used for the consonants (the reason being that white caps are more easily obtained).

**Structure of syllabus for reading instruction using the bottle caps**

Step 1: The first session commenced with the cap arrangement into the alphabet series using the modified ABC song – *abcd efg hij klm nop qrs tuv wxyz* – with shorter segments and where *m* and *n* are separated into different segments.

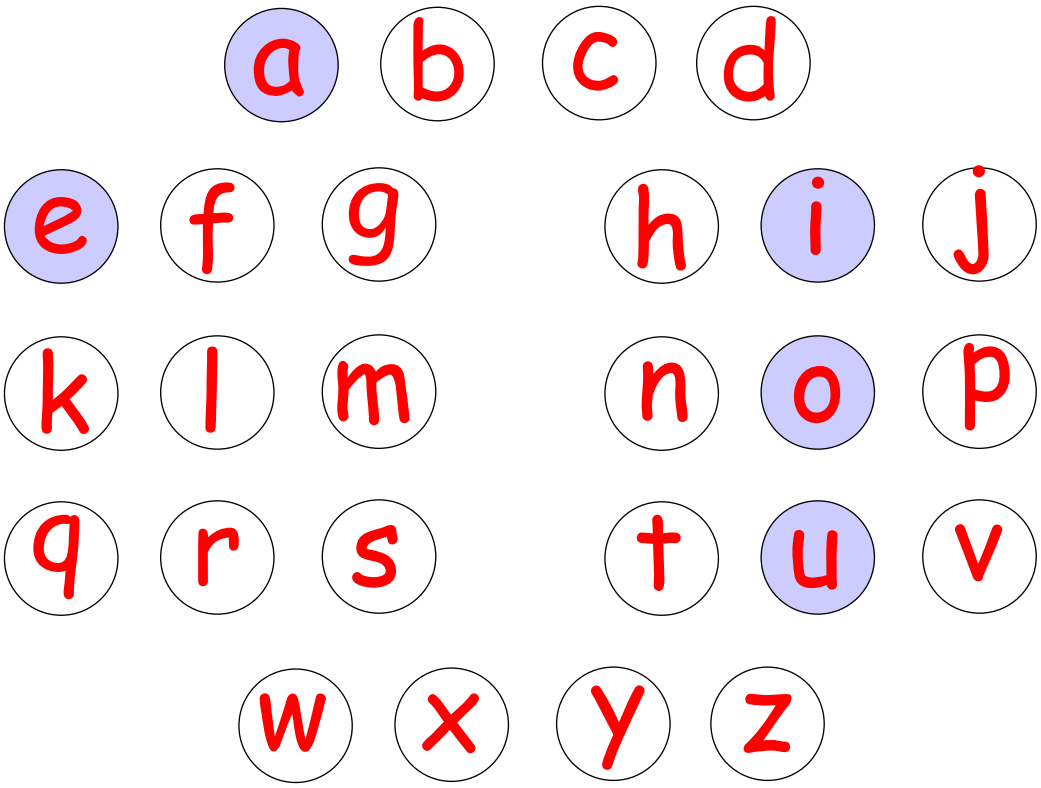


*Figure 1. Bottle cap arrangement for step 1*

Compare this with the regular ABC song, taught right from kindergarten –

*abcdefg hijklmnop qrstu and v wxyz*. There is a definite tendency for students, especially for those with learning disabilities, to 'drop' one of the pairs of similar-sounding letters like *j* or *k*, *m* or *n,* or to forget parts of the lengthy segments or think that the 'and' in the song is for another letter. The repeated singing of the ABC song attempts to commit to sheer memorization of the alphabet series and this will be successful for typical children. However for children with dyslexia who have difficulties in working memory, this method might not be effective. The arrangement of bottle caps while singing the modified ABC song brings together tactile, visual and auditory components for meaningful memorization. In addition, children with dyslexia are often confused with directionality of letters of similar shapes like *b-d-p-q, m-w, m-n* and *u-n*. Use of bottle caps allows them to turn or rotate the caps while trying to figure them out.

Step 2: Upon mastery of the alphabet series, the sounds for the first set of 10 letters, *a b c f h m p r s t*, are introduced. Caps of letters outside this set are kept aside.

Step 3: After mastery of these letter sounds in Set 1, blending of CV is introduced. Students practiced forming and reading the CV syllables, where V is a, with the caps. The syllables are *ba, ca, fa, ha, ma, pa, ra, sa* and *ta.* Set 1 of four sight words - *and, the, on, is* – is introduced using flash cards.

Step 4: After mastery of these syllables, CVC word building with Set 1 letters is then introduced, where words such as *bat, cat, fat, hat, mat, pat, rat, sat, tap, tab, tac, fab, ham, has* can be formed. Phonemic segmentation and auditory processing activities are done with these words to increase understanding and mastery. Examples include:

a. Form *cat*. What do you do to change *cat* to *hat*? Student changes cap *c* with cap *h*.
b. Now, change *hat* to *ha*s. The cap *t* is removed and replaced with cap *s*.

Set 2 of four sight words - a, this, has, it – is introduced using flash cards. Short sentences are then introduced. Some examples include:

*The cat is fat.*
*The cat sat on the mat.*
*The cat and the rat sat on the mat.*
*This is a hat. It is on Pat.*

Step 5: After mastery of Set 1 letters and Sets 1-2 sight words, the letter sound for vowel o is then introduced as Set 2. The combination of 11 letters in Sets 1 and 2 forms new CVC words like *hot, pot, cot, tom, etc.* Phonemic segmentation and auditory processing activities are done using the bottle caps together with reading and spelling activities. Set 3 of three sight words - *have, I, you* – is introduced. Examples of short sentences introduced are:

*This is a pot. It is hot. This is a cot.*
*I have a mop.*
*You have a hot pot.*
*This is a tap.*

Step 6: After mastery of CVC words from Sets 1-2 letters and Sets 1-3 sight words, letter sounds of Set 3 - *i u d g j* - are introduced. Examples of new CVC words from the combination of 16 letters in Sets 1-3 include *bug, bun, dig, wig, cup, sit.* Again, bottle caps are used in the phonemic segmentation and auditory processing activities for these CVC words. Set 4 sight words - *play, with, we* – is introduced, together with the following examples of short sentences:

*A bug. This is a big bug.*
*I play with big bug.*
*We have a cup.*
*Big bug sat on jug.*

Step 7: Upon mastery of CVC words in both reading and spelling from Sets 1-3 letters and Sets 1-4 sight words, the letter sounds of the final Set 4 is introduced - *d e k l n v w z*. New words include *dug, dig, Ken, lot, wet, nut, etc*. Set 5 sight words - *at, look, me, come* – are introduced using flash cards, together with the following short sentences:

*Big Ben plays with a hat.*
*You and I play with the cat.*
*Look! The hat is wet. The mat is wet.*
*Come and play with the bug. It is fun.*

Appendix 1 shows the use of the bottle

caps and Appendix 2 displays the syllabus of the above reading instruction program.

**Results**

The above syllabus was employed in a 6-day literacy camp for 13 struggling readers from six different primary schools. The students were named as A to M and were average age 9 years. Students E and F were females while the rest were males, giving a male: female ratio of struggling readers in the camp as 11:2 or approximately 5:1. The bottle caps were used as manipulative tools in a highly structured and cumulative manner. The students' reading ability was tested in a pre-test, progressive test, post-test (at the end of the camp) and a re-assessment two months after the camp.

Figure 2 shows the number of sight words read correctly in one minute in the four tests. In all the students except E, the number of sight words read correctly increased at different incremental rates from pre-test to progressive test and to post-test. For the re-assessment after two months of the camp, the number of sight words read correctly increased or remained constant from that of the post-test for eight of the 13 students (≈ 62%). For the five students who showed a reduction from post-test to re-assessment, the number of sight words read correctly during the re-assessment is still higher than that of the pre-test for each child. Student K started out without being able to read a single sight word in the pre-test, but after the reading program, he showed a steady increase from the progressive test onwards.

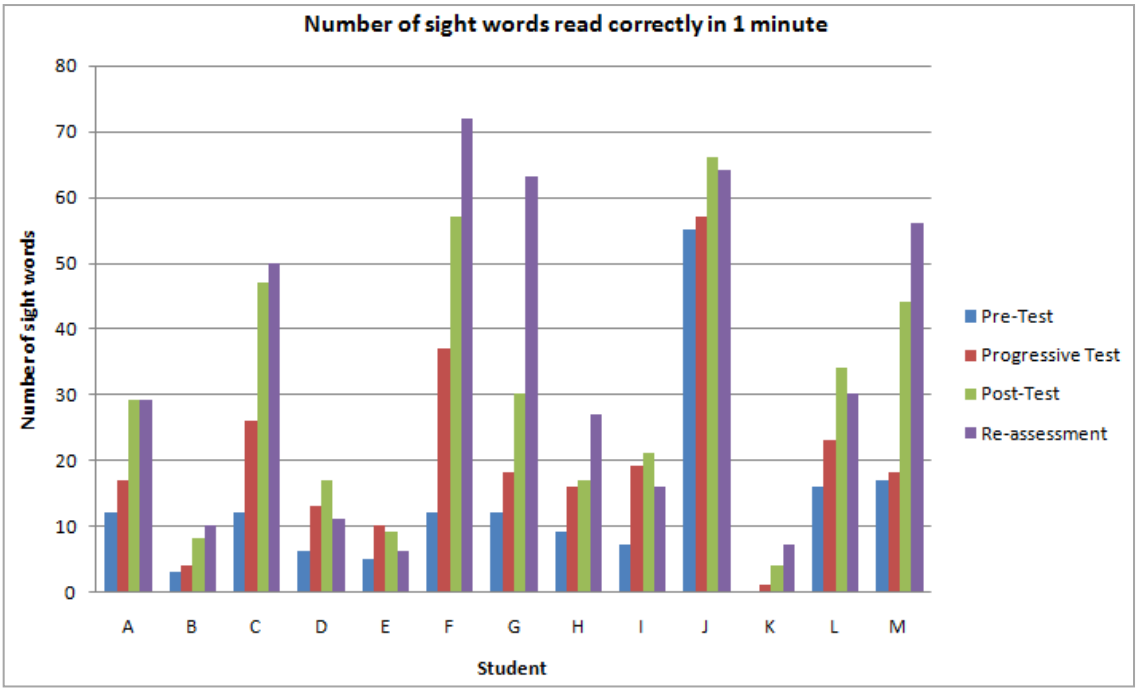


*Figure 2 Number of sight words read correctly*

A Wilcoxon Paired Signed-Rank Test showed that the increases in the number of sight words read correctly in one minute was significant between the post- and pre-tests ($Z = -3.183$, $p<0.05$) and re-assessment after two months and pre-test ($Z = -3.071$, $p<0.05$).

Figure 3 shows the percent increase in the number of sight words read correctly in one minute during the re-assessment conducted two months after the camp with that from the pre-test. While all students registered increase, dramatic increase of 100% and more was shown by nine of the students (≈69%).

Figure 4 shows the number of CVC words read correctly in one minute in the four tests. With the exception of C, E and K, the rest of the ten students exhibited increased or maintained constant the number of CVC words read correctly from pre-test to progressive and post-tests (≈77%). For the re-assessment after two months of the camp, learning seemed generally stable – four students showed increments in the number of CVC words read correctly while the others showed a slight decrease. With the exception of K, the scores at the end of two months for the rest of the students were higher than that obtained from the post-test.

A Wilcoxon Paired Signed-Rank Test in SPSS showed that the increases in the number of CVC words read correctly in one minute are significant between the post- and pre-tests ($Z = -3.115$, $p<0.05$) and re-assessment after two months and pre-test ($Z = -3.062$, $p<0.05$).

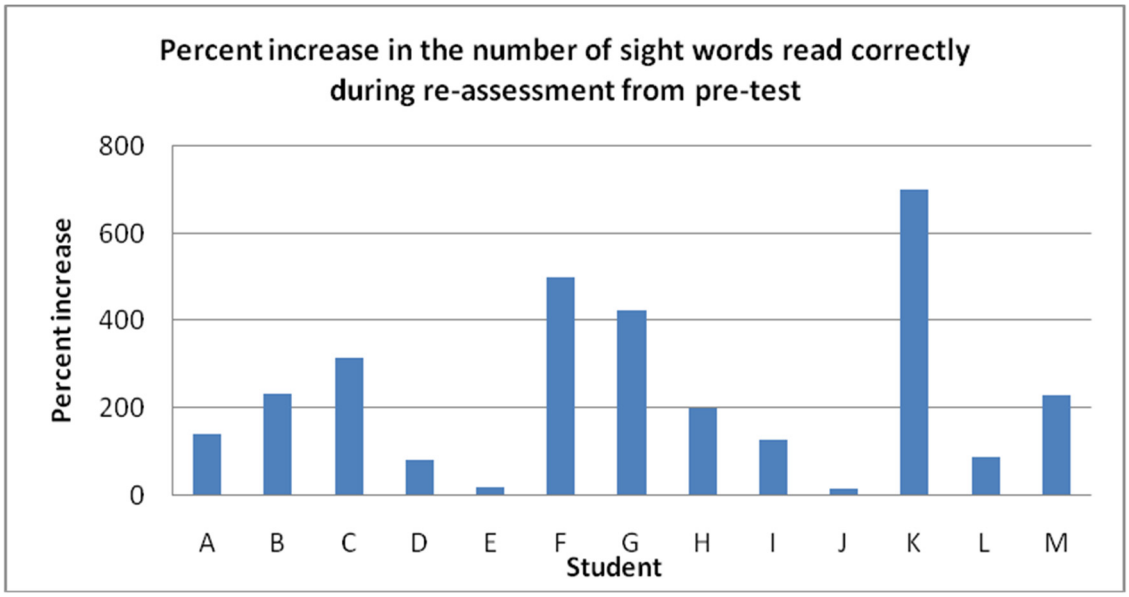


*Figure 3 Percent increase in the number of sight words read correctly from pre-test to re-assessment (done two months after the camp)*

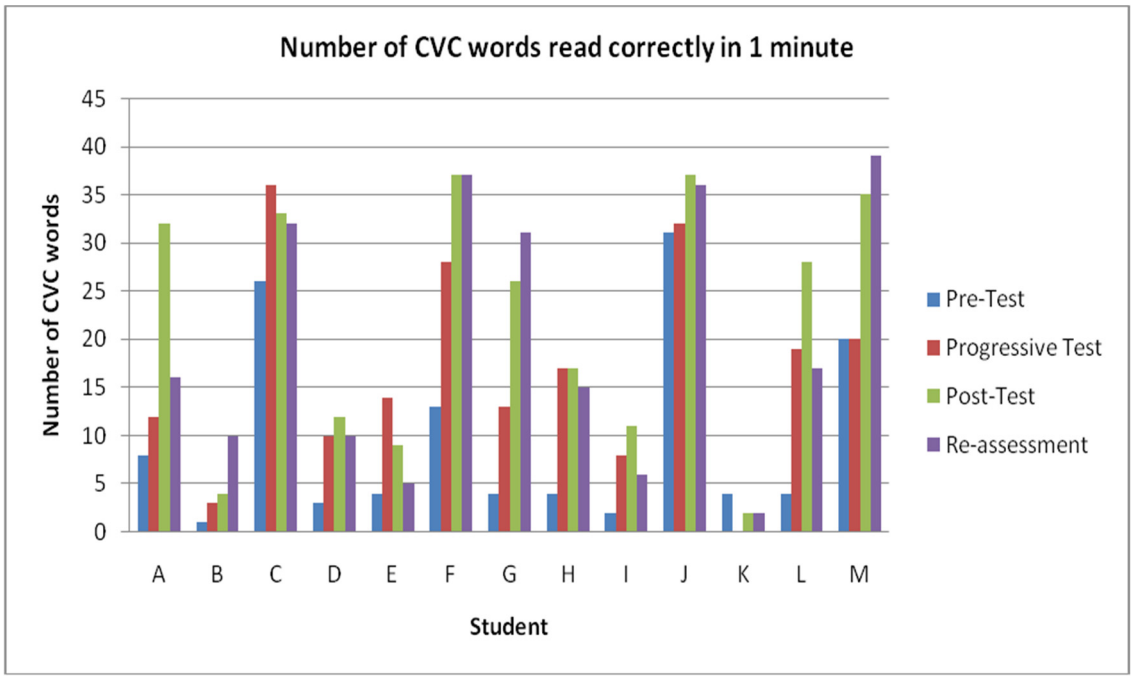


*Figure 4 Number of CVC words read correctly in one minute*

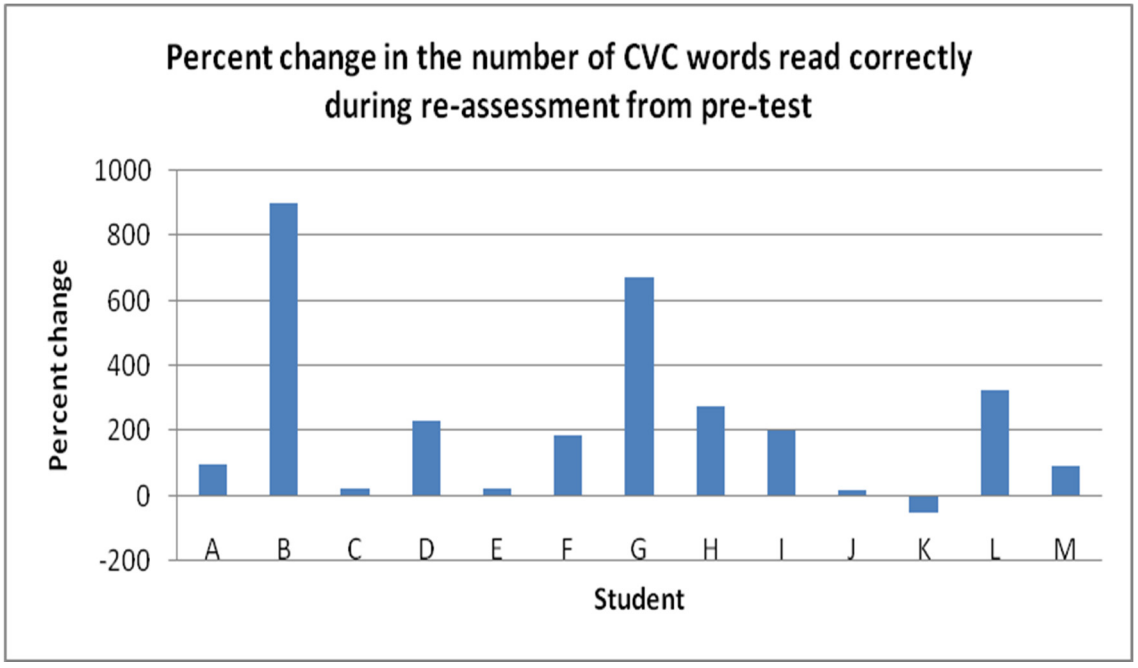


*Figure 5 Percent change in the number of CVC words read correctly from pre-test to re-assessment (done two months after the camp)*

Figure 45 shows the percent increase or decrease in the number of CVC words read correctly during re-assessment two months after the camp with that from the pre-test. Only student K registered a 50% reduction while the rest of the 12 students showed different percentages of increase.

**Discussion and Conclusion**

The reading ability of this group of 13 struggling readers, both in terms of sight words and CVC words, has generally improved after the literacy camp where the reading instruction program was conducted in a structured and cumulative manner and where bottle caps were used as manipulative aids in letter recognition, word building, phonemic segmentation and auditory processing. This ability to read sight and CVC words seemed rather stable, even after two months. It is highly probable that the students have somewhat gained a sense of decoding, that is, making a clear connection between the grapheme and phoneme of the alphabet series for English. Without acquisition of this decoding skill, learning would be temporary.

It is often easier to improve the skills of children who have already made some progress in reading. Interestingly, however, children who were very low achieving made striking improvements in their ability with the use of this easily available technique. It should also be noted that the improvements made were striking, with one child (G) reading only 10 words at pre-test and achieving over 70 at the delayed post-test. If we consider the z scores achieved, which are equivalent to effect sizes, an effect size of 0.2 in interventions is deemed small, 0.5 moderate and 0.8 and over high. Note that the immediate impact of the intervention was z score 3.2 and the delayed effect 3.1 for sight words, whereas CVC words were almost equivalent at 3.1 for both times of testing. This indicates an extremely high effect size on all conditions at all times of testing.

This reading instruction program has shown that teaching strategies that use multi-sensorial activities and physical learning aids such as the ubiquitous bottle caps can be effective to guide struggling readers to learn to read and write. Further research should be done to gather more concrete evidence of the use of bottle caps by conducting a case-control study design.

The implications of this research for countries where facilities for support are limited can be particularly encouraging. This suggests that free, easily available materials such as this can begin to change the educational outlook for children at risk across the region, even where continued specialist support may always be available. With the provision of early intervention and specialist support, these figures could be extended to many more children with problems in learning to read.

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APPENDIX 1—Use of Bottle caps to read and spell in Malay language by a young struggling reader.

APPENDIX 2—Syllabus of Reading Instruction Program using bottle caps as a learning aid

| STEP | LEARNING OUTCOMES | ACTIVITIES | MATERIALS |
|---|---|---|---|
| 1 | Alphabet series | ABC song<br>Sequencing of alphabet series with bottle caps | ABC cards<br>Bottle caps |
| 2 | Set 1 Letter sounds | Matching animals with their sounds<br>Matching Set 1 letters with their sounds<br>*a, b, c, f, h, m, p, r, s, t* | Picture cards of animals<br>Bottle caps |
| 3 | CV syllables from Set 1 letters<br>Set 1 sight words | Blending and reading of CV syllables from Set 1 letters -<br>*ba, ca, fa, ha, ma, pa, ra, sa* and *ta*<br>Reading of Set 1 sight words - *and, the, on, is* | Bottle caps<br>Flash cards |
| 4 | CVC word building from Set 1 letters<br>Set 2 sight words<br>Set 1 short sentences | CVC word building with Set 1 letters -<br>*bat, cat, fat, hat, mat, pat, rat, sat, tap, tab, tac, fab, ham*<br>Phonemic segmentation and auditory processing activities<br>Review of Set 1 and reading of Set 2 sight words -<br>*a, this, has, it*<br>Reading of short sentences:<br>*The cat is fat. The cat sat on the mat. The cat and the rat sat on the mat. This is a hat. It is on Pat.* | Bottle caps<br>Flash cards |
| 5 | Set 2 letter sound<br>CVC word building from Sets 1-2 letters<br>Set 3 sight words<br>Set 2 short sentences | Review of Set 1 letter sounds and introduction of letter sound for *o* as Set 2.<br>CVC word building with Sets 1 and 2 letters -<br>*hot, pot, cot, tom, top, etc.*<br>Phonemic segmentation and auditory processing activities<br>Review of Sets 1-2 and reading of Set 3 sight words -<br>*have, I, you,*<br>Review of Set 1 and reading of Set 2 short sentences:<br>*This is a pot. It is hot. This is a cot. I have a mop. You have a hot pot. This is a tap.* | Bottle caps<br>Flash cards |
| 6 | Set 3 letter sounds<br>CVC word building from Sets 1-3 letters<br>Set 4 sight words<br>Set 3 short sentences | Review of Sets 1-2 letter sounds and introduction of letter sounds for Set 3 - *i u d g j.*<br>CVC word building with Sets 1-3 letters -<br>*bug, bun, dig, wig, cup, sit, etc.*<br>Phonemic segmentation and auditory processing activities<br>Review of Sets 1-3 and reading of Set 4 sight words -<br>*play, with, we.*<br>Review of Sets 1-2 and reading of Set 3 short sentences:<br>*A bug. This is a big bug. I play with big bug. We have a cup. Big bug sat on jug.* | Bottle caps<br>Flash cards |
| 7 | Set 4 letter sounds<br>CVC word building from Sets 1-4 letters<br>Set 5 sight words<br>Set 4 short sentences | Review of Sets 1-3 letter sounds and introduction of letter sounds for Set 4 - *d e k l n v w z.*<br>CVC word building with Sets 1-3 letters -<br>*dug, dig, Ken, lot, wet, nut, etc.*<br>Review of Sets 1-4 and reading of Set 5 sight words -<br>*at, look, me, come.*<br>Review of Sets 1-3 and reading of Set 4 short sentences:<br>*Big Ben plays with a hat. You and I play with the cat. Look! The hat is wet. The mat is wet. Come and play with the bug. It is fun.* | Bottle caps<br>Flash cards |

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# Evaluating the progress of dyslexic children on a small-group maths intervention programme

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1 Dyslexia Association of Singapore

*Abstract*

*Many students with dyslexia have areas of difficulty that can affect their maths performance. These include memory deficits, problems with sequencing, and number reversals. Moreover, their reading deficits and poor comprehension may impact on their ability to solve word problems, a key area in Singaporean maths and in many other countries. Maths is particularly important in Singapore, because success in maths dictates whether a child completes the last 2 years of primary education at Foundation or Standard level. In this article, we present an analysis of the progress of 39 dyslexic children aged 7-11, enrolled with the Dyslexia Association of Singapore, who had completed 6 months support for maths. Support is based on principles used in literacy with a strong emphasis on building concepts to allow word problems to be completed successfully. Pre and post intervention measures of children's maths performance across a full range of curriculum topics were taken. Results show statistically significant improvement in all topics targeted, including addition, subtraction, multiplication, division, time, fractions, geometry, decimals, percentage, and ratio. These results are discussed in relation to the increasing complexity of school maths over the primary phase.*

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**Introduction:**

The main mission of the Dyslexia Association of Singapore is to help dyslexic students to learn to read and write more successfully. It teaches over 2800 students in its 13 Learning Centres. All students have been identified as dyslexic. About 6 years ago, DAS decided to offer a teaching programme specially for our dyslexic students who also experienced difficulties with maths, because of persistent, strong demand from parents of dyslexic children.

Students with dyslexia have specific areas of difficulty that can affect their maths performance: poor short term memory, poor working memory, poor sequencing, reversals, difficulty with reading word problems and poor comprehension and vocabulary stemming from low language ability. In mathematics, these difficulties can impede their ability to understand concepts, compute and apply what they have learned to word problems.

The DAS Maths Programme has grown steadily since its small beginnings, and now supports 250 students in weekly small group classes. It aims to effectively support students with dyslexia who have persistent difficulties in maths, particularly in word problems, by providing dyslexia-friendly lessons while keeping in touch with the mainstream school maths syllabus. As students with dyslexia often have poor vocabulary and comprehension skills due to a late start in reading, word problems are often their biggest area of deficit. As such, the programme works on building a student's maths vocabulary, tying it to concrete manipulatives and pictorial representations. This, coupled with teaching students how to break down word problems, enables students to identify which operation to use in order to solve such questions.

The teaching methodology is based on the needs of the child, with a strong emphasis on concept-building, addressing areas of skill deficit (see Bunn, 2014 for a series of case studies).

The teaching methodology is language based, cognitive, structured, sequential and cumulative, simultaneously multisensory, diagnostic-prescriptive and emotionally sound. These principles, based on experience teaching dyslexics to read and write, are hypothesised to be also appropriate for dyslexics learning maths. In teaching maths, three stages (or levels of representation) are more clearly evident than in teaching reading and writing:

1. **Concrete Stage** – use of tangible manipulatives

2. **Representation Stage** – use of pictures and 2D drawings

3. **Abstract Reasoning Stage** – use of symbols and word to solve problems.

Every stage of learning ensures that the student links mathematical ideas in a progressive and cumulative way. The teaching methodology is multisensory in its delivery and allows students to gain hands on experience with maths concepts. It is imperative that a student is equipped with all the necessary

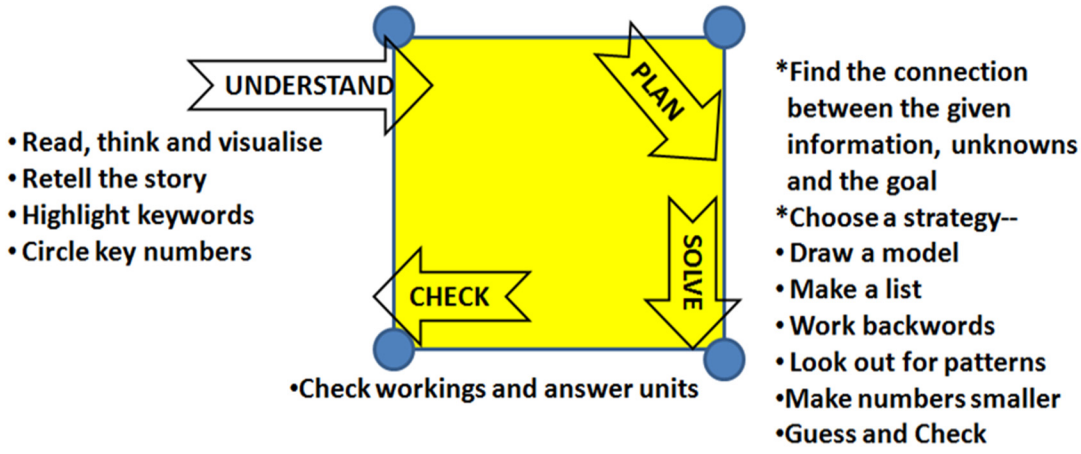


*Figure 1. Polya's Four step process approach (1945)*

prerequisite skills that he needs but may not necessarily have, in developing his mathematical skills. This would strengthen their foundations for confidence in higher-level maths, building the path towards curriculum based interventions such that the teaching methodology helps to bridge the gap between the student's maths abilities and the school mathematics syllabus.

DAS maths programme students are also taught to solve problems using Polya's Four Step Process approach- understand the problem, plan a strategy, solve the sum and check the workings:

**Research on Dyslexia and Maths Learning Difficulties:**

Estimates of the prevalence of dyslexia vary, depending on the definitions and statistical cut-off points used, but 3-6% of the general population is perhaps a conservative estimate (Hulme & Snowling, 2009, p38). Estimates for dyscalculia, or maths learning difficulties also vary and are less widely agreed. Shalev's research (Gross-Tsur, Manor & Shalev, 1996)) in an Israeli context suggests 5-7% of the population, and studies in other countries (eg Lewis, Hitch & Walker, 1994, in the UK) suggest a similar range. Research on co-morbidities between these and other learning difficulties now strongly suggests that, far from the expected rate of co-occurrence of 0.3% (5% x 6%), the actual prevalence of children with both difficulties is much higher, perhaps 3%.

A small scale piece of research carried out by DAS in 2012 suggested that of 80 dyslexic children not currently receiving additional help for maths, about a third (36.3%) were in fact weak at maths (scoring below 90 on the Steve Chinn 15 Minute test) (Yeo, Shen & Bunn, 2012). The same study estimated 7.6% of these children had scores below 90 on both word reading and maths calculation tests. These figures form part of the justification for the Dyslexia Association seeking to develop its maths teaching programme.

The nature of and causal explanation for mathematical learning difficulties remains very unclear. Some theories suggest that there is a single fundamental cause: Brian Butterworth, for example, (Butterworth 1999) has argued strongly that a small localised brain region, the horizontal Intraparietal Sulcus (hIPS), functions as a "number module"; other neuroscientists have argued that there are more than one number processing locations in the brain (Dehaene, 2011, p266-271). Other researchers have argued that several general background cognitive processing difficulties, such as procedural learning, semantic memory and visuo-spatial learning difficulties (Geary, 2004) may together explain the variations in maths learning that teachers commonly encounter.

DAS does not espouse one particular theory of mathematical learning difficulties. Our teaching programme, as summarised above, is intended to support the learning of students with as wide a range of maths learning difficulties as possible. It does not screen children for severity or for specific strengths and difficulties (eg. calculation dysfluency or working memory limitations) Some support for our small-group approach comes from a study in Singapore (Kaur & Ghani, 2011) in which over 300 students at the Primary stage were interviewed about their maths learning in small groups; the researchers found that the students expressed clear preferences for working in small groups using manipulatives when learning maths.

The assessment of children's progress in maths usually depends most heavily on performance in public exams and tests, including international comparison studies (eg. Trends in International Mathematics and Science Study (TIMSS) see Kaur 2009). Such tests are intended to say whether a child has learned enough maths, not what difficulty if any they have in learning. Tools for assessing maths learning with a focus on learning difficulties have been developed (eg Key Maths, UK Test of Mathematical Abilities, and TOMA, US). Studies of their value in a Singapore context have suggested that tests from other curricular contexts do not always work well in Singapore (eg Chia & Kho 2011, on TOMA2). DAS's own research did suggest that the Chinn 15 Minute and Calculation Fluency tests (Chinn, 2012) showed very similar patterns of results between UK and Singaporean dyslexics (Yeo, Shen & Bunn 2012).

The DAS maths team wanted to develop a broadly focused maths test whose main purpose would be to evaluate how much learning had taken place topic by topic and stage by stage. The aim was not to differentiate between maths learners or to look for patterns of strengths and difficulties. The test, it was hoped, would both measure progress reliably and be a guide to teaching priorities across topics. The test was evaluated in a short pilot study in 2013 (reported in Bunn, Yeo, Siti Aisha and Abdullah, 2014, p 85-93). The results suggested that the students were making progress (Bunn et al. 2014, p 86). However, the team wanted to evaluate the test more thoroughly, and a study was a carried out to examine the strengths and weaknesses of the test.

## Method

### Participants

A total of 39 students took part in this study. The participants were Primary 2 (between the ages of 7.5 to 8 years old) to Primary 5 (between the ages of 10.5 to 11 years old) students who were already on the DAS Maths programme at least 6 months at the time of the first testing. All students who did not meet this criterion were excluded from the sample. This is to ensure that all students have had sufficient time to benefit from the programme before we evaluate their performance. The students were from the centres where the DAS Math programme was available at the point of assessment. As of November 2013, the DAS Math programme was only available at six centres.

The breakdown of the sample by grade levels is as follows: 2 students at Primary 2 (P2) level, 11 students at Primary 3 (P3) level, 14 students at Primary 4 (P4) level, 5 students at Primary 5 foundation (P5F) level and 7 students at P5 standard (P5S) level (refer to Figure 2). The grade levels of the students were based on the students' chronological school level at the beginning of the study.

In all primary schools in Singapore, all students would undergo a streaming examination for all subjects at the end of the Primary 4 year (i.e. when an average child is between the ages of 9.5 to 10 years old). The papers for this exam are prepared by the school, with the purpose of evaluating the students' strengths and abilities based on their performance in each subject. The results of this streaming exercise will then be used to guide students' placement into the types of

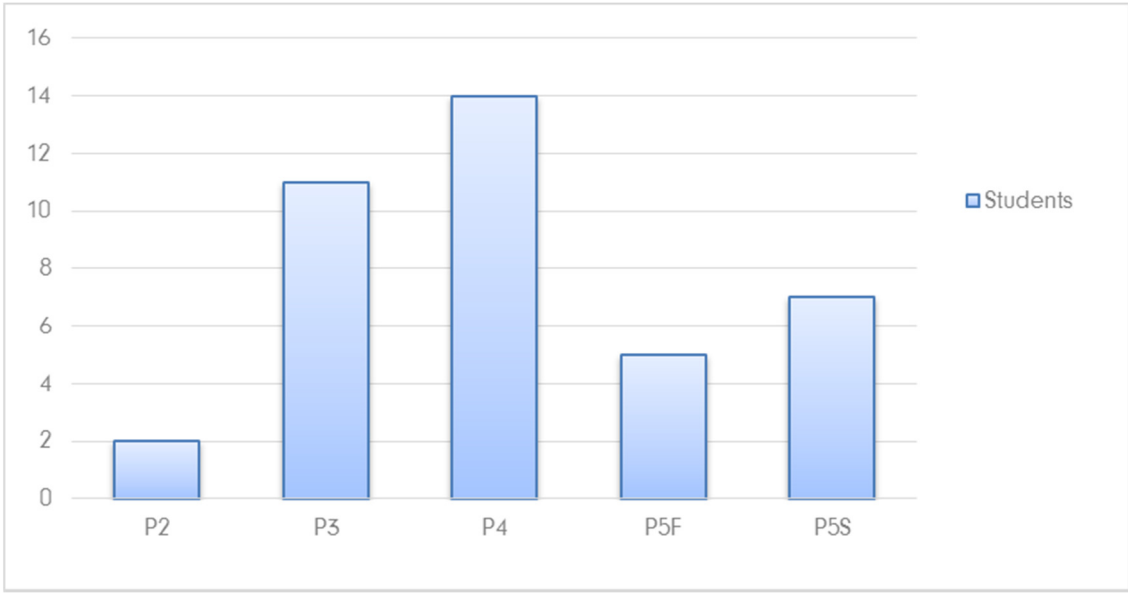


*Figure 2. Breakdown of the students by grade levels.*

subjects they would take in the remaining two years of their primary school education: Standard or Foundation. Students who have passed at least 3 subjects are allowed to take 4 Standard subjects, while students who have passed 2 subjects or less are given the flexibility to decide whether they would like to take 4 Standard subjects, 3 Standard subjects with 1 other Foundation subject, 2 Standard subjects with 2 other Foundation subjects, 1 Standard subject with 3 other Foundation subjects or 4 Foundation subjects (MOE Communication and Engagement Group, 2014). However, these subject combinations are not set in stone. If a student performs well in one of the Foundation subjects at the P5 level, the school may allow for the student to upgrade one or two subjects to the Standard level if the school believes that the student can cope. On the other hand, for students who seem to be struggling with Standard subjects at the P5 level, the school may also allow for the student to change that subject to that at the Foundation level.

**Materials**

The students' mathematical conceptual knowledge was assessed using a comprehensive set of topical tests that were previously developed by the maths team, with some guidance from Professor Angela Fawcett and Dr Tim Bunn. The items in this instrument were created with reference to the 2007 Primary Mathematics Syllabus developed by the Curriculum and Planning Development Division of the Ministry of Education, Singapore (2006). We decided to use our in-house test because published maths tests do not cover the Singapore maths syllabus fully, and do not reflect the balance of computational and word problems that Singaporean students face. Moreover, we wanted to be able to identify topic by topic what concepts students had learned and still needed to work on. This collection of tests, known as the Annual Testing papers, assesses ten topics (addition, subtraction, multiplication, division, time, fractions, geometry, decimals, percentage, ratio) and covers calculations and word problems separately within each area.

The test was broken down by grade level (i.e. Primary 1 to Primary 6) such that students only need to attempt the items for their grade level and one grade below. Based on the Singapore mathematics curriculum, certain topics were only introduced from a certain grade level onwards (e.g. Decimals is only introduced from Primary 4) and thus were not tested for students who had not yet learned the topic because of the grade level they were in (e.g. Primary 3).

In addition, students were assumed to have attempted the items that are two grades or more below their grade level correctly, and thus these items were not included in their test paper. For example, a Primary 5 student would be assumed to have attempted the items at the Primary 1, Primary 2 and Primary 3 levels correctly even though he did not do the questions. The test provides measures of learning on each concept. It also guides teaching as it enables therapists to show which grade level their students are working on within each topic and whether there is more to do at that level.

**Procedure**

Students were administered the first test in November 2013 and then a copy of the same test six months later (May 2014). The tests were administered during one of the Math lessons within the school term so as to reduce the logistics problems related to data collection. The test was not timed but students were allowed a maximum of two hourly sessions to complete the test. While students were doing the test, the teachers in charge had to walk around to check the final answers of each question. If the final answer was correct, the student could proceed forwards to attempt the next question. However, if the final answer was incorrect, the teacher had to direct the student to try the question before. The testing on a topic will be discontinued if the student has three consecutive questions incorrect or if they have reached the end of the section. At the end of the entire test, teachers will mark the students' responses using the answer scheme that has been provided and input the number of errors the student has made into a Microsoft Excel file. A percentage score would be calculated automatically by the Excel document that can be used for statistical analysis.

**Results**

Before the data was analysed, it was first cleaned by checking for scores that fell outside the range of possible scores. The range of possible scores is defined as the scores between the lowest possible score for each grade and topic and the highest possible score for each grade and topic. Calculation of the range depended on the total number of items that the students were assumed to have attempted, and the total marks allocated for these items. A total of 27 scores were found to have fallen below the range of possible scores. These scores were adjusted to the lowest possible score as per the grade level of the student.

Using the clean data, the students' pre-test and post-test scores were compared using a one-tailed matched samples t-test. The data was evaluated on two levels: (a) by topic, and (b) by level.

**Students' progress across the topics**

On the whole, regardless of the grade levels students were in, the results showed that there was significant improvement across all ten topics. Table 1 summarises the students' performance across the topics.

**Students' progress across grade level**

**Students' progress at the P2 level**

The Primary 2 students were only required to attempt a total of 7 topics, based on the school curriculum. These topics include addition, subtraction, multiplication, division, time, fractions and geometry. The analysis also revealed that there was no significant improvement in their scores when the topics were looked at as a whole ($t(6) = .003$, $p=.50$). The comparison of their scores across topics is documented in Table 2. No significant differences were observed in any of the topics at the $p<.05$ level. However, scores improved or remained steady on 4 out of 7 topics, with the greatest improvement in division.

Table 1 — Students' progress across the topics

| | Pre-test scores | | Post-test scores | | | |
|---|---|---|---|---|---|---|
| Topic | *M* | *SD* | *M* | *SD* | *t-score* | *p* |
| Addition | 83.60 | 14.11 | 88.44 | 11.20 | $t(38) = 2.29$ | .01* |
| Subtraction | 75.86 | 22.33 | 83.58 | 17.85 | $t(38) = 1.92$ | .03* |
| Multiplication | 79.82 | 16.56 | 89.75 | 11.51 | $t(38) = 4.07$ | <.001*** |
| Division | 66.55 | 23.09 | 84.48 | 17.51 | $t(38) = 5.67$ | <.001*** |
| Time | 72.36 | 18.41 | 81.32 | 19.21 | $t(38) = 3.48$ | <.001*** |
| Fractions | 58.79 | 23.47 | 77.62 | 22.85 | $t(38) = 4.35$ | <.001*** |
| Geometry | 72.25 | 25.41 | 81.88 | 24.82 | $t(38) = 2.84$ | .003** |
| Decimals | 45.46 | 13.36 | 65.93 | 34.04 | $t(25) = 3.61$ | <.001*** |
| Percentage | 36.00 | 35.93 | 70.86 | 20.39 | $t(6) = 2.66$ | .002** |
| Ratio | 57.80 | 42.12 | 92.81 | 3.38 | $t(6) = 2.23$ | .03* |

*Note.* *$p$ <.05. **$p$ <01. *** $p$ < .001

Table 2 - Progress of P2 students across the topics

| | Pre-test scores | | Post-test scores | | | |
|---|---|---|---|---|---|---|
| Topic | *M* | *SD* | *M* | *SD* | $t(1)$ | *p* |
| Addition | 90.90 | 0 | 95.45 | 6.43 | 1.00 | .25 |
| Subtraction | 75.00 | 7.07 | 80.00 | 0 | 1.00 | .25 |
| Multiplication | 100.00 | 0 | 100.00 | 0 | N.A. | N.A. |
| Division | 57.80 | 42.00 | 93.75 | 8.84 | 1.53 | .18 |
| Time | 77.80 | 15.70 | 72.25 | 7.85 | 1.00 | .25 |
| Fractions | 83.35 | 23.55 | 47.20 | 66.75 | 0.06 | .34 |
| Geometry | 100.00 | 0 | 96.00 | 5.66 | 1.00 | .25 |

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

Table 3 – Progress of P3 students across the topics

| | Pre-test scores | | Post-test scores | | | |
|---|---|---|---|---|---|---|
| Topic | *M* | *SD* | *M* | *SD* | *t*(10) | *p* |
| Addition | 87.88 | 11.85 | 91.65 | 10.55 | 0.85 | .21 |
| Subtraction | 76.02 | 22.74 | 81.81 | 23.00 | 0.87 | .20 |
| Multiplication | 77.91 | 23.01 | 93.35 | 9.40 | 2.38 | .02* |
| Division | 59.70 | 33.58 | 80.99 | 26.79 | 2.95 | .007** |
| Time | 60.91 | 21.89 | 77.27 | 23.49 | 2.21 | .03* |
| Fractions | 51.64 | 30.62 | 75.19 | 26.06 | 2.99 | .007** |
| Geometry | 72.1 | 21.92 | 86.00 | 20.59 | 1.90 | .04* |

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

Table 4—Progress of P4 students across the topics

| | Pre-test scores | | Post-test scores | | | |
|---|---|---|---|---|---|---|
| Topic | *M* | *SD* | *M* | *SD* | *t*(13) | *p* |
| Addition | 80.11 | 17.52 | 84.18 | 11.63 | 1.11 | .14 |
| Subtraction | 70.42 | 23.79 | 77.26 | 18.43 | 0.84 | .21 |
| Multiplication | 76.07 | 14.76 | 82.39 | 12.94 | 1.81 | .046* |
| Division | 63.51 | 14.73 | 80.94 | 13.24 | 4.17 | <.001*** |
| Time | 68.54 | 14.36 | 72.17 | 16.80 | 1.43 | .09 |
| Fractions | 50.36 | 18.38 | 73.68 | 16.52 | 5.08 | <.001*** |
| Geometry | 54.06 | 25.96 | 62.91 | 28.11 | 1.22 | .12 |
| Decimals | 26.94 | 23.39 | 46.04 | 35.48 | 2.12 | .03* |

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

Table 5—Progress of P5F students across the topics

| | Pre-test scores | | Post-test scores | | | |
|---|---|---|---|---|---|---|
| Topic | *M* | *SD* | *M* | *SD* | *t*(4) | *p* |
| Addition | 78.54 | 16.02 | 82.86 | 14.82 | 0.59 | .29 |
| Subtraction | 90.00 | 6.74 | 89.08 | 7.61 | 0.30 | .39 |
| Multiplication | 87.60 | 11.61 | 98.66 | 3.00 | 2.61 | .03* |
| Division | 79.98 | 13.95 | 89.98 | 9.15 | 1.18 | .15 |
| Time | 86.66 | 11.18 | 94.16 | 5.59 | 1.50 | .10 |
| Fractions | 70.46 | 13.61 | 92.52 | 10.24 | 2.82 | .02* |
| Geometry | 89.98 | 12.09 | 98.46 | 3.44 | 1.83 | .07 |
| Decimals | 60.90 | 21.92 | 88.66 | 3.43 | 2.85 | .02* |

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

Table 6—Progress of P5S students across the topics

| | Pre-test scores | | Post-test scores | | | |
|---|---|---|---|---|---|---|
| Topic | *M* | *SD* | *M* | *SD* | *t*(6) | *p* |
| Addition | 85.37 | 9.28 | 93.90 | 4.93 | 2.01 | .046* |
| Subtraction | 76.63 | 28.18 | 96.10 | 7.16 | 1.70 | .07 |
| Multiplication | 78.97 | 8.06 | 89.53 | 8.48 | 2.26 | .03* |
| Division | 76.31 | 14.45 | 90.47 | 12.20 | 1.96 | .049* |
| Time | 86.24 | 9.91 | 99.40 | 1.59 | 3.67 | .005** |
| Fractions | 71.56 | 14.65 | 87.39 | 10.96 | 3.30 | .008** |
| Geometry | 88.29 | 11.82 | 97.46 | 4.47 | 2.70 | .02* |
| Decimals | 71.49 | 30.57 | 89.47 | 34.04 | 1.87 | .055 |
| Percentage | 36.00 | 35.93 | 70.86 | 20.39 | 2.66 | .02* |
| Ratio | 57.80 | 42.11 | 92.81 | 3.38 | 2.23 | .03* |

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

**Students' progress at the P3 level**

The P3 students showed significant progress in all topics at the post-test level except for addition ($t(10) = 0.85$, $p = .21$) and subtraction ($t(10) = 0.87$, $p = .20$). Table 3 summarises the results of the students at the P3 level. A significant improvement was also observed when all the topics were studied collectively ($t(6) = 5.15$, $p < .01$).

**Students' progress at the P4 level**

At the P4 level, decimals is introduced as a new topic. Thus, a total of eight topics were assessed at the P4 level. Significant improvements were only observed for four topics: multiplication ($t(13) = 1.81$, $p < .05$), division ($t(13) = 4.17$, $p < .001$), fractions ($t(13) = 5.08$, $p < .001$) and decimals ($t(13) = 2.12$, $p < .05$). As a whole, a significant improvement was observed in the post-test ($t(7) = 4.17$, $p < .001$). Table 4 summarises the results of the students at the P4 level.

**Students' progress at the P5F level**

Students in the P5F level were assessed on the same topics as the P4 students. Students in the P5F level are considered to require more help with their mathematics foundation as compared to their peers in the P5S level. Therefore, in the Singapore Mathematics curriculum, P5F students are exempted from two new topics that are introduced at the P5S level, namely Percentage and Ratio.

Data analyses show that the P5F students improved significantly in three topics: multiplication ($t(4) = 2.61$, $p < .05$), fractions ($t(4) = 2.82$, $p < .05$) and decimals ($t(4) = 2.85$, $p < .05$). When all the topics were considered as a whole, a significant improvement was observed at the post-test level ($t(7) = 3.42$, $p < .01$). Table 5 summarises the results of the students at the P5F level.

**Students' progress at the P5S level**

Students in the P5S level were assessed on the greatest number of topics. Data analyses show that the P5S students showed significant progress in their scores in all topics except for subtraction ($t(6) = 1.70$, $p = .07$) and decimals ($t(6) = 1.87$, $p = .055$). When all the topics were considered as a whole, a significant improvement was observed at the post-test level ($t(9) = 5.90$, $p < .001$). Table 6 summarises the results of the students at the P5F level.

**Discussion**

The objective of this study was to objectively measure the progress of the students in the DAS Maths program to see if our program is effective in improving the mathematical knowledge of our students. The results showed that students generally made significant improvements in their knowledge of all the topics that we have assessed them on. However, when we scrutinise the results by grade level, we find that the amount of progress the students made varied by topic, as well as across levels. There appears to be a steady decline in the number of topics where improvements are observed from P3 to P5F. One factor that could account for this decline is the increase in difficulty of the topics as one progresses through the

school system. While our program aims to help students to understand concepts within their zone of proximal development and at their learning pace, schools are teaching students concepts that are getting increasingly complex. Therefore, we find that although they do show some improvement, the students are still not matching up to their expected school standards.

There are also some unexpected trends in the results that are worthy of mention. First is the finding that the P2 students did not make any significant progress in any of the topics. There are several reasons to account for this. First and foremost, the sample size is too small for the results to be valid in explaining trends in a population. A bigger sample is needed to test if our intervention is effective at the P2 level. Secondly, due to the small sample size, a change in one of the participants' scores is likely to affect the overall mean and standard deviation of the scores significantly, which was what happened in the dataset. However, we also noticed that there was an anomaly in one of the students' scores. In this case, the student was observed to have regressed in his performance in the topic of Fractions. We approached the teacher of this student to try and investigate why this was so. We learned that the most probable explanation for this is due to a long time lapse of more than 6 months between the time he had learned Fractions in P2 (pre-test) and the time that his school had covered Fractions again in P3. This finding highlights the difficulties that some of our students with dyslexia encounter in schools which follow a spiral curriculum. One of the characteristics of dyslexia is a difficulty of retrieving information from long-term memory. By the time of the post-test, the student had already forgotten what he had learned about Fractions at the P2 level and his school had only just began to teach Fractions at the P3 level. This was probably why he did not perform as well as he did during the post-test 6 months ago.

There were also limitations to the design of the study and areas we could improve on. Firstly, we did not check which topics were already covered by our teachers at each testing. Matching the topics teachers had already covered with the progress of students would give us a more accurate picture of the effectiveness of our program. This could also explain why students improve in certain topics not in others. Second, we were unable to form a control group in this design because we did not have ready access to students not on our maths programme. Nor did we control for other extraneous and mediating variables such as the number of hours students receive other forms of mathematics remediation (e.g. tuition) outside of our program. Therefore, we were unable to determine if the results were entirely due to our programme or due to other factors. If we had controlled for other factors, we would perhaps be able to conduct a factor analysis to identify the main contributors to our students' improvements. Finally, the test was not being timed even though students could take a maximum of two hours to complete it. Thus, their results may not be an accurate reflection of their performance in school-based examinations where they have to complete their paper within a stipulated time limit. In future research it would be

useful to check how much they could complete within a fixed time period, as well as allowing them as much time as they need to complete the test.

## Conclusions

The main aim of the study was to evaluate the use of a comprehensive test of Singaporean primary maths as a measure of progress for dyslexic students on the DAS small group maths intervention programme. The study shows that students made significant improvement across all topics covered by the test. Analysis grade by grade shows that at each grade level some topics show much greater improvement than others, with fewer topics showing progress at higher grades. This may be a result of harder topics being introduced later in the primary phase, and there may also have been less progress because of poor retention when topics were taught a longer time before the test.

The test is considered to be a useful instrument, but the DAS maths team may need to consider alternative test designs to see if other ways of testing would be equally or more efficient. We may also need to consider ways to recruit non-intervention children as controls to measure the unique contribution of the programme.

## Future Directions

To help our very weak students who are struggling with basic math concepts, the team is currently compiling a set of differentiated lesson plans and strategies that are catered towards helping our weaker students with their number sense, a fundamental skill for grasping mathematical concepts. This will be integrated into the current Essential Maths programme to help our teachers reach out to students with diverse math abilities.

Currently, our annual assessment of students' progress takes approximately one to two hours to complete. In the team's opinion, this is too long a duration, and students do report feeling unmotivated to finish the paper. Some have even displayed task avoidance. Based on the feedback, the team will look into how to shorten the test without affecting its psychometric properties. We will continue to uphold the high standards in teaching quality as well as the professional development of our dual specialists through in-house training (insets) and workshops. The teaching standards of our existing dual specialists will be monitored by a peer dual specialist and one of the core team members using video observations of a lesson, once every year.

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# Improving the fluidity of whole word reading with a dynamic co-ordinated movement approach

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Abstract

*In this article we present an intervention approach geared towards improving the fluency of reading and processing in children with dyslexia and dyspraxia. This is an important topic, identified by the National Reading Panel 2000 as key to improving reading comprehension. The approach, the Crispiani method developed in Italy is derived from theories of cerebellar deficit and procedural learning, and adopts a dynamic approach based on a combination of whole word reading with rapid co-ordinated movement. Following a literature review, an intensive case study of clinical practice with a 10 -year old girl with dyspraxia and dyslexia shows marked improvement in initiating and completing tasks. Finally, an experimental study with 33 children show an average improvement of 30% in reading fluidity following a 3 months intervention designed to improve processing speed and confidence in a clinical setting. This improvement was highly statistically significant. The implications for a whole child approach to intervention are discussed.*

## Introduction

The article starts with a review of phases in theoretical understanding of dyslexia, moving from phonologically based to a recent emphasis on cerebellar deficit and procedural learning, which provide a rationale for the Italian Crispiani method

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of intervention. This method emphasises the fluidity of reading in conjunction with sequences of movement in order to improve fluency. In 2000, this was identified by the National Reading panel in the USA as the key missing component in fluent reading and comprehension, advocating the inclusion of fluency training in programs for children with dyslexia.

We present an in depth analysis of the Crispiani method and the approach adopted as a whole child intervention involving the family and school. The case study provides a moving example of a child with complex impairments who has benefitted from an intensive 3 day course. The final study is an experimental analysis of a group of dyslexic children and the impact on their fluidity of this intervention over a three-month period. The article moves from theory to practice to illustrate the approach in action.

**Definitions and diachrony**

The complex phenomenon defined as *Specific Learning Disorder* has found a plurality of intense theoretical interpretations, and different experiences of research and professional practice in diagnosis, functional assessment, prevention practices and treatments, advice for school, and orientation. The Diagnostic Manuals such as ICF and DSM-5 have introduced multiple and important theories, only partially reported and supported in the literature. Adopting a diachronic perspective, on the development of these theories over time, it is possible to make a brief summary of the multitude of theoretical visions in a series of historical phases.

**First Period**

From the 1930's to the1960's, a variety of approaches and theoretical models follow one another: These include theories of motor and cortical differences. Theories founded on neuro-psycho-motor functions such as motor organization and space-time and the assertion of lateral dominance, for example Orton (1937) Theories of neuro-cortical differences, with Critchley and Critchley(1970).

**Second period**

From the 1970's to 2000's, comes a period of enhanced linguistic theories. In Italy, in this period, there were a substantial number of theories, dominated by a strong phonological approach referring reductively to sign-sound connections.

**Third period**

Since the 2000's, there has been a change of paradigm in terms of complexity. By the end of the '90's, recent theoretical conceptions on dyslexia are oriented towards a more neurobiological foundation. In this period a dynamic and complex vision of cognitive processes in general moves towards an important global *breakthrough paradigm*. The functional performance of reading, writing and math skills, as well as disorder in many areas, confirm previous multi-factorial theories, from neurological dynamics interpretations, today expressed in the conception of multi-components which impact on the course of development over time (Karmiloff-Smith, 1993) .

Table 1 Language theories, including many options

| LANGUAGE THEORIES |
|---|
| Phonological Deficit Theory, based on a problem in breaking down the sounds: e.g. Bradley and Bryant (1983), Stanovich (1980, 2000), Ramus et al. (2003), Snowling (1981, 2001). |
| Dyslexia as a deficit of phonological recoding, e.g. Lovett (1992), Tressoldi, Stella and Fagella, 2001 etc. |
| *Theories of language processing* - a visual and auditory processing disorder, based on organization of sequences, especially in terms of speed, by Livingstone et al. (1991), Tallal et al. (1995), Galaburda, and Livingstone(1993) |
| *Theories of visual-motor deficit* - related to the disorder of visual and/or auditory information processing (Wolff et al., 1984) |
| Disorders of visual processing, visual-spatial or with involvement of "magnocellular system", Livingstone et al. (1991), Tallal (1995), |
| Failure of the rapid processing of visual stimuli Slaghuis et al. (1993) and acoustic stimuli: Merzenich et al. (1996). |
| Difficulty in managing the assembly of words and letters mostly on the right side of the visual field, the effect of crowding (crowding) asymmetric: Geiger and Lettvin (1987). |
| *Neuro-Cortical Theories.* Neurological disorder related to the cortex or of higher functions, mainly in the left hemisphere and with involvement of Broca's area brain asymmetries, or variations of symmetries, asymmetry reversed (Geschwind and Galaburda 1985) |
| *Theory of the disorder of working memory (Baddeley, 2000; 2003).* |
| Deficits in executive or procedural order, based on memory retrieval |
| *Theory of the disorder of management attention or attentional orientation:* Plaza and Cohen, 2006 |
| *Neuro-Psycho-Motor Theories.* |
| In a second phase, still on the neuro-psycho-motor conception, dyslexia has been discussed as a disorder of motor coordination and involvement of lateral dominance, by: Geschwind and Galaburda (1986), |
| *Theory of deficit magno-cellular.* |
| Sensory deficits Theory, related to dysfunctions or migration of magnocells delegated to the optimization of behaviors, in Tallal, (1984) Stein and Fowler (1993). |

There is a trend to dismiss simple interpretations and to consider instead the diversity of the phenomenon, taking into consideration its roots (both structural and functional), and manifestations of syndromes, approaches to the prevention and rehabilitative treatment. Numerous considerations are central when theorizing dyslexia:

- The sense of the complexity of the phenomenon.
- The nature of human functions multi – components.
- The componential analysis, structural and functional, cognitive function.
- The reference to the executive functions and the related cortical system.
- The reference to automatic neuro – psychic functions.
- The partial pervasiveness of the disorder.

A multiplicity of paths of inquiry and theoretical constructs have been undertaken, whose mapping is not always easy, even for the partial overlap that the phenomenon manifests from conceptual viewpoint. These multiple interests in dyslexia, give a sense of a more homogeneous scientific platform, more oriented to neuro-cortical systems related to executive functions, which can be traced back to reading and writing and math performance.

**Theories of attention deficit or executive functions.**

Multiple authors explain dyslexia as a condition of attention deficit disorder in terms of the constancy of action, associated with a disorder of executive functions (Stein and Walsh, 1997; Facoetti and Turatto, 2000; Facoetti et al., 2010).

**Anthropological-Evolutionary Theories**

Authors mainly engaged in the history of writing such Dehaene, and Carr, are interested in the structural and functional changes in the brain produced to fit the task, also denoting sensitive ethnic and cultural diversity, the process of adaptation of brain structures to the written language.

In Dehaene's 2009 study the functions of reading and writing are seen as a recent evolutionary conquest. Developing the necessary neural circuits in the brain still involves a process of adaptation, so this is based on some sort of modification of functions by means of a neuronal recycling in conjunction with the decline of orality, the preference for spoken language. The process develops on the basis of converting existing neural circuits to reading. This is a function that, in dyslexics, is expressed differently and makes the recognition of phonemes within words difficult. The authors then consider reading as a visuo-motor disorder with reference to the decoding of letters, tending to believe that a transparent or regular script (such as Italian) allows for faster learning of written language.

Similar evolutionary positions are expressed by Wolff (2009) which indicate that the origin of automatic reading is the generation of symbolization, when certain linguistic codes come to an alphabetical scheme for which each word is divided into individual sounds, phonemes represented in graphic signs. So this is a

story based on semantics, the ability to analyze the meaning of sounds and words, which fully engages the brain in visual areas, in occipital-temporal pattern recognition, and in parts of the frontal lobes.

The evolutionary perspective can be linked to the conceptual work of Carr, (2011) who considers how new technologies have changed the way we work and the perceptions of the human mind, and therefore how we direct our attention. Reading involves in fact a synergy of actions that, in practice brings together fragments of learning.

**Theory of cerebellar disorder and "procedural dyslexia"**

Of increasing importance is the "Cerebellar Deficit Theory" of Nicolson (1990, 1996), that identifies the cause of dyslexia in the dysfunction of the cerebellum and the subsequent ineffectiveness of the procedural processes, in particular the sequential, with effects in disorders of motor skills and automatic transmission in motor areas of the cortex, including Broca's area.

The analysis starts from the consideration of the multiplicity of brain structures involved in skill proceduralization through the Doyon and Ungerleider (2002) model. This model refers to two separate circuits responsible for learning: the Corticostriatal system particularly involved in learning motor sequences and the Corticocerebellar system particularly involved in adapting to environmental perturbations. Nicolson and Fawcett (2010) analyse the role of the cerebellum, together with the motor cortex and the basal ganglia in the acquisition of motor skills, integrated systems and the corticocerebellar phase of automation. It is the declarative-procedural circuits that can compromise the initial acquisition of motor skills, in particular in the fast phase (*fast learning stage*), in the presence of inefficiency of a single part of the system. The Corticostriatal system regulates the motor sequential activities, and the Corticocerebellar system regulates *balance* and *adaptive timing*. Nicolson and Fawcett (2010) place great importance on the secondary symptoms, with particular reference to impaired balance and motor skills that do not constitute the primary cause of reading disorder, however, contribute to the phonological processing and the *verbal working memory involved in reading*.

Turning to the neurophysiology of cognitive-motor skills, the research of Bullock (2004), underlines the complexity of the skills involved in reading and writing, where a loss of performance may be due to impairments in any brain region such as the parietal cortex, motor cortex, frontal cortex, basal ganglia, cerebellum. Evidence from cerebellar patients provides support for the importance of this structure in language and literacy (Fabbro et al., 2000).

In any case, the difficulty is related to activation time and execution, in other words the temporal dimensions of fluent action. The execution of accurate and speeded actions, such as how to take the ball at a glance, depends on the coordination of speed (*velocity scaling*), the speed of perception, or contact time (*time to contact*) and the speed of the

muscles (*muscle force*), based on the activation of timed patterns of action. Further evidence for disorders in reaction time in all tasks apart from a simple reaction time, even where language is not involved, comes from Nicolson and Fawcett, (1994).

This condition inevitably disturbs language as it involves both time and fluency, then the automatic and fast processing of information, from which connections with reading and writing and dyslexia may be seen. These apparently heterogeneous disturbances are the cause of cerebellar dysfunction, related to discrepancies between actions and the time of their execution, and generate a procedural learning deficit.

**Links to theories of magnocellular deficit.**

This is a theoretical solution expressed mainly by Stein 2001 that signals the impairment of the magnocellular layers, with negative effects for binocular stability, then for visual localization mainly on the left side. The author indicates ganglions in the cerebellum crucial for establishing binocular stability and selecting lexical functions that are disturbed in dyslexics, therefore, a neurological syndrome affected by in-coordination, difficulty in working from left to right and poor "sequencing".

Other authors back the theory of magnocellular dysfunction as a decisive factor for the onset of the dyslexic disorder. On the basis of genetic and neurophysiological research, mainly attentive to visual disturbances such as processing deficits, with effects on the analysis of spatial relationships and movement, dyslexia appears as a functional disorder, (Ruffino et al., 2014) linking potential loss of spatial and temporal co-ordination, and dyslexia.

**Links to theory of programming and sensory integration**

Chiarenza and colleagues (2014) propose a neurophysiological disorder in terms of integration of sensory information, with involvement of the cerebellum and motor functions and attention to reaction time and self-regulation of behaviour

Neuromotor and co-ordinative theories.
With reference to the neuromotor field, anchored to the scientific tradition, there are important theories that indicate the nature of the motor and coordinative dyslexic disorder, based on the work of Crispiani (2006, 2011), Massenz (2013), etc.

**The Praxic-Motor Theory and The Crispiani Method**

**The theory**

In a series of neurobiological and functional studies, we undertook our Praxic Motor Theory (TPM), with reference to the investigation of cognitive processes and motor coordination.

We provide a developmental account of dyslexia in terms of a disorder of praxia with particular reference to the sequential functions/procedures and the fluidity of executive functions and involvement with the organization of space and time and lateral dominance.

The cognitive, visual-motor and semantics actions related to reading and writing, appear dysfunctional in the organizational sense, in the sequential processing of the stimuli. It is not in our view a disorder of discrimination, nor phonological conversion, but it involves difficulties in organizing perception in terms of speed, alternating rhythms or overlapping sequences or responding to prolonged visual or auditory stimuli. For this reason it is in our view, a qualitative disorder.

Executive disorders related to reading, writing and math skills are based on phonological problems (sound-symbol relationship, semantic, symbolic), but sequentially proceeding from left to right, the automaticity and the fluidity of the action, the organization in space and time, the rhythms and the relationship between part and whole.

Slowness in the precipitation of actions, in particular in the incipit – initiazation, can be easily recognized in all the actions of the person, from the motor to the mental, compared with a lack of lateral dominance and dyspraxia in general, leading back to neuronal cortical disorder.

Critical aspects concerning functional performance are related to neuronal cortical circuits, in particular in the bidirectional exchange between brain areas and in inter-hemispheric reciprocity. In this complex system, both the cerebellum (cerebellar function as sequential projection in motor areas) and lateral dominance are important. Both generate effects of slowness or randomization of the electrical flow of the brain. Randomization and slowness in the executive phase seem to be the most significant indicators.

We support a complex consideration of the phenomenon in the sense of a multi-factorial and multi-componential disorder as reading and writing are executive functions.

For this reason, they are not reducible to a "mere" symbolic process (sign-sound association, phonology, and meta-phonology). They are dynamic functions, motor and cognitive ones, self-regulated with feedback processes and anticipation.

Under normal conditions, reading-writing is not a fragmented nor cumulative phase (adding elements to one another such as graphemes, phoneme, other symbols), but it may become a fragmented process in the presence of obstacles, as in the case of procedural disorder, sequential disorder, space-time disorganization or difficulty in left –right directionality.

It is a process of solidarity of motor coordination, perception and movement, along physiological coherence that normally regulate the higher human functions (Maturana et al., 1995). Dyslexia is often an integrated condition, inclusive of dyslexia, dysgraphia and disorders of mathematical skills, with extension to the overall praxis in the sense of a qualitative disorder, (partially pervasive disorder). Dyslexia is revealed as a sequential dyspraxia related to sequences founded on a matrix of bio-psychic functions .

Our research and theory define the Dyslexia Condition in Paradigm D:

Dyslexia, Dysgraphia, Dyscalculia, disfluency, Dis-laterality, Dyspraxia, Disorder. We are therefore working with children with complex needs.

**Treatment- Intervention Programme**

Starting from praxic-motor nature, Dyslexia, dysgraphia and dyscalculia are treated according to the scientific-professional procedures based on prevention, early functional assessment, recommendations for school and families, educational and professional guidance, cognitive enhancement and study methods and cognitive development activities to improve sequences

The Treatment (intervention programme) is ecological and dynamic, in the sense that it takes care of the entirety of the person in all its functional areas (motor, perceptual, emotional, affective, thought, communication, social performance and school) and promotes mental and motor reaction. Moreover, it promotes the dynamic of all functions, making them fluid and automatic, through a training aimed at soliciting a continued coordination, under the automatic and intense cognitive presence, in all functional areas.

The activation training is conducted on motor skills, perception, memory, grapho-motor, language, thought, storytelling, reading, writing and mathematics. All actions are in a professional kit of 12 cognitive training modules which combine practices of Motor Training.

Our therapies insist on the dynamics of Succession, Automation and Fluidity (Polo SAF).

The training tends to generate neurophysiological automaticity, fluid and oriented in the sense of space and time. It is indicated for dyslexics because they always prefer to isolate gestures, phonemes or graphemes.

The active and fluid execution of motor automatic sequences, including exercises about grapho-motor skills, mnemonic procedures, language fluency (reading, writing, calculating) improve not only the function but the co-ordination of the brain itself. While inertia is the cause of decay and progressive dysfunction, the simultaneous activation of coordinated and constant functions is the strength to reorganize the **inter-hemispheric cortical flows,** working in reciprocity and parallelism, developing their effectiveness. In particular, the increased fluidity (readiness incipit – to initiate action, the right speed, agile self-correction, perseverance, etc.), together with the global approach to real learning (words, sentences, strings of signs, numbers, figures) allows the dynamization of slow and messy executive processes. An entire approach and fluidity guide the action of all people in conditions of normal-functionality and they are therefore taken as skills on which to build and establish correctness.

The most important qualitative indicator is the **executive fluidity**, not speed.

We define a **Neuromotor Storm** a global activation with intense involvement of all kind of functions, linguistic and perceptual, and their coordination (synesthetics). Through our treatment we obtain improved fluidity of executive functions, enhancing the capabilities of electrophysiological braking, self-

regulation, self-inhibition and self-control allowing the adjustment of dynamics from slow and precipitous to smooth and consistent. This strengthening function assumes four major vectors, named Physio Praxis Vector (VFP) that constitute the **energizing platform**: 1. Incipit - 2. Fluidity - 3. Cross lateral pattern - 4. Rotary pattern. The treatment usually takes three months for three sessions a week.

There is a **Common Training**, based on the 12 cognitive training modules that make up the system, working in an intensive and consistent way, towards fluidity and the strengthening of sequences.

This training may be complemented by a **Special Training of functional activation**, that may be used in more severe cases or for subjects who are not able to follow an ordinary course. It is very intensive and concentrated on consecutive days and in conjunction with neuro-motor activation, and with fast reading (Champion LIRM: Intensive Reading Speed Motor).

The aim of the treatment is not to use tools to bypass the problem, depriving children of the necessary functional exercises, but to solicit, track and push fluidity both in basic skills (motor, perceptual, memory, language, thought, grapho motor) and the primary ones of reading, writing, and maths.

The treatment can be followed in various disciplines (mathematics, Latin and Greek, foreign languages), or exercise performance as the report, the synthesis, the interview, interrogation, and note taking always including speech training. It also deals with training to support study methods.

The specialist *takes charge* of the student and his personal situation. He is systematically evaluated by comparing questionnaires from family members, teachers and the therapist.

**Assessment of Treatment**

**Critical aspects**

Assessment of Treatments (VTA) of the dyslexic condition, constitutes a widespread critique of many aspects and it reveals, at the same time, recognition of the complexity of the phenomenon as defined by Italian researchers, who emphasise the importance of attention, fluency and learning. The treatment can be distinguished from a mere collection of recommendations or the use of tools/ technologies that allow the child to avoid reading and writing exercise. Another critical aspect is what is under assessment during the treatment, which is the target and criteria used. In our training the indicators are Fluidity, (rather than speed itself, which maybe incorrectly used in Italy), Accuracy and understanding of the text, complex skills that lead the analysis to a number of theoretical explanations and interpretations.

In terms of the DSM.5, there is also a focus on the observation of everyday conduct and evaluation of school performance in all areas, not only the association of reading performance from a psychometric point of view. The concept of *speed* is another key point because it is opposite to that of *fluency,* so it is important to include the *incipit* – start in the measurement of time, the possibility of reverse dynamics between speed and accuracy and the consequent limits of the calculation of the direct

correlation. This refers to a trade off between speed and accuracy that is frequently noted in readers with dyslexia

**Assessment and speed**

The Crispiani method sustains a qualitative culture of Assessment treatment, according to the VES strategy (Empirical Semiotics Approach – Crispiani, 2011) oriented to the description of dyslexia-dyspraxia in terms of "low qualitative measurement". In this context and in recognition of the need to integrate qualitative and quantitative assessment, we have applied a process of measuring the absolute speed, which refers to the time it takes to read selected and standardized passages.

**Reading tests and Index of Difficulty of Text (IDT)**

The test consists of reading a narrative passage and measuring the time taken.

**Characteristics of the passage.**

The text reading is part of a set of narrative passages validated by the Itard Staff with reference to: n. 12 complete lines, Times New Roman, 100%, size 12, n. 83/85 beats per line (average and including spaces and punctuation) absence of paragraphs or other interruptions, absence of unusual graphemes (K, J, W, Y, X, etc.), The absence of distractors and foreign words, no repetition of long words (four syllable), very low repetition of general words, absence of the title and any illustrations.

Index of difficulty of the text (IDT) = 0.05. The Index is the ratio between the number of long words (four syllable or more) and the total number of words.

**Modality**

Activate the normal form of reception. Perform the test before starting other assessments or treatments. Invite the student to sit inform him that he has to read, avoid any other pronunciation. Show passages with the sheet covered. Simultaneously uncover the text, and start the stopwatch. Stop the clock on the pronunciation of the last word of the text.
In each case note:

Date, age (in years and months), class and school attended, number of the text read, time taken (in minutes and seconds).

Type of reading: phonic-fragmented, sibilant, Periodicals sibilant, radical sibilant, sub-voice, predictive (global, intuitive and with errors), refusal of reading, reading correct.

Main distinctive features: slow/fast, fluency/disfluency, opening words, errors, constancy of the disorder or initial reading correct and fluid.

Index Fluidity Individual (IFI). The Index of Individual Fluidity is the ratio between the number of lines/spaces and number of seconds used, (Space Time).

**Conclusions**

Our Practices defined as Ecological-Dynamic encourage neuromotor and neurocognitive activity with particular reference to the fluidity and efficiency of inter-hemispheric exchange and it also gives a general rapid warning of executive disfunction.

Our treatment improves the following, with great appreciation from parents and teachers, obtainable from reporting and direct observations:

- General executive functions
- Readiness
- executive fluidity
- grapho-motor skills
- reading and understanding of texts
- processes of self-regulation
- Cognitive processes
- An understanding of their practices
- Improvement in school commitment

The experiences reported here consider briefly reading speed after an Intensive Treatment (Champion LIRM), revealing sensitive increases, even within the limits of a brief therapeutic intervention conducted by specialized therapists.

The case study analysed, presents the severity of the dyspraxic disorder and included performance of reading and writing and math skills. After an initial process of Motor Intensive Training (Champion LIRM) and treatment based on Ecological-Dynamic Practices, it shows a progressive and significant functional improvement and active participation.

**Informal observations of the approach in practice**

On entering the child is put at ease by the therapist, and asked to join in by imitating a series of movements that the therapist executes. Errors in copying the sequence are not corrected, but correct copying is verbally reinforced with praise. There is a clear rapport between the child and the therapist and even the complex movements are designed to be challenging but fun. These may include walking backwards while juggling. The approach moves on from more complex sequences, to following a pattern of movements recorded in a book held by the therapist – thus translating symbols rather than repeating concrete actions. Finally, the reading or maths is added, once the fluidity and rhythm of the movements has been successfully established.

**CASE STUDY – Dyslexia and Dyspraxia**

**Presentation**

Valentina is 10 years old and attends the fifth class of Primary School in Italy. She came to our centre because of learning difficulties, in particular, in the performance of reading, writing and in completing tasks. At school she is disorganized and she often loses attention, looking away, almost enchanted.

She tends to isolate herself from the group and she used to be on friendly terms with only a few of her class-mates. The organization of her homework is stressful because of her slowness in reading and writing. For this reason Valentine often becomes nervous and hesitant in carrying out tasks. Her mother reports that they often spend whole afternoons in the organization of homework because her daughter is slow to start working and to do tasks. When she is left to herself, she often remains motionless or she gradually becomes distracted, looking around or fiddling with objects.

**The context**

Valentina belongs to a high socio-cultural group, her parents provide a stimulating environment, showing a high sensitivity to the learning process and the value of school and education. The climate, the values and interest in school activities and the daily attention to what happened at school everyday, are important factors that allow a serene educational continuity. It is clear that her parents have done their best to help and support her.

**The diagnostic process**

After the first interview with Valentina's parents, we proceeded to the functional evaluation according to the guidelines and procedures specific to the "Crispiani Method", with an ecological and qualitative approach, founded on "Bio-Psycho-Active Structure"

**Functional assessment**

**Motor area:** Parents referred to delays in motor–coordination but after a long period of difficulties, there have been significant improvements. Today she expresses hesitation in initiating actions, slowness in motor coordination and in the execution of a task, hesitation in walking down stairs and crossing the road. On closer examination, this may be due to her lack of lateral dominance, she is partly left handed and partly right handed with interference and orientation to the left (Hourly closures, mirror writing numbers and graphemes p, b, d, q). Time -space disorder. Awkwardness, clumsiness and general disorientation in team games, especially when they are fast and require coordination with other people (such as volleyball). In terms of eye movements, previous assessments from other specialists are referred to, as she has difficulty in perceptual tracking and in cross lateral patterns, rotary patterns and speed.

**Emotional area:** Valentina shows emotional sensitivity with uncertain self-esteem. She has poor and discontinuous attention. Her personal strategy is a tendency to isolate herself, whenever there is too much noise or confusion. She is impulsive but has a strong relationship with her family.

**Affective Area:** She shows a normal availability and interest in human relations accompanied by discontinuous availability for the task.

**Perceptive Area:** Her perceptual and visual discrimination are normal in conditions of stillness and calm. However, she has a disorder in perceptual pursuit and synthesis, suffering from an overload of stimuli, reaction to unusual sounds and strong light stimulation. She shows a tendency to repeat to herself what she heard or saw (difficulty in auditory and visual procedural) to reinforce the sequential order.

**Area of thought:** Valentina shows hesitations and delays in the coordination and sequencing of concepts, thoughts and ideas. She shows poor cognitive organization, indicative of ideational dyspraxia, accompanied by difficulties in temporal and sequential structure. Her poor school performance is due to her learning disorder, exclusively in the executive phase, not in the intellectual one (in terms of dyspraxia, and disorder in sequencing), with difficulty following

sequences of thought and language, above all when they are too long and complex. She demonstrates slowness of activation in cognitive processes (a phenomenon of Mind-Out).

**Area of communication and language:** Parents referred to delay in development of speech with a global improvement in communication and eye contact over the years. Valentina shows slowness of speech and difficulty in the initiation of speech. She has difficulty with long and fast verbal messages, with a tendency to cognitive loss in multiple explanations, reflecting a disorder of "succession or sequence". In learning, she often requires dual explanations, verbal and written short deliveries.

**Social Skills:** She expresses a positive attitude even if she tends to self-select interests, hobbies and places or contexts.
Reading - Dyslexia in terms of lack of fluency, hesitation, interruptions and losses. She reads better in an oblique direction with small fonts (improving the visual span and movement to the right). She show an uncertain understanding of the text, accompanied by tiredness when reading.

**Writing:** Dysgraphia in terms of a functional disorder in grapho-motor skill (irregularities generally, untied letters, interruptions), alternating slowness and precipitation. Syntactic structures are often contracted. Uncertainties in proceeding from left to right.

**Calculation and math skills:** Uncertainties in the time line and in the line of numbers, writing numbers.

**Foreign language:** Difficulties in written language, better in oral performance.

**History:** Cognitive loss in timelines. Difficulty in sequencing of events.

**Stories:** Difficulty with the timeline. Difficulty with the sequence of events.

**School situation**: Progress at school is compromised because of the disorders of executive functions and the discontinuity of Valentina's attention – concentration.

Consequently to summarize or paraphrase, remember and express properly the contents of the texts, understand mathematical problems, organize verbal exposition, are disordered and confused.

In other words Valentina's performance is often discontinuous, involving procedural – sequential processes, characterized by lack of coordination. She tends to lose attention with frequent cognitive losses, and she often exits from situations (especially when someone talks to her for a long time or when she talks by herself for long). Concerning temporal organization Valentina appears hesitant in telling the facts in the right sequence and she often makes mistakes in the memory of order or procedural memory, rather than in the memory of the individual events.

When she has to do a simultaneous and coordinated action for example two motor activities (clap hands while jumping) or motor and linguistic together (jump and say a rhyme), she is not fluid as a result of a lack of general coordination problems (involving both cognitive and praxic disorder).

**Assessment**

Valentina has a dyspraxic condition involving severe disorders of reading, writing and math skills based on disorganization in time and space with a poorly defined lateral dominance (dis-laterality).

Symptoms are observed in:

- **The subject:** She demonstrates alternating slowness and precipitation in school performance with a tendency to "cognitive loss" and to escape from the task.

- **Parents:** Valentina's mother, helping her daughter every day with her homework, is especially subjected to a state of strong emotional distress.

**Treatment ( Intervention programmes)**

a. **Welcome to the family**

In the Crispiani Method, great importance is placed on the relationships with parents.

Referring to the case presented, the interview before the intervention programmes was conducted with efficiency, thanks to Valentina's collaboration and the careful analysis presented by the parents (in this case they are two doctors and inform us in details about some critical aspects). The diagnostic process was followed by the provision of information on the nature of the syndrome, subjective manifestations, trends, intervention programmes and strategies applied. Parents were informed of the nature of the disorder in terms of dyspraxia, involving difficulty in motor coordination in different functional areas.

b. **Treatment**

Concerning Valentina's disorder, it activated an intervention programme based on procedures and strategies, that belong to the CO.CLI.TE System (Cognitive Treatment Clinical Education – Crispiani, 2011).

This consists of a series of cognitive and dynamic programmes (12 cognitive training modules) that work to improve automaticity, cognition, coordination of thought and concepts. The dominant trait is a dynamic and qualitative conception of dyslexia/dyspraxia, partially considered as a pervasive disorder that manifests dyspraxia in many other functional areas.

As Valentina lives in an another town, far from our center, a special training has been activated in the form of the Champion LIRM (Intensive Reading and Speed Motor), a very intensive therapeutic intervention with total monitoring of the subject, with a short duration (3 days and for 5/6 hours a day in two stages). The aim of this special training is to improve fluency from a neurological point of view, (Storm Neuromotor) alternating an intensive physical activity (sequential praxic processes) and, after this, exercise of reading in

terms of fluency. This constitutes the programme of Intensive Reading and Speed Motor (Crispiani and Palmieri, 2012).

c. **Assessment of reading speed before treatment**

After the functional assessment of the child, before starting the Intensive Training Programme, a component of reading function, Speed, was also assessed. This was obtained from the time taken to read a narrative passage, with an Index of Difficulty (IDT) 0.05. Valentina's reading performance at the beginning was 3 minutes and 15 seconds, with an index of Individual Fluidity (IFI) of 2.32.

Her performance also showed some important aspects:

- hesitation in reading
- slowness in the initiation (*incipit*)
- Hyphenation at the beginning of the word, prolonged in long words (Pa ... or ... linen, all .... ar ... mata, pia ... ... ne....rottolo)
- Replacements of words (*piegare* instead of *pigiare*, *aquiloni* instead of *inquilini*)
- Slowness in eye movement and orientation left to right, top down
- Tends to lose line ahead during reading
- Frequent fixations and some regression
- Inclination of the head
- Need to boost voice.

d. **Working method of Champion LIRM (2012)**

The Intervention programme designed for Valentina was divided up as follows:

First day
8:30 to 11:00 & 14:30 to 17:00
Second day
8:30 to 11:00 & 14:30 to 17:00
Third day
8:30 to 11:00 & 14:30 to 17:00

A break was planned every two and half hours of functional activity, alternating each time 15 minutes of physical activity with 3 to 4 minutes of reading until the completion of the specified times.

The Special Training has the following features.

a. oriented to Sequences - Automaticity - Fluidity, which forms the Polo SAF;
b. conducted in terms of fluidity with considerable attention to cognitive pressure.

This strengthening functional programme, is based, as in the common training, on the four major vectors named Physio Praxic Vectors (VFP) that constitute the energizing platform:

1. Incipit- initiation.
2. Fluency
3. Cross lateral patterns
4. Rotator patterns.

The main clinical importance of the Champion LIRM is that it is an intensive therapy conducted through

the repetition of physical activities and reading alternating each time, physical activity (15 minutes) and speeded reading (3 to 4 minutes).

The Champion LIRM is a Professional Practice that helps to maintain a high cognitive level providing fluid and automatic convergence of important components such as motor coordination, perception, and language, while reading and writing.

**Phase 1**

The application of the treatment consists of an initial phase of observational work on the motor behaviour of the child, an important moment since the early days of praxic-motor activity. Through the extension of coordinated activities repeated for over 15 minutes, the therapist takes into consideration the most dysfunctional areas that will be the subject of the intensive work in therapy.

In the case of Valentina, a lack of coordination in motor areas is highlighted, especially in fast movements and cross lateral patterns with loss of sequences.

Difficulty in postural balance is often accompanied by oscillations of the head and the trunk involving the entire body, producing clumsiness and poor self - regulation.

This functional disorder makes the child slow in activation (incipit) and discontinuous in the execution of skills, with a marked loss of attention.

**Phase 2**

Physical activity is immediately followed by reading for 3-4 minutes, which is outlined in a series of exercises that focus on improving predictive and global reading. The activities proposed in this phase are different and graduated.

The first one is global reading of words at a glance where the educator quickly shows a series of cards with words of varying complexity (two syllables, three, four etc.) and the subject must speed read.

The second activity consists of reading brief sentences that are cut out in cardboard. The therapist shows these quickly and the child has to read at a glance. This exercise is useful for building automaticity without breaking reading into single elements.

In this phase, Valentina appears immediately slow, stumbling in the middle of the word with general irregularities. After showing the card, there are frequently interruptions in perceptive tracking with fixed gaze, lack of initiation of reading, difficulties at a glance as a form of disorder in space-time.

**Initial phase of treatment: consideration.**

In this first observation, Valentina is characterized by cognitive discontinuity and insufficient coordination in acting, with a tendency to lose concentration and difficulty with sequences.

In summary, a previous list of indicators have emerged in motor, communicative

and perceptual areas. Valentina has difficulty in the following areas.

MOTOR AREA:

- Execution of fast motor sequences
- Execution of sequences with the ball
- Execution of motor coordination
- Executions of praxis using her hands
- Execution of ballistic coordination
- Simultaneous realization of multiple functions both perceptual-motor and verbal-motor)
- Control of multiple functions
- Frequent lack of lateral dominance (interference)
- Frequent dyspraxia in lateral and cross patterns

COMMUNICATIVE AREA

- following verbal instructions and putting in sequences
- using syntax in a communication

PERCEPTUAL AREA

- Perception of distance
- Execution of rhythms
- Execution of visual and auditory procedures

**Results**

**General functional gains**

One of the first signs of improvement that was recorded was the reduction of sequential disorder, a cause of slowness and disorganization in space-time. Valentina has improved in the coordination of motor areas (control of multiple functions, speeded cross patterns, general fluidity, incipit) and in reading.

Below the evaluation about the four major vectors Physio – Praxis - Vectors (VPF), incipit, fluidity, cross patterns, rotary patterns.

1. **Incipit:** significant improvement in motor readiness, both in starting the coordinated motor gesture andt in the readiness of language. A decrease is revealed in the initial suspension of word attack or interruptions in reading. Valentina showed sufficient capacity to maintain concentration and attention in execution of tasks. There was a reduction of excessive movements with head and body, coupled with an observable relationship between attention and gaze.

2. **Fluidity:** significant fluidity in the rhythms and the creation of more functions with sufficient appropriate monitoring of multiple functions and speed work. Cognitive participation became less disoriented and unsure. Reading more fluid with reduction of moments of fixed gaze on every word, more regular shifts from left to right.

3. **Cross patterns:** better efficiency of cross system (hand, foot, eye and ear) and directionality in space expressing a greater fluidity of the limb against the opposite side.

4. **Rotary patterns:** At the beginning, the movement was insecure and poorly organized in time-space, alternating abrupt gestures, slow and precipitous, but the frequency of exercises improve the result and allows the storage of the motor pattern.

### Gains in reading

At the end of the intensive special training, Valentina was given a new reading test aimed at speed, obtainable from the time taken to read a new piece of the same length (bars and spaces) and the same index Difficulty of Text (IDT) of 0.05. The reading was performed in 2 minutes and 10 seconds, and with an index of Individual Fluidity (IFI) of 1.66.

The student also expressed:

- Reduction of hyphenation
- Greater accuracy
- Reduction in minor interruptions (more fluidity).

A substantial improvement was recorded in terms of speed (space/time) and accuracy compared to the first evaluation, best expressed by the Index of Individual Fluidity (IFI).

### Individual Technical Report

At the end of the treatment lasting 3 days, for 15 hours, Valentina has made excellent progress. She has improved in her organizational functions in general, with particular reference to the motor area and in terms of reading fluidity her percentage improvement is 34% in three days.

All this information was provided in an Individual Technical Report and given to the family. It contains of both the evaluation output (post test) and recommendations for the family, school and therapist (work plan and monitoring), that is useful for the maintenance of gains obtained in motor coordination and fluidity of reading and writing.

### Conclusions

Intensive Rehabilitative Treatment, in this case based on Champion LIRM, tends to accelerate improved neuromotor plasticity that is reflected in many performances coordinated in space and time.
The intensiveness, the right pressure and the consistency of the work, are the origin of the enhancement of this neurological pattern in the sense of the automation and speed work.

## OUTCOMES AND ASSESSMENT

### Assessment of Rehabilitation Treatments according to Crispiani method (Ecological Dynamics Practices)

### The target

The study concerns the value of the speed of reading execution, measured before and after the treatment according to the Ecological and Dynamic practices belonging to the Crispiani Method. Assessment, treatment, measurement and data processing were conducted by the research team consisting of Piero Crispiani, Ivan Di Pierro, Antonio Grifoni, Eleonora Palmieri.

## THE PARTICIPANTS

The tests and measurements were administered to a sample of n. 33 Italian dyslexic children between 7 and 13 years already diagnosed with qualitative or quantitative procedures, including 19 females and 16 males.

All the participants undertook a "Functional assessment" conducted in the Psychology and Pedagogy Clinic Centre

"Victor" in Macerata, including a syndromic picture affected by the following:

- General dyspraxia
- Clumsiness (difficulty in movement patterns and rapid crusaders (rapid movements combining opposing hand and foot in cross over , synesthesia, self)
- Hesitation (slow in activation – incipit) in praxic-motor planning and linguistic expression
- General lack of fluency in executive function, alternating slow and fast action, disorder in automaticity
- Lack of coordination in many areas
- Disorganization of space and time
- Lateral dominance not established
- Slow reading and lack of fluency, with breaks, inversions, cognitive loss, and tiredness
- Slow writing and irregular grapho-motor disorders, missed closures, interruptions (disconnected letters)
- Difficulties in the field of mathematics are considerable, with uncertainty in relation to writing long numbers, queuing, rapid movement in the line of numbers, calculation, oral comprehension, problems, etc.

**Treatment**

After the Clinical Evaluation, all the participants attended Rehabilitative Treatment for 3 months, three times a week, (one hour each time) at our Psychology and Pedagogy Clinic Centre "Victor" in Macerata, from September 2014 to January 2015.

Treatment consisted of the fluid dynamics of sequential actions/procedures and control of executive functions: motor training, grapho-motor skills, perception, memory, thought, space-time organization, working left-right, language, reading, writing, maths skills and activities understanding of texts, together with practices of self–cognition and general educational support.

Practice in Motor Training (Training praxic-motor and general Activity Gym) was activated and 12 sessions of training programme based on the Crispiani Method, accompanied by advice for schools and families:

- Family Educational Practices (PEF)
- Warnings School (ASCO)

**Assessment of Performance of Reading (VEL)**

In the logic of our professional practice, the assessment of performance of reading follows a procedure at the beginning of each therapy. Our team has a series of narrative passages, unknown to the reader, that were written and standardized by the Itard Team.

The characteristics of the text are described in the Crispiani Method, in the first part of this article.

**The outcomes**

In this section we present the data with results for the improvement achieved after three months of treatment. In terms of the variability of initial reading, there is a difference at the pre-test, as it is not similar in all subjects, but depends on the level of severity of the disorder. This aspect is necessary because it is reasonable to expect major changes to

be variable based on the level of initial performance.

Effectiveness was evaluated by the difference in fluidity in reading before and after training, and also, as a further measure, it was decided to consider not only the simple difference between before and after, but also the incipit (the start of the word) inversions and so on.

In summary, our treatment is effective because it provides the best changes in fluidity, in terms of consistency, which does not reflect absolute speed but the following:

- Readiness
- Constant trend
- Right speed
- Lack of interruptions
- Scarcity of errors
- Self auto regulation
- Constant attention

The tables and graphs below show the results achieved.

Table 2 displays the average of the differences between reading speed before and after treatment according to the calculation index of Individual Fluidity. In this table, starting from the left, we report the initial value of each subject, then the value after three months of treatment, and the percentage of improvement for each one (a mean of 30% improvement).

Figure 1 displays the score for each subject at pre and post test.

Figure 2 shows a chart presenting reading performance at the beginning and end of therapy: as you can observe the changes appear to be significant. The gray line

Table. 2 Average of the differences between reading speed before and after treatment

| | Start | After 3M | - % |
|---|---|---|---|
| Samuele | 3m 21s | 2m 49s | 15,9 |
| Viola | 4m 36s | 3m 58s | 13,77 |
| Giacomo | 2m 48s | 2m | 28,57 |
| Veronica | 2m 43s | 2m 8s | 21,47 |
| Matteo | 2m 32s | 1m 24s | 44,74 |
| Tommaso | 1m 33s | 44s | 52,69 |
| Michelle | 1m 25s | 1m 4s | 24,71 |
| Rebecca | 1m 2s | 38s | 38,71 |
| Mandarina | 2m 20s | 1m 20s | 42,86 |
| Giacomo II | 1m 50s | 50s | 54,55 |
| Daniele | 2m | 1m 23s | 30,83 |
| Serena | 1m 20s | 45s | 43,75 |
| Angelica | 1m 25s | 1m 2s | 27,06 |
| Giorgio | 2m 40s | 1m 58s | 26,25 |
| Emma | 3m 10s | 2m 34s | 18,95 |
| Matteo II | 5m 32s | 4m 36s | 16,87 |
| Marco | 2m 34s | 2m 7s | 17,53 |
| Anna | 2m 57s | 2m | 32,20 |
| Assunta | 1m 45s | 1m 2s | 40,95 |
| Alessio | 3m 5s | 2m 15s | 27,03 |
| Chiara | 1m 26s | 46s | 46,51 |
| Margherita | 3m 17s | 2m 45s | 16,24 |
| Sara | 2m 22s | 1m 40s | 29,58 |
| Tommaso II | 2m 54s | 1m 49s | 37,36 |
| Alessio | 2m 49s | 1m 43s | 39,05 |
| Diego | 3m 39s | 2m 35s | 29,22 |
| Umberto | 2m 29s | 1m 39s | 33,56 |
| Laura | 1m 34s | 44s | 53,19 |
| Luca | 1m 44s | 56s | 46,15 |
| Riccardo | 2m 21s | 1m 34s | 33,33 |
| Francesco | 3m 23s | 2m 47s | 17,73 |
| Chiara II | 2m 14s | 1m 10s | 47,76 |
| Vanessa | 2m 33s | 1m 16s | 50,33 |
| Media in sec. | 152s | 105s | -30,92% |

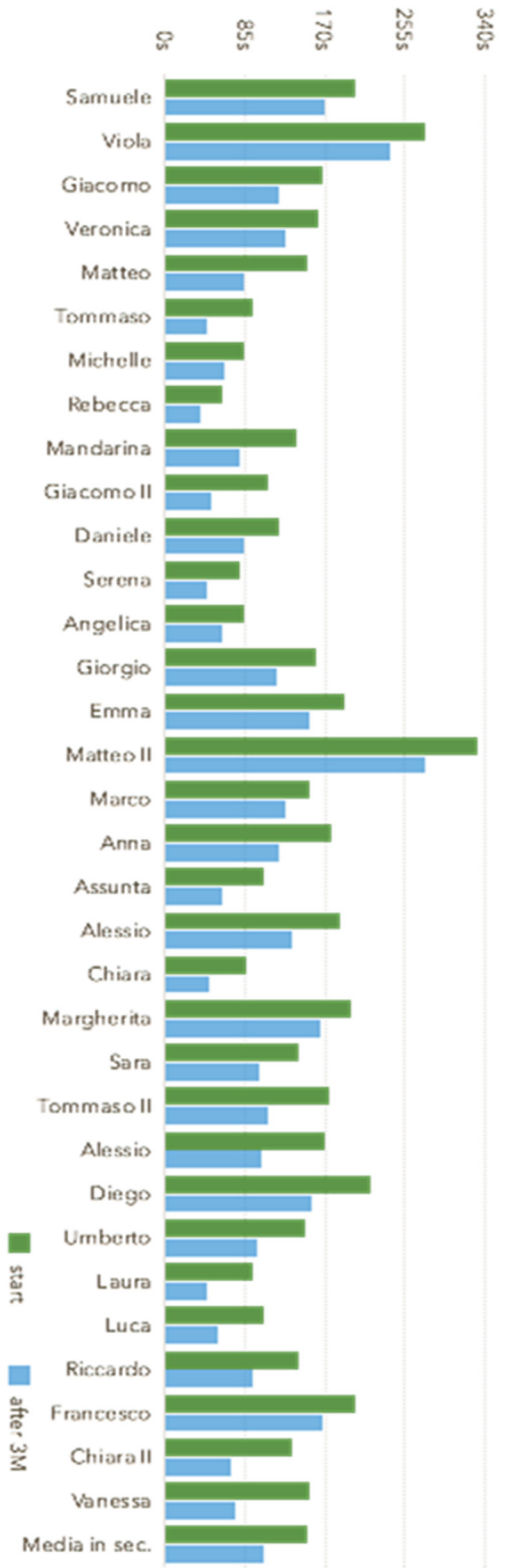


*Figure 1 Pre and post test scores*

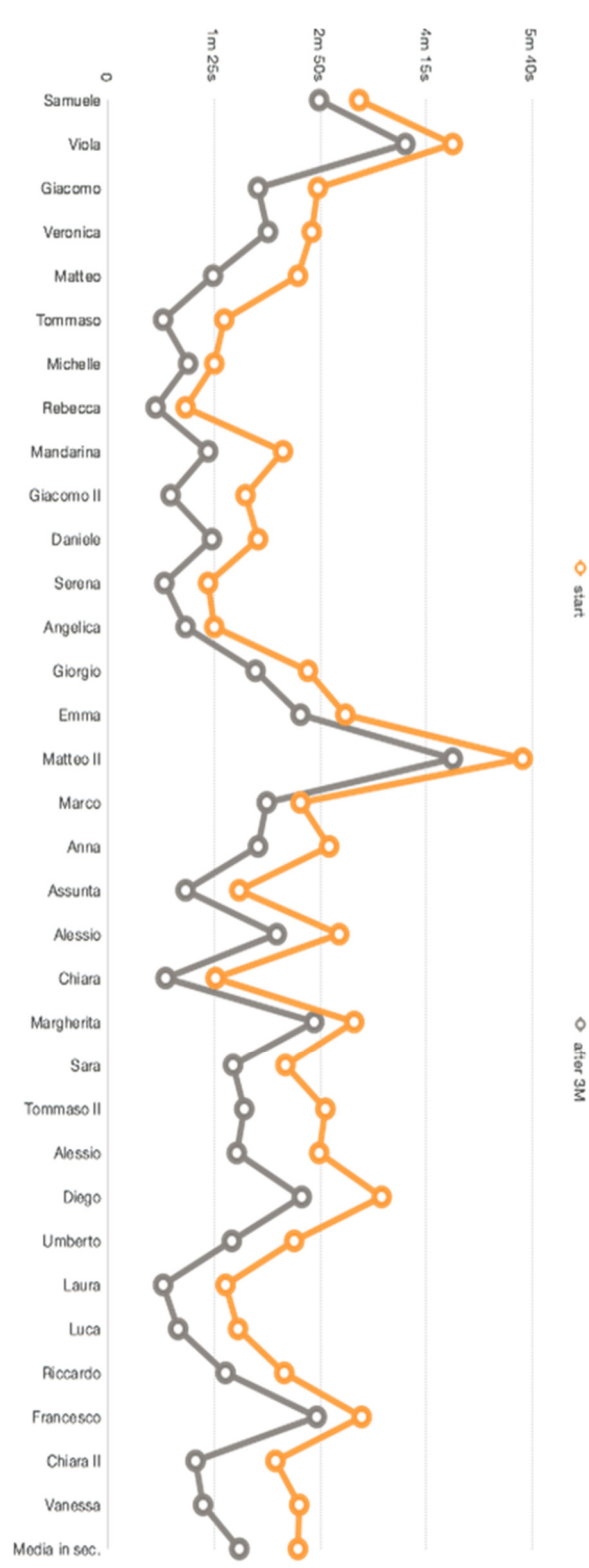


*Figure 2 Pre and post test scores*

shows that all subjects improve in fluidity compared to the initial phase, the orange line shows the slow process of production at the beginning of treatment.

Table 3 and Figure 3 show the percentage improvement after three months of treatment. This improvement ranges from 10-60% compared to the initial phase. The majority of subjects achieved results between 20 and 50%.

Table 3 The percentage improvement after three months of treatment

| **differenza %** | **f %** |
|---|---|
| < 10 | |
| 10-20 | 7 |
| 20-30 | 8 |
| 30-40 | 7 |
| 40-50 | 7 |
| 50-60 | 4 |

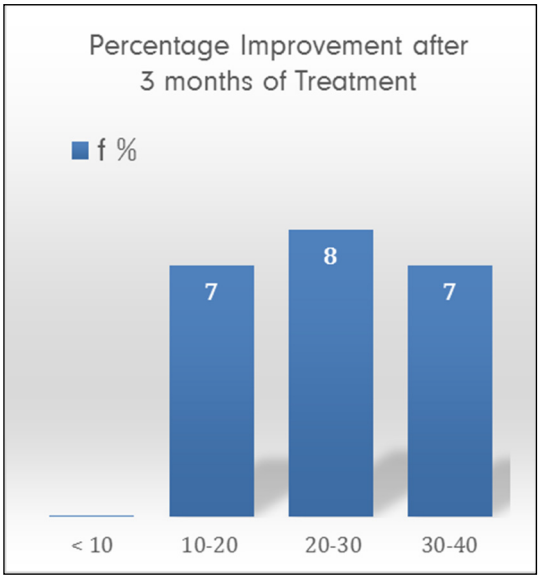


*Figure 2 Percentage improvement after three months of treatment*

In a further explanation of increased fluidity, the sample shows that the improvements are in readiness to start with decreased interruptions (stumbling) and a more consistent rhythm.

A repeated measures *t* test was undertaken on the times for pre and post test, (mean pre-test, 153seconds, mean post-test 108 seconds, standard deviation 55.4 and 54.4 respectively), *df* 32, *p*=<.0001. This shows a highly significant effect of the intervention, with the time for each child reduced from pre to post. In terms of our high and low achievers, if we split the groups into 2 with group 1 subjects (fast) completing the pre-test in less than 150 seconds, and group 2 (slow) taking longer than 150 seconds, it is interesting to note that the improvement in group 1 is 50 seconds and in group 2, 49 seconds. Although there is more room for improvement in the 2nd group, it should be evident that both groups make good progress.

**Conclusions on our research**

The treatment based on Ecological Dynamics Practices within which the Method is performed, shows improvement in a concise time of 3 months. This study provides evidence that the treatment is efficient because it aims to affect the automaticity of the reading process through qualitative and intensive procedures.

The reading speed, translated as fluidity, is the potential recovery obtained by all subjects, which is pervasive in all areas of the personality in an ecological and dynamic approach impacting on the whole child and their performance. In this sense the issue of the potential recovery is

central, since our treatment is aimed at people of all ages and regardless of the initial level of severity. Our treatment is open to all, not only at the early grades of elementary school, getting the first results in the first month. To be effective, these treatments must be carried out intensively, 3 hours a week for three months. The treatment has been designed to be not only effective but also cost effective, with moderate charges for participation in the treatment.

In conclusion, and in terms of the requirements of fluency and comprehension, we have been able to speed the reading and increase the word attack and concentration of a group of children with evidence of dyslexia. Building on theoretical perspectives that are well-regarded in Italy, of the need for attention and motor fluency, we have combined reading and co-ordinated movement in order to smooth the sequencing and fluidity of reading. The approach restores an element of fun and challenge to the reading process and can impact on the self-esteem and success of the whole child.

**Limitations and directions for further research**

Although the data provided in conjunction with the case study provide some evidence for the effectiveness of the Crispiani approach, we cannot extrapolate too strongly from these results. Ideally, the gold standard for educational research would be a double blind controlled study. However, it is clear that this is not really possible to deliver within an educational setting and the best we could hope for would be a controlled study where the performance of children undertaking the Crispiani method was compared with a matched group of children who did not undertake this approach. Nevertheless, the quasi-experimental approach adopted here, with each child acting as their own control, has been widely used in intervention research. Secondly, it may well be that there is an experimenter effect with a whole child intervention of this type with the relationship between the child and the therapist influencing the results.

Clearly further research would need to be undertaken to address these issues. It should also be noted that concerns have been expressed over the use of motor skill interventions that do not include reading practice in the UK and USA, with English particularly susceptible to problems in phonology. Nevertheless, the evidence provided here is suggestive of a highly significant positive impact for the approach for the Italian language, and this reflects similar evidence from other studies of co-ordinated movement (e.g. McPhillips et al., 2000 in Ireland) but here for the first time providing some evidence of improvement in fluency of reading, one of the key issues in literacy research.

It is important to acknowledge that the children who took part in this study in the main showed severe impairments reflecting complex needs, and that Italian is a regular language that may be less susceptible to problems in phonology. If this pattern of results can be found with other children with co-morbid problems who have proved resistant to traditional remediation, it has implications for our understanding of the importance of the whole child in therapy. In particular, the emphasis in success and positive

feedback to enhance self-esteem and commitment to succeed may prove to be an important contributory factor for remediation in all languages.

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# *Improving English exam skills for dyslexics in primary education in Singapore*

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*Abstract*

*Many children with dyslexia show problems with English language skills and grammar, and struggle to obtain results which reflect their potential. Problems with decoding, fluency and comprehension can all impact on progress, and this has particular impact in Singapore, where good performance in primary education has particular significance. Parents and teachers have high expectations for their children and students, especially when they sit for their Primary School Leaving Examinations (PSLE). The results of the PSLE can determine a child's educational pathway following their primary school education. Students with dyslexia struggle with the English PSLE subject, and score badly in several components of the paper. In response to this need, curriculum developers with the Dyslexia Association of Singapore (DAS) have developed an English Exam Skills Programme (EESP) to help Dyslexic learners in the DAS overcome their difficulties in the PSLE English Paper. The EESP focuses on teaching skills and strategies that directly helps students in the Grammar, Editing, Synthesis and Transformation, and Comprehension components of the PSLE paper. In this paper, we present a continuous evaluation of the results of students on the EESP over a period of 4 terms, with group sizes ranging from 29 to 46. This evaluation revealed that students made consistent progress and significant improvements in their skills, particularly in the Editing and Synthesis and Transformation components of the programme. Implications for wider applications of this approach are discussed.*

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**Introduction**

The primary emphasis in dyslexia has traditionally been on learning to read and spell, these problems are causing dyslexic learners from keeping up with their peers across the school curriculum, particularly affecting progress in English language skills in the primary stage. If reading remains laboured, slow and errorful, it is difficult not only for learners to extract meaning but also to understand the underlying structure of the language that is being read – a process known as statistical learning that underlies language acquisition. This means that many children with dyslexia will show problems in components of their English language skills, and this may be compounded for children who are learning in their second language.

Structured educational systems tailored for primary school children have been implemented in countries such as the US and UK for several decades. In the US, children embark on their journey in elementary schools after nursery or kindergarten (U.S. Department of Education, 2015). In the UK, the national curriculum is divided into key stages (Gov.uk, 2014). Young children and toddlers will embark on education in Key Stage 1 before starting on Key Stage 2, which is the equivalent of the elementary school in the US. Education in Singapore follows a similar structure where formal education starts at age 7 when children enrol into primary schools after kindergarten and nursery. Children within these three primary school education systems will progress to High School, Stage 3, and Secondary School in the US, UK, and Singapore school systems respectively. A clearer comparison between the three educational systems is presented in Table 1 below.

Although a similar educational structure can be observed in all three systems, there is a distinct difference in emphasis on examinations at the end of primary school education. In the US system for example, children do not have to sit for any major examinations in elementary school. The first major examination students in the US sit for is the SAT's after high school, for entry to undergraduate programmes. Children in Stage 2 of the UK system, and in Singapore primary schools however have to sit for examinations before they can move on to secondary schools. Children have to sit for the Statutory Assessment Tests (SATS) in

Table 1. Comparison of educational systems in US, UK, and Singapore.

| **Country** | **US** | **UK** | **Singapore** |
|---|---|---|---|
| **Before Primary** | Nursery/Kindergarten | Stage 1 | Nursery/Kindergarten |
| **Primary** | **Elementary School** | **Stage 2** | **Primary School** |
| **After Primary** | High School | Stage 3 | Secondary School |

the UK where they will be tested for spelling, punctuation, grammar, reading, and maths (Gov.uk, 2014). In Singapore, children will have to sit for their Primary School Leaving Examinations (PSLE) where they will be tested on English, Mother Tongue, Maths, and Science subjects (Ministry of Education (MOE), 2014). In both the UK and more significantly in the Singapore education system, these examinations are considered as high stake examinations since results will determine students' placement in secondary schools. However, the emphasis on good performance differs between Singapore and the UK, where results may only determine the set level that the child is assigned to on entry. By contrast, there is a cutoff which determines which type of secondary education a Singaporean child is able to access, similar to that in the traditional UK grammar school and 11 plus system prior to the introduction of the comprehensive system. In Singapore, most parents and teachers have high expectations for their children and students to perform in their PSLE, because an Asian society such as Singapore is predominantly result based. Students will need to perform in several high stakes examinations to progress to better educational opportunities throughout their academic years.

Children in the Singapore education system will enrol in primary school at the age of 7. They will be in the primary school education system in Singapore for 6 years before sitting for their first major examination at the end of their sixth year. They will be sitting for their PSLE (MOE, 2015), one of the first and most important examinations every Singaporean child has to take.

Considering the importance of performing in the PSLE, students with dyslexia in the Singapore education system struggle to keep up with their peers and meet their parents expectations. Because of their difficulties in reading and writing, they often struggle to cope with their school work. It is particularly challenging for these students to progress, perform, and excel in their PSLE English paper, since most of the English paper requires these students to demonstrate language competence in writing (Singapore Examinations and Assessment Board (SEAB), 2015). These are skills that are difficult for dyslexic learners to grasp and master. Despite their acknowledged difficulties, there are still huge expectations for most of them to perform well in their PSLE, and indeed this result dictates their future school placement.

**Intention and features of the EESP**

Taking into consideration the struggles of a dyslexic child in Singapore schools, and the emphasis on performance in national examinations in Singapore, the English Examination Skills Programme (EESP) was implemented with the intention of addressing the examination needs of upper primary students with dyslexia in Singapore and with the DAS, who will be sitting for their PSLE.

Unlike the established MOE-aided DAS Literacy Programme (MAP) implemented in DAS that addresses the literacy issues and demands of a learner with dyslexia, the EESP aims to address the examination expectations and needs of these learners. Thus, a very clear distinction between the purposes of the MAP and the EESP is established. It is essential that learners in

DAS are remediated in the MAP to develop and progress in their literacy skills, the EESP on the other hand works on the several skills acquired during the MAP remediation, teaching learners to apply these skills in their examinations in Singapore schools. In short, the MAP addresses the long term literacy needs a learner with dyslexia is lacking, while the EESP caters to the national and cultural demands of a learner's performance in examinations.

In line with the examination expectations and demands on Singaporean children, signing up for tuition lessons and classes on top of and after school is not an uncommon practice in Singapore. With similar goals, tuition programmes have been compared to the EESP. It is thus important to establish a distinction between tuition programmes in the public and the EESP.

The EESP is specially tailored to cater to the needs of a learner with dyslexia. As such, it addresses the minute necessities of these learners and their profiles. For example, classes are kept small to ensure that teachers are able to attend to every child's individual needs; lessons are structured and cumulative referencing the Orton-Gillingham (OG) Principles (Gillingham and Stillman, 1997) to ensure students are given opportunities to understand and review concepts and skills taught; moreover, detailed and in depth mental processes and meta-cognitive strategies are explicitly taught to provide learners with the skills and structure to equip themselves for examinations, given that implicit learning can be impaired in these children.

In practical terms, it is important the EESP lesson activities are comparable to the actual PSLE paper. This is obvious since the end goal of students who are enrolled in the EESP is to improve in and excel in their PSLE paper. The structure of the EESP lesson activities generally starts off with the introductory skills and concepts required for individual components of the PSLE paper. Again referencing the OG principles, these lessons start of as engaging multisensory and cumulative activities during the introduction of these skills. Lessons however will end up with actual practice activities replicating the PSLE format, that require the use of skills taught within the lessons. Taking into account the vast amount of topics and skills covered in the PSLE paper in accordance with the Singapore Examinations and Assessments Board (SEAB)(2015), and the limited time (1 hour) the EESP teachers have with students each week, only selected topics were taught. Careful consideration had been taken before the team decided to focus on teaching the 'Grammar', 'Synthesis and transformation', 'Editing', and 'Comprehension' components of the PSLE paper.

## Literature Review

### Topics covered in the EESP

The four components mentioned that are covered in the EESP were decided based on close monitoring of marked school examination papers. The EESP team realised that most students in DAS tend to struggle with similar components of their examination papers. Specifically, several students were failing badly or getting zero marks for these components. Analysis of

their mistakes revealed that their answers to these components demonstrated a lack of understanding of certain skill sets, or the inability to apply skills and concepts that they already know. These could be due, as Snowling and Hulme (2011) described, to 'higher level' language difficulties such as problems or deficiencies with grammar and vocabulary. The EESP thus aims to address these weaknesses within the four PSLE components. As well as ensuring that students in DAS who will be sitting for the PSLE paper can get a firm grasp and improve in their PSLE scores for these components, we considered several other reasons for the implementation of these components. Detailed descriptions of the rationale and purpose of each of the components taught in the EESP will be presented in the paragraphs below.

**Grammar**

There are several components in the PSLE paper that require the knowledge and use of appropriate grammar. The main grammar components include the Grammar MCQ with a weightage of 10 out of 95 marks (SEAB, 2015), the Grammar Cloze with a weightage of 10 out of 95 marks, and Editing for Grammar, with is part of Editing for Spelling, and Grammar with a total weightage of 12 out of 95 Marks. In addition, PSLE candidates will also be assessed on their ability to demonstrate the correct use of grammar throughout the PSLE paper (SEAB, 2015). For example, students will also be marked for grammar in Synthesis and Transformation as well as Comprehension components in the PSLE paper. This suggests the importance of having a firm grasp of grammatical concepts in order to answer questions throughout the PSLE paper. Grammar was thus considered as one of the core components in the EESP curriculum.

**Synthesis and Transformation**

The Synthesis and Transformation component takes up 10 out of 95 marks of the PSLE paper (SEAB, 2015). One of the reasons why students with dyslexia struggle with this component is strictness in the marking. Students are required to transform sentences from one form to another in this component. For example, if a direct speech is presented as a question in the Synthesis and Transformation section, students will need to know how to transform the sentence to its indirect speech form. Any form of spelling or grammatical mistake within each question would cause students to lose marks for the entire component. This component is also difficult since it involves students needing to synthesize and transform sentence into grammatically perfect forms. Such sentences are uncommon in the actual spoken language of Singaporeans. Thus, Singaporean students will have to learn how to write sentences in a form that they may not be at all familiar with. The synthesis and transformation of these sentences follow certain grammatical patterns. These patterns are structured, thus, the EESP teaches students to remember and apply mechanisms to synthesize and transform sentences.

**Editing**

Editing takes up 12 out of 95 marks in the PSLE paper 2 (SEAB, 2015). Considering the need to be familiar with grammatical

concepts and spelling, students with dyslexia in DAS very often lose out in this component of the PSLE since these are two of the distinct difficulties a child with dyslexia faces. Teaching students to tackle Editing questions for spelling is not impossible. Since all of the students in DAS are enrolled in the MAP, they are familiar with a wide range of spelling rules. The EESP taps onto their knowledge of these rules and teaches students to retrieve and reinforce concepts taught in MAP, and apply them into editing questions. Processes taught during Editing lessons for example would start off with the teacher reviewing a concept taught in the MAP, after which the student would be exposed to words mistakenly spelled and flouting the spelling rules reviewed. Students will then be taught how to identify the rules the wrongly spelled word is violating, and make necessary changes to correct the spelling of the word.

**Comprehension**

Reading comprehension is one of the biggest components in the PSLE paper. With a weightage of 20 marks out of 95 in Paper 2 of the PSLE paper. (SEAB, 2015) According to the examination guidelines, (SEAB, 2015), students taking the paper are expected to demonstrate literal and inferential comprehension ability by answering questions after reading a text passage. Students in DAS however struggle with both literal and inferential comprehension skills since they are having difficulties understanding the text they are given. The EESP team thus took on the challenge to ensure that these students will be equipped with skills and strategies that could help them better understand text passages literally and inferentially despite their reading difficulties. One of the established strategies to ensure better comprehension of text is through reference tracking. Several studies including Pretorius (2005) and Walter (2004) suggested that reference tracking while reading impacts inference forming skills. Reference tracking is a strategy used to identify various mechanisms that can signal readers to recover ideas, persons, or objects that are previously mentioned in a text (Pretorius, 2005; Walter, 2004). Lessons designed for comprehension strategies in the EESP involved tasks and strategies using reference tracking. For example, students were taught how to identify personal and demonstrative pronouns in the text passages, and learn how to track and refer them to the nouns, clauses, or sentences referring to these pronouns. These tracking processes and skills taught are mechanisms for coherence building (Gernsbacher, 1990, 1997). This means that students who track are able to comprehend these texts more fully. These tracking activities are also important to teach because most PSLE papers have direct questions asking for students to identify what personal pronouns (he, she, it, I, etc.) or demonstrative pronouns (this, these, that, etc.) refer to.

**Limitations**

While the EESP aims to help learners with dyslexia in their PSLE paper, there are limitations to the programme. Considering the student's busy schedule and the logistic and financial practicality of lessons, the EESP only runs one hour lessons weekly. Thus, topics and components taught within the EESP are limited. This is the main reason for

teaching only four out of the several components in the PSLE paper. With these limitations, the EESP aims to focus on the students' weaknesses in the PSLE paper. An emphasis on practical skills for each of the components are also key features of the EESP.

**Material design and curriculum development**

Several material design principles were taken into account when developing the EESP. This was to ensure that while the ultimate goal of the programme is for students to be able to make use of strategies taught in their national examination paper (PSLE), all the lessons that were conducted also had to be suitable for learners with dyslexia. With this in mind, the EESP curriculum was designed adhering to the structured and sequential schema of the OG principles (Gillingham and Stillman, 1997) while addressing the examination needs of the students. An example of how this was achieved was how lessons were designed to be partially multisensory to ensure that students are given activities closest to examination conditions as possible, but also given opportunities to experience several possible pathways to learning, increasing the chances of retention of concepts learnt (Gillingham and Stillman, 1997). Created and adapted text and worksheets were also scanned to ensure

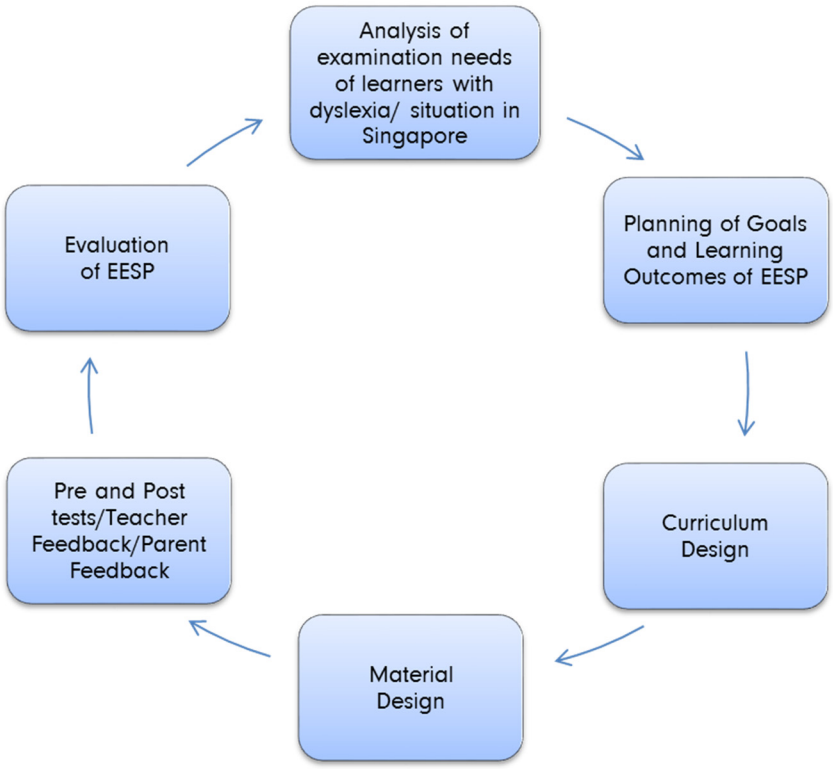


*Figure 1. Curriculum design processes for the EESP, adapted from Nation & Macalister (2010), and Richards (2001)*

if adaptations were necessary. The most common adaptations made in the material were what McDonough, Shaw, and Masuhara (2013) described as 'Modifying', 'Simplifying' and 'Deleting'. For example, texts were modified by changing the font of text to a larger and dyslexia friendly font (Century Gothic Font). Passages that were too long were simplified by presenting only selected sections of passages to be used in class.

The curriculum development processes of the EESP references Nation & Macalister (2010), and Richards (2001), who suggested a systematic and cyclical curriculum development process, involving the analysis of needs and situation, goal and learning outcome planning, syllabus, assessment and evaluation. Adhering to these processes, the developers were able to consistently analyze, review, assess, and evaluate the designed curriculum from the feedback acquired from teachers, students, as well as the pre and post tests conducted at the start and end of each term. An example of how the EESP curriculum was evaluated every term is presented in Figure 1, adapted from Nation & Macalister (2010), and Richards (2001).

The cyclical framework and the consistent review of the curriculum not only ensures the quality of the designed intervention, it also enables teachers and developers to consistently modify the EESP to suit the changing demands of a student with dyslexia. These also enable teachers to track the progress of students attending the programme. This information, at the end of the day was for the purpose of supporting students in DAS with the PSLE examination paper.

**Research Question**

With its curriculum developed with a sound rationale, it is important to validate and evaluate the effectiveness of the EESP. This is with reference to Nation & Macalister (2010), and Richards (2001) curriculum model, which emphasises the importance of repeatedly evaluating programmes implemented. Thus the following research questions were formulated:

1. Do students effectively show improvements in various skills required for exam components after EESP classes?
2. Is the quality of EESP improving after implementing the cyclical curriculum design framework suggested by Nation & Macalister (2010), and Richards (2001)?

**Methodology**

**Participants**

This study consists of students who were enrolled in the EESP in 2014. These students were learners with dyslexia, and are current students of the MAP. All of these students were in Primary 5 and 6, and in the Standard PSLE stream. The EESP welcomes enrolment of students at the beginning of every term, and graduates students after their PSLE. Although attempts were made to collect full data on all the students, several students tend to miss the pre-test or post-tests since they may be away on holiday or studying for examinations during the first and last week of the EESP. Thus, the students in each term may fluctuate across 2014. Tabulation and

analysis of the data should also take into account that there may be a different set of students in each term. The numbers of EESP students who participated in the study each term are presented in the table below.

Table 2. Number of students involved in the study in each term.

| **Term** | **1** | **2** | **3** | **4** |
|---|---|---|---|---|
| **No. of Students** | 37 | 46 | 26 | 29 |

**Instrumentation**

Pre-tests and post-tests were the primary tools that were used for data collection of this study. Pre-tests and post-tests were carefully designed by teachers to ensure that these tests test for concepts, skills, and strategies taught in each term. These are cross checked between curriculum developers and validity checklists recommended by Brown and Abeywickrama (2010) to ensure the validity of the test items. The same paper was used as the pre-test and the post-test for a single term, different papers however were used across the terms with respect to the topics covered within terms. The practice effect was initially a concern for pre and post-tests within each term, since students participating in the study will be sitting for the exact same test only after a 10-week time frame. This concern was addressed after taking into consideration the content of the tests. Grammar, Editing, Synthesis and Transformation, and Comprehension questions are not prone to the practice effect since students for example, will not be able to realise grammatical rules, correct spelling of words, or understand the syntax of transforming sentences just by completing the pre-test. Any of these skills or knowledge acquired will be solely from the EESP curriculum in the period between the pre and the post-test. Also, considering the scale of this study, it is not practical to attempt to design alternate forms for pre-tests and post-tests since it may compromise the validity of the results which would be of greater concern.

**Data collection**

Results of each of the four terms were collected independently. Both the pre-test and post-test for each term were marked and compared against each other. These data were used to present the quality and effectiveness of the EESP by revealing the percentage of students who did better in their post-test as compared to their pre-test. Further analysis of these results were also considered to unveil how much this improvement was across the board. t-tests were conducted for these two sets of results across the four terms, and analysed as a whole.

**Limitations**

Results of this study cannot fully evaluate any student progress over the full four term period, because of changes in the students participating over time. The data collected however will be able to reveal the effectiveness of the programme in each individual term, as well as the progress of the EESP curriculum as a whole.

**Results**

The pre-test and post-test results of all students across four terms were tabulated and analysed to evaluate the effectiveness of the EESP. The first set of data was tabulated to reveal the number of students who have shown improvements after each term. In Term 1, 89.5% of the students who completed the programme scored better in their post-test compared to their pre-test. In Term 2, 89% of students did better. There was an observable improvement in the students who improved in Terms 3 and 4 compared to Terms 1 and 2. In Term 3, all of the students performed better in their post-test. In Term 4, 96.5% performed better, and the 4 students who made up the 3.5% who did not improve in Term 4 were borderline. *t*-tests were conducted to ensure that all of the improvements were statistically significant. Results of the t-tests suggested that percentage improvements across all four terms were statistically significant ($P<.001$). A summary of consolidated results of the percentage of students who improved in their post-test after each term's remediation is presented in Table 3.

Evaluating and revealing the percentage of students who have improved after undergoing a ten week EESP can provide useful information about the general effectiveness of the EESP, however, it will not be able to evaluate the extent of the improvements these students made. Therefore, further analysis of the data was conducted to demonstrate the differences or improvements of scores between their pre-tests and post-tests across the four terms. In Term 1, students scored an average of 48.4% for their pre-test. This score was increased to 81.1% in their post-test. In Term 2, students scored an average of 46.4% for their pre-test. This score was increased to 55.7% in their post-test. Similar trends of increase of scores from pre-tests to post-tests can be observed in Terms 3 and 4. Students scores increased from 39.2% to 67.6%, and 50.6% and 64.1% respectively. The scores of the students revealed that the average percentage of scores improved across all four terms, with the largest increase in Term 1. A *t*-test comparing performance at pre and post-test showed highly statistically significant improvements in all 4 terms. Similarly, a summary of these consolidated results are presented in Table 4.

Both tables revealed that there was progress for students who underwent the EESP. Indicating that students were able to grasp and perform increasingly well in the several skills taught during each term. Following term 1, the difficulty of the tests was increased, because the original test was deemed too easy. The slight increase in the total number of students who improved in Term 3 and 4 as compared to Term 1 and 2 also revealed that the quality of the curriculum had improved across the terms.

Further analysis of the results of each term were conducted to evaluate how students performed in each of the four components. A breakdown of the percentage score of each of the four components across the four terms were presented in Tables 5 to 8.

Post-test scores of all four components were better compared to the pre-test scores in Term 1. The difference in the

Table 3. Percentage of students out of total students who improved in their post-test.

| Term | T1 2014 | T2 2014 | T3 2014 | T4 2014 |
|---|---|---|---|---|
| % Improvement | 89.5 | 89 | 100 | 96.5 |
| P value | P<.001 | P<.001 | P<.001 | P<.001 |

Table 4. Percentage of scores of students comparing pre-test and post-test

| Term | T1 2014 | T2 2014 | T3 2014 | T4 2014 |
|---|---|---|---|---|
| Pre test % | 48.4 | 46.4 | 39.2 | 50.6 |
| Post test % | 81.1 | 55.7 | 67.6 | 64.1 |
| P value | P<.001 | P<.001 | P<.001 | P<.001 |

Table 5. Individual component progress (T1 2014)

| | Pre-test % score | Post-test % score | Difference |
|---|---|---|---|
| Grammar | 58.4 | 65.4 | 7 |
| Synthesis & Trans. | 23 | 62 | 39 |
| Editing | 47.6 | 67.6 | 20 |
| Comprehension | 26.1 | 36 | 9.9 |

Table 6. Individual component progress (T2 2014)

| | Pre-test % score | Post-test % score | Difference |
|---|---|---|---|
| Grammar | 71 | 70.4 | -0.6 |
| Synthesis & Trans. | 36.5 | 57.9 | 21.4 |
| Editing | 33.9 | 44.3 | 10.4 |
| Comprehension | 42.5 | 32.3 | -10.2 |

Table 7. Individual component progress (T3 2014)

| | Pre-test % score | Post-test % score | Difference |
|---|---|---|---|
| Grammar | 53.8 | 80 | 26.2 |
| Synthesis & Trans. | 32.3 | 71 | 38.7 |
| Editing | 65.4 | 83 | 17.6 |
| Comprehension | 37.7 | 41.5 | 3.8 |

Table 8. Individual component progress (T4 2014)

| | Pre-test % score | Post-test % score | Difference |
|---|---|---|---|
| Grammar | discontinued | discontinued | discontinued |
| Synthesis & Trans. | 56.7 | 70.9 | 14.2 |
| Editing | 34.8 | 47.9 | 13.1 |
| Comprehension | 33 | 42.5 | 9.5 |

grammar and comprehension components however were not as significant as the difference in Synthesis and Transformation and Edition. In Term 2, post-test scores were only better for Synthesis and Transformation and Editing components. Scores were not better for the Grammar and Comprehension components. In Term 3, students improved in their post-test scores for all four components. The improvements for Comprehension however were not significant. In Term 4, all components shown improvements in post-test scores.

**Discussion**

It was encouraging to observe the increase over time in the percentage of students who improved from Terms 1 and 2 to Terms 3 and 4. Across the terms, pre-tests, post-tests, and worksheets were analysed with respect to Nation & Macalister (2010), and Richard's (2001) evaluation stage of the curriculum development cycle. After observing classes and looking at students' completed work in Term 1 and 2, teachers and curriculum developers realised that students were already performing in grammar exercises even during their pre-

test. Thus, their grammar performance was at a plateau in Terms 1 and 2 resulting in little improvements and progress in grammar. Upon considering the situation of the grammar component of the EESP, curriculum developers considered revising the grammar curriculum in Term 3 which resulted in a poorer performance in the pre-test but a bigger improvement in the post-test. After further evaluation, the team eventually discontinued the grammar component to emphasise on the other weaker components in Term 4. (The grammar component however was introduced in the newer Primary 3 and 4 EESP curriculum). These decisions in Terms 3 and 4 resulted in the improvements in scores in Terms 3 and 4.

Students were generally performing in both the Editing and the Synthesis and Transformation components throughout the four terms in the EESP. Considering the constant improvements in both components of EESP lessons, the structure, difficulty, and lesson execution plans of these lessons remained similar throughout the terms. Different topics and skills within each component however were taught in each term. The consistent improvement in the Editing component could be based on the fact that lessons were in line with the MAP course students were concurrently enrolled in, allowing students to relate lessons from both the MAP and the EESP. Being familiar with spelling rules in MAP allowed these students to easily apply these rules in editing activities. Students' improved performance in the Synthesis and Transformation component could be due to lessons being taught systematically and progressively referencing the OG Principles. For example, major Synthesis and Transformation topics such as 'Direct and Indirect Speech' were explicitly taught over several weeks systematically. Students were taught words that they need to look out for to transform every week. This gave students ample time to retain the information as well as transforming skills to work on actual 'Direct and Indirect Speech' questions in exam papers. Figures 2 and 3 show a sample of a student's Synthesis and Transformation section in the pre-test and post-test. The figures illustrates the vast improvements observed in the scores of the Synthesis and Transformation components in each term. It may be seen that the student struggled to successfully complete the pre-test, but that the post-test by contrast, showed only three errors.

Evaluation of the pre-test and post-test scores of each term revealed the difficulty in helping students perform in the comprehension component of the PSLE paper. Comprehension results across the terms were not ideal. Teachers and curriculum developers discussed and agreed that these results can be explained by how comprehension requires long term remediation before skills can be taught and applied. Further analysis of the pre-tests and post-tests and students' worksheets revealed that students were able to make use of skills such as annotation and reference tracking that were taught. Most of these skills however were only able to help students perform in questions asking to identify pronouns within the text passage. Teachers and curriculum developers believe that improvements in the comprehension component may not be observable within short single term periods.

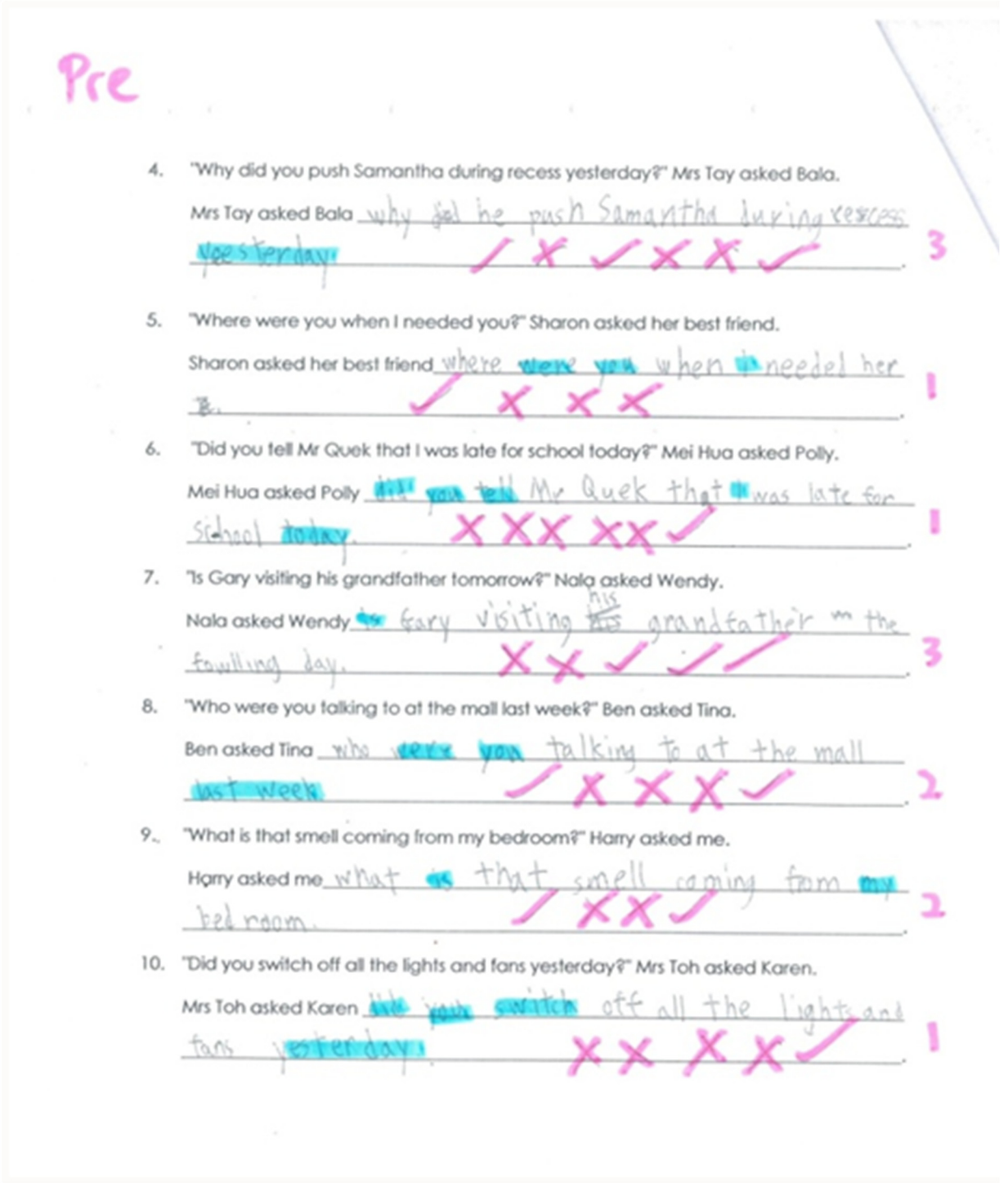


*Figure 2. Example of a student's Synthesis and Transformation work in a pre-test.*

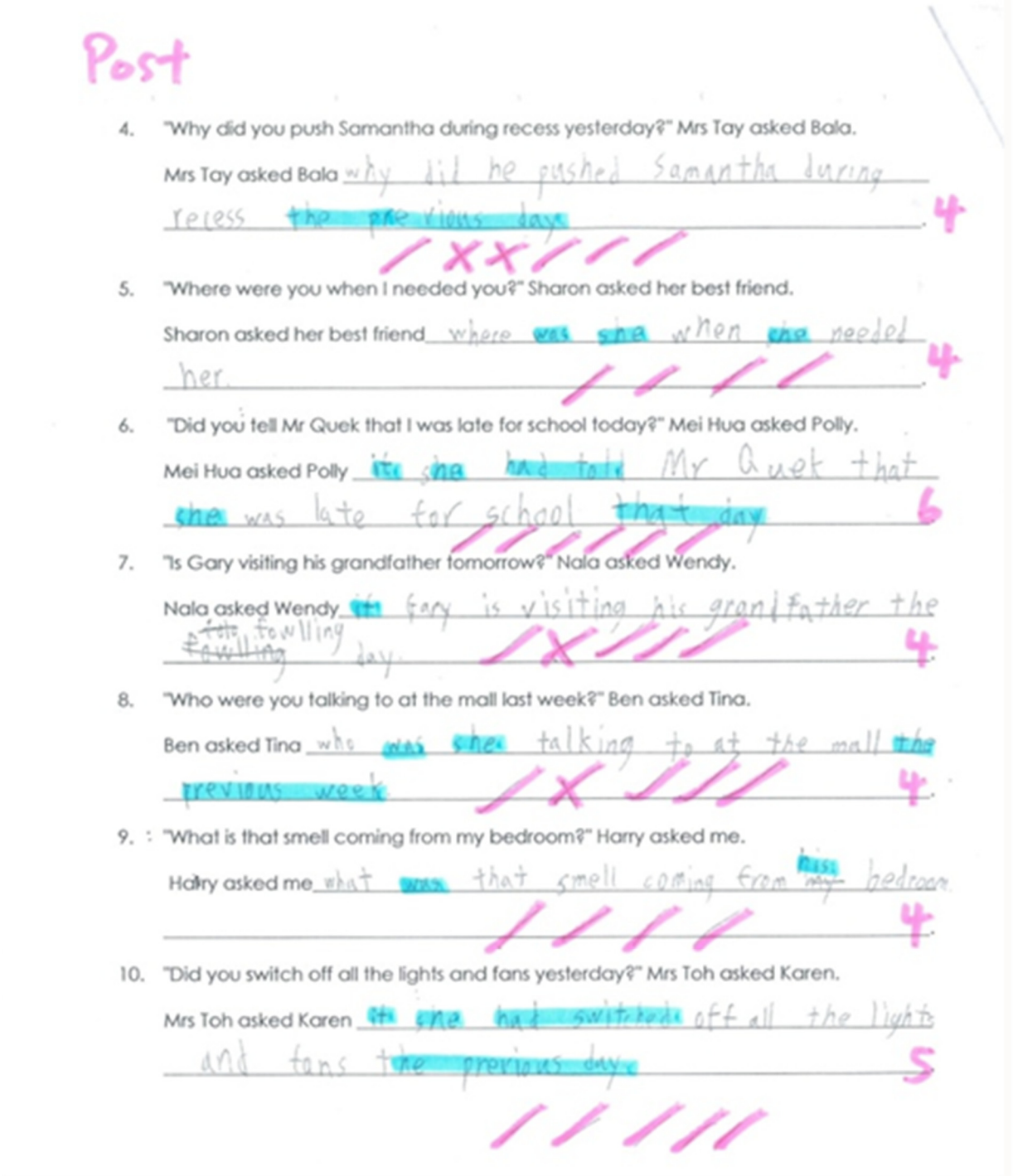


*Figure 3. Example of a student's Synthesis and Transformation work in a post-test.*

On top of the observable progress of the individual components, it was interesting to note how the percentage average score of the post-test of students in Term 1 was a great deal better than the rest of the terms in comparison to their respective pre-tests (Table 4.). This could be because the general difficulty level of the curriculum was raised when teachers and developers realised certain components were not challenging enough.

Feedback from teachers, parents and students indicated a general high level of satisfaction with the outcomes of the EESP. Specific feedback from parents included the following:

> "I am impressed that Jack's English Exam has improved from a low grade C during prelims to achieving a B in PSLE. His Comprehension has shown great improvement. I hope he will continue to apply the skills throughout his learning journey. Thank you DAS! "
>
> "I am very happy that Ken has passed his English for PSLE. He has never passed his English before."
>
> "Thank you for your coaching. John has shown such significant improvement that he will be receiving his Edusave Good Progress award. We are very glad that he has applied his skills on his exam, especially English"

The development and evaluation of the EESP revealed interesting information that was very useful for curriculum developers to improve on and design EESP curriculum for subsequent terms. From the analyses and results of this study, developers were aware that students were able to grasp Editing and Synthesis and Transformation concepts and skills taught. Future lessons should maintain topics in these two components. Results of the comprehension component however need to be further analysed. Perhaps future research could look in to longitudinal studies especially in the comprehension component to better track the progress of these students. With a more established EESP curriculum, the team could also look into implementing a single and more elaborate pre-test and post-test when students enter the EESP and leave the programme after their PSLE rather than pre-tests and post-tests every term, using a refined curriculum that has been shown to impact on comprehension skills. This would provide opportunities for more longitudinal results to be revealed, and also makes it possible to track the long term progress of students.

We are now seeking further feedback from parents on the impact of participation in the EESP programme on PSLE results, in comparison with students who have not taken part in this particuar programme. We also plan to compare the progress of students in the EESP with students who have benefitted from an extra hour of intervention in Math of Chinese. This can be done by conducting EESP pre and post-tests for students in Math and Chinese classes as a control. Comparisons of scores between these groups would take into account several other variables demonstrating that any improvements made in scores of the EESP students are specific to the EESP curriculum.

What are the implications of this approach for other programmes of intervention? Many dyslexic children fail to do

themselves justice in formal timed examinations because they lack the study skills to approach this type of assessment. This model of designing a curriculum, refining the curriculum in a cyclical fashion, and pre and post testing to evaluate progress is a model of good practice that can be used in intervention more widely. Recent reviews of intervention have generally shown that support for around 1 hour weekly in small groups, as demonstrated here, can be beneficial for improving students literacy over a period of 1 term. This can be more effective and cost effective than more intensive remediation. Support for phonology and reading has been consistently evaluated, but it has been hard to demonstrate transfer of skills to areas such as comprehension and grammar. This is one of the first examples of a successful evaluation of exam skills intervention. Given the importance of demonstrating improvement in timed examination format, there is considerable potential in extending this approach more generally in order to achieve success and build confidence in dealing with formal assessments of this type.

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# The Dyslexia Experience: Difference, Disclosure, Labelling, Discrimination and Stigma

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*Abstract*

*This paper reports on a qualitative/quantitative adult dyslexic study of 22 dyslexics who presently or have in the past suffered from a depressive disorder, and 7 control dyslexic adults. It compares depressive to non-depressive dyslexics, with gender and academic success variables. Interpretive Phenomenology Analysis was used to investigate dyslexia and stigma.*

*Many perceived dyslexia as positive and gave them unique skills, but made them feel different. This difference was perceived to come from having to work harder than their non-dyslexic peers to achieve in life, as dyslexia affected many aspects of their daily life. Interestingly most would not seek a cure if it was offered - suggesting they perceived their dyslexia to be integral to whom they were, and losing their dyslexia would be as great as losing a limb.*

*Evidence suggested that dyslexics experience discrimination due to their disability, whether they perceive it as a disability or not. They felt there was a lack of public domain information on dyslexia and its effects, as many of their peers perceived it being negative. Recent legislation in the US and the UK aims to protect dyslexics in the workplace, however to gain protection they need to disclose their hidden disability to the world, making them vulnerable.*

*Many dyslexics have survived the last twenty, thirty or more years in the workplace and school without their difficulties being highlighted, one participant noted that they had felt successful in hiding for so long, with many feeling unhappy about disclosing their difficulties as they may fear this would firstly go on their record and*

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*secondly it might have a negative effect on promotion and career prospects.*

*Many felt dyslexia was a disability when they were children, as school was seen as an inflexible environment with no escape from reading and writing, along with unfair comparison with age appropriate peers - 'I'm only disabled by my dyslexia when you put me into a classroom' (Natasha). It was felt as an adult there was more flexibility to choose professions that play to a dyslexic's strength and use supportive technology (e.g. computers and spell-checkers). However, a minority withdrew from a society when they felt ill-equipped to function effectively within it.*

*Stigma due to dyslexia was highlighted as many camouflaged their difficulties at work, attributing their difficulties to quirkiness (positive) rather than being disabled (negative). Implications for the Asia Pacific area are discussed.*

Keywords: Dyslexia, Difference, Disclosure, Discrimination, Labelling, Stigma

## Introduction

The aim of this study was to pose a semi -structured interview script to a range of UK adult dyslexics to investigate how they coped, their reactions to success/ failure and a review of their childhoods. Adult dyslexics were chosen as they would have the ability to review their childhoods for the origins of their coping strategies, and could give a data rich explanation of any emotional damage. Four groups were sought: dyslexics with and without a clinical depression diagnosis, degree-educated and non-degree-educated dyslexics. This research aimed to support a hypothetical 'Dyslexia Defensive Mechanisms' model as first proposed in Alexander-Passe (2009).

## Empirical Review

### What is Dyslexia?

'Dyslexia' first coined by Berlin (Wagner, 1973) described word blindness, defined through Greek roots: 'Dys' difficulty and 'Lexia' with words. In 1886 Morgan first documented the term and condition in the British Medical Journal (Snowling, 1996). Since then numerous medical and educational professionals have sought to understand the condition, its origins, its cause or causes, and its treatment.

Whilst the origins of the condition concerns difficulty with words, modern definitions are broader and this forms disagreements in the field. Symptoms include difficulties in: short-term memory, phonology, rapid naming, balance, motor skills, and organisation.

Based on the disparity between the original definition and modern symptom lists, a number of alternative names have been proposed to describe the condition better: Specific reading retardation, reading difficulties, specific reading difficulties, reading disability, learning disability, unexpected reading difficulty, and Specific learning difficulties. 75% tend to agree the

difficulty is with words, with the remainder noting a broader difficulty with learning.

Reflecting this disagreement, the draft revision to the 5th version of the American Psychiatric Association's 'Diagnostic and Statistical Manual (DSM-5)' originally suggested the term 'learning disorder' to be replaced with 'dyslexia' to *'render APA terminology consistent with international use',* describing *'difficulties in reading accuracy or fluency that are not consistent with the person's chronological age, educational opportunities, or intellectual abilities'* (Cowen & Dakin, 2013).

However its final version (APA, 2013) now uses 'Specific Learning Disorder', based on a reasoning that the international conceptions and understandings of dyslexia (and other conditions) exist but disagree on its definition (Tannock in Elliot and Grigorenko, 2014). Elliot and Grigorenko argue that attempts to find a single definition have been hampered by factors of inclusivity, some criticised as being too inclusive and others too exclusive. Rice & Brooks (2004) and Fitzgibbon & O'Connor (2002) agree that a universally agreed definition and explanation remains elusive, and that definitions to date have been subjective and too broad, and serve self-obsessive purposes.

Fletcher & Lyon (2010) offer three primary reasons why dyslexia is hard to define:

Dyslexia is an 'unobservable construct' meaning that attempts to measure it are imperfect and people suffering from the disorder cannot objectively report it.

Dyslexia is 'dimensional' meaning that there are varying degrees to which individuals may experience difficulty, from minor, severe and in between the two.

There is great disagreement from practitioners and psychologists about what characteristics to include and exclude.

The lack of an agreed definition and assessment route has meant that dyslexia is misunderstood which can lead to low identification rates, with many only being diagnosed in adulthood. It is argued that the majority of dyslexics leave school without diagnosis, and suffer at school through unsuitable and discriminatory teaching methods by teachers lacking special educational needs (SEN) training to identify children with learning difficulties (Hartley, 2010; OFSTED, 2010; Rose, 2009). Whilst current UK education policy states that all classroom teachers are teacher of all pupils including SEN, the lack of SEN training of teachers remains a concern (OFSTED, 2010; Driver Youth Trust, 2013).

Dyslexia affects both children and adults, but as children they are less able to hide their difficulties or differences (e.g. reading aloud, having their writing critically assessed etc.) as much as in adulthood where assisted adults or technology can be utilized. However many dyslexics experience discrimination on a daily basis (Dale &

Aiken, 2007; Michail, 2010). Scott (2004) and the Alexander-Passe (2004, 2006, 2010), Riddick (1996) and Willcutt & Pennington (2000) note the frustration and anger that can build up inside dyslexics when faced with tasks that highlight their inabilities, causing stress and anxiety (the fear of an already experienced negative event or task).

Alexander-Passe (2010), Scott (2004), McNutty (2003) agree that dyslexics generally camouflage their difficulties, with advanced coping strategies, so a sense of normality can be projected. Dyslexics are very conscious of their differences, so create a secondary persona to operate in the wider community (Alexander-Passe, 2010, 2012; Scott, 2004). However when cracks occur in this persona, it can be highly embarrassing, demonstrating how vulnerable they can be, and confirming their otherness compared to their peers.

There is however a shortage of research concerning dyslexia, disclosure, discrimination and stigma and this paper aims to shed light on this subject.

**Disclosure**

Dale & Aiken (2007, p.14) note in a recent study of dyslexic nurses '*many have gone to considerable lengths to hide their difficulties'.* Morris & Turnbull's (2006) study found dyslexic student nurses experiencing widespread concealment of student disabilities in clinical settings, as one student nurse noted *'when they (staff) find out they withdraw from you and make out you're not on the same level...they try to rubbish you and make you feel you've got nothing in your brain' (p.38). However without disclosure no 'reasonable adjustments'* and mentoring can be possible, to deal with the task-based difficulties experienced – so a double-edge sword

The need for disclosure is complicated by many dyslexics not perceiving themselves as being disabled (Blackfield, 2001) or not being recognised by others as being disabled. However the legal and bureaucratic position of dyslexia (in employment legislation and law) defines it as a disability. Also to gain additional support in the workplace individuals would need to disclose their dyslexia within the first 6 weeks of UK employment, to gain reasonable adjustments.

To disclose dyslexia at a work interview may mean that you may not be offered the post. Is it a risk worth taking? If you avoid disclosure until you start, your employer could argue you withheld disclosure of an important aspect relating to your ability to fulfil the post - thus you could be fired for non-disclosure.

Nalavany, Carawan and Sauber (2013) investigated dyslexia as a hidden disability. They note that adult dyslexics face complex decisions over disclosure. Hellendoorn, and Ruijssenaars (2000) found most participants felt dyslexia impacted on their daily life, experiencing many educational and career related problems. Nalavany, Carawan and Rennick (2010) noted that from 39 adult dyslexics, nine distinct cluster themes were identified, including: Why can't they see it?; Pain, Hurt, and Embarrassment

from past to present; and Fear of disclosure.

Barga (1996) studied the experiences of nine university students with learning disabilities (another term often used for dyslexia in the USA). Over a six-month period, students experienced labelling and stigmatization, which they considered to be a barrier to their education. Whilst all participants were selective when disclosing information about their disability to others, 6 of them reported deliberately using avoidance behaviours and concealment to hide their disabilities, fearing ridicule and stigmatisation. They feared rejection, ridicule and stigmatisation, so adjusted their lives to avoid the likelihood of perceptions of difference. Dyslexic participants noted regular examples of clinical misunderstanding and often misinformed ignorance and hostility by staff in regard to their dyslexia. Barga argues that dyslexia continues to attract an unwarranted stigma, which in some individuals can adversely influence the development of a constructive relationship with their mentor. Goffman (1964) defined stigma as the perceived deviance of personality or characteristics from the norm, within a particular context.

Rao (2004) reported that many undergraduate students avoid reporting their disability to avoid negative social perceptions, although admitting that their academic achievement may suffer as a result.

Empirical evidence suggests that dyslexia is similar to invisible differences such as religious orientation, in that there is no obvious appearance of disability (e.g. being in a wheelchair or exhibiting so called abnormal behaviour). Such invisible groups according to Beatty and Kirby (2006) have difficulty forming group awareness, because people are reluctant to publicly claim a potentially damaging identity in the workplace and socially.

Being visible means declaring one's hidden identity and 'coming out' to employers, friends and family. Such disclosure is weighed up for its advantages and disadvantages, before the plunge to openly disclose. Thus in many ways being dyslexic and sexual preference are similar as they are both (incorrectly) perceived to be negative in the workplace and 'coming out' is required to gain protection by discrimination legislation. Gordon and Rosenblum (2002) note that ironically the laws that protect people with invisible identities also creates and reinforce stigma by naming and categorizing groups.

This points to the lack of power by certain minority groups to advocate for themselves e.g. being black or a woman in the last century or being gay in this century, along with dyslexics these groups may find it hard to advocate for themselves as many lack the skills. In the UK, the main national charity protecting the rights of dyslexics (British Dyslexia Association) was set-up and run for many years by parents of dyslexics for school-aged dyslexics. Unintentionally they supported the argument that dyslexics were unable to voice their concerns and were incapable of fending and campaigning for themselves.

Hover, The BDA has evolved from this model with dyslexics being involved, especially at the top, and a developing focus on adult dyslexics.

In a personal relationship when should you disclose dyslexia? If you say it on your first date, then will there be a second? If you leave it until a relationship has settled, then you could be perceived as lying e.g. not admitting that you are a drug addict or addicted to gambling. Alexander-Passe (2012) found that some dyslexics disclosure on the first date as a discussion point, such as wearing glasses for reading, whereas others waited several dates into the relationship, as they wanted to secure the relationship before dropping the bomb-shell. Alexander- Passe concluded this depended on how dyslexia is perceived by the individual. Is it a strength or a weakness?

Disclosure has risks in the workplace; however it can have also its benefits. In the UK and the US disclosure brings access to support required to do the job well. As noted earlier, 'Access to Work' and the 'Disability Support Allowance' can mean the difference between succeeding at work or in your studies. These issues are particularly pertinent for the Asia Pacific region where adult support and legislation may be in its infancy.

**What is Stigma?**

Susman (1994) defines Stigma as an adverse reaction to the perception of a negative evaluated difference. It is not the attribute of the individual who bears the difference, but rather it resides in the interactions between the person with the difference and others who evaluate the difference in negative terms (Goffman, 1964). Critics of stigma argue it is too broadly conceived (Cahill & Eggleston, 1994).

Schulze & Angermeyer (2003) suggest that stigma adds a dimension of suffering to the primary illness – a second condition which may be more devastating, life-limiting, and long-lasting than the first.

Link & Phelan (2001) define Stigma as having five main components:

- Labelling – the recognition of differences and the assignment of social factors to those differences e.g. recognising that the individual may have different biological/ neurological traits to the norm.

- Stereotyping – the assignment of negative attributes to these social factor differences e.g. differences that matter and are deemed by others to be undesirable.

- Separation – occurring when the reactions to others leads to avoidance of those with the undesired difference (felt stigma).

- Status Loss – when the individual with differences is not allowed to fully participate in society or a community, thus the value of their place is reduced e.g. net worth is devalued by other people's views. This is perceived as 'enacted stigma'.
- Discrimination – when those with

the differences are viewed negatively and they are barred from certain jobs or tasks in society. Not based on abilities but perception (enacted stigma).

- Power differential – occurs when those with the authority use their position to bar or reduce those with the difference from taking full roles in society e.g. a company boss who feels negatively about disability may not shortlist a person with a disability for a vacant job.

- Stigma comes from making a conscious choice to discriminate against another individual, be it at school, walking down the street, at work, or socially. Within the medical model of disability, stigma can cause families to send a disabled or sick person away 'for their own good' but really to protect families from social stigma.

Stigma and discrimination go hand in hand as part of the medical model of disability (a disability that needs medical intervention to be cured). It has meant that disabled individuals, such as those with dyslexia are unable to get jobs, based on an incorrect perception that if a person can't read or write that they were 'stupid', and 'unintelligent'. In schools children may avoid making friends with those on the slow table, or make nasty remarks when a dyslexic child is made to read aloud in class and stumbles over their words.

**Unfair advantage**

Green, Davis, Karshmer, Marsh & Straigh (2005) found that those with an invisible disability were perceived by others as 'faking it' to gain special privileges or advantages, comments such as *'what's the matter with her? She's not in a wheelchair!'*

Lisle (2011) argues that there is growing evidence that a stigma exists towards those with a learning difficulty (LD) e.g. speaking of LDs as being intellectually inferior (McNulty, 2003; Denhart, 2008; Gerber, Reiff & Ginsberg, 1996). Interestingly, Snyder, Carmichael, Blackwell, Cleveland & Thornton (201) found those with non-physically visible disabilities reported more negative experiences than those with physical disabilities, questioning the validity of invisible disabilities in public perceptions (are they really disabled? Are they just trying to gain an unfair advantage).

The use of a label that identifies dyslexia was found to affect teachers perceptions and actions, many felt sorry for the students (Frymier & Wanzer, 2003), some perceived them as not only more difficult to teach but also less intelligent (Gersten, Walker & Darch, 1988; Frymier & Wanzer, 2003). Frymier & Wanzer found that many negative perceptions by teachers were due to the negotiation between student and teacher about reasonable accommodations, and the teacher questioning the validity of a non-visible disability.

Lock & Layton (2001) found some college professors held beliefs that the label 'learning disabilities' was an excuse to get out of work and laziness/not trying hard enough. Even though studies suggest dyslexics/LDs work themselves to exhaustion and illness to achieve at the level of their peers (Barga, 1996; Denhart, 2008; Reiff, Gerber & Ginsberg, 1997; Rodis, Garrod & Boscardin, 2001).

**What drives stigma towards dyslexics**

Lisle (2011) argues that stigmatisation of those with dyslexia/learning disabilities persists for the following reasons:

- Lack of Knowledge – Duchane, Leung & Coulter-Kern (2008) found that teachers stigma towards those with dyslexia comes from misunderstanding or a lack of knowledge about disabilities. Roe (2004) found educators with better knowledge of disability legislation had a more positive attitude towards those with learning disabilities.

- Invisibility of disability cues – Upton, Harper & Wadsworth (2005) found that perceptions of accommodation deservedness was greater for disabilities that are more visible and have more obvious educational implications; thus the visibility/invisibility of disabilities is an important influence on the formation of disability perceptions. The lack of physical cues hinders non-disabled individuals from understanding any educational difficulties. It is still perceived that those with dyslexia/LD have lower IQ, so performing on par or better than peers and claiming extra accommodations can be misunderstood as cheating by both educators and students (Winters, 1997; Field, Sarver & Shaw, 2003; Elaqua, Rapaport & Kruses, 1996).

- Self-fulfilling prophecies – Jussim, Eccles & Madon (1996) and Hornstra, Denessen, Voeten, van den Bergh & Bakker. (2010) discuss the correlations between teachers expectations of LD/ dyslexic students and their resulting student achievements, with those treated as having low ability accordingly believing such perceptions and acting/achieving in line with these beliefs. Evidence suggests that students with dyslexia/LD are more likely to drop out of college and university than those with LD/dyslexia and this will lead to social and economic disadvantage, argued to lead many such individuals into criminality (Mishna, 2003; Morrison & Cosden, 1997; Kenyon, 2003)

- Confirmation of bias – It is argued by Nickerson (1998) that educators will interpret information in a manner consistent with existing beliefs or explanations. Thus once a view of dyslexia/LD has been formed, maybe from teaching a single individual with such learning differences, then they will tend to ignore individual characteristics and treat all with a single definition and give a single type of

accommodation (Higgins, Raskin, Goldberg & Herman, 2002). However as noted earlier, all dyslexics are different and the differences are along a continuum, thus all dyslexics need tailored accommodations.

- Out-group homogeneity – it is argued that dyslexics/LDs are viewed by others as being of lower intelligence than themselves, they tend to be grouped together and ignored in social settings. This is based on convenience, rather than treating all people as individuals.

- Abelism – Hehir (2007) explains that there is an assumption in society that those without disabilities are more capable than those with disabilities, and in society groups tend to socialise with likeminded individuals. Thus as seen in school playgrounds, those who like football socialise together, and those with disabilities socialise together. It is also argued that in schools the use of withdrawal for intervention groups will mean that some groups are viewed as incapable and abnormal, and thus can be shunned and barred from joining certain high achievement social groups. This can create an unwelcoming and inaccessible environment for individuals with disabilities.

**The effect of labelling with dyslexia**

Several studies in the US and UK have investigated the impact of labelling in schools. These range from historical studies drawn from the 1970's and 80's to more recent studies.

Foster, Schmidt & Sabatino (1976) showed a film of a non-disabled child to two groups of 22 primary/elementary school teachers. One group was told the child was normal (control), other group (experimental) was told the child had learning disabilities. The study found the experimental group rated the child more negatively, which led to researchers to conclude the label generates negative expectations in teachers affecting their objective observations of behaviour and may be detrimental to a child's academic progress.

In a larger study of 88 teacher Foster & Salvia (1977) similar results were found *'teachers perceived more deviance when the child was labelled learning disabled than when he was labelled normal'* (p.533). Moreover, Gillung & Rucker (1977) found similar outcomes with 176 regular and 82 special education teachers in seven urban and sub-urban educational districts/ authorities *'teachers apparently perceived a child described with a label as having more severe academic or behavioural problems and required more intensive special services than the same child described without a label'*.

More recently, Bianco (2005) in a study of 247 general and special educational teachers were more willing to refer non-labelled students to gifted and talented programs (91%) than the same student labelled with emotional/behavioural disability (70%) or labelled as having a

learning disability (63%). Some of the teachers remarked that they wanted disabled students to be in a less pressured environment.

The focus now turns to student peers, are they affected by labels? Bak, Cooper, Dobroth & Siperstein (1987) investigated how non-disabled peers viewed students being removed for intervention sessions without the use of labels for difficulties. Two scenarios were investigated, removal to the 'resource room for 25% of the school day' and removal to the 'special needs room for 80% of the school day'. Results indicated that students were sensitive about students who leave classrooms during the day, the authors noted (p.154*) 'the absence of formal labels did not prevent children from forming negative (although realistically pessimistic) expectations based on their own experiences with special class children's academic limitations'.* Those students were aware of the differences of where students were being taught for long periods, and negatively perceived removal for intervention.

Sutherland, Algozzine, Ysseldyke & Freeman (2001) suggests students were not rejected by their peers based on a disability label, but were more likely to be rejected by their actions. However, those who were informed about the positive attributes of the learning disabled students were held in higher regard by their non-disabled peers. The authors argue teachers need to inform the classes of positive-strengths rather than purely focus on negative-weaknesses.

Labels seem to have both negative and positive affects in education. Knowing a child's label, especially those of mental retardation, emotional/behavioural difficulties and learning difficulties tends to affect teacher perceptions and expectations for student success (Bianco, 2005; Foster & Salvia, 1977), with teachers also highly influenced over student behaviour over labels (Levin, McCormick, Miller, Berry & Pressley, 1982).

More recently, studies point to labelling of dyslexia having a positive effect by mitigating the effects by providing an acceptable explanation for a student's difficulties in reading, spelling, or writing effectively, compared to negative concepts of laziness or having a low IQ (Solvang, 2007; Riddick, 2000; Taylor, Hume & Welsh, 2010). This may reflect greater awareness if dyslexia through advocacy groups and the media, and a recognition that there can be strengths as well as weaknesses in dyslexia.

Taylor, Hume & Welsh (2010) investigated self-esteem levels in three groups of students: with a dyslexia label, with a general special educational needs label, or no label at all. The authors noted '*being labelled as having a general need negatively affected children's self-esteem, because unlike the label dyslexia, this label offers very little in the way of an explanation for the child's academic difficulties, and because targeted interventions are not as available for those with a less specific label'* (p.191). Riddick (2000) also found the dyslexia label was preferred by children, than a general 'special educational needs' label. In

Norway, Solvang (2007) also found that discovering they had the label *'dyslexia, many students were relieved that their difficulties were not their fault, removing the status of lacking motivation or having a low IQ'.* However it did suggest a greater problem for the parents based on the implication that they had given the child the neurological difficulties through their genes.

**Acceptance of labelling**

Dyslexics and their parents commonly have issues over labelling, which come from the acceptance of difference. The perception is that a label can confirm a difference so severe that it warrants a label. Early screening and intervention is seen by many educationists to be the key to helping the dyslexic to achieve their potential at school (Johnson, Peer & Lee, 2001; Lyon, Fletcher, Shaywitz, Shaywitz & Torgesen, 2001), as leaving screening/identification until late in primary school or early secondary school will mean negative concepts of difference will be established, with possible secondary emotional manifestations as a consequence.

Riddick (1996) and Zetterqvist-Nelson (2003) discuss the use of labelling and also whether such a label is a suitable definition of a person made up of combinations of strengths and weaknesses. Alexander-Passe (2010) noted a research participant labelled as a young child, who found the label a negative badge or 'noose around her neck'. It limited her ability to attempt subjects as they were known to be difficult for dyslexics, her curriculum was reduced, and she concluded the label was a negative factor in her life, especially at school. Zetterqvist-Nelson (2003) found similar findings, in that dyslexics preferred non-labelling as they did not want to stick out amongst their peers. However participants did find the label useful on a personal level as a relief and explanation for their difficulties, along with a moral relief that their difficulties were not their fault; but not on a public level, as it could be a cause of bullying or weakness in the eyes of others (as also found by Singer, 2005). Both Zetterqvist-Nelson and McNulty (2003) agree that the positivity of the labelling comes from individual's understanding of their diagnosis. This places an onus on diagnosticians, teachers and parents to ensure that dyslexic children and adults understand their profile of abilities and disabilities.

**Stigma and Disability**

Relating to this paper's topic of Stigma, it is argued that the lack of a single agreed definition of dyslexia, as per the lack of a single identification measurement instrument, has meant that dyslexia is broadly misunderstood. It is this lack of understanding that creates difficult situations for dyslexics at school as children and in the workplace as adults. In the majority of cases the stigma has come from lack of public knowledge and the inability to see that all individuals have skills and abilities to aid society. Stigma has caused problems such as social exclusions and religious persecution, however it is more subtle influences which underlie the problems that stigma causes, being turned down for jobs and treated as unable to mix in society which can have

lasting effects on countless generations.

Empirical knowledge in the field of stigma suggests that the experience of stigma (Byrne, 2000) includes the following: shame, blame, secrecy, being the black sheep of the family, isolation, social exclusion, stereotypes and discrimination. He then suggests there is a cycle to stigma which begins with the initial condition (e.g. disability) which leads to stigma, then discrimination, then disadvantage, leading to lower self -esteem and more disability as a result. This then leads to less resistance and then triggers and reinforces the initial condition. Such a cycle is self-perpetuating and leads to greater stigma as no understanding is added to society. In the workplace Stuart (2004) suggests a cycle starting with the initial condition (e.g. disability) leading to social stigma, then unemployment, then under employment due to feeling too inferior to their peers to work, leading to self-stigma by viewing yourself as less worthy by internalizing the social stereotypes which again leads back to reinforcing the initial condition. Both models suggest that unless intervention is made both cycles are self-perpetuating and society cannot develop.

There are four main definitions of disability (Kaplan, 2008) which is relevant to the discussion of stigma and dyslexia. The first is the 'moral or religious' definition of disability, where the individual is regarded as disabled by sinning against God. The second is the 'medical' definition where the person is disabled by being born defective or they develop a condition which makes their body ineffective. The third is the 'rehabilitation' definition that comes to the fore in that until such a fix is made with medical intervention they are not a complete person without the medical fix. The last is the social definition, which believes that difference is part of society and that everyone has something to give to society. It celebrates difference compared to the other three definitions which sees difference as something to be feared and to be avoided.

**Dyslexia and Stigma**

Little research has been undertaken to study dyslexia and stigma. The author's earlier work on 'Dyslexia and Depression' (Alexander-Passe, 2010) was the first, looking at adult dyslexics through an investigative qualitative study; this paper is based on this investigation.

Riddick (2000) in an interview study of 27 children and 16 adults, all dyslexic, argued that although labelling can lead to stigmatisation, this is not always the case. It is argued that stigmatisation can take place in the absence of formal labelling, and stigmatisation can precede labelling, thus Riddick sees a greater gain from labelling, than not.

MacDonald (2010) argued that in a study of dyslexia in prisons, dyslexic inmates felt stigmatised by their literacy inabilities by not having a dyslexia label. In fact the stigma of restricted reading and writing ability had an indirect impact on offenders' self-confidence. MacDonald concluded (p.95) that *'the data in this study suggests it is not the label causing the stigma, but the*

*symptoms. Removing the label only reduced the educational support and prohibits their legal rights'.*

Morris and Turnbill (2007) with a sample of 87 trainee nurses during their clinical placements in hospitals, argued that dyslexia continues to attract an unwarranted stigma and can adversely affect the learning experience. The need for disability awareness training in the workplace and improved education/ service partnerships to support these students is considered crucial, one noted *''I overheard heard him (my mentor) tell another nurse that I wouldn't make it as a nurse because I'm dyslexic.'.* Co-workers too, often discriminate and stigmatise, by only seeing the perceived negative aspects of dyslexia, thus an biased focus on negatives (McLaughlin et al., 2004).

Rice & Brooks (2004) and Elliott & Place (2004) argue that using the label of dyslexia can be counter-productive as it stigmatise individuals, however Elliott (2005) argues the lack of a label will stigmatise poor readers who lack the dyslexia label – damned if you do, damned if you don't!

**The Dyslexia Debate**

Recent debate has focused on the effectiveness of using the term 'dyslexia' in educational settings. Elliott & Grigorenko (2014) argued in a recent controversial book 'The Dyslexia Debate' that the term is not only misleading (as it can cover more than just difficulty with reading and writing), but as intervention for dyslexics is no different to that for poor readers, that dyslexia is not a distinctive learning disorder and as such the term should be discontinued. They also note that using the term dyslexia can 'reduce the shame and embarrassment that are often the consequence of literacy difficulties. It may help exculpate the child, parents and teachers from any perceived sense of responsibility'.

Bishop (2014) tends to agree that the term is incorrect but concludes that there are other conditions such as depression and schizophrenia which are also 'massively problematic in terms of validity and reliability' (Kendell & Jablensky, 2003). However Bishop suggests that for each term whilst being incorrect and misleading, the strongest argument for retention comes not from science but public perception. That 'some of the most passionate defenses of the dyslexia label come from those who have built up a sense of identity around this condition, and who feel they benefit from being part of a community that can offer information and support'.

Also the term 'poor readers' leads readers to assume that such difficulties could be fixed through more effort and quality teaching, whereas 'dyslexia' suggests something different, long-term, and requiring specialist intervention. Bishop interestingly concludes that 'at present we are between a rock and a hard place. The rock is the term 'dyslexia', which has inaccurate connotations of a distinct neurobiological syndrome. The hard place is a term like 'poor readers' which leads people to think we are dealing with a trivial problem caused by bad teaching'.

The recent 2010 OFSTED review of special educational needs (SEN) and disability in UK schools found that pupils were often incorrectly identified as having SEN when they were not, and that good or outstanding teaching would remove such a barrier to learning, '...as many as half of all pupils identified for School Action would not be identified as having special educational needs if schools focused on improving teaching and learning for all, with individual goals for improvement' (p.5). However it also noted that identification was generally inconsistent and many SEN pupils were not identified, that children with similar difficulties were treated differently; and lastly that parents views of inconsistency were well-founded. The review also found that parents pushing for a statement of SEN (now replaced with 'Educational Health Plans') may not be enough to guarantee the high level of specialist interventions required. They noted that many schools misidentified pupils with SEN to cover up for their poor quality teaching and that by diagnosing them as having SEN they were assisted in removing their GCSE results from school result league table data, and gaining additional government funding.

The Bercow Report (2011) for the UK's Department for Education supports OFSTED's view that SEN is inconsistently supported in the UK, and that even having a statement of SEN does not guarantee the specialist support needed, noting 'the current system is characterised by high variability and a lack of equity. (It) is routinely described by families as a 'postcode lottery' (p.14)'. It again stresses the need for early screening and intervention in schools, something that has been noted for several decades in UK schools. This lack of 'early screening and intervention' has meant millions of dyslexics in the UK have lacked the specialist intervention they need to reach their potential, and can be argued to lead to many dyslexics ending up in prison.

Hewitt-Mann (2012) suggests that up to 50% of the prison population is dyslexic, a figure not dissimilar to similar studies from the UK, Sweden and the USA (Mottram, 2007; Rack, 2005; Alm & Andersson, 1995; Kirk & Reid, 2001).

Tony Blair, the then UK Prime minister commented that *'many of those people in the prison population did not have the educational opportunities [that most of the population received] – often because they are dyslexic, had not been diagnosed properly, or did not get the extra help they needed'* (Hansard, 2007).

To conclude, dyslexia is contentious in its definition, diagnosis and intervention. It is generally misunderstood, but as a term it is accepted and those with the identification gain assistance in managing the difficulties they face. Incorrect public perceptions of dyslexia are misleading, and being an invisible disability many find it hard to accept which can lead to discrimination, stigma and bias in many environments.

However gaining the help required at school is highly problematic (high variability and a lack of equity), not only in schools screening and identifying policies, but once an identification has been made, receiving the specialist

support needed. As adults, many dyslexics lack diagnosis so face stigma and discrimination in the workplace, whilst coping with their difficulties, and will tend to use a number of defensive mechanisms to camouflage their difficulties, but these can result in negative mental health manifestations (Alexander-Passe, in press).

## Methodology

### Sample

Participants were recruited in three ways: (1) emails to UK dyslexia newsgroups, (2) adverts on dyslexic web -forums, (3) inclusions on dyslexia associations' websites. Four dyslexic sample groups were requested (with/ without depression, degree/non-degree educated), with dyslexic adults with depression being the largest group recruited.

All participants were required to provide evidence of: (1) formal diagnosis of dyslexia evidence (e.g. educational psychologist reports), (2) depression (e.g. a clinical depression diagnosis or at least one course of physician/GP prescribed anti-depressants). Whilst mild depression is common in society, only severe cases tend to be referred for clinical diagnosis.

See Tables 1-3 for sample details. The mean age of dyslexia diagnosis data indicated that non-depressives tended to be diagnosed earlier, however in both groups they were mainly diagnosed post -school and after leaving university.

### Apparatus

An investigative semi-structured interview script was used with 31 main themes (See Figure 1). Interviews lasted between an hour and three hours.

Table 1. Sample data: Size, mean age and standard deviations

| | N | Mean age (years) | Standard Deviation |
|---|---|---|---|
| All | 29 | 40.56 | 12.67 |
| Depression diagnosis | 22 | 42.32 | 13.0 |
| No depression diagnosis | 7 | 35,14 | 10.89 |
| Depressed - females | 15 | 38.8 | 11.71 |
| Depressed - males | 7 | 49.86 | 11.32 |
| Non-depressed - females | 3 | 18.0 | 1.63 |
| Non-depressed - males | 4 | 43.5 | 6.54 |
| | | | |
| Depressed - dyslexia diagnosis | 22 | 28.09 | 11.83 |
| Non-depressed dyslexia diagnosis | 7 | 22.28 | 14.77 |

Table 2. Sample data: Depressed participants

| Depressed | Age | Diagnosed age of Dyslexia | Male or Female | Degree Educated | Non-Degree Educated | Depressed at school |
|---|---|---|---|---|---|---|
| Adrian | 45 | 32 | M | X | | |
| Brian | 70 | 35 | M | X | | X |
| Jasper | 59 | 45 | M | X | | |
| Norman | 40 | 33 | M | X | | X |
| Anita | 47 | 45 | F | X | | |
| Emma | 36 | 25 | F | X | | X |
| Maureen | 34 | 27 | F | X | | |
| Rachel | 40 | 32 | F | X | | X |
| Shelley | 61 | 50 | F | X | | X |
| Susan | 27 | 20 | F | X | | X |
| Trixie | 58 | 11 | F | X | | X |
| George | 54 | 40 | M | | X | |
| Ronnie | 33 | 15 | M | | X | X |
| Samuel | 48 | 19 | M | | X | |
| Andrea | 41 | 39 | F | | X | |
| Karen | 56 | 40 | F | | X | |
| Kirsty | 23 | 16 | F | | X | X |
| Lara | 25 | 20 | F | | X | X |
| Milly | 37 | 7 | F | | X | |
| Natasha | 40 | 25 | F | | X | |
| Norma | 29 | 23 | F | | X | X |
| Phoebe | 28 | 19 | F | | X | X |

Table 3. Sample data: Non-depressed participants

| Non-depressed | Age | Diagnosed age of Dyslexia | Male or Female | Degree-educated | Non-degree educated | Depressed at school |
|---|---|---|---|---|---|---|
| Zara | 26 | 8 | F | X | | |
| Harry | 52 | 45 | M | | X | |
| Jordan | 34 | 33 | M | | X | |
| Malcolm | 46 | 36 | M | | X | |
| Peter | 42 | 8 | M | | X | |
| Izzy | 24 | 5 | F | | X | |
| Jean | 22 | 21 | F | | X | |

Book Interview Questions:

1. Please describe how you are feeling today? (Are you taking any depression medication at present?)
2. Please describe your life/yourself? (I need to create a description of you e.g. age, education, job, character, personality etc.)
3. Do you enjoy life?
4. Please describe your childhood? Was it happy? (e.g. with your family)
5. Do you have any siblings? Do you think you were treated fairly/unfairly to your siblings?
6. Please describe your time at school? Was it enjoyable?
7. Did you ever get frustrated from your learning difficulties?
8. What does dyslexia mean to you?
9. **Is dyslexia something positive or negative?**
10. **How does dyslexia affect your daily life?**
11. What classic dyslexia symptoms to you have?
12. Do you think your hobbies help you? Giving you self-confidence?
13. Do you ever blame your dyslexia for things?
14. Do you/have you ever resented your teachers at school for not seeing your difficulties?
15. **Do you ever feel rejected? Please explain?**
16. **Have you ever encountered stigma towards your dyslexia?**
17. **Have you ever tried to hide your dyslexia?**
18. **Why might people try and hide their dyslexia?**
19. **Do many people know you are dyslexic? How did they find out?**
20. **Did you tell them? What was their reaction to your disclosure?**
21. **How do you feel about disclosing your dyslexia to other? Friends or at work, university?**
22. **Do you think dyslexics are discriminated against at school, university, at work, socially?**
23. How does failing or getting things wrong affect you?
24. Do you ever say why me? Why am I dyslexic?
25. Do/Did you self-harm? Why? What are the triggers?
26. Have you ever thought about or tried to commit suicide? Why? What were the triggers?
27. Do you think dyslexia and depression are correlated (linked)?
28. Did you ever truant/run away from home?
29. How do you feel going into schools now, what triggers any negative emotions?
30. Do you enjoy being you? Please explain?
31. Would you call yourself a successful dyslexic?

*Figure 1. Book Interview Script 31 items. (Items in **BOLD** are included in this paper.)*

**The Interview Process, Confidentiality, Informed Consent and Personal Disclosure**

All participants were sent details of the study before the interview, and all verbally confirmed participation before the start of each recorded interview. Participants were also advised that they could avoid any questions that were too emotional to answer and to halt the interview and their participation in the study without reason; fortunately, no participants took this option. As avoidance was noted in several interviews, further investigative questions were required.

Confidentiality was assured at several points: (1) in the original study advert; (2) in email confirmation/requests for basic details (name, age, education etc.); (3) at the start of each interview, (4) advising participants that pseudonyms names would be used.

Each participant was also reassured that they would receive a copy of their transcript which they would have the opportunity to check and modify. As the interviews concerned participants disclosing emotionally painful or frustrating events it was felt best that the interviewer (the author) also disclosed, where required, that he was diagnosed dyslexic at fourteen years old and understood and had experienced many of the difficulties at school that they may have encountered.

**Analysis**

Each interview was recorded on audio tape, transcribed, spell-checked with minimal grammar changes; lastly a check was made for readability. The transcript was then emailed to each volunteer for them to check and amend if required, with the opportunity for them to add additional notes or post interview revelations, as interviews can commonly trigger post-interview thoughts. Interviews were then subjected to IPA analysis.

**Interpretative Phenomenological Analysis (IPA)**

IPA is a relatively recent analysis model but has its historical origins with the phenomenology and Husserl (1970) aiming to return to studying living things. This refers to "to return to the things themselves is to return to *that* world which precedes knowledge, of which knowledge always speaks" (Merleau-Ponty, 1962). Husserl was very interested in the life-world, which comprises of the objects around us as we perceive them and our experience of our self, body and relationships.

Whilst there are many forms of phenomenology in use (*Idiographic, Eidetic, and Transcendental*), IPA using Idiographic ideals is used in this study. Smith developed Interpretative Phenomenological Analysis (Smith, Harré and Van Langenhove, 1995; Smith and Osburn, 2008) to analyse elements of the reflected personal experience - the subjective experience of the social world. Giorgi (1994) argues that phenomenology avoids the reductionist tendencies of other research methodologies, and uses the researcher's assumptions/divergent links to inform new insights from the data,

rather than forcing data to fit pre-defined categories. Such intuition in the researcher allows 'outside the box' thinking. The researcher is an interpretative element to understand themes and body language, compared to Discourse Analysis (Potter, 1996) which relies on precise analysis of the words used.

IPA has been used in many research studies (Duncan, Hart, Scoular, & Brigg, 2001, Thompson, Kent, & Smith, 2002; Clare, 2003; Biggerstaff, 2003; French, Maissi, Marteau, 2005).

IPA is suitable for this sample due to: (1) Being 'social model of disability' and inclusion friendly, aiding understanding in special need samples; (2) Allowing flexibility and the ability for themes from initial participants to inform an investigative interview script; and (3) Dyslexic friendly as it does not rely solely on discourse.

**Analysis Methodology Used in this Study**

This study predominately uses IPA methodology for analysis of data; however the results from the transformations (themes) were then used to create quantitative data, thus mixing qualitative and quantitative methodologies. Nineteen main themes were identified from transformations in the third stage of IPA and two-hundred feelings or aspects were identified for these nineteen themes, displayed in quantitative percentages. The quantitative data was then used to create tables along with interview evidence in the form of quotes (from mean units from the second IPA stage) are used to form each argument/topic for the results.

**Results: Profiles**

Profile results from this study are drawn from Table 4.

Overall the sample found dyslexia to be positive (57.7%) and to give individual unique skills (76.9%), but dyslexia makes them feel different (76.9%). Most (61.5%) agreed that not only does dyslexia affect their daily lives but they feel the world is unfair to dyslexics. Many agree that they must work harder in life (38.5%) but only a small percentage would want to take a magic pill to rid themselves of their dyslexia (11.5%).

Males seemed unsure if dyslexia was something positive or negative (both 36.4%) but most agreed that it gave unique skills, made them feel different, but the world was unfair to dyslexics (all 72.7%). Most felt dyslexia affected their daily lives (54.5%) but only a fraction would want to get rid of their dyslexia (9.1%). Interestingly females saw dyslexia as more positive (61.1%) and like the males, felt it gave them unique skills and made them feel different (66.7%).

Unsurprisingly, the depressed sample found dyslexia to be mainly negative (72.7%) but most agree that dyslexia is a social construct (55.6%), gave unique skills (63.6%), made them feel different (68.2%), affected their daily lives (59.1%), however few would want to be cured (9.1%). Compared to this the non-depressed sample, who felt dyslexia

Table 4. Perceptions of Dyslexia

| What is Dyslexia? | All Participants | | | Depressed | | | | | Non-Depressed | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | All | Males | Females | All | With degree | Without degree | Males | Females | All | Males | Females |
| | N=29 | N=11 | N=18 | N=22 | N=11 | N=11 | N=7 | N=15 | N=7 | N=4 | N=3 |
| Its positive | 57.70% | 36.40% | 61.10% | 54.50% | 45.50% | 63.60% | 28.60% | 66.70% | 42.90% | 50.00% | 33.30% |
| Its negative | 26.90% | 36.40% | 16.70% | 72.70% | 27.30% | 27.30% | 42.90% | 20.00% | 14.30% | 25.00% | 0.00% |
| Dyslexia is a social construct | 50.00% | 27.30% | 55.60% | 45.50% | 36.40% | 54.50% | 28.60% | 53.30% | 42.90% | 25.00% | 66.70% |
| Dyslexia gives me unique skills | 76.90% | 72.70% | 66.70% | 63.60% | 63.60% | 63.60% | 57.10% | 66.70% | 85.70% | 100.00% | 66.70% |
| Dyslexia makes me feel different | 76.90% | 72.70% | 66.70% | 68.20% | 63.60% | 72.70% | 71.40% | 66.70% | 71.40% | 75.00% | 66.70% |
| Dyslexia affects my daily life | 61.50% | 54.50% | 55.60% | 59.10% | 63.60% | 54.50% | 57.10% | 60.00% | 42.90% | 50.00% | 33.30% |
| I feel the world is unfair for dyslexics | 61.50% | 72.70% | 44.40% | 50.00% | 45.50% | 54.50% | 71.40% | 40.00% | 71.40% | 75.00% | 66.70% |
| I must work harder because I'm dyslexic | 38.50% | 45.50% | 27.80% | 31.80% | 36.40% | 27.30% | 42.90% | 26.70% | 42.90% | 50.00% | 33.30% |
| I would take a pill to cure myself of dyslexia | 11.50% | 9.10% | 11.10% | 9.10% | 18.20% | 0.00% | 0.00% | 13.30% | 14.30% | 25.00% | 0.00% |
| I'm disorganised due to my dyslexia | 30.80% | 27.30% | 27.80% | 31.80% | 45.50% | 18.20% | 28.60% | 33.30% | 14.30% | 25.00% | 0.00% |
| I blame thing on my dyslexia | 19.20% | 27.30% | 11.10% | 13.60% | 9.10% | 18.20% | 14.30% | 13.30% | 28.60% | 50.00% | 0.00% |

was more positive (42.9%) than negative (14.3%). However agree that dyslexia gave unique skills (85.7%), made them feel different, but the world was unfair to dyslexics (71.4%). Many agreed it was socially constructed, affecting their daily lives and that they needed to work harder because of their dyslexia (42.9%). Interestingly more non-depressed individuals wanted a cure than depressed (14.3% to 9.1%), however both are minority views.

Looking at the largest sample, depressed individuals. Those without a degree felt dyslexia was less positive (45.5% to 63.6%) with both group agreeing to the same level of it being negative (27.3%). Interrogating the interview data, degree-educated depressive dyslexics noted that by going to university they truly understood the barriers involved, whereas before such education they had an insular impression of their learning difference.

This was confirmed by them understanding that dyslexia was socially constructed and compared to non-degree educated individuals; they would take a cure pill (18.2% to 0%).

## Results and Discussion: Interview Evidence

### Stigma or Lack of Knowledge?

**Have you encountered any stigma towards dyslexia?** Not really, I think I have encountered more that people do not know what it is, especially at work, that people misunderstand it, but I have never really encountered any stigma about it, but I'm working with people who know what the problems are. (Anita)

**Have you ever tried hiding dyslexia?** Yes. Why do you think you tried to hide it? Because sometimes I don't want to answer questions on it, I don't want to have to explain why I do things and how I feel about it, and then when I kind...if I do answer questions I want to do so eloquently or properly or so that people understand or in a way that people understand, so that they are accepting of it. I know I try and hide it when I know I can't answer the questions. (Emma)

**How were your parents concerning your learning difficulties?** The problem with me was they knew there was a problem but they thought the solution was me putting in more effort and more hard work, without admitting it was there. If they admitted there was a problem then they have to talk about it, about it, they thought if I worked harder, all of this will go away. **Did that cause friction with you?** I was talking about dyslexia years later to my mum and she would not discuss it, it was still a stigma thing then. (George).

The interview evidence suggests that there has been a void of information in the public forum that truly describes the dyslexia experience, thus disinformation creates situations where dyslexics choose to hide their differences, as they themselves cannot fully explain how and why they do things. As each dyslexic has a different combination of difficulties, one single profile would be misleading.

**Work Discrimination**

**Do they know you are dyslexic at work?** Yes. I kind of decided when I changed my job, because of the role it was, I was going to be very clear all the way through the recruitment process and when I got into the team. To be very explicit to what the problems were and to get support there. I felt a bit coerced into telling people, like the manager saying 'you will tell everybody, won't you?', so that began with, then 'when will you tell them, what are you going to tell them, you need to tell them soon', so I think in the end I found the most comprehensive description of the problems a dyslexic might have and emailed everybody that. I think they thought I had all of the problems I wrote about, all I really wanted them to know was I was dyslexic and dyspraxia and I might need some adjustments made for me and to be understood. I felt I was pushed a bit to send out that general email, having done that I felt exposed, as I wasn't given the support by my employer, so I had to fight for it and get the union involved. It got messy and fraught. So I got stress from their lack of adjustment (Norman).

**It sounds surprising for a social work job; you got no support and needed to be protected from the people who were not only paid to know better but to help others. So you needed your own social worker really?** The irony for me was I was working for an NHS (National Health Service] mental health team in the UK as a social worker, but they didn't identify that I was getting unwell there, getting extremely stressed and losing the plot. So that's when I talked to the union person and she was the one that told me to see a doctor, she said 'you look like you're at the end of your tether', but no one at work had picked it up. Which is worrying. (Norman).

Whilst some dyslexics are open about their differences, most are not (Passe, 2010, 2012) as they feel they would be treated poorly in the recruitment process. In the UK there is 'Access to Work' a government funded program to put in place reasonable adjustments (training and software etc.) so that anyone with a disability can be assisted to reach their potential as per their peers. However many argue that this only comes after the recruitment process and as many dyslexics attain poorly academically they can be seen as under -qualified for the post and are not even interviewed. As Norman notes there is little support for those who need to educate colleagues to their learning difference and this can cause emotional trauma.

**Social Construct: Is it Only a Disability at School?**

**Do you ever get frustrated/annoyed by your learning difficulties?** Reading and spelling did annoy me at school; I think that it only annoyed me at school. Therefore, you think dyslexia is mainly about school, a disability at school, not as an adult? It depends on what line of work you go into, it is not a disability in my area. I mean I am really good at what I do, but I am not in an area of work where you have to write things down and to be organised, but why would you go into a job like that, if you

were not going to be good at it. (Izzy)

**Do you think the problem is us (dyslexics) or the world around us?** No, I do not believe there is a problem. To hear some people say [things, or] to receive certain reactions, if it can be agreed that we have difficulties in learning, which doesn't make us inferior or worse than others, then why can't it be agreed that in a situation where people don't have a condition, that won't act or respond, not as relative to our class as the norm (as normal). I do not think it is a problem, I do not see it as a problem with them or us, and it is just a lack of understanding. If they understood dyslexia and the implications of dyslexia there would be less problems encountered. **You were talking about 'normal', do you feel normal?** What is normal? **Do you feel normal?** Well, what is normal? (Jordan)

I don't regard myself as disabled by it, I regard myself as disabled by how other people see it and whenever I meet dyslexics I sort of tell them that, especially kids who are feeling...don't know how to feel about it and I can kind of see something switching in their face when I put it to them like that, it is quite a state of mind – another coping strategy. (Milly).

As Milly notes 'I don't regard myself as disabled by it, I regard myself as disabled by how other people see it'. Many dyslexics believe dyslexia is socially constructed and until the social model of disability is used in the workplace, difference will be perceived as negative. Whilst few professions openly recruit dyslexics (e.g. computer graphics), most see it negatively which will affect productivity. Normality is noted by Jordan, to explain how dyslexia is perceived in the workplace.

**Is it a Taboo Subject?**

But probably taking to you is the most honest I've felt or at ease talking about my problems for a long time. **I don't think people really talk about how they feel about their difficulties; it's like a taboo subject.** Yes, the same as the homosexual was 20 yrs ago. It's similar to how I feel; it astounded me thinking back about it. **You are right there are similar themes to it.** Yes. **I guess coming out is similar to coming out that you are gay?** Yes. **It's a fascinating link, fascinating.** I'll wait for the how dyslexics are homosexual link next. I used to work out that it is the same occurrence. They said that it was one in five is gay and also they say that one in five could be dyslexic. I should put a patent on that. (Ronnie).

Ronnie makes parallels to homosexuality which he perceives as a similar difference to be self-conscious about in the workplace and with friends. The notion of coming out as a dyslexic was fearful to many in the study, with most avoiding telling their employer for fear of being made redundant or passed over for promotion.

**Disclosure of your Dyslexia**

**So you feel you are very open about it so they blamed the dyslexia not you?** It's one of the first thing I say, but I suppose I use it as an excuse. I do not mind telling people I am dyslexic, as it is

who you are. I would be lying if I said I do not use it as an excuse. I guess it is because I have been told I am stupid a lot growing up, you are quite eager to tell people the reason why you cannot do things. **How do people normally react to you telling them you are dyslexic?** Most people say 'really, you don't look dyslexic', because I think a lot of people have this perception of dyslexia and disability, they have this idea about people with a disability, and because I'm quite well-spoken I can get through day-to-day life quite well, I'm quite good at hiding all the little things I do to get me through it. (Kirsty).

Kirsty comments on the dilemma that most dyslexics face. Do they disclose and face unhelpful and negative comments, or do they stay silent and use coping strategies to get by.

**Labelling**

**You were talking about not telling people you were dyslexic, being 'in the closet'.** You see the thing about it was, I had not been formally assessed, although I screened positive when I was 15 years old, and they turned round and said that I had poor visual and hearing memory, but refused to label me because it was deemed to be inappropriate, it was in 1976, labelling wasn't the done thing. So although it was a brief thirty minute chat with a psychologist, nothing really happened from it. It was not a formal assessment and I was not aware of how much help was available then and what I could have been getting. It was only when I was struggling with assignments at Oxford University that I finally thought I would do something about it and it could make a difference. (Anita).

**I guess you are the first person I know who was diagnosed at five year old stage. It is fairly interesting how you view the situation**. Do you know what it is, I can't remember a single time in my life when I haven't been told that I'm dyslexic. It has been a constant word in my life. I can only vaguely remember the test, at the time I wasn't sure why I was being tested, being taken out of class for it...It has always been this word, I'm angry that in my whole life I have been labelled, just because the educational system didn't fit into my strengths, that I didn't fit into a mould, my brain isn't like yours, we are all different, you know. I guess if you test my whole class, most would have a similar IQ, a few would have a high IQ, and others might have an IQ a bit lower. We all have our strengths and weaknesses, it's a spectrum. If you don't fit into the mould with creativity, artist ability and original thought, maybe they should be labelled creative or something. Now I'm in the real world, and in what I'm doing I'm brilliant at it. I'm starting my own business, I know what my strengths are, and I have proven I'm good at things. (Izzy)

Anita and Izzy see labelling from different perspectives. Anita sees labelling in a positive way, as a means to explain what is going on. Izzy on the other hand has found it a heavy weight around her shoulders, as other quotes from Izzy suggested that it had a negative impact on her education as it prevented her doing things, as teachers had a stereotypical perception of what

dyslexics could and couldn't do, which prevented her from creating her own dyslexic profile (of strengths and weaknesses).

**Conclusion**

The quantitative data in this study painted a picture of different perceptions amongst depressive and non-depressive adult dyslexics, along with sub groups of degree and non-degree educated, and gender splits.

There were high frequencies that perceived dyslexia as positive and gave them not only unique skills but made them feel different. This difference was seen to come from having to unfairly work harder to achieve in life, with dyslexia affecting their daily life. Interestingly most would not seek a cure if it was offered, which suggests they see dyslexia as integral to who they were, and losing their dyslexia would be as great as losing a limb.

The interview evidence in this study suggests that dyslexics experience discrimination due to their disability, whether they perceive it as a disability or not. There seems to be too little information about dyslexia and what it affects in the public domain, thus many perceived dyslexia as something negative and not something they feel able to help with. It is hoped that recent legislation in both the US and the UK will protect dyslexics in the workplace, however as noted earlier, to gain protection by such legislation they will need to disclose their hidden disability to the world. However many dyslexics have survived the last twenty, thirty or more years in the workplace and school without their difficulties being highlighted. Other extracts of Passe (2010) asked 'Do you feel successful', with one participant that they had felt successful in hiding for so long, with many feeling unhappy about disclosing their difficulties as they may fear this would firstly go on their record and secondly that it could have a negative effect on promotion and career prospects.

Many in this study perceived that they only felt dyslexia was a disability when they were at school, as it was an inflexible environment with no escape from reading and writing along with unfair comparison with age appropriate peers. As one participant in this study noted 'I'm only disabled by my dyslexia when you put me into a classroom' (Natasha). There is much more flexibility as an adult to choose professions that play to a dyslexic's strength and one that limits the need for reading and writing, with greater use of technology (e.g. computers and spell-checkers). Whilst a minority, it should be noted that some dyslexics may withdraw from a society which they feel ill-skilled to participate in (Scott, 2004).

The author in this study who is dyslexic, has at time chosen to hide his difficulties, creating situations where his sometimes strange range of skills was attributed to quirkiness (positive), rather than being disabled (negative). This camouflaging was a common feature in his research with other dyslexics.

Until the social model of disability is used more widely in the workplace,

there will always be instances of discrimination against those who do not fit into the perceived 'norm' model. Thus, further research is needed to understand dyslexia, stigma and discrimination in the workplace.

Labelling was lastly discussed. This is a contentious issue as many parents incorrectly feel a label is negative with life-long longevity (post school and into the workplace). However in education the lack of labels may prevent teachers from making sense of their child's strengths and weaknesses, and denying their child can prevent access to suitable interventions. Whilst the author agrees that a label is only as good as the diagnosis given with it, it relies on starting educational intervention discussions rather than ending them; as non-SEN teachers commonly rely on incorrect stereotypical views on the strengths and weaknesses of individuals with dyslexia, and these need to be challenged.

**Limitations**

Whilst 29 participants took part in the study, 22 were diagnosed as depression and only seven had no depression diagnosis. The author took the viewpoint that the vast majority of the participants suffered one or more depressive symptoms, and that the study would not label any quotes as from a depressive and others from a non-depressive, as this might be misleading and lead the reader to make assumptions. However, a slightly different pattern of responses might be found from a group of participants who were not suffering from depression.

Finally, it should be noted that the material here is drawn from adults who received their education when less awareness of dyslexia and the pattern of strengths and weaknesses was available. It could be argued that within the Western world, the situation for children going through the educational system will be vastly different in 2015. This study has particularly strong implications for some Asian-Pacific countries, where public awareness of dyslexia may still be in its infancy. The onus is on those with expertise in the area, dyslexia associations and trained teachers, to ensure that this knowledge is shared and the strengths in dyslexia are recognised, in order to ensure that up to 10% of the population can no longer be stigmatised. With greater recognition and early structured support, dyslexic children and adults will have every opportunity to overcome their weaknesses and express their strengths fully

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# *Expanding the Provision for People with Dyslexia in Singapore*

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*Abstract*

*Studies show that dyslexia affects about 10% of the population. While the Ministry of Education (MOE) and the Dyslexia Association of Singapore (DAS) have provided more support for students with dyslexia in recent years, this remains inadequate. Based on literature review and comparison with other developed countries, as well as discussions with local stakeholders, including the MOE, DAS, teachers, parents, and subject matter experts, this paper investigates the gaps in dyslexia provision in Singapore and finds that the roots causes are in three main areas: service volume (under-identification of students with dyslexia), service nature (limited scope of dyslexia intervention), and service support (insufficient resources to support the provision of dyslexia services). We recommend a broad expansion of the current provision to improve the identification, intervention, and support for people with dyslexia, through the following key measures: harmonising intervention efforts between the MOE and DAS, expanding professional learning pathways for mainstream teachers and Allied Educators (Learning and Behavioural Support), investigating the feasibility of a specialist school for students with severe dyslexia, investing in assistive technology, and increasing the reach of public awareness and anti-bullying campaigns.*

Keywords: dyslexia, Singapore, early intervention, identification, pre-school, post-secondary school, teacher training, specialist school, technology, coordination.

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## 1. Problem Definition: Background and Context

### 1.1 What is Dyslexia?

Dyslexia is a specific learning disability that is neurological in origin. It is characterised by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction.

Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge (International Dyslexia Association [IDA], 2002).

The difficulty children with dyslexia have with reading and writing is not determined by their intelligence, but by the severity of their dyslexia. Children with average intelligence and mild dyslexia are likely to be more skilled at reading and writing than children with high intelligence and more severe dyslexia.

There are several theories about the causes of dyslexia, but it is generally accepted to be genetic and neurobiological. Anatomical and brain imagery studies show differences in the way the brain of a person with dyslexia develops and functions, as compared to a person without dyslexia (IDA, 2012).

### 1.2 Dyslexia in the World

IDA, British Dyslexia Association (BDA), and DAS have reported that dyslexia affects about 10% of the population. More specifically, a study by Nathlie Badian reported by the BDA found that about 4% of any population have severe dyslexia (DAS & ISEAS, 2008). Rose (2009) has similarly cited that dyslexia may significantly affect the literacy attainment of between 4% and 8% of children in the UK, while Whiting (2005) estimates that the proportion of children potentially requiring additional assistance for dyslexia is approximately 7% in Australia.

Dyslexia affects people of all ethnicity as well as languages based on symbols such as Chinese. The effect of dyslexia varies across languages, for instance, dyslexia is less problematic in languages with pronunciation rules such as Spanish, Portuguese, and Italian. Languages such as English, where there is often no clear connection between the written form and sound, can be more challenging for a person with dyslexia.

While it was previously reported that dyslexia is four times more common in males than females, recent studies suggest that the gender ratio is more balanced. The previous gender difference may be due to more males being identified with the learning difficulty than females (DAS & ISEAS, 2008).

### 1.3 Social Impact

According to a survey conducted in the UK in 2012, the social and emotional impact of dyslexia can be the hardest to

deal with (Dyslexia Action, 2012). Children with dyslexia tend to have a hard time at school and sometimes feel isolated or bullied. The results showed that:

- More than 50% of parents in the UK said that there were times when their child with dyslexia did not want to go to school.
- 57% of parents felt that their child had a negative experience at school.
- 53% of parents reported that their child felt different compared to their peers.
- 47% of parents said that their child had been bullied or picked on at some point.
- 37% of parents reported that teachers made unhelpful comments like "try harder", which had a negative impact on their child's self-esteem.

From our discussions, parents of students at DAS learning centres shared that their children had similarly received negative comments and labels from their school teachers. These included comments that their children were "stupid", "the naughty one", "lazy", "uncooperative", and "sotong" (colloquialism for "failing to understand"). Some parents said that their children's self-esteems were affected to the extent that they would say these of themselves when they failed to meet their teachers' expectations.

### 1.4 Dyslexia in Singapore

The Early Intervention Programme for Infants and Children (EIPIC) in Singapore provides therapy and educational support services to pre-school children with special needs and learning difficulties. As of April 2015, there were 16 EIPIC centres run by ten voluntary welfare organisations, of which seven organisations offered programmes to address global developmental delay, including literacy difficulties.

In 2012, the MOE launched an S$3.6 million School-based Dyslexia Remediation programme in 20 primary schools, of which the breakdown of the programme expenses was not publicly available. This two-year intervention programme is designed for Primary 3 and 4 students, who are identified for support through a screening process for dyslexia conducted at the end of Primary 2. The programme is conducted by allied educators and English language teachers who have received specialised training, and among other things, teaches students letters and name sounds, as well as how to read and spell words. These students typically meet in small groups of three to four people, four times a week at their schools for 45 minutes per session.

The MOE had piloted this programme given feedback that these younger students found it difficult to travel to DAS learning centres outside school hours for the specialised remediation (MOE, 2012). In 2013, the pilot project was expanded to another 22 schools, bringing the total to 460 assisted children. The findings from the 2012 pilot showed that students who participated in the remediation programme had improved in their reading and spelling skills. The majority of them made more than two and a half years gain in their reading age. The MOE will expand its remediation

programme to 60 more primary schools in 2015, covering 121 or two-thirds of the schools, and make available the programme to all primary schools in 2016 (MOE, 2015a).

The MOE has reported that there are about 13,000 students with learning difficulties or mild special educational needs across primary schools, secondary schools, and junior colleges in 2014 (Fang, 2015). Of which, the number of identified students with dyslexia has increased significantly by 83% from 3,320 in 2009 to 6,063 in 2013 (see figure 1), notwithstanding the general decline in total student enrolment from more than 500,000 students in 2009 to 473,000 students in 2013 (MOE, 2014a). The increase in number of dyslexia diagnoses in mainstream schools possibly reflects the MOE's efforts in identifying students with dyslexia and parents' growing awareness of dyslexia as a learning difficulty.

Besides its dyslexia programme, the MOE offers Learning Support Programmes for all students who have any learning difficulties and literacy delay, not limited to dyslexia. Students who participate in this programme are from the Primary 1 and 2 levels only.

The overarching strategic plan for people with disabilities in Singapore, including special education needs, is the Enabling Masterplan (2012-2016). The Masterplan aims to create an inclusive Singapore where persons with disabilities can maximise their potential and are embraced as part of the society. The development of the Masterplan involves representatives from voluntary welfare

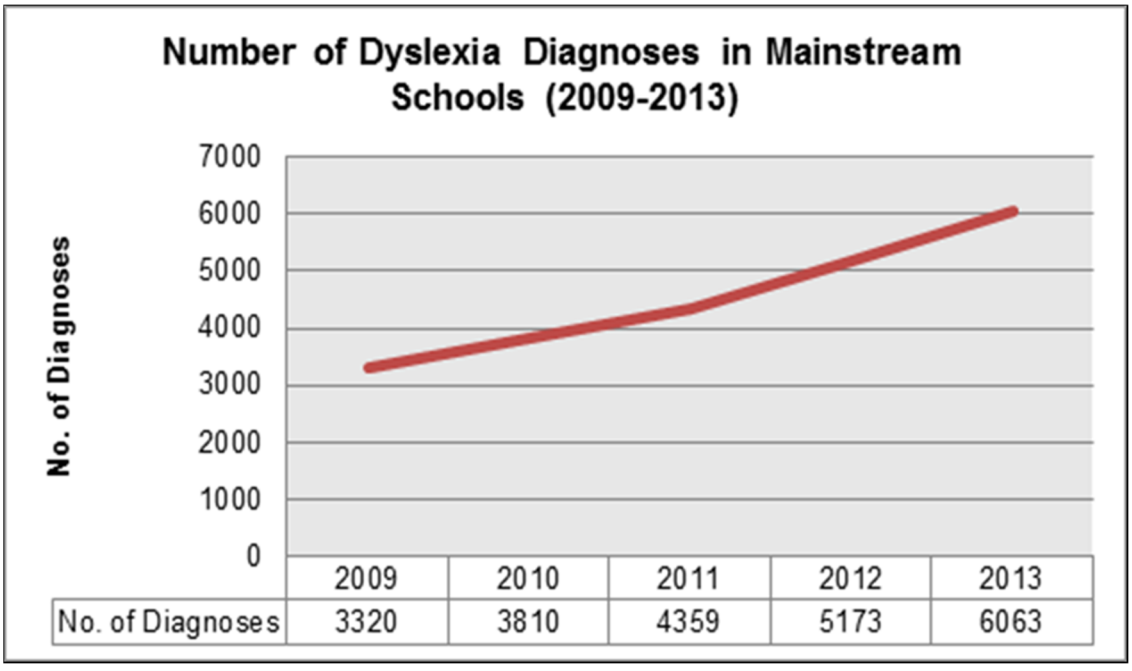


*Figure 1: Number of students diagnosed with dyslexia (MOE database, 2014)*

organisations, as well as the private and public sectors. Launched in 2007, the first Enabling Masterplan (2007–2011) charted the development of programmes and services to enable persons with disabilities to better integrate into society. The second Enabling Masterplan (2012–2016) builds on the earlier initiatives and adopts a life-course approach for persons with disabilities. It starts with the early pre-school years, followed by the education and employment phases, then the adult and ageing years. The literature review section will highlight the relevant points in the second Masterplan relating to our research focus.

### 1.5 The Role of DAS

DAS offers two main programmes for students with dyslexia. The MOE-aided DAS Literacy Programme focusses on five key areas – phonemic awareness and phonics, reading fluency, reading comprehension, vocabulary, and writing. The MOE-subsidised programme fee is about S$500 for 10 weeks of lessons (2 hours per week). Specialised Educational Services (a division of DAS) which provides additional programmes for students such as; preschool early intervention, Chinese, English exam skills, mathematics, specialist tutoring, speech and drama arts, and speech and language therapy. The fees for these programmes range from about S$300 (for 10 lessons) to S$700 (for 20 lessons).

DAS provides a range of assessment services for diagnosing dyslexia among students. The applications and actual assessments for diagnosing dyslexia have generally increased from 2004 to 2014 (see table 1), suggesting an increased parental awareness of dyslexia as a learning difficulty. Full psychological assessments are conducted only for primary and secondary school children. Between 2004 and 2008, the difference between the number of applications and assessments conducted is mainly due to the applications for pre-school children to be assessed for dyslexia. DAS generally does not conduct an assessment for these pre-school children, given the difficulty in making an accurate diagnosis of dyslexia at a young age. Between 2010 and 2014, the number of assessments conducted is higher than the number of new applications, as the former includes both new and review cases.

Table 1: Dyslexia assessments conducted by DAS (DAS statistics, 2015)

| **DAS Assessments** | **2004** | **2006** | **2008** | **2010** | **2012** | **2014** |
|---|---|---|---|---|---|---|
| Applications for dyslexia assessment | 434 | 550 | 730 | 559 | 629 | 837 |
| Actual number of assessments conducted | 389 | 479 | 613 | 656 | 684 | 1,110 |

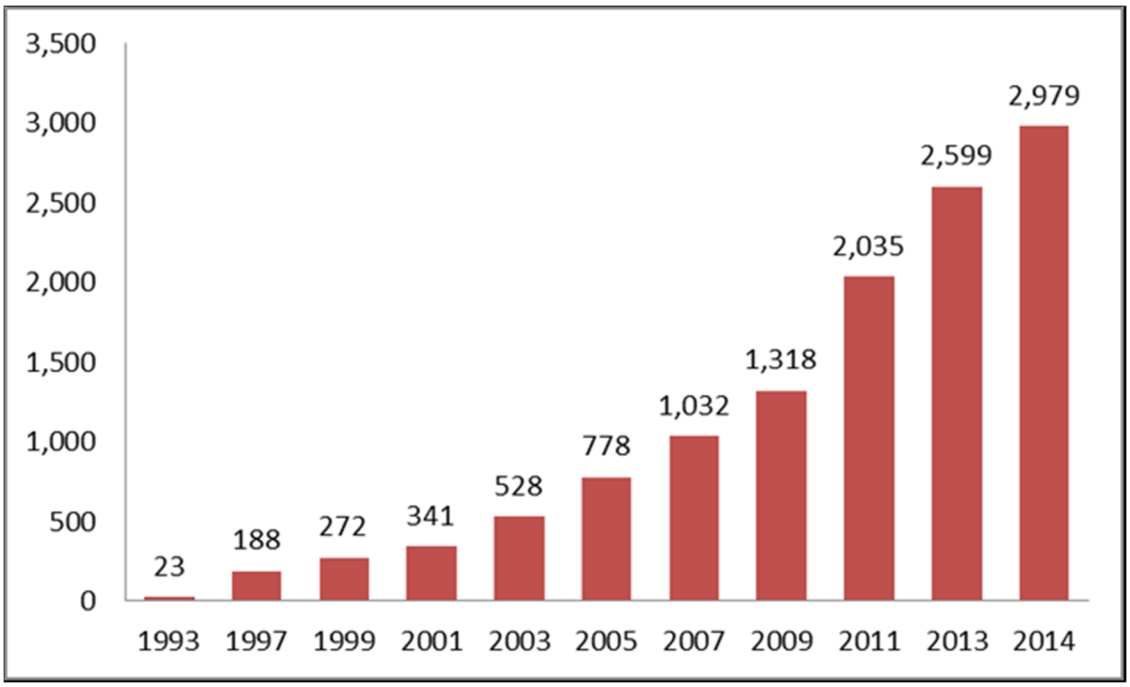


*Figure 2: Student enrolment at DAS learning centres (DAS statistics, 2015)*

Parents and teachers appear to be increasingly aware of dyslexia as a learning difficulty and its impact on children's learning process, which may have resulted in the increase in numbers of children being diagnosed with dyslexia. Further, there has been a steady increase in DAS total enrolments over time, with the highest percentage increase of 54% from 2009 to 2011 (see figure 2). To meet the increase in demand, DAS has expanded its facilities, with four learning centres being opened over the stated period.

**1.6 Research Question**

This study examines the current provision for people with dyslexia in Singapore, the limited services provided, and policy options to expand the provision. While the MOE and DAS have provided more support for students with dyslexia in recent years, we find that there remain significant gaps in dyslexia provision. This warrants a research study on what can be done to expand the services for people with dyslexia in Singapore.

DAS suggested six areas that we could cover in our research studies:

a. coverage in terms of the number of people with dyslexia who are receiving support;
b. dyslexia services offered across age groups;
c. scope of dyslexia intervention;
d. regional cooperation and exchange of knowledge;
e. adequacy of special needs professionals and tools; and
f. research on the local population.

Beyond these areas, we have examined other possible strategies for addressing the existing problems with dyslexia provision. In summary, our key research objectives are to:

- Investigate relevant policies and initiatives in other countries and their applicability to Singapore;
- Identify and evaluate the gaps in provision for people with dyslexia in Singapore; and
- Propose recommendations to expand the provision to improve the identification, intervention, and support for people with dyslexia.

## 2. Problem Analysis

Our analysis of the current gaps in provision is based on our literature review and comparison with other developed countries, as well as discussions with local stakeholders, including the MOE, DAS, teachers, parents, academia, and subject matter experts. The key stakeholders such as the MOE and DAS are aware of the gaps and have taken actions to address some of these issues. For instance, the MOE has taken a phased approach in the expansion of its School-based Dyslexia Remediation programme, which may in part be due to the need for time and training to increase its pool of teachers and allied educators to run this programme. DAS similarly has to manage its priorities within its resource constraints and is currently focussed on expanding its preschool programme and use of technological tools, developing a new programme to support post-secondary school students, and refining its programme evaluation reports.

To build capacity for future needs and ensure coherent strategic priorities, it is important for the key stakeholders to understand holistically the existing gaps in dyslexia provision. This will ensure that attention and resources are directed to expanding service provision in the areas of priority. We find that the root causes for the gaps in provision are in three main areas:

### 2.1 Service Volume

First, service volume refers to the quantity or depth of dyslexia services that are provided vis-à-vis the number of people with dyslexia that has been identified. We find that there is a significant under-identification of students with dyslexia in Singapore. This is mainly due to: a reliance on teachers' observations when they are not adequately trained to make the identification; poor public awareness and the social stigma attached to dyslexia; and a lack of standardised psychological assessment for dyslexia.

Based on the MOE's database, there are about 6,000 or 1.3% of students identified with dyslexia across primary schools, secondary schools, and junior colleges. However, using a conservative prevalence rate of 4% based on academic studies, we expect that there should be least 20,000 students with dyslexia across primary schools, secondary schools, and junior colleges. This suggests a potential gap of 14,000 students who are not identified or reported as having dyslexia.

Besides the gap in the identification of people with dyslexia, there is an existing shortfall in the provision of support for the existing 6,000 students with dyslexia. The MOE has reported that about 1,500 students have benefited from its School-based Dyslexia Remediation programme since 2012 (MOE, 2015a). DAS current enrolment across its 13 centres is about 3,000 students. This leaves a potential gap of at least 1,500 students with dyslexia who are not receiving any form of intervention. The MOE will partially mitigate this gap with the expansion of its remediation programme to all primary schools by 2016. However, students with dyslexia in secondary schools and junior colleges remain unsupported within the education system.

Our study will assess the means of improving the identification of students with dyslexia and expanding the service volume to meet the consequential increase in demand for dyslexia support. Our evaluation criteria include the monetary costs, political viability, infrastructure needs, and organisational capacity.

**2.2 Service Nature**

Second, service nature is the breadth of dyslexia services that are provided across various age groups, academic and non-academic subjects, and severity of dyslexia. We find that the existing service nature is significantly limited in terms of age group and scope of intervention. In particular, pre-school and post-secondary school students are not offered sufficient support, although dyslexia can affect a person throughout one's life. The existing focus on English remediation is also inadequate, as students with dyslexia are likely to struggle with other academic and non-academic areas, including art, memory, and organisational skills.

The MOE schools that run the School-based Dyslexia Remediation programme are mainly focussed on helping students with basic literacy skills in English such as reading, spelling, and comprehension, at Primary 3 and 4 levels only. DAS has a broader range of programmes for primary school students, but its programmes are similarly limited to English intervention at the secondary school level. Given that there is currently limited dyslexia support for post-secondary school students, DAS plans to develop a programme for these students by 2017. DAS also has plans to extend its programmes beyond basic literacy to other academic and non-academic subjects such as social and life skills. Overall, DAS is of the view that the existing intervention remains inadequate, especially for students with dyslexia and other special needs such as attention deficit hyperactivity disorder.

Our study focusses on how the service nature should be expanded to support people with dyslexia across age groups and across academic and non-academic subjects. Our evaluation criteria include the scope of intervention, the capacity of the MOE and DAS, as well as monetary costs.

**2.3 Service Support**

Third, service support is the system-level resources that support the provision of dyslexia services, which include the

availability of special needs professionals and technological tools, coordination between key stakeholders such as the MOE and DAS, and research support. We find that there are insufficient resources dedicated to supporting the provision of services for people with dyslexia. There is a shortage of professionals with the expertise and skills to work with people with dyslexia and other special needs in Singapore. The Government's Enabling Masterplan (2012-2016) has recognised the shortage of Allied Educators (Learning and Behavioural Support) to support students with special needs in mainstream schools. As allied educators are often thought of as a liaison between classroom teachers and parents of students who struggle with dyslexia and other special needs, this is a critical gap in support services. We also find that the existing mainstream teachers and allied educators have not been able to provide satisfactory intervention due to inadequate training, time constraints, and a lack of empathy. Further, assistive technology and examination access arrangements such as extended time are not adequately provided, although these could reduce students' struggles with writing and spelling when completing classwork and taking examinations.

A prominent area that requires attention is the coordination of service support between partners. While the MOE has chosen DAS as a service provider in supporting students with dyslexia, there remains a lack of coordination, particularly in the area of curriculum planning and training programmes for their teachers. A closer coordination will minimise the duplication or inconsistency in the curriculum and encourage the exchange of useful resources and teaching practices. Another area that is lacking is the limited academic research on dyslexia in Singapore and the effectiveness of various dyslexia interventions locally. The reasons for the weak research support may be attributed to Singapore's relatively small population size and a lack of publicly available data on people with dyslexia. Such research is useful for the development of pedagogy and technology to help people with dyslexia learn and work effectively.

Given these challenges, our study considers measures to expand the service support that contribute to meeting the needs of people with dyslexia in Singapore. Our evaluation criteria include the value-add of service support initiatives, monetary costs, political viability, and organisational capacity.

Throughout this study, we will reference these three categories of service volume, service nature, and service support as our analytical framework. This framework helps us to categorise the challenges of dyslexia provision, what other countries have done, and how we can solve the problems in Singapore. This categorisation is important. Instead of dealing with individual weaknesses in the system, we can group them together, and design policy tools to tackle each category of challenges.

## 3. Research Methodology

**Literature review:** we reviewed comparative studies and literature on provision for dyslexia in Singapore and

other developed countries such as the UK, US, and Australia, which are relatively more advanced in their support for people with dyslexia. Through this review, we obtained a general overview of how Singapore and other countries had studied and tackled the challenges of dyslexia, what approaches worked well, and what issues would need to be explored through other research channels.

**Observation at DAS learning centres:** we observed the classes conducted at one of DAS learning centres and spoke with the centre manager to understand the DAS programmes, pedagogy, and operational matters. Our observation of DAS classes provided background information on how the curriculum was organised, how teachers and students interacted, and helped us in our preparation for subsequent discussions.

**Interviews with subject matter experts and the MOE:** we interviewed Professor Angela Fawcett, Research Consultant to DAS, and Dr Thomas Sim, former Executive Director of DAS Academy. They provided useful insights into our research study, including provision for dyslexia globally, gaps in Singapore's provision, and means of expanding intervention locally. We also met with Mr Terence Tan, Assistant Director, MOE Psychological Services Branch and his team. They provided further insights into the MOE's initiatives in identifying and supporting students with special needs in mainstream schools, as well as some relevant statistics. The DAS Embrace Dyslexia Seminar held on 20 November 2014 was another good source of information on dyslexia from subject matter experts, including Mr Thomas West and Dr Thomas Sim.

**Interviews with DAS teachers:** we conducted face-to-face individual interviews with four DAS teachers, who had at least nine years of experience teaching primary and secondary school students in the DAS. Based on their teaching experiences, they shared useful insights into the DAS curriculum, performance of students, and use of technological tools as teaching aids.

**Focus groups with parents:** we conducted two focus groups with a total of 12 parents of students attending classes across different DAS learning centres. The first group focussed on the adequacy of dyslexia intervention for primary school students, and comprised parents of primary school students who had attended DAS classes for at least 2 years. The second group focussed on the type of support that that could be offered to post-secondary school students, and comprised parents of secondary school students who had attended DAS classes for at least 4 years. Consents were obtained from these parents for the anonymous disclosure of their quotes from the focus group discussions.

## 4. Literature Review

Our literature review has examined the international research and provision for dyslexia, with particular attention to the three key areas of service volume, service nature, and service support.

The objective was to gather evidence on the effectiveness of interventions and

support for people with dyslexia, so as to formulate evidence-based policy recommendations for Singapore.

### 4.1 Service Volume

Academic research all over the world has recognised the importance of early identification in providing timely support for students with dyslexia. However, similar to Singapore, the UK, US, and Australia have reported challenges in identifying people with dyslexia (Rose, 2009; Fletcher et al., 2006, & Whiting, 2005). The main reason for this is that dyslexia is not a clear-cut diagnostic category (Snowling, 2013). Further, dyslexia may not present itself to parents or teachers until the child begins to read.

The lack of international agreement on the definition and causes of dyslexia imply that a differential diagnosis is not possible, and the formal evaluation focusses on a number of indicators that may suggest an individual has dyslexia (New Zealand MOE, 2007). Similarly, in the US, the definition of dyslexia and eligibility criteria differ across states, which may result in a child not being recognised as having a learning disability just by crossing a state border. This situation undermines the credibility and integrity of any identification process (Klassen, 2002).

The academia is divided on how early identification of dyslexia should be achieved. One view is that children should be systematically screened for dyslexia, while the other view disagrees on the grounds that blanket screening tests are unreliable and that there are better ways to identify children with dyslexia. Taking the first view, Australia has created the Australian Early Development Index, to measure how children have developed in school and improve the early identification of children with dyslexia. Teachers complete a checklist of their students' language and communication skills in their first year of full-time school. The Progressive Achievement Tests in Reading and Mathematics is the most widely used of such performance measures, which help identify students with learning difficulties (Pyne, 2014).

Instead of a systematic screening test, some countries have advocated the role of teachers and parents in identifying children with dyslexia. The US has pioneered the "response to intervention" method (Fletcher & Vaughn, 2009), which involves monitoring the progress of a group of children through a programme of intervention, rather than undertaking a static assessment of their current skills. Children at risk of dyslexia are those who fail to respond to effective teaching. Such a strategy was similarly advocated by the UK's Rose Review (2009). Since the publication of the Code of Practice (1994), the UK has required that teachers identify children who are struggling in the early years of school and provide support for children at risk of dyslexia, with legal provision for a statement of special needs for those diagnosed as having dyslexia.

In 2003, the assessment of children's progress at the end of the foundation stage (from three to five years of age) was formally introduced into UK schools through the Early Years Foundation Profile Stage (EYFS). A study was conducted to investigate whether an assessment

undertaken by teachers at the end of the EYFS could provide a screening tool for the identification of children at risk of dyslexia (Snowling, 2013). It was found that the teachers' assessment provided a good measure of the children's development and was a reasonable predictor of literacy attainments two years later.

The MOE currently takes an in-between approach in its identification of students with dyslexia. An assessment is conducted at the beginning of Primary 1 to identify students who are generally weak in English and/or Mathematics (this assessment is not a screening test for dyslexia). These students will then be placed in the Learning Support Programme for additional support at the Primary 1 and 2 levels. At the end of Primary 2, students on the Learning Support Programme who may need to be enrolled in the School-based Dyslexia Remediation programme are identified for an assessment of whether they have dyslexia.

On an ad-hoc basis, teachers may also identify and refer students for the dyslexia assessment. The limited screening and reliance on teachers' observations when they are not adequately trained to make the identification may have contributed to the significant number of students with dyslexia who are not identified or reported as having dyslexia.

**4.2 Service Nature**

Following identification, the next challenge is to provide adequate intervention to people with dyslexia. The nature of provision in the researched countries appears to be more comprehensive in terms of age group and subject coverage than that in Singapore.

Empirical evidence shows that early intervention for dyslexia (Ehri et al., 2001; Fawcett et al., 2014) and the continuity of effective intervention for adults with dyslexia (Eden et al., 2004) result in better outcomes. However, in Singapore, the provision for pre-school and post-secondary school students with dyslexia is currently limited. For instance, the MOE-aided DAS Literacy Programme is extended to only primary and secondary schools students between 7 and 17 years of age. The Enabling Masterplan (2012–2016) has also acknowledged that students with special needs in institutes of higher learning have difficulties accessing integration support services such as career support. Singapore can take a leaf from the UK, US, and Australia, particularly in terms of post-secondary support.

Under the UK's Education, Health and Care (EHC) Plan, support will be made available to students from preschool to 25 years of age (UK Department for Education, 2014). The change in the UK policy is supported by academic research, which shows that older students with dyslexia continue to face difficulties in learning even if they have received appropriate intervention and improved their literacy skills. Goulandris & Snowling (2001) followed up a group of children with dyslexia who had received intervention and found that none of them had been able to catch up with their peers, despite their positive motivation and self-image.

Hunter-Carsch (2001) has reviewed ways in which students with dyslexia can be effectively supported in secondary schools. She outlines several areas of activity that will need careful attention if students' learning are to be maximised, including differentiation in writing activities with emphasis on systematic drafting, peer tutoring in which students with dyslexia are paired with peers who have good literacy skills, use of computer technology, as well as parental support and home-school liaison.

In the US, academic institutions have provided strong support for people with dyslexia. Besides help with literacy, college students are supported in note-taking, time management, health, and study skills. There are also colleges dedicated specifically to learning-disabled students, including those with dyslexia, such as the Landmark College and Strategic Alternative Learning Techniques Centre at the University of Arizona. The faculty at these institutions dedicate significant time to research in the field and provide access to new technology. In addition, each student works with a learning specialist to create an individualised learning plan and is offered career development assistance.

In terms of the type of intervention, the UK, US, and Australia offer a wider range of services, both from the government and other organisations, compared to the current provision available in Singapore. The MOE's mainstream schools that run the School-based Dyslexia Remediation programme are mainly focussed on helping students with dyslexia with basic literacy skills at Primary 3 and 4 levels only. There is scope for the MOE to consider expanding its intervention to other academic subjects such as Chinese, given the effectiveness of such intervention (Goswami, 2011).

In the UK, with the launch of the EHC plan, the number of hours and the scope of intervention vary according to each student's severity of dyslexia. When it comes to non-government provision, the interventions provided by Dyslexia Action include traditional academic subjects such as mathematics, as well as study skills, advice for parents on adaptations and use of technology, and individual tutoring. The tuition offered by Dyslexia Action is normally conducted in two one-hour sessions per week in groups of up to three children working at similar levels, with daily practice activities to be carried out at home.

Under the EHC legislation, which came into force from 1 September 2014, British local authorities have to publish information about what support is available for people with special educational needs in their respective geographical areas. Further, the new system places more emphasis on healthcare and the family will be more involved in the planning stage. However, there have been criticisms of the new approach, particularly on the lack of regulations and guidelines.

Each local authority can have its own system, which may lead to huge variations in how an EHC plan is developed. Charities are also concerned that this will make it difficult for them to advise parents and young people on the processes involved in the EHC plans (Driver Youth Trust, 2013).

In the US, a holistic view of dyslexia is established through the Individualised Education Programs (IEP), which is part of the Individual with Disabilities Education Act (IDEA) from 2006. The IEP holds that parents, mainstream teachers, special education teachers, and the student should work together to develop a customised education programme (US Department of Education, 2010). As mentioned earlier, specificities of the scope of intervention in the US differ across states and even districts, making a cross-country comparison challenging. Nevertheless, schools across the US have been trying to incorporate more non-academic subjects into their curriculums for integration purposes, such as language arts, as well as organisation and study skills.

In Australia, support for people with dyslexia is similarly extended to both academic and non-academic subjects, but to a lesser extent than the US. The state and territory governments take responsibility for the day-to-day delivery of school education in Australia. The local education authorities are seen to be best placed to determine the provision of specialist dyslexia teachers for students who require more intense, explicit, and individualised instruction (Pyne, 2014).

When it comes to extra support for test-takers with special needs, all four countries (US, UK, Australia, and Singapore) offer some form of special arrangements. Under the American IDEA, testing agencies have a duty to provide accommodations to students with disabilities such as offering them more time, use of a private room, or access to a scribe. A University of California-Berkeley study showed that students with dyslexia taking a standardised reading test could score on par with their peers when granted extra time (Runyan, 1991). However, the quantity of extra time that should be granted for such tests remains a point of debate (Ofiesh & Hughes, 2002).

In the UK, students with dyslexia are generally given an additional 25% of the allocated time for their examinations. In addition, the British Equality Act (2010) requires organisations to ensure that people with disabilities are not treated unfavourably and are offered reasonable adjustments, which can include a reader, oral language modifier, scribe, using a computer instead of handwriting, using assistive software (screen reader/voice recognition), exam papers in dyslexia friendly font, hard copy instead of on-screen, and supervised rest breaks.

Similarly, the Australian Disability Standards for Education (2005) emphasise that reasonable adjustments must be made to help ensure students with disability are able to access the tests wherever possible. Teachers and schools are best placed to determine how many minutes of extra time a student should have to take the test. Generally, it is recommended that no more than 5 minutes of extra time per half hour of test time be granted. In some cases, an additional 50% of the allocated time could be granted (National Assessment Program, 2015).

In Singapore, access arrangements for students with learning difficulties and/or sensory and physical disabilities include exemption from a component in a subject

such as oral examination, extended time, exemption from answering certain types of questions such as questions with graphic stimulus or questions related to measurements, constructions and drawings, tessellations and symmetry, and special assistance through the use of readers or scribes (MOE, 2013). However, unlike countries such as the UK, Singapore has not published a full and detailed list of access arrangements that are being offered for students with dyslexia.

Another issue of debate is whether students with dyslexia should attend a specialised school that caters to their learning needs or whether they should be in mainstream schools, so that they can interact with other students and integrate better into society following their education. In Singapore and Australia, the education policies are inclined towards integrating students with dyslexia in mainstream schools, regardless of their severity of dyslexia.

In the US, whether a student is educated in a mainstream school or a more specialised special needs program depends on the severity of the student's learning disability. In the UK, both options are available. Besides specialist schools, there are about 77 independent mainstream schools that have a Learning Support Unit providing specialist tuition on a small group or individual basis. The general approach is to keep all the children together most of the time and to withdraw those needing extra support for tailored sessions when necessary.

Findings from academic research have been divided on whether students with special education needs (SEN) should be included in mainstream schools. Studies supporting inclusion in mainstream schools have found that students with SEN can benefit from mainstream education if they receive adequate support. Some students with SEN in mainstream schools have achieved improved academic performance and developed social skills. Students without SEN have also benefitted socially with an increased understanding and acceptance of differences with students with SEN (Weng, Walker & Rosenblatt, 2015).

Academic studies that do not support inclusion in mainstream schools have argued that students with SEN should be educated in specialised schools that specifically cater to their needs. Such studies have found that students with SEN in mainstream schools have not received adequate support from teachers who are not trained to do so. Further, when teachers and students without SEN have negative impressions of disability, it can lead to a marginalisation of students with SEN in mainstream schools and they may experience humiliation, bullying, and a loss of self-esteem. Having students with SEN in mainstream schools may also add stress to both teachers and parents (Weng, Walker & Rosenblatt, 2015).

Overall, the success or failure of the inclusion efforts appears to be highly dependent on the academic environment and teachers. In the case of Singapore, studies have found that the MOE's focus on inclusion remains largely limited to the physical integration of students. It has been argued that inclusive education should extend beyond the physical presence of all kinds of students to

adjustments to cultures, polices, and school practices so that communities respond to student diversity and encourage all students to participate and achieve within the communities (Lim, Wong & Tan, 2014).

DAS had conducted study trips to specialist schools for students in the US and Canada to identify the best practices for its conception of such a school in Singapore. Among other schools, it visited Shelton School in Dallas, one of the largest private schools in the world for students with learning difficulties, and Fraser Academy in British Columbia. DAS found that these schools share a number of common characteristics that contribute to their success – low student-teacher ratio, curriculum that is designed after the mainstream education system, and affordable fees. In terms of outcome, Shelton School cited that 25% of its student population had re-joined mainstream or other private schools, while Fraser Academy reported that the majority of its students go on to post-secondary education (DAS & ISEAS, 2008).

### 4.3 Service Support

Adequate volume and scope of dyslexia provision depends on the quality of service support available, especially in terms of special needs professionals, technological tools, and research and regional collaboration. As compared to Singapore, the other researched countries are generally more advanced in their investments in each of these areas to support the provision for people with dyslexia.

#### Special Needs Professionals

The special needs educators in other developed countries tend to hold higher academic qualifications that those in Singapore. For instance, in the US, 70% of the early intervention teachers and professionals have a Master's degree, following the obtaining of their general education degree (Enabling Masterplan, 2012). In addition to the Master's degree, US special education teachers are required to complete continuous education requirements, including the completion of 150 hours every five years in a planned academic program pertaining to the types of students they teach. Similarly, the UK Department of Education has set as a target that every teacher should expect to teach children with special educational needs, and therefore needs to be equipped with the relevant skills (Rose, 2009).

In Singapore, all teachers in mainstream schools are currently provided with a basic awareness of special educational needs. Over the past decade, there have been steps taken to raise the level of teacher competency pertaining to special needs education. In 2005, the National Institute of Education (NIE) introduced a compulsory 12-hour module on special needs in the training of new teachers. From 2011, the NIE re-designed the module to situate this area within a compulsory 24- to 36-hour module on "Teaching and Managing Diverse Learners" for all beginning teachers during their pre-service training. Further, the MOE has offered certificate-level training (108 hours) to develop a core group of Teachers trained in Special Needs (TSNs) in every school to support

students with mild special education needs. As of end-2013, about 10% of primary school teachers and 20% of secondary school teachers (total of about 3,800 teachers) have been trained as TSNs (MOE, 2014b).

At a more specialised level, the MOE has trained and deployed about 400 Allied Educators (Learning and Behavioural Support) to support students with special needs. These allied educators are required to undertake a one-year Diploma in Special Education programme at NIE, before they are posted to the schools (Sim, 2012). In terms of entry requirements, the MOE has set out that allied educator applicants should possess a university degree or polytechnic diploma; those without a degree/diploma and with relevant experience and expertise may also apply. As of February 2015, all 190 primary schools and 69 secondary schools (about 40% of the total number of secondary schools) have at least one allied educator who is trained to identify and support students with learning difficulties and mild special education needs (Fang, 2015).

In addition, there is currently a wide range of degree and diploma programmes in Singapore pertaining to special needs education, which is comparable with other developed countries. The NIE offers the following programmes for teachers who intend to specialise in special need education: Diploma in Special Education, Advanced Diploma in Special Learning and Behavioural Needs, Master of Education (Special Education Specialisation), and Master of Education (Early Childhood Specialisation).

In terms of psychology courses, the NIE offers a Master of Education (Developmental Psychology), while the National University of Singapore offers a Clinical Psychology Masters Degree. James Cook University Singapore offers both undergraduate and postgraduate degrees in Psychology, including a Master of Psychology (Clinical).

As to diploma courses, the National Council of Social Service has partnered with Ngee Ann Polytechnic to introduce the Advanced Diploma in Early Childhood Intervention (ADECI) and Certificate in Early Childhood Intervention for teachers and teacher assistants respectively. The ADECI study awards and training scholarships were also introduced in 2007 to encourage more professionals to be trained in early intervention (Enabling Masterplan, 2012).

**Use of Technological Tools**

The Enabling Masterplan (2012–2016) recognises that the use of assistive technology (AT) and information and communications technology (ICT) enhances the quality of life of persons with disabilities and their potential to lead productive lives. In 2011, the Society of the Physically Disabled (SPD) conducted a study that surveyed more than 700 SPED school staff, caregivers, and students on the use of AT aids, and found that AT was significantly underutilised. The findings showed that:

- 34% of teachers and 37% of therapists in SPED schools said that they used AT devices as part of their work.

- 6% of the parents reported the use of AT by their child in SPED schools.
- 46% of parent respondents in the SPED school survey reported that one of the reasons they were not using AT was its high cost.
- 68% of the parent respondents in the SPED school survey had never heard of AT.
- 48% of the parent respondents in the SPED school survey were unaware of the type of AT that might benefit their child.

The SPD study concluded that the low utilisation of AT was mainly due to low awareness of the devices and the lack of coordination of resources at the national level. There was also a shortage of trained AT specialists to support teachers and therapists, and to address parents' queries. For mainstream schools, the MOE has shared that it provides a Support for Special Needs Grant to every school resourced with an Allied Educator (Learning and Behavioural Support) to purchase resources for the support of students with special educational needs. However, the MOE currently does not maintain a recommended list of special education needs resources, which have proven to be effective in the following developed countries.

The UK is currently using computer assisted learning as part of its instructional process, which is beneficial for students with dyslexia as it enhances motivation, provides individualised instruction and immediate feedback, creates an active learning environment, and can monitor the student's performance. Singleton and Simmons (2001) reported a study of the use of the program "Wordshark" in 403 primary and secondary schools in the UK. Wordshark provides training in word recognition and developing phonic skills for reading and spelling, using a wide range of entertaining and challenging games. More than 90% of children using Wordshark made improvement in their reading skills and spelling. Other common programmes used in the UK to support reading and writing are Lexia, Catch up, Rapid Reading Assistant, e-books that can be read to or by children independently, Write Out Loud (word processing), and touch typing.

The US makes use of classroom tools such as the Wilson Reading System to help students with dyslexia. This reading system uses manipulatives such as cards with letters and a finger-tapping procedure, to teach phonics and word analysis skills systematically. In terms of assistive technology, common tools used in the US include the Livescribe Smartpen (for note-taking), Dragon Naturally Speaking/Dragon Dictate (a voice recognition program), and various smartphone applications such as Phonics Genius, Audio Note, and Read to Kids.

**Research and Regional Collaboration**

The literature review on other developed countries shows that many of the best practices currently in place were developed based on academic research. The UK is one of the leaders in studies on dyslexia globally with many research centres throughout the country. For instance, the University of Buckingham manages the Research in Adult Dyslexia

website, which provides a forum for researchers to submit their qualitative and quantitative research, as well as case studies, on the experiences of adults with dyslexia. Another example is the Miles Dyslexia Centre of Bangor University, which provides assessment, teaching, and support services for dyslexia that are informed by research findings.

The US similarly has a number of established research institutes that are dedicated to dyslexia research. The Dyslexia Research Institute operates Woodland Hall Academy and Dyslexia Research Institute Literacy and Life Skills, an adult program, which provides parenting information, teacher training, and research and development resources. The Yale Centre for Dyslexia and Creativity serves as a nexus for dyslexia research, and is a leading source of advocacy and information to improve the lives of people with dyslexia. The advances in dyslexia studies in US and UK can in part be attributed to the countries' open data policy, which facilitates the conduct of research.

In response to recommendations made by dyslexia interest groups, the Australian Government has agreed in principle to provide funding for research to determine effective dyslexia support in schools. This includes funding for large randomised controlled trials of school-based dyslexia intervention studies, evaluation of the efficacy of dyslexia treatment programs, and trial of models of teacher training and AT for students with dyslexia (Australia Government, 2012).

Comparatively, the research on dyslexia in Singapore remains limited. One source of research is the Early Childhood and Special Needs Education Academic Group at NIE, which has conducted a number of research studies on child development, early childhood and special education, and teacher education. The other source is from the DAS, which has published its Asia Pacific Journal of Developmental Differences to address the range of special educational needs in the regional context.

An efficient way to expand research would be through regional cooperation. The UK is very active in international organisations pertaining to dyslexia, particularly in Europe. One example is the Welsh Dyslexia Project, which aims to assess the provision and use of ICT for students with dyslexia in European universities. The project has involved people with dyslexia, practitioners, policy makers, and developers across Europe, to put together the best practices.

Another important UK initiative is the Dyslang project, which aims to develop a course that equips special education needs professionals with skills to help students with dyslexia learn an additional curriculum language. Partners of the Dyslang project from the UK and other European countries have reported the importance of transnational cooperation and the value of exchanging experience and broadening their knowledge about dyslexia in different European contexts.

In the US, a number of associations actively participate in dyslexia campaigns and conferences both at the national and international levels. The country also hosts important events pertaining to dyslexia such as "Unlocking Dyslexia",

which is sponsored by the International Dyslexia Association and takes place every October to raise awareness of dyslexia and offer resources to parents, teachers, and individuals with special needs.

In Australia, there is a growing number of parent-initiated associations (SPELD organisations) that are motivated by a strong desire to improve the quality of instruction and increase the level of support that are currently offered to students with dyslexia. In many states, the SPELD organisations collaborate with universities on research projects designed to improve understanding of dyslexia and successful interventions (Australia Department of Education, 2014).

## 5. Research Findings and Analysis

In light of our literature review, we have engaged various stakeholders in the provision for people with dyslexia in Singapore, including the MOE, DAS teachers, parents of students with dyslexia, and subject matter experts. From our comparison with other developed countries and local fieldwork, we have identified and analysed the existing gaps in the service volume, nature, and support for people with dyslexia in Singapore.

### 5.1 Service Volume

Failing to identify dyslexia and intervene at an early stage is often cited as a huge impediment for students to better cope with the learning pace at the mainstream schools. During the DAS Embrace Dyslexia 2014 seminar, a recurring theme across the personal stories of successful people with dyslexia in Singapore was that many were diagnosed only when they were in their teenage years. As a result, they worked very hard, but were unable to excel academically, bringing frustration both to themselves and their parents, as the following comment from a person with dyslexia shows:

> "Everyone around me was trying their best to help me, and I was trying hard, really hard. No results. I felt like the tortoise in 'The Tortoise and the Hare', except that this tortoise could never win the race."

Parents in our focus groups strongly agreed on the importance of early identification and intervention:

> "The best time to help special needs students is from Primary 1 to 4, when they start developing their skills. We cannot neglect them during this phase."

The identification of people with dyslexia remains a significant challenge in Singapore, probably more so compared to other developed countries such as the UK, US, and Australia. Dyslexia in Singapore is likely to carry a higher level of social stigma, to the extent that some parents will rather hide the fact that their child has dyslexia, than to acknowledge the fact and request that their child obtain certain examination access arrangements such as extended time. These parents are concerned that their child will carry the label of having dyslexia, which may affect their tertiary education and career prospects. Students may also want to hide their struggles to protect themselves from being singled out or bullied. During

the focus group, one parent disclosed:

> "[my son] is very unhappy; he wants to hide he is dyslexic because he is not failing ... but he isn't doing great either."

Besides the negative label of dyslexia, the MOE has shared during our meeting that another reason for the low level of students identified is the poor awareness of dyslexia as a learning difficulty among parents and teachers. The existing means of identifying students at risk of dyslexia is largely dependent on the limited screening for dyslexia, progress monitoring under the Learning Support Programme, and the teachers' ability to recognise that their students are displaying symptoms. The assessment that is conducted when students enter Primary 1 is intended to identify students who are generally weak in English and/or Mathematics, and is not a screening test for dyslexia. These students will then participate in the schools' Learning Support Programme. At the end of Primary 2, students who demonstrate persistent literacy difficulties based on progress monitoring scores in the Learning Support Programme will be identified by MOE for further assessments to confirm if these students have dyslexia. These assessments are conducted by the MOE. On an ad-hoc basis, teachers who are able to identify students at risk of dyslexia may engage their parents to conduct further investigation.

Besides the limited screening for dyslexia and the progress monitoring under the Learning Support Programme, the existing process of identifying students with dyslexia is dependent on the teachers' ability to identify the symptoms. However, this reliance on teachers has not been an effective means of identifying students with dyslexia, given that most teachers are not adequately trained to make this identification. Parents in the focus groups believed that many teachers were simply "mislabelling students with dyslexia as lazy." Even if they find that a student is at risk, they do not appear equipped to recommend to the student's parents the necessary follow-up measures, including the formal psychological assessment and dyslexia intervention.

A third challenge in the identification of students with dyslexia is the lack of a defined process of doing so. Parents in the focus groups gave feedback that when they suspected that their child was at risk of dyslexia, there was no clear process of how their child could be formally assessed as having dyslexia. "Sometimes, you do not know where to get help from", a parent said. From media reports, the 'DAS Parent Support' Facebook group, and experiences of parents in the focus groups, there have been a number of cases where parents have brought their children for psychological tests, and obtained different results from different psychologists. There appears to be a lack of a standardised methodology and guidelines for psychologists to assess if a child has dyslexia. For one of the parents in the focus group, it took three years and multiple visits to different psychologists, before she obtained a formal psychological assessment that her child has dyslexia. Further, even if a psychologist has assessed that a child has dyslexia, there have been instances where the MOE schools have not

recognised the assessment nor granted any examination access arrangements to the student, partly on the basis that these students are continuing to achieve "acceptable" academic grades. The MOE has clarified that access arrangements are made based on the needs of individual students.

Put together, this has led to a low number of students identified with dyslexia at only 1.3% of the student cohort, when it should be at least 4% based on academic studies. There remains further scope to enhance the process of identification, so that students with dyslexia may receive earlier intervention, which is more effective. The currently low proportion of students who has been identified as having dyslexia shows that the existing process is not effective. There are also reports of parents trying to obtain a psychological assessment to exempt their child from Chinese, as Chinese characters can be confusing for a child with dyslexia.

A parent from the focus group shared that, "Especially when it comes to exemption from mother tongue, [the MOE] are sceptical of psychology reports because even 'normal' kids will try to get these reports." While a number of parents may try to game the system and claim that their children have dyslexia, so that they can be exempted from their mother tongue language, particularly Chinese, this in itself should not be a reason for not improving the process of identification. Rather, the process should be enhanced such that such parents will not be successful with their false claims.

### 5.2 Service Nature

#### Limited Service Provision

The MOE's School-based Dyslexia Remediation (SDR) programme has an overly ambitious objective of helping students with dyslexia to read at the same level as their peers by the end of the two-year programme in Primary 3 and 4 (Sim, 2012). Studies cited in our literature review have shown that dyslexia intervention should be offered from the pre-school level and continued through to tertiary education to achieve sustained outcomes. The current two-year SDR programme is therefore too short, as compared to that provided by other developed countries. Even if the MOE's internal studies show an improvement of the students' results after the SDR programme, it should track the students' subsequent results to assess if they were able to maintain their academic performance without any intervention. While the MOE-aided DAS Literacy Programme extends the support to other primary and secondary school students, the subsidised programme fee of about S$500 for 10 weeks of lessons implies that some households, especially the low-income ones, may not have access to the programme, notwithstanding the bursaries offered.

The MOE's SDR programme and DAS programmes are currently limited in terms of its scope. The SDR programme is limited to English remediation, while students with dyslexia are likely to be also struggling with their mother tongue language, mathematics and science. DAS programmes are more broad-based at the primary school level, covering the

academic subjects and non-academic ones such as speech and drama. Most parents in the focus group concurred that DAS programmes were helpful, with one parent attributing her son's successful admission to the Express stream in Secondary 1 to the DAS programme. At the secondary school level, the DAS programme is similarly limited to English remediation.

Parents in the focus groups gave feedback that their children would greatly benefit if DAS could expand its secondary school programme, and cover other academic subjects such as mathematics, humanities, and sciences. One parent voiced a "need for someone to break equations down for their kids. Not many DAS teachers can do this. A queue for a mathematics teacher will be very long and one or two teachers will not be enough. It will probably take DAS a year to find a good teacher." The parents also indicated the usefulness of non-academic programmes to enhance their children's memory, as well as processing, organisation, and application skills that "they will take along for the rest of their lives rather than for just a period of time." While such programmes are useful, these are additional classes outside of school hours and incur additional costs. There is therefore a limit to the number of such DAS classes that students can afford and are able to attend. Additionally, requests were made for courses organised to enable parents to teach their children with dyslexia at home – "something that empowers us."

The mainstream schools generally do not appear to provide a supportive environment for students with dyslexia to thrive. One of the teachers interviewed shared that she received feedback from her students that they found the MOE's Learning Support Programme to be too fast-paced for them. Given their difficulty in keeping up with the classes, most students with dyslexia are perceived as "lazy", "slow", and "uncooperative", and end up performing poorly in the mainstream schools. This then affects their self-esteem and confidence, resulting in a downward spiral in academic performance. Several parents corroborated stories of their child being bullied by other students and even by teachers, which further impacted their child's self-esteem. These "comments stay with them" and, as a result, they "always refer to themselves that way." Earlier intervention, then, is critical to help them cope with the learning disability. For instance, the children we observed participating in DAS classes exhibited much more confidence, wanting to impress us with their knowledge and progress, which was very different from the nervous, uncertain children described by parents in the focus groups. Most of their children had received dyslexia intervention only at the upper primary or secondary school level.

Similarly, the wellbeing of students with dyslexia is significantly affected by teachers and fellow students who do not show an understanding of their learning difficulty, and may have even laughed at their linguistic difficulties. Some of these students with dyslexia also have difficulty with their mother tongue language, particularly Chinese. One mother described her son's efforts to learn Chinese: "He tries so hard but he keeps failing. This is demoralising." Other

parents in the focus group shared that while they requested that their child be exempted from the mother tongue subject, the school would typically grant the exemption only when the student performed poorly in the subject. As a result, the parents had taken actions such as carefully dissuading their child from studying the mother tongue language or withdrawing them from tuition classes, with the intent of having their children do poorly in the subject, so that the school would accept their exemption request.

Students with dyslexia are currently subject to the schools' discretion in the granting of examination access arrangements. From the focus group discussions, we found a lack of consistency across the schools' practices. For instance, some schools have not granted an additional time of 10 minutes for every 1 hour of examination to students with dyslexia, except for the second Semestral Assessment. To the surprise of other parents, one parent shared that her daughter's school had granted her request for her daughter to take her examination in a classroom on her own "so that she could read to herself out loud." The MOE has clarified that access arrangements are granted based on the level of needs of each individual student.

Overall, given their dissatisfaction with the mainstream schools, 92% of the 856 parents who responded to a DAS parent survey in July 2011, as well as parents in the focus groups have supported the establishment of a specialist school for dyslexia, as an alternative path of education.

**Lack of Focussed Attention on Students with Severe Dyslexia**

Since 2008, DAS has proposed the establishment of a specialist school for students with dyslexia. This is intended to provide a conducive and safe environment for students to learn, without the stigma attached to having dyslexia. The school will follow a modified MOE curriculum to the extent that it pays particular emphasis on literacy and numerical skills. All the classes will be taught by special needs teachers, who are trained in pedagogy that caters to and helps students with dyslexia to learn academically. Other non-academic life skills that are useful for people with dyslexia will also be taught.

The MOE's objection to such a specialist school is primarily on the basis that it is keen to promote integration between students with dyslexia and normal students, which benefits both groups. Such experiences are also intended to help these students cope when they transit to their working lives, where they are expected to work together. As cited in the literature review, students with dyslexia can benefit academically and in terms of social skills from mainstream schools if they receive adequate support. Normal students may also benefit socially from their interactions with students with dyslexia.

Parents in the focus groups felt that it was unfair for the MOE to push for integration when the mainstream schools were not providing sufficient support for their children. In their opinion, the teachers had shown a lack of empathy and understanding of dyslexia as a learning

difficulty, and had not provided the necessary support and teaching to their children. Other students might also bully the students with dyslexia, as they were granted "privileges", including extra time for their examinations. The parents attributed the negative behaviour of teachers and students in general to a lack of awareness of dyslexia as a learning difficulty. The difference between mainstream teachers and DAS teachers "is really just training." During our classroom visit, we observed that DAS teachers continuously made encouraging comments such as "good job" or "you can do it" to nurture confident responses. Even when the student stumbled, the teacher had the flexibility in the small group setting to prompt the correct answer through a line of questioning, rather than by simply giving the right answer. Parents greatly appreciated this method and could see obvious improvements.

The benefits of integration should be evaluated against the costs and harms of keeping students with dyslexia in the mainstream schools. Students who feel ostracised generally have difficulty interacting with others, which puts into question the ability for students with dyslexia to truly integrate with their peers. Further, the MOE's decision to keep students with severe dyslexia in mainstream schools has affected some students' self-esteem and confidence, as they continue to fail regardless of how much effort they put into their studies. Finally, dyslexia as a learning difficulty does not imply that students with dyslexia are not able to learn to communicate effectively in a specialist school. In fact, they can probably learn to communicate better in an environment where they do not have to fear being laughed at. The benefits of integration therefore appear limited in this context.

The establishment of a specialist school essentially provides students with severe dyslexia and parents with the choice of an alternative path of education. Students with dyslexia and their parents should be given the freedom to choose, especially when the students have attempted to, but have not been able to integrate and excel in the mainstream schools. The MOE should not assume that it has made the right choice for these families simply based on the objective of integration, without recognising that the education system has not been able to fully benefit and accommodate students with severe dyslexia.

### 5.3 Service Support

#### Scarcity of Adequately-Trained Teachers and Allied Educators

There are currently insufficient resources dedicated to supporting the provision of services for people with dyslexia. The mainstream teachers and Allied Educators (Learning and Behavioural Support) have not been able to provide adequate support to students with dyslexia. Parents in the focus groups were dissatisfied with the teachers' competency, availability of time and resources, and attitude in supporting their children with dyslexia. While 10% of primary school teachers and 20% of secondary school teachers are Teachers trained in Special Needs and the younger teachers will have attended the 24- to 36-hour NIE module on "Teaching and

Managing Diverse Learners", the majority of teachers remain untrained to support students with special needs. This is significantly below the level of teacher training in other developed countries.

Parents in the focus groups all cited negative experiences in their interactions with the teachers and schools regarding their child with dyslexia. While there were a few teachers who tried to help their child, the parents found that most teachers had a poor understanding of dyslexia as a learning difficulty, and lacked the empathy and training to help their child. Below are the comments from parents in our focus groups:

> "Teachers usually do not address the real problem. Instead, they punish our child for not completing the assignment. Dyslexia is not only about learning difficulties, but it also involves emotional problems, and mainstream's professionals do not seem prepared to cope with it."

> "As long as children with dyslexia are passing their exams, teachers ignore their problems."

As their child progress to the next academic level, parents in the focus groups often had to repeat the process of informing the new teachers of their child's dyslexia and the associated learning difficulties. While there is the School Cockpit System – an existing academic record for each student, the parents felt that such records might not have been updated, and even if they were, the new teachers did not seem to have referred to the records. The lack of a proper handover of the students had led to significant frustration among the parents in having to explain their child's learning difficulties with every change in teachers.

Parents in the focus groups are generally aware that each school has at least one Allied Educator (Learning and Behavioural Support). However, they questioned the adequacy of the training that these allied educators received such that they were able to effectively provide differentiated learning and remediation support to their child. The parents also found that the allied educators were generally "overwhelmed" by the number of students that they were managing. They felt that the allied educators tended to be dealing more with behavioural issues of students, than focussed on providing learning support to students with dyslexia. As a result, the parents were of the consensus that the mainstream teachers and allied educators did not provide sufficient support to their child.

**Low Utilisation of Technological Tools**

There is a lack of provision of ICT and assistive technology to help students with dyslexia with their learning and taking of examinations, relative to other developed countries. Our literature review shows that the use of technological tools can provide important learning support for students with dyslexia. Parents in the focus groups were supportive of the use of computers, tablets, calculators, electronic dictionaries, and other technological tools in the classrooms. The parents concurred that "dyslexic kids are better in terms of technology ... they can play around and fix things in a different way." They believed that these tools would speed up their children's

understanding and work by helping them overcome their difficulties with spelling and reading comprehension.

Unlike other developed countries, students with dyslexia are generally not able to use technological tools during their examinations, except for a digital dictionary for Chinese. Parents in the focus groups felt strongly that the MOE should review its policy and be more accommodative towards students with special needs. The use of dictionaries during English exams was mentioned as a useful aid, as a way for a "child to become "unstuck" when he or she gets stuck." The parents questioned the emphasis on spelling and grammatical accuracies for students with dyslexia, given the availability of technological tools the children could eventually use to support their writing at work. One parent commented that:

> "Classroom needs to facilitate more IT [information technology] usage. The real world is computers now, not pen and paper. Why are schools focussed on spelling when the real world is moving away from that?"

DAS has been exploring the increased use of technology as a complementary teaching tool. For instance, it conducted a trial on the use of iPads as a teaching aid at a few of its learning centres in 2014. Given the positive feedback from the teachers and students, DAS intends to invest in and expand the use of iPads across its learning centres. DAS is also considering the investment in other assistive technology to support its students' learning.

**Redundancies and Missed Opportunities in Service Offerings**

Based on our fieldwork and discussions with stakeholders, we observed that there is scope for improved coordination between the MOE and DAS in their curriculum planning, to ensure consistency and continuity in the intervention offered to students with dyslexia. There are currently students who are attending the MOE's Learning Support Programme in Primary 1 and 2, and are concurrently attending DAS classes.

Following the School-based Dyslexia Remediation programme in Primary 3 and 4, some students in Primary 5 and 6 may attend DAS classes to continue with the remediation. There is therefore a need for the MOE and DAS to regularly exchange information on their programmes to minimise any duplication or inconsistency in the curriculum and encourage the sharing of useful curriculum resources and good practices.

We found that the MOE has not regularly communicated its academic expectations and curriculum changes to DAS and its teachers. While the MOE's syllabus is publicly available, it will be useful for the MOE to highlight and explain the changes to DAS, so that the latter can refine its programmes accordingly.

An experienced teacher from DAS recalled that the frequency of such communication was about once in three years. She commented that she would find out about such curriculum changes as a parent at her daughter's school, instead of through the MOE's communication with DAS.

**Limited Investment in Research and Regional Collaboration**

There has been limited research on the effects of dyslexia and the effectiveness of various interventions on the local population, as compared to other developed countries covered in the literature review. Besides the small population size, the other key impediment is the lack of publicly available data on people with dyslexia in Singapore. Such research is useful in the design and development of new pedagogy and technology to help people with dyslexia learn and work effectively.

From our discussions with the academia, there are currently limited collaborations within the region to study topics of common interest such as the teaching of the Malay language to students with dyslexia.

DAS has made some progress in this regard with the organising of conferences with its regional counterparts in Kuala Lumpur, Malaysia and Bandung, Indonesia, to facilitate the exchange of knowledge and teaching experiences. Such collaboration will serve to augment local research and improve the pedagogy to benefit students with dyslexia.

## 6. Policy Viability Evaluation Criteria

We have developed an analytical framework to assess the viability of our policy recommendations that are developed based on our field work and literature review.

Our policy evaluation criteria covers four key elements:

a. benefits of policy option;
b. costs of policy option;
c. political feasibility; and
d. capacity to implement policy option.

Each element of the criteria is elaborated as follows:

a. Benefits of policy option
   - Reach of policy measure (number of people with dyslexia that will benefit from the policy)
   - Quality of intervention (curriculum, pedagogy, timeliness, and coordination between MOE and DAS)
   - Quantity of intervention (number of hours of classes)
   - Quantity of intervention (scope of academic and non-academic subjects)
   - Capacity-building for future

b. Costs of policy option
   - Operational costs (manpower)
   - Training costs
   - Technological costs (for the adoption of assistive technology and ICT)
   - Infrastructure costs (physical facilities)
   - Research costs

c. Political feasibility – support from the Government/MOE in terms of:
   - Financial support
   - Data availability for research
   - Partnering with DAS
   - Partnering with other voluntary welfare organisations, the

private sector, and the public
- Partnering with regional counterparts

d. Capacity to implement policy option
- Financial capacity
- Adequacy of special needs professionals (availability of specialised degree and diploma programmes)
- Availability of physical facilities
- Availability of technological resources
- Parental support

Depending on the policy option, some of the detailed criteria may not be relevant and are therefore not applied in our assessment of the policy recommendations.

## 7. Policy Recommendations

Based on our research findings and analysis, we recommend a broad expansion of the current provision to improve the identification, intervention, and support for people with dyslexia. We have ranked the following five policy recommendations based on their importance and priority, taking into account potential socio-economic and political constraints. Under recommendation 1, the priority is to establish a systematic and cost-effective screening process to identify students with dyslexia. With an expected increase in the number of students identified with dyslexia, the MOE and DAS will have to expand their service volume, nature, and support offered to these students, including expanding teacher training (recommendation 2), investigating the feasibility of a specialist school for students with severe dyslexia (recommendation 3), investing in assistive technology (recommendation 4), and increasing the reach of public awareness and anti-bullying campaigns to support integration into mainstream schools (recommendation 5). We believe that these recommendations will contribute to the Government's efforts to build an inclusive society, where all citizens have the opportunity to achieve their aspirations.

**Recommendation 1:**

**DAS and MOE should harmonise their intervention strategies across multiple stakeholders and streamline existing interventions in order to supply and expand dyslexia provision in a coordinated manner.**

One of our main findings is the need to increase the effectiveness of current provision for students with dyslexia, which could be achieved by creating a unified approach across all current service offerings, including screening for dyslexia, curriculum planning, and access arrangements. In the longer term, the key stakeholders (DAS, MOE, parents of students with dyslexia, and teachers) should work towards a harmonised approach in supplying and expanding the service provision in a coordinated manner.

The expansion of dyslexia provision, supported by an increase in cooperation among key stakeholders, will increase the reach, as well as quantity and quality of intervention. The enhancement of dyslexia support begins with a systematic process of identifying students with dyslexia, so that they may receive early

intervention, which is proven to be more effective. This lays a stronger foundation for them to advance their studies to the best of their potential and contribute to society in future. Further, as the MOE and DAS both have plans to expand their existing dyslexia provision, it is important for the expansion to be done in a coordinated manner, instead of doing so on separate tracks, which increases the risk of duplication and inconsistencies in approach.

Cooperation among key stakeholders will provide economies of scale, while reducing duplicative efforts and clarifying the approach can achieve cost savings. The partnership between the MOE and DAS has worked well, particularly in the MOE-aided DAS Literacy Programme. There is further potential for collaboration. DAS has offered screening tests, parental support, and awareness campaigns at the school level. Such activities could be scaled up with the MOE's support and coordination. Feedback from parents of students with dyslexia, DAS teachers, and mainstream teachers will be useful in considering the expansion of such activities. In this regard, we recommend that DAS and MOE streamline their existing intervention strategies, to achieve the benefits and cost effectiveness from implementing a unified intervention method in the following areas.

**Short-term measures (within 2 years)**

Determine the most cost-effective screening process: the MOE should establish a broader and more systematic screening process to identify students at risk of dyslexia. The screening process could be conducted at the end of Primary 1 after students have undergone their foundational year of education. This would be similar in principle to the model for the UK and Australia in identifying children with dyslexia and the MOE's existing screening test for the Gifted Education Programme, which is offered to academically gifted students in the top 1% of the national cohort. To identify these students, the MOE conducts a screening test for all Primary 3 students to assess their intellectual ability and potential. In addition, the MOE, with stakeholder feedback, should seek to standardise the psychological assessment, given that there appears to be varying practices across psychologists. While the MOE generally accepts the psychological assessment of DAS, the MOE should consider maintaining an accepted list of other psychologists whom it recognises.

Streamline curriculum: the MOE and DAS should work towards streamlining the curriculum for students with dyslexia who go through MOE's Learning Support Programme in Primary 1 and 2, and are concurrently attending DAS classes. Further, the MOE and DAS should ensure consistency and continuity in the intervention offered through the School-based Dyslexia Remediation programme in Primary 3 and 4, and the continued remediation through the DAS programme in Primary 5 and 6. There also remains scope for the MOE and DAS to regularly exchange information on useful curriculum resources and good practices.

Publish access arrangements: the MOE should publish the list of examination access arrangements that may be granted to students with dyslexia, so that parents know the available options they

can apply for their children. This will also ensure that the access arrangements are consistently granted across the schools for students with similar severity of dyslexia. In addition, parents have requested spelling leniency for students with dyslexia, so that they will not be penalised during exams for their spelling and grammatical errors.

**Long-term measures (more than 2 years)**

In the long term, this unified approach will serve as a good foundation for the MOE and DAS to expand their current provision. The existing MOE-aided DAS Literacy Programme should be expanded to offer subsidised intervention to preschool and post-secondary school students. Empirical studies have shown that early intervention for dyslexia among preschool children results in better outcomes, and that students with dyslexia in tertiary education continue to require effective intervention. Further, DAS should expand its programme for secondary school students, to cover other academic subjects (besides English), including mother tongue languages, mathematics, humanities, and sciences. The parents in the focus groups have also indicated interest in non-academic programmes to enhance their children's memory, as well as processing, organisation, and application skills. Additionally, DAS should consider the further expansion of its learning centres to meet the expected increase in demand for dyslexia services with a more robust screening process.

For students with mild or moderate dyslexia, we agree with the MOE's ongoing efforts to expand its School-based Dyslexia Remediation programme to all primary schools by 2016 to support these students. The MOE should consider the feasibility of expanding the programme to other academic levels, as well as to other academic subjects such as mother tongue languages, mathematics, and science, given that students with dyslexia are likely to also struggle with these subjects besides English. These subjects should be taught in specialised classes by specialised teachers within the mainstream schools to students with mild or moderate dyslexia. The experience from other developed countries has shown that such continuous and broad-based interventions have been effective in improving students' performance.

**Recommendation 2:**

**The MOE should expand professional learning pathways for mainstream teachers and Allied Educators (Learning and Behavioural Support) to better meet the needs of students with dyslexia.**

The improvement of mainstream teachers' and allied educators' capabilities to better meet the needs of students with dyslexia was one of the pressing issues raised by parents during the focus groups. We have identified that the majority of teachers are not adequately trained to identify and support students with dyslexia. This contributes to the relatively low proportion of students identified with dyslexia in Singapore at 1.3%, compared to the international norm of at least 4%. By improving the level of training, these teachers and allied educators will be better equipped to identify students at risk of dyslexia.

The expansion of professional learning

pathways for teachers and allied educators will also enhance the quality and quantity of intervention. Teachers will be more prepared to meet the needs of students with dyslexia within the classroom, which should improve their learning process, self-esteem, and performance, and thereby develop their potential to excel in future.

Our recommendation will involve moderate operational and research costs, as we suggest an expansion and intensification of the programmes for pre-school, primary, and secondary teachers, as well as allied educators. We expect low infrastructure and technological costs since it is possible to utilise the existing physical facilities and resources.

Our proposed expansion of the current training programmes is consistent with the general policy objectives of the Government and MOE. We also expect parents to support such initiatives in raising teachers' competency to work with students with dyslexia.

There continues to be limited data that is publicly available for research on special needs in Singapore. Part of the reason could be due to the low engagement of universities in the special needs research field. Researchers locally and within the region should therefore be encouraged to conduct more academic studies on dyslexia and special needs, and contribute to the availability of public data.

**Short-term measures (within 2 years)**

Expansion of training in special needs for teachers: the MOE should expand its training and certification of Teachers trained in Special Needs (TSN) beyond the existing 10% of primary school teachers and 20% of secondary school teachers. These TSNs should be trained to plan and adapt the curriculum for students with special education needs. The MOE should also ensure that tertiary institutions have tutors, who can support students with dyslexia. These tutors should be trained in special needs education, and be able to help the students understand academic concepts and develop study skills at the tertiary level.

Raise awareness: general awareness needs to be raised among teachers and principals pertaining to students with special education needs, so that they are better able to support these students, including those with dyslexia. The National Institute of Education's special needs training programmes should be followed up with annual workshops covering: (a) daily classroom and exam skills; (b) identification/screening process; (c) technology-based curriculum; (d) public awareness; (e) how to communicate with parents; (f) how to manage the transition process when students change teachers or academic levels; and (g) emotional consequences of mishandling a student with dyslexia. The MOE could also engage DAS to conduct dyslexia awareness talks to mainstream teachers.

Training in identification: preschool and mainstream teachers, as well as Allied Educators (Learning and Behavioural Support) (AEDs) should be adequately trained to identify students with literacy difficulties and dyslexia. This should entail a careful observation and

assessment of these students' response to reading activities in comparison with their peers. This is similar to the approach taken by the UK and US. The teachers and AEDs should also be equipped to advise parents on the appropriate follow-up measures, including a formal psychological assessment and dyslexia intervention.

Career progression: the MOE should set out the potential career progression for AEDs and ensure that they are adequately remunerated, to mitigate their high attrition rate. In addition, given the existing concern that some AEDs are preoccupied with students' behavioural issues, the MOE should consider separating the responsibilities of AEDs such that there are dedicated AEDs who provide learning support to students with special needs, while other AEDs provide behavioural support.

With enhanced career progression options and clearer delineation of responsibilities, more people should be attracted and incentivised to become AEDs, and thereby increase the number of AEDs per school. Ideally, there should be at least one AED for each academic level, given the need for a low student-teacher ratio to effectively conduct intervention programmes (DAS maintains a ratio of 4:1 for its classes).

**Long-term measures (more than 2 years)**

Our literature review shows how important research studies on local population are in designing teacher's training modules. In other countries, researchers within their own disciplines have begun asking questions about what it is like being dyslexic, how people with this learning difficulty navigate through school and other life situations, and how the cumulative psychological impact that persistent academic trauma and stress has on people with dyslexia (Sykes, 2008). These answers are critical in preparing teachers to better support students with dyslexia in the classrooms.

The MOE should increase the availability and transparency of data pertaining to special needs students and education, in order to promote research on the local population. The MOE should also consider funding external research to investigate the effectiveness of dyslexia support offered in the mainstream schools through the School-based Dyslexia Remediation programme and AEDs, and make the necessary enhancements to its intervention. In addition, the MOE and DAS should partner with their regional counterparts to conduct research studies and teacher cross-training to benefit students with dyslexia. One area of potential collaboration is with DAS counterparts in Malaysia and Indonesia in the teaching of the Malay language.

**Recommendation 3:**

**The MOE should investigate the feasibility of a specialist school for students with severe dyslexia.**

With an enhanced process for identifying students with dyslexia, we have considered how best to support students who are identified to have severe dyslexia. The options are to maintain the status quo, create special classes for students with dyslexia within the mainstream schools, or establish a

separate specialist school as proposed by DAS. In partnership with the Institute of Southeast Asian Studies and based on the best practices of specialist schools in the US and Canada, DAS has submitted a proposal to the MOE in October 2008 for a specialist school for students with dyslexia, and followed up with a refined proposal in January 2012. However, the MOE has indicated its preference for the status quo, where students with dyslexia remain in the mainstream schools to promote integration with other students.

We have assessed that the status quo is untenable given that the mainstream school environment is unable to cater for and support students with severe dyslexia, and has harmed their self-esteem, confidence, and ability to achieve their aspirations. Creating special classes for students with severe dyslexia within the mainstream schools lacks the economies of scale and the capacity to adopt a different pedagogical approach to facilitate the students' learning process. Further, students in these special classes may develop a stigma since they appear to be unable to cope in the mainstream classes, unlike the rest of the students. It may also be difficult to find mainstream schools that are willing to house such special classes within their premises given the potential stigma attached to students with learning difficulties.

We recommend the establishment of a specialist school for students with severe dyslexia to achieve the following benefits. First, the specialist school will provide a conducive and safe learning environment with intensive individual support for students with dyslexia to achieve academic success and acquire life skills. Second, given that DAS proposed a specialist school will follow a modified MOE curriculum, students who are equipped with the necessary learning strategies may return to the mainstream schools, while still receiving intervention support from DAS. Third, the specialist school will have economies of scale in the design of pedagogy, training of special needs teachers, and use of assistive technology, which contribute to capacity-building for the future.

While the establishment of a specialist school may incur higher operational and infrastructure costs than the other two options, its benefits in raising the quality and level of intervention, as well as its efficiency and reach may outweigh the costs. The school fees are expected to be substantial given the expected quality of the programme and intensive individual support for each student. DAS has not provided an estimate of the quantum, but has indicated that it will be lower than similar specialist schools abroad. To ensure access to the specialist school, DAS has proposed a fee-subsidy scheme, with appropriate means-testing and funded by donations and the MOE, to enable deserving students to attend the school (DAS, 2012).

DAS has expressed that without the MOE's support, it would not be able to finance the specialist school on its own. The DAS proposal is for its specialist school to be funded in the same way the MOE funds the Pathlight School, a special school for students with autism that offers mainstream academic curriculum with life skills. It is proposed that the MOE covers the land costs and 90% of the budget for standard facilities, furniture, and

equipment, while the balance will be raised in donations by DAS. DAS has requested that the specialist school be operated on a per student MOE annual grant, which is four times the recurrent expenditure for primary school students. On this basis, the specialist school is estimated to breakeven and be self-sustaining after the first four years of operations. DAS has also committed to raise funds to offset any annual deficit of the school budget (DAS, 2012).

The MOE's support for the proposed specialist school would demonstrate its commitment to create "a variegated education landscape with diverse pathways" (MOE, 2015b). The MOE teachers in mainstream schools would also be less strained in terms of time and resources if students with severe dyslexia were supported by the specialist school.

As for parental support, the establishment of a specialist school will be greeted by parents with children who are struggling to learn and integrate into the mainstream schools. From the DAS parent survey conducted in July 2011, 92% of the 856 parents surveyed supported the establishment of a specialist school. Parents who are not supportive of the specialist school were mainly concerned about the potential stigma attached to the school and its students' ability to assimilate into the mainstream schools in future.

There is also concern on the foregone benefits of inclusion in mainstream schools, where students with dyslexia and normal students have the opportunity to gain social and developmental skills through their interactions. While these are valid concerns, they should not detract from the majority of parents' support for the specialist school and the offering of a choice of an alternative path of education.

Given our analysis of the benefits, costs, political feasibility, and implementation capacity, we believe that there is merit for the DAS proposed specialist school. However, this has to be balanced against the concerns of the potential stigma attached to the school, future assimilation, and the opportunity costs of segregation. We therefore recommend that the MOE investigate the feasibility of a specialist school for students with severe dyslexia.

**Recommendation 4:**

**DAS and MOE should identify and invest in assistive technology that help students with learning and enhance communications across various school channels.**

The use of assistive technology and ICT, including mind-mapping, mind-to-speech, and spelling applications, to help students with dyslexia in their learning, have demonstrated effectiveness in other countries surveyed in our literature review. However, assistive technology remained "underutilised at the systemic level" in Singapore, as set out in the Enabling Masterplan (2012-2016). Interestingly, the low utilisation was not attributed to a lack of resources, but low awareness of such devices and the lack of coordination of resources at the national level.

In terms of benefits, it should be recognised that based on research studies, the academic performances of

students with dyslexia have significantly improved with the appropriate use of technological tools. Besides the improvement in performance, students have shown a greater interest in learning. The challenge lies in the selection of effective technological tools and coordination in the use of these resources.

As the Enabling Masterplan has set out, the low utilisation of assistive technology in Singapore is not primarily due to high, prohibitive costs. Instead with the influx of a wide range of applications, the costs of such technological tools have generally decreased. However, there remain significant costs in determining the appropriate tools in the local context and in training teachers and allied educators to use these tools effectively.

The MOE and DAS can play an important coordinating role in the selection of technological tools and training of their teachers. Both institutions have the capacity to initiate pilot trials to assess the effectiveness of technological tools that have worked in other countries. The institutions can then contribute to a recommended list of special needs resources, which the mainstream schools can consider investing in based on the needs of their students.

In relation to funding, the MOE's Support for Special Needs Grant provides schools with the financial capacity to invest in and utilise technological tools. Parents are also expected to support the use of such tools to support their children's learning.

**Short to long-term measures (continuous investment required)**

The MOE and DAS should incorporate the use of technological tools and assistive technology in its programmes to support students with dyslexia. To encourage schools to do so, the MOE should ensure that its Support for Special Needs Grant is adequate and that a certain portion of the fund is dedicated to investment in such tools. Further, the MOE and DAS could work together to provide the schools a recommended list of such resources. The MOE and DAS should also coordinate the necessary training to ensure that the teachers and allied educators are able to effectively employ these tools. The MOE should also consider expanding the current examination access arrangements to grant students with dyslexia an allowance for the use of technological tools such as digital dictionaries for English.

The MOE teachers should ensure that the School Cockpit System is adequately updated, particularly for students with special needs, to ensure a proper handover of the students at the beginning of each academic year. An understanding of the students' learning difficulties will help the new teachers to better accommodate and teach these students, as well as to better interact with their parents.

Additionally, the MOE and DAS should improve their communication with parents of students with dyslexia regarding their academic and non-academic progress. An online communication portal will be useful for teachers to update parents on what their children are learning and

provide feedback on their performance. Parents can then help reinforce what the teachers have taught their children and request additional information or set up meetings, as necessary. The MOE and DAS should ensure that the online portal is secure and that the information exchanged remains confidential.

**Recommendation 5:**

**DAS and MOE should increase the reach of public awareness campaigns to identify children who may require dyslexia intervention and initiate an anti-bullying campaign to aid integration efforts.**

The identification of students with dyslexia tends to occur only after poor performance is observed in the classroom. In addition, teachers and students receive minimal information about the consequences of bullying, especially to children struggling with a learning disability. Schools with a school counselor or social worker may provide some information and support, but the level of effort currently varies across schools.

Increasing the public's awareness of dyslexia is expected to provide a number of benefits. Other developed countries have been able to effectively launch informational campaigns and point to success stories in the corporate world. This has led to increases in the number of children identified and led to more children being identified earlier.

A positive spillover effect may also be a change in social stigma. By promoting success stories, such as Charles Schwab (founder of the Charles Schwab Corporation), the general public may be more accepting of those struggling with dyslexia and more willing to identify whether their own children struggle with it. This may also create an environment where students with dyslexia can integrate better into the mainstream schools.

The costs can be very high to develop a successful nation-wide campaign, such as television or newspaper advertisements. However, there are ways to implement these types of programmes in a cost-effective way. Until there is financial capacity, a team could disseminate information about dyslexia through public spaces. This can, at a minimum, start the conversation in new forums than the ones currently being tapped. In addition, campaigns can be led through social media, such as Twitter or Facebook.

Given the social stigma that accompanies any learning disability, the MOE and DAS may encounter resistance from parents, students and even some teachers of mainstream schools for two key reasons. First, anti-bullying campaigns may be dismissed by some of these stakeholders because bullying, for years, has been considered normal as part of the learning process or as harmless child's play. However, these campaigns intend to promote the opposite.

Today, victims of bullying tend to experience higher rates of depression and other mental instability as a result of harassment. Second, teachers may resist any criticisms of their teaching style and pedagogy. However, it is important to develop a school climate that is

conducive to learning, regardless of the students' abilities.

Anti-bullying is increasingly becoming a priority in many schools in the US and UK because bullying is no longer confined to the classroom, but continues at home through social media channels. A significant worry of most of the parents in our focus groups pertained to the emotional well-being of their children due to constant misunderstandings that arose between their children and teachers and/ or other students. One of the MOE's main priorities is the integration between students with dyslexia and mainstream students. This means that bullying must be addressed early and consistently. Tapping current resources, school counselors or social workers, to help broaden the current piecemeal initiatives will keep costs of pursuing such a programme low.

When financial capacity increases, it will be imperative to measure the success of these campaigns to understand how these campaigns are directly linked to increases in identification of students with dyslexia or decreases in parental complaints regarding bullying. Such studies will provide more tangible data on which to base further recommendations. Partnering with local universities or local voluntary welfare organisations could also provide a spillover benefit of increased research interest in the area of dyslexia in Singapore.

**Short to long-term measures (continuous investment required)**

Raise parental awareness: parents of a child with dyslexia should be equipped with a deeper understanding of "positive dyslexia", which emphasises the strengths of people with dyslexia. In particular, people with dyslexia tend to be strong in big-picture and 3D thinking, integration of complex information, and strong pattern awareness. Such capabilities have helped a number of people with dyslexia to achieve success in a variety of careers (West, 2014). This emphasis on positive dyslexia is important in encouraging parents to continue to invest and believe in their child's prospects, and not simply lower their expectations given their child's learning difficulty.

Establish anti-bullying campaigns for all students and teachers: the MOE and DAS should leverage regional studies to develop an anti-bullying campaign targeted at reducing the bullying of students with dyslexia in mainstream schools. The campaigns could include educational videos, classroom activities, and other programmes customised to age -levels, which are aimed at enhancing student integration.

## 8. Limitations of Study and Future Research

In the course of our study, we faced limitations in conducting a more precise cost-benefit analysis of the policy options due to the lack of data availability regarding costs of dyslexia provision both in Singapore and in the other developed countries covered in the literature review. For this reason, our assessment relies on qualitative criteria rather than quantitative data. Given the scarce data on the prevalence of dyslexia in Singapore, our

field work was conducted primarily through qualitative research, which required an understanding of processes, events, and relationships in the context of the social and cultural situation of the learning disability in the country. There is also a limitation to the generalisability of the comments made by parents in the focus groups, given the small sample size. This was mainly due to limited interest among parents to participate in such focus groups, although our sessions were conducted over the weekend and limited to two hours per session. Nevertheless, the qualitative research was extremely useful for obtaining insights into situations and problems concerning the current provision for students with dyslexia in Singapore, which were critical for shaping our policy recommendations.

Aligned with the recommendations of this report, we understand that DAS intends to:

a. expand its preschool programme and use of technology, including the use of iPads and other assistive technology, as complementary teaching tools;
b. expand the range of subjects under its Specialised Educational Services, including the support for post-secondary school students and adults with dyslexia; and
c. continue its efforts to increase public awareness of dyslexia, including "positive dyslexia", which emphasises the strengths of people with dyslexia and thereby increases their self-esteem. Future research should therefore explore these areas of expansion and their effectiveness, especially in terms of the benefits of early intervention, pre-school and post-secondary support, as well as provision for adults with dyslexia, weighed against the costs of non- or delayed intervention such as the loss of labour productivity.

## 9. Summary and Conclusions

Despite efforts from the MOE, DAS, and other relevant stakeholders, there remain significant gaps in the provision for people with dyslexia in Singapore. In quantitative terms, there is a potential gap of 14,000 students who are not identified as having dyslexia, and therefore are not receiving any type of intervention. From a qualitative perspective, the services that are currently in place are limited in scope and there are insufficient resources to support dyslexia provision.

Based on our literature review and comparison with other developed countries, as well as discussions with local stakeholders, including the MOE, DAS, teachers, parents, and subject matter experts, we find that the root causes for the gaps in provision are in three main areas:

1. **Service Volume:** there is a significant under-identification of students with dyslexia in Singapore. This is mainly due to: a reliance on teachers' observations when they are not adequately trained to make the identification; poor public awareness and the social stigma attached to dyslexia; and a lack of standardised psychological assessment for dyslexia.

2. **Service Nature:** the current interventions are limited in terms of age group and scope of intervention. In particular, pre-school and post-secondary school students are not offered sufficient support. The existing focus on English remediation is also inadequate, as students with dyslexia are likely to struggle with other subjects.

3. **Service Support:** there are insufficient resources dedicated to supporting the provision of services for people with dyslexia. First, mainstream teachers and Allied Educators (Learning and Behavioural Support) have not been able to provide satisfactory intervention due to inadequate training, time constraints, and a lack of empathy. Second, there is low utilisation of technological tools to help students with dyslexia with their learning and taking of examinations. Third, there is scope for improved coordination between the MOE and DAS in their curriculum planning, as well as collaboration between Singapore and other regional countries to enhance local research and improve the pedagogy to benefit students with dyslexia.

Based on our research findings, we propose five policy recommendations to expand the current dyslexia provision. The recommendations are assessed based on an evaluation criteria, comprising benefits, costs, political feasibility, and capacity of implementation.

1. **DAS and MOE should harmonise their strategies across multiple stakeholders and streamline existing interventions in order to expand dyslexia provision in a coordinated manner.** The priority is to establish a systematic and cost -effective screening process to identify students with dyslexia. Further cooperation between DAS and MOE will facilitate the expansion of current provision, increasing the reach, quantity, and quality of intervention.

2. **The MOE should expand professional learning pathways for mainstream teachers and Allied Educators (Learning and Behavioural Support) to better meet the needs of students with dyslexia.** In particular, we propose an expansion of training in special needs for teachers and dyslexia awareness workshops; training in identification of students with dyslexia; and the development of enhanced career progression options and clearer delineation of responsibilities for allied educators.

3. **The MOE should investigate the feasibility of a specialist school for students with severe dyslexia.** We have considered that its benefits in providing a conducive learning environment, effective intervention, and economies of scale have to be balanced against the concerns of the potential stigma attached to the school, future assimilation, and the opportunity costs of segregation.

4. **DAS and MOE should invest in assistive technology and ICT to help students with dyslexia in their learning and examination access arrangements.** Additionally, the MOE teachers should ensure that the School Cockpit System is adequately updated to ensure a proper handover of the students at the beginning of each academic year. The MOE and DAS should also improve their communication with parents regarding students' progress by using an online communication portal.

5. **DAS and MOE should increase the reach of public awareness campaigns** to identify children who may require dyslexia intervention and initiate an anti-bullying campaign for all students and teachers to aid integration efforts.

We expect our report to support an ongoing discourse about the policies and means to ensure that Singapore embraces dyslexia and provides the conditions for all students, including those with dyslexia and other special needs, to excel and succeed in life.

## 10. Acknowledgements

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# *DYSLEXIA ASSOCIATION OF SINGAPORE (DAS)*

***Our Mission:*** Helping Dyslexic People Achieve

***Our Goal:*** To build a world class organisation dedicated to helping dyslexic people and those with specific learning differences in Singapore.

***Our Aims:***

- To put quality first in delivering a comprehensive and effective professional service for dyslexic people and those with specific learning differences on a not-for profit basis.
- To provide an assessment service for individuals at risk of having dyslexia and/or specific learning differences.
- To provide educational programmes and other support services for individuals with dyslexia and/or specific learning differences.
- To raise public and professional awareness of the nature and incidence of dyslexia and specific learning differences.
- To enable others (teachers, parents and professionals) to help dyslexic individuals and those with specific learning differences.
- To assist and elicit financial and other support for people with dyslexia, those with specific learning differences and their families.
- To promote and carry out local research into dyslexia, specific learning differences and to disseminate results.
- To network with other organisations in Singapore and internationally to bring best practices to the DAS and Singapore.

***DAS as a Social Enterprise***

- We provide high-quality, professional, innovative and client-focused solutions to create and sustain services for the dyslexic community in Singapore and the region.
- We operate as a financially viable and cost-effective business which at the same time ensures that no dyslexic person is unable to access our services because they cannot afford it.
- We generate social returns on our investments through the development of a dynamic, motivated team of highly qualified and experienced professionals.
- We have a heightened sense of accountability to stakeholders through our professional management team.

Registered in 1991, the Dyslexia Association of Singapore (DAS) is today a vibrant voluntary welfare organisation with over 240 full-time staff who provide a wide array of services for dyslexics not only in Singapore but in the region. DAS Specialist Psychologists conduct assessment and diagnosis for preschool students to adults. DAS Educational Therapists, Speech and Language Therapists and Specialist Teachers provide support for over 3,000 preschool, primary and secondary school students in 13 venues all over Singapore. Increasingly, DAS provides support for dyslexics who also suffer from other Specific Learning Differences such as ADHD, Dyspraxia, Dyscalculia and Non-verbal Learning Differences.

The DAS Academy is a Private Education Institution (PEI) registered with the Council for Private Education (CPE). It is a wholly-owned subsidiary of the Dyslexia Association of Singapore (DAS). Like DAS, the Academy is also a registered charity with the Commissioner of Charities. DAS Academy delivers a wide range of workshops and courses including a Master of Arts in Special Educational Needs. DAS Academy provides the bridge that links professionals, caregivers and people with special needs.

# *Asia Pacific Journal of Developmental Differences*

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Primary consideration for publications will be given to manuscripts that are focused on developmental differences within the Asia Pacific region. Manuscripts will be peer reviewed and included in the journal on the following criteria:

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All manuscripts are to be sent in electronic copy (MS WORD) as well as a PDF copy of the final edited document. PDF copy is required to verify the word copy and for publishing purposes. There is no need to submit hard copies of manuscripts.

Submissions are to be emailed to the editor at both email addresses below:


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