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# Early Intervention for Dyslexia in Singapore

Teo Jee Ti, Mya The Pwint, Priya Trigunayat, Yin Shiqi, Lim Yong Yin, Chow Rui Ping Dexter and Edward Phua Zheng Yi

*Singapore Management University*

## ABSTRACT

In this article, the authors address the issue of current levels of early intervention for dyslexia in Singapore. Following interviews with DAS and a dyslexic counsellor, a survey of 67 parents and teachers was undertaken to evaluate understanding of dyslexia in this group. Results suggested that concerns about stigma, and the potential complexity and cost of diagnosis and support are seen as key in reducing numbers coming forward. A range of suggestions for increasing visibility and for mobile apps to facilitate screening are proposed.

Keywords: early intervention, awareness, benefits, technology

## INTRODUCTION

Dyslexia is a learning disability that affects one's ability to master basic literacy skills. These skills include the knowledge of the letters of the alphabet, phonograms, as well as reading and spelling abilities (Wong & Sathiasilan, 2018). KPMG – a multinational professional service network and one of the big four accounting organizations that has a foundation committed to bring about change in business and society - wrote a report on dyslexia. The report, the lack of early intervention in dyslexia could impede a child's ability to master basic literacy skills, potentially costing Singapore an estimated sum of S\$8,800 to S\$112,000 per dyslexic individual, over a lifetime (KPMG Foundation, 2006).

The term "early intervention" in this report refers to appropriate measures taken prior to the diagnosis of dyslexia and after the diagnosis of dyslexia in young children between the ages of 4 to 8. Children above the age of 4 were targeted

because research has indicated that it is possible to identify pre-school children who are at risk of dyslexia (See & Koay, 2014).

In this article, children under the age of 8 have also been targeted. This is because research has shown that if dyslexia is identified before the age of 7, with effective teaching, individuals with dyslexia can improve to the point where they have little disadvantage as compared to their peers. After 9 years old, the effects of intervention will be significantly reduced (Wong, 2015). Therefore, it was decided to include children up to the age of 8, where most children should have mastered the necessary basic literacy skills (Bernhardt & Major, 2005), just before the effectiveness of early intervention drops significantly.

The failure to master these basic literacy skills could result in hefty, unnecessary costs to society. These costs include educational, employment, social and health costs and the cost of crime. These could potentially amount to a sum of S\$8,800 to S\$112,000 per dyslexic individual over a lifetime (KPMG Foundation, 2006).

The research question addressed in this study, is how to increase the rate of early intervention amongst dyslexic children between the ages of 4 and 8

## LITERATURE REVIEW

### What is Dyslexia?

According to the Dyslexia Association of Singapore (DAS), dyslexia is a specific difficulty in mastering basic literacy skills such as reading, writing and spelling. Dyslexia is observed in individuals with weaknesses in language development, memory and sequencing (DAS, n.d.).

Dyslexia is not a disease, however, it is a condition that cannot be prevented or cured. Identifying dyslexia and receiving specialist teaching early is critical in mitigating the detrimental effects of dyslexia (DAS, n.d.).

### Signs and Symptoms

During a child's growing years, it is normal for children to reverse the letters of the alphabet in their writing - for example, mistaking 'b' for 'd', 'p' for 'q', and vice versa. Therefore, parents and teachers might not see the need for an assessment for dyslexia if the child is able to read, but faces issues with writing. By the time dyslexia is detected, there might be an aggravation of the child's learning difficulty (DAS, n.d.).

In addition to difficulties in reading, writing and spelling, a child with dyslexia may experience challenges in verbal and written memory, speech, speed of understanding and grasping mathematical concepts. The child may also prefer to communicate with gestures rather than speaking (DAS, n.d.).

### **Prevalence of Dyslexia in Singapore**

According to Dyslexia International, an estimated 10% of any given population has dyslexia (Dyslexia International, n.d.). This figure applies to the Singapore population as well and is confirmed by DAS (Chan, 2016).

Recently, there was a rise in the number of children diagnosed with dyslexia. In 2013, DAS's "School Age Assessment Outcome" diagnosed 68 children with dyslexia while in 2017, that number rose to 113 (DAS, n.d.). This can be attributed to an increased awareness of the condition and improved screening methods available compared to a decade ago (Salinger, 2016).

### **Identifying and Diagnosing Dyslexia**

It is important to note that screening programmes do not lead to a diagnosis immediately. Diagnosis for a child with dyslexia happens over a period of time. A simple reading test might not be able to effectively diagnose a child. Assessment over a period of time is necessary to differentiate the condition of dyslexia from other disorders such as Attention-Deficit/Hyperactivity Disorder (ADHD) or oral language delays (Brock, Davis, & Christo, 2009).

Even after the diagnosis of dyslexia, psychologists need to determine the learner's profile of the child. This will enable educational therapists to select appropriate educational goals that target the child's needs closely. The progress of every student is monitored and reviewed by educational therapists every six months. After three years, psychologists may conduct review assessments to determine the child's overall progress since his previous assessment (DAS, n.d.). This long and complex process required to diagnose dyslexia might deter some from seeking early intervention.

### **Existing Measures of Early Intervention**

Apart from DAS, there are other organisations and private clinics that are able to diagnose children with dyslexia. These organisations include Therapy Alliance and SHINE Children. However, we will mainly consider the activities of DAS in this report since they are the main organisation in Singapore that deals specifically with dyslexia.

This is evident from the wide scope of services available and the fact that it is the only organisation that partners with Ministry of Education (MOE) officially (MOE, n.d.). We will also consider the existing programmes offered by MOE in the mainstream schools.

### **Programmes by the Ministry of Education (MOE)**

There are two main learning support programmes provided by MOE for Primary 1 students. The Learning Support Programme (LSP) is organised for Primary 1 students facing difficulties mastering the English language and literacy skills. For students who are weaker in mathematics, they may enter the Learning Support for Mathematics (LSM) programme (MOE, n.d.).

Although these programmes are not specifically designed for children with dyslexia, at the end of the 2-year LSP, the Primary 2 students who are still struggling with literacy skills are screened for dyslexia. Those who are identified with the learning disability are supported through the School-based Dyslexia Remediation programme in Primary 3 and 4 (Toh, 2018), when they are at the ages of 9 and 10 respectively.

However, this intervention might come too late since the effectiveness of an intervention programme falls significantly after the age of 9 (Wong, 2015).

### **Programmes by the Dyslexia Association of Singapore**

The early intervention measures that DAS offers include screening and literacy programmes.

Firstly, DAS offers free public screening services for children at the primary and pre-school level at the various learning centers in Singapore. For pre-school children, the educational therapist will conduct a quick 15-minute early literacy screening, while primary school students will take a short computerised test (LUCID Rapid Dyslexia Screening test) in a fun game format. However, these tests only provide a probability or risk of dyslexia rather than a diagnosis of dyslexia (DAS, n.d.).

Secondly, the Main Literacy Programme (MLP) offered by DAS helps primary and secondary school students with dyslexia specifically in their English literacy skills. The MLP helps students in the 4 main areas of literacy. This includes vocabulary, writing, reading comprehension and reading fluency (DAS, n.d.).

Thirdly, DAS works with the MOE under the MOE-Aided DAS Literacy Programme (MAP). This MOE-subsidised programme aims to help dyslexic children in the “areas of phonics/phonemic awareness, reading, comprehension, spelling and writing”. In

2016, this programme provided intervention for over 3000 students. Around 46.7% of all MAP students received the MOE Financial Assistance Scheme (FAS) or DAS bursaries (Ram et al., 2016).

### **Other Programmes**

There are other early intervention programmes at preschools such as Early Intervention Programme for Infants & Children (EIPIC) and Development Support Plus (DS-Plus) (SG Enable, n.d.). These programmes are targeted at children below the age of 6 and they have to be recommended by doctors to be eligible for this programmes. In addition, children who are eligible for this programmes have to be a Singapore Citizen or Permanent Resident.

### **Limitations of the Existing Measures**

While the existing literacy programmes are sufficient and effective, we find that the screening for dyslexia only covers a small proportion of children with literacy development delays.

In its intervention programme annually, DAS screens about 300 children per batch, for children who are at risk of dyslexia. 67% out of these 300 children are eventually diagnosed with dyslexia (Samsudin, 2018). However, based on international statistics, 10% of any given population is likely to have dyslexia, with 4% of the population having dyslexia that is severe enough to warrant intervention (Dyslexia International, n.d.). Based on these statistics, out of an average of 40,000 births in Singapore annually (Department of Statistics Singapore, n.d.), around 1,600 children would have dyslexia that is severe enough to warrant intervention. The 300 children that are screened by DAS are only considered to be the “tip of the iceberg” (Samsudin, 2018). DAS is one of the organizations who does screening. If we take a look at DAS screening of preschoolers, it is suggested that the existing screening programmes are insufficient.

Programmes such as EIPIC and DS-Plus requires children to be recommended by doctors into the programmes which does not help address the issue of a lack of screening.

There are two possible reasons why people choose not to go for these screening programmes. Firstly, many perceive dyslexic individuals as people with lower intellectual capability, with some even associating dyslexia with mental retardation (DAS, n.d.). A study conducted showed that achievement gaps between dyslexic children and normal students appear as early as first grade and persist into adolescence (Ferrer et al, 2013). This difference in academic achievements



contributes to the stigma that dyslexic individuals are less capable.

Therefore, many choose not to go for an assessment for dyslexia because of this stigma. However, dyslexia is simply a difficulty in learning that requires a different form of teaching. Overcoming the barriers of learning will allow them to master the basic literacy skills just as effectively as other students (DAS, n.d.).

Secondly, the process of assessment is complex and time-consuming. Furthermore, 75% of the total cost of treatment for dyslexia goes into diagnostic tests (Rojien, Goettsch, Ekkebus, Gerretsen & Stolk, 2011). Hence, many parents might be deterred by the high costs of treatment and the tedious process that they might choose to delay the diagnosis and treatment of dyslexia.

There is a pertinent need to improve the efficiency of such assessment process and to reduce the costs for diagnosis. This is because the failure to address the issue of dyslexia early will affect the child's ability to master basic literacy skills, leading to a plethora of issues to the individual and the society.

## **IMPACT OF DYSLEXIA**

### **Emotional Impact**

In Singapore, teachers in mainstream schools expect Primary 1 students to possess basic literacy skills such as "reading, copying and writing ability" (Sim, Wong, Samsudin, & Bunn, 2015) once they enter Primary 1. Such expectations might pose tremendous stress for students with dyslexia who experience "developmental delays in literacy" (Sim et al., 2015). This is especially prominent in a competitive society like Singapore where good academic grades are highly desired and sought after. Research has also shown that children with dyslexia are at a higher risk of being lonely and bullied (Hellendoorn & Ruijsenaars, 2000). In a study conducted by Ingesson (2007), 40% of 75 dyslexic subjects admitted that dyslexia had negative impacts on their self-confidence. Having an inferiority complex was found to be the main impact. Dyslexic individuals may feel inferior from being unable to match up to their peers in class. Further, research has shown that dyslexic individuals who were not diagnosed early are more likely to have emotional and social problems as adults (Hellendoorn & Ruijsenaars, 2000).

Moreover, a study conducted by University College London (UCL) on 99 Primary 3 students from 13 local primary schools in Singapore showed that besides facing literacy problems, dyslexic children tend to have higher levels of panic, anxiety and emotional imbalance, and are more prone to display signs of depression (Lee, 2017).

## **Social Impact**

Low self-esteem, social isolation and educational failure often result from undiagnosed dyslexia. It is highly likely that these negative feelings will develop into anti-social behavior, which could lead to deviant or offending behaviours (Kirk & Reid, 2001). In some extreme cases, it could even lead to crimes. For example, a study in eight Yorkshire and Humberside prisons found that dyslexia was three to four times more common amongst prisoners than in the general UK population (Rack, 2005).

Dyslexic individuals with poor literacy skills might also find it difficult to find jobs. The UK Parliament reported that 40% of unemployed adults seeking help from UK government job centres were dyslexic (Walmsley, 2012). This can lead to dyslexic individuals being dependent on their community, increasing the burden on society.

## **IMPORTANCE OF EARLY INTERVENTION**

Early intervention for dyslexia is vital because it can lead to higher literacy gains and economic benefits.

### **Higher literacy gains**

Several studies have shown that the early intervention of dyslexia could lead to better academic performance. Research by Torgesen (2011) has shown that one hour of intervention at the age of 8 led to an increase of between 0.2 to 0.3 standard score improvements. Furthermore, researchers from the University of Pennsylvania and the University of Delaware conducted a study to analyse the effectiveness of Reading Recovery, a programme that helps 1st graders (6- to 7-year-olds) who are struggling with reading, one of the basic literacy skills. The study found that the struggling 1st graders who were enrolled in the programme attained 3.4 points higher in the Iowa Test of Basic Skills (ITBS) Reading Total test than their counterparts who did not participate in the programme (May, Sirinides, Gray & Goldsworthy, 2016). From this study, it is evident that early intervention can increase literacy gains as compared to delayed intervention.

### **Economic Benefits of Early Intervention**

Early intervention is a cost-effective solution to the problems that stem from the failure to master basic literacy skills. Investments in early intervention will yield significant savings for society. For example, according to a KPMG Foundation report (2006), approximately £800 million can be saved in employment-related costs in the UK through the "Every Child a Reader" programme. This report further states that the

highest savings from early intervention are from unemployment, followed by the savings in the costs of crime and education.

Additionally, early intervention can also help to save hidden costs which will accumulate in the long run for the family of the dyslexic individual. This includes the costs for counselling, special education services and costs to the family for supporting their unemployment (Noland, 2018).

## **RESEARCH METHODOLOGY**

Primary data was collected by conducting interviews with two experts in the field and a survey for the public. This is to affirm our findings from our secondary data and evaluate how we can improve existing measures to increase the rate of early intervention in Singapore.

### **Interview with DAS**

DAS is the main organisation that provides lessons and screening programmes specifically for children with dyslexia in Singapore. Hence, an interview with DAS will help us understand the prevalence of dyslexia in Singapore and the current measures in place that encourage parents to seek early intervention for their children who are at risk of dyslexia. In addition, as a key player in the treatment of dyslexia, interviewing DAS will enable us to review our solutions, to see if they are feasible.

### **Interview with counsellor**

Charlene Wong, aged 28, is a graduate counselor who is about to pursue her doctorate at Princeton University. Charlene had previously counselled children with dyslexia, audited existing programmes and designed new programmes that catered to the needs of dyslexic children in MOE schools. Since Charlene counsels children with learning difficulties, conducting an interview with her will help in gaining a more in-depth understanding about the social and emotional impact on dyslexic children and the reasons why some might be resistant or unaware of the various screening and learning programmes currently available.

### **Survey**

A survey was conducted to ascertain the public's level of awareness of dyslexia. The survey was conducted using stratified and convenience sampling methods. We disseminated the survey specifically to parents with children at the pre-school or primary levels and teachers, who are teaching these levels, via an online survey link.

The aim of the survey is to find out the level of awareness and perception of dyslexia amongst parents and teachers. The survey was split into three different blocks. Each block served a different purpose in understanding the respondents' perception and understanding of dyslexic children.

The first block consists of questions to obtain the demographics - age, gender and educational qualifications - of the respondents, their level of understanding on dyslexia and their opinion on how important it is to seek early intervention. We wanted to see if there is any possible correlation between the different types of demographics and their knowledge and awareness of dyslexia. This will help guide us in our recommended solutions.

The second block consisted of a list of 10 statements, requiring the respondents to determine if the statement is true or false. The aim of these questions is to find out how knowledgeable respondents are about dyslexia.

The third block of questions aimed to find out the respondents' experience with dyslexic individuals. Questions on whether they have had interactions with dyslexic individuals, what the symptoms of dyslexia are and whether there is a stigma attached to dyslexia were posed. This set of questions sought to find out the public's perception of dyslexia and whether there is a difference in the opinion of those who have interacted with dyslexic individuals and those who have not.

By assessing our respondents' understanding on dyslexia, it was possible to clarify whether there is a need to raise awareness on dyslexia and whether dyslexia is properly understood. This will then help to draw up suitable recommendations to improve the situation.

## **RESULTS**

### **Interview with DAS**

In our interview with DAS, three main points were raised.

Firstly, it was pointed out that most people do not fully understand what dyslexia is. Most are not aware that dyslexia is genetic and that children with dyslexia require different forms of learning. In some cases, people even associate dyslexia with intellectual disabilities like Down Syndrome. Hence, there is a need to increase the awareness of dyslexia in Singapore.

Secondly, the costs of diagnosis and the treatment of dyslexia were outlined. Diagnostic tests are free if they are done with MOE psychologists. However, it can

take up to 6 months before one can consult an MOE psychologist, thus some parents resort to seeing a private psychologist instead, which can be costly. DAS further noted that the cost of treatment is not cheap, but pointed out that there are various financial assistance schemes available for parents, depending on their financial situation.

Thirdly, DAS provided information about the current measures in place for dyslexia. They mentioned that they have various centres in convenient locations including schools and void decks for parents and children to seek help. However, DAS noted that the centres at the void decks tend to be mistaken for tuition centres, hence many are unaware that help for their children is actually conveniently located near their homes. In addition, they have organised roadshows at public places, such as the UOB Plaza and Dhoby Ghaut, to raise awareness on this issue.

### **Interview with counsellor**

In the interview with the counsellor, she identified two main reasons for why there is a low early intervention rate for children with dyslexia in Singapore.

Firstly, she pointed out that many parents are afraid of the stigma attached to dyslexia. They think that this might “leave a mark” on their children and limit their opportunities of entering into the various special programmes at school. Therefore, many parents bring their children to private clinics for diagnosis, since government clinics usually keep their child’s medical records. Those who are unable to afford going to a private clinic will choose not to seek intervention. This phenomenon also contributes to a dearth of information on the rate of early intervention in Singapore as such information is only available from public institutions, while many private clinics are unwilling to release their patients’ records.

Secondly, the counsellor also affirmed the finding that the costs of treating dyslexia in Singapore is high. This high cost might be one of the reasons why many parents from low income families choose not to seek intervention. However, she also mentioned that there are many subsidy schemes offered by both the government and DAS which many families might not be aware of.

Various issues that children with dyslexia face were highlighted. The counsellor noted from her experience in counselling that many dyslexic children felt pressured to perform beyond their current abilities, limited by learning differences like Dyslexia. This lowered their self-esteem, especially when they underperformed compared to their peers. In some serious cases, this even led to other medical conditions such as Generalised Anxiety Disorder (GAD) and depression. The long-term effect of this could be that their proficiency in literacy skills might be lowered, adversely affecting their employability in the future.

The best way to increase a child's ability to master basic literacy skills is to allow the child to learn at his own pace, through a medium that he is comfortable with. Early intervention can help to reduce the stress and anxiety that a child might potentially face. Enrolling in the various special programmes at an early age will make the learning process much more enjoyable.

## **SURVEY FINDINGS**

### **Survey Results**

The survey gathered 67 responses in total from parents and teachers, aged 18 and above.

In the first block, the respondents were asked to rate their understanding of dyslexia out of 10. With a mean score of 5.1, it was observed that the average respondent thinks that he does not fully understand what dyslexia is. The respondents were also asked to rate the importance of seeking early intervention for dyslexia out of 10. An average score of 7.9 was observed. This showed that although the respondents indicated a relatively low level of understanding of dyslexia, many recognised the importance of seeking early intervention.

In the second block, the respondents were asked to answer 10 True/False statements. One point was given for every accurate answer. With an average score of 6.6, it was observed that there are still misconceptions that exist about dyslexia. In particular, 61.3% of the respondents felt that dyslexia can be outgrown where in actuality (Appendix A), dyslexia is not a lifelong disease, but a learning difficulty that can only be improved with proper intervention (DAS, n.d.). This could suggest that many people might not see the need to seek any form of intervention since they see it as a condition that can resolve on its own. In another question, 51% of the respondents answered that dyslexia is more prominently found in boys than girls (Appendix A). However, there is an equal chance of having dyslexia for both genders (Gentry, 2014).

From the third block, it was observed that the respondents were unfamiliar with some of the symptoms of dyslexia. In particular, more than 45% of the respondents associated poor grades with dyslexia (Appendix B). However, having poor grades is not an indication of dyslexia, although it can be the result of a failure to master basic literacy skills (DAS, n.d.).

From the survey results, it can be concluded that while many respondents see the need for early intervention, they may not understand why this is necessary due to the misconceptions that they have about dyslexia. Therefore, the survey results

supported the need to increase the public's awareness on dyslexia and the benefits of early intervention.

### **Survey Limitations**

Several limitations to the survey included the inherent drawbacks of the sampling method chosen and a limited sample size.

The survey was performed based on convenience sampling where the survey was only extended to those within one social sphere. This could lead to a bias in the results as the demographics of the people in this social circle can be rather similar. Therefore, some groups of people might be over-represented while others are left under-represented. This could also pose a difficulty when drawing generalised conclusions because there may be low transferability of the results to the general population of Singapore.

Additionally, it was not possible to establish a correlation between the various educational levels and age groups with the level of awareness. This was because a majority of the respondents had similar demographics. 58.2% of them fall within the ages of 18 to 25 and 77.6% possessing the educational level of diploma and above. Moreover, as the sample size was only 67, it might not be a full representation of the Singaporean public. These factors could limit the accuracy of the survey results.

### **Overall Findings**

Through this primary and secondary research, two main reasons have been identified for a lack of early intervention in Singapore. Firstly, there is an ongoing lack of understanding of dyslexia and an existing stigmatisation towards seeking treatment for dyslexia. Secondly, the diagnosis of dyslexia is a complex and time-consuming process that can cost a significant amount of money.

Therefore, parents and teachers should be targeted, who are in the best position to seek the necessary help for a child. It should also be possible to reduce the time taken for screening and diagnosis and make it more convenient for children with dyslexia and their parents to seek help.

### **Recommended Solutions**

#### **Raising Awareness and Removing Stigma**

From the interview with DAS, it was learnt that they hold roadshows in public office spaces. While these roadshows might be able to capture the attention of the public,

they are not targeted at the teachers and educators that need to be reached out to as they might not be in the vicinity of these roadshows. Hence, article proposes conducting a roadshow at a more convenient location, such as a local neighbourhood school, so as to get more parents and teachers involved. This should be held during a weekend before the June holidays, since this is usually the time when parent-teacher meetings are conducted. Therefore, parents will be more inclined to attend the event after hearing about the concerns that the teachers might have about their children.

For this roadshow, a few primary schools in a specific neighbourhood could collaborate with DAS to organise the event. The following booths should be featured at the roadshow:

- ◆ A general booth for the public to find out more about dyslexia. This booth will educate the public on what dyslexia is and how dyslexia can be identified and treated.
- ◆ A booth to inform parents of children with dyslexia of the programmes and subsidy schemes offered by DAS.
- ◆ A booth for non-dyslexic children where they get to experience dyslexia via a virtual reality simulation. This booth will help them empathise with their peers who have dyslexia.

By organising an interactive event that informs people further about dyslexia, it is believed that this roadshow can reduce the stigma attached to dyslexia and increase the knowledge that the parents and teachers have of this condition. The information booth on the programmes and subsidies offered by DAS would also reduce a parent's hesitation to enrol their dyslexic children at DAS due to financial constraints.

However, as this roadshow will require several primary schools in the neighbourhood and DAS to work together, planning will be difficult as a high level of collaboration would be required. Moreover, as awareness is intangible, it would be difficult to measure the success of the event. This solution has a long-term goal and it will take time to see the effects of the roadshow. As attendance for this event is on a voluntary basis, the number of people that it reaches out to might be limited.

### **Improving the Process of Diagnosis**

75% of the total cost of treatment goes into screening and diagnostic tests (Rojien, 2011). Additionally, it has been established earlier that the process of diagnosis is



long and complex. As a result, this suggests that it deters parents from getting their child tested for Dyslexia. Hence, it would be useful to collaborate with DAS to create a mobile application (DASapp) to tackle the issue of cost and to make the process more convenient.

This mobile application would consist of multiple functions to cater to the different issues faced by children with dyslexia, their parents and educators.

### **On the go - Online Assessment**

A digitalised version of the pre-diagnostic test would be used to assess the individual's reading, writing, listening and comprehension skills (Appendix D). A computer generated result will inform the user of his risk of dyslexia and better enable the user to consider whether further steps for intervention are required. The results can be sent to DAS for further assessment, subject to the user's approval. The user will then be contacted by DAS should his result warrant further assessment. This digitalised version would allow the assessment to be conducted in a more convenient and efficient manner when compared to a physical assessment.

### **Learner's Profile - Assessment Result**

This application would generate a learner's profile if the child is found to be at risk of dyslexia (Appendix E). This could be accessed by the 3 key stakeholders: parents, educators and psychologists from DAS. Results from the assessments and their academic performance at school can be uploaded. These results can then be evaluated by the psychologist, subject to approval of the user. It could also act as a platform of communication, facilitating discussion about the progress of the child.

### **Event Updates**

Linked to the solution of raising awareness, this application would update users on the latest happenings and events organised by DAS (Appendix F). This feature would also inform parents about the new and existing grants and subsidies that they may be eligible for.

### **Advantages**

The digital solution would help to greatly reduce the time and cost required in the conventional process of screening and diagnosing dyslexia. It would also help to promote collaboration between parents and teachers to closely check on the child's progress. It would also serve as a convenient way to seek an expert's advice on the condition.

Additionally, as parents might hesitate to go to clinics to seek intervention due to the stigma associated with dyslexia, the application could help combat this by allowing them to conduct the initial assessments at home. This can promote the rate of early intervention.

## **LIMITATIONS**

There would be a reduction in the accuracy of the assessment because the digital means of assessment would be limited in its scope compared to one conducted physically. Only part of the assessment could be conducted online and parents and children would still need to go down to the centre for completing the assessment.

Parents might be reluctant to use the application as they may feel that it is difficult to operate, or they may have concerns about the accuracy of the assessment being conducted. Thus, partnering with and getting endorsed by DAS would be important as this will make the application more credible.

## **CASE STUDIES**

Recently, there have been many companies that have emerged that provides internet healthcare platforms. These platforms offer services such as online consultation, hospital referral and appointment, inpatient arrangement, and second opinion services. Such companies include Ping An Healthcare and Technology Company, Doctor on Demand and Teladoc. The idea of this platform is to allow better access to doctors, better communication with medical providers and greater personalization of care to meet the individuals at a lower cost. It also serves to reduce the waiting time in clinics for a patient to get a consultation. DASapp aims to mimic the benefits of such platforms.

## **CONCLUSIONS**

In summary, the different ways of addressing the low rate of early intervention of dyslexia in Singapore were considered. Based on this primary and secondary research, dyslexia is a learning disability that affects a significant proportion of the Singapore population. The impact of dyslexia is not limited to the individual, but extends to society as a whole. Through this report, it is hoped to reduce the costs of diagnosing a child and the hefty costs to society of ensuring a more conducive and inclusive environment for individuals with dyslexia.

Currently the rate of early intervention for dyslexia in Singapore is low. This can be attributed to a lack of awareness about dyslexia, stigma attached to the condition, and the complex diagnostic procedures as well as the high costs of treatment. To

overcome these issues, an annual roadshow and a mobile application were proposed.

As an African proverb goes: “It takes a village to raise a child”. To help a child with dyslexia effectively, everyone has a role to play in reducing the stigma attached to the condition. Parents and teachers, in particular, play an important role in assessing a child’s progress and determining when a child needs help. Early intervention will ensure that a child masters the necessary literacy skills. This could go a long way in improving the life of the individual as well as in reducing the costs to society.

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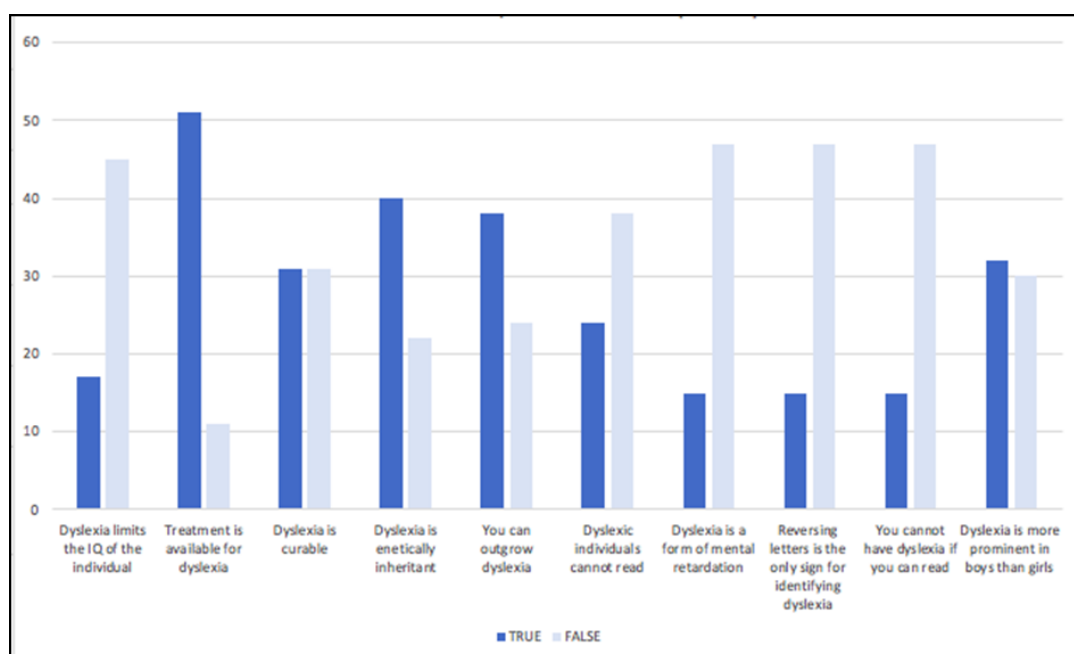
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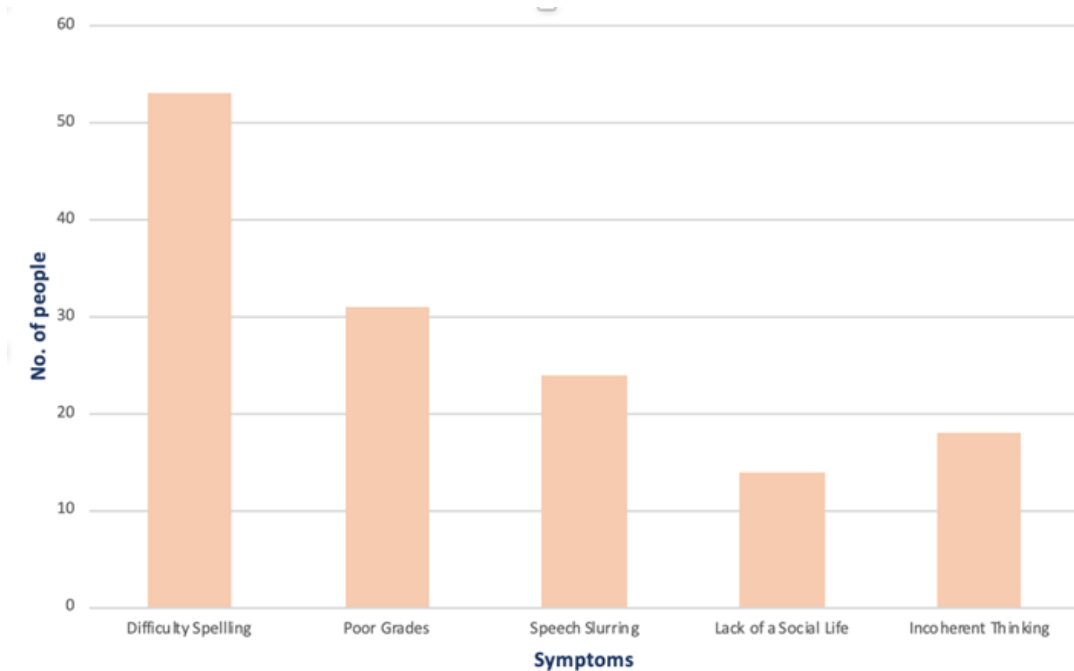
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## APPENDICES

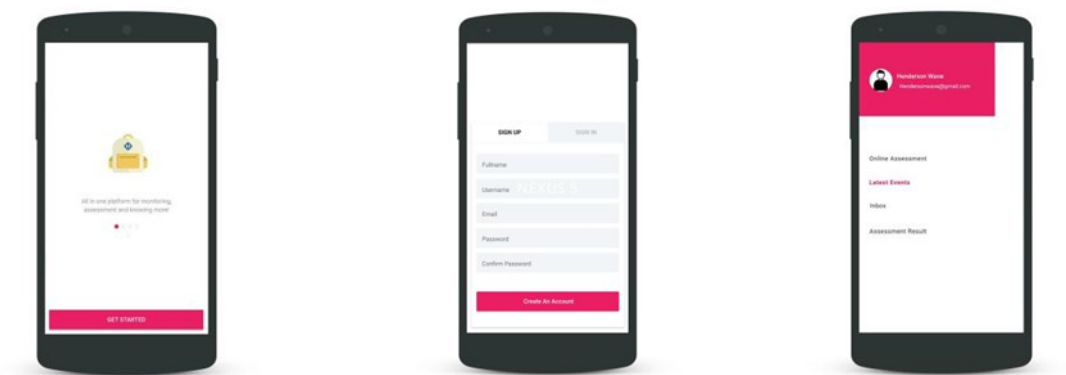
Appendix A: Chart representing the results from the True/False section (Block 2) of the survey.



**APPENDIX B: Graph of the number of people against symptoms of Dyslexia (Block 3) showing the public's understanding of the possible symptoms of dyslexia.**



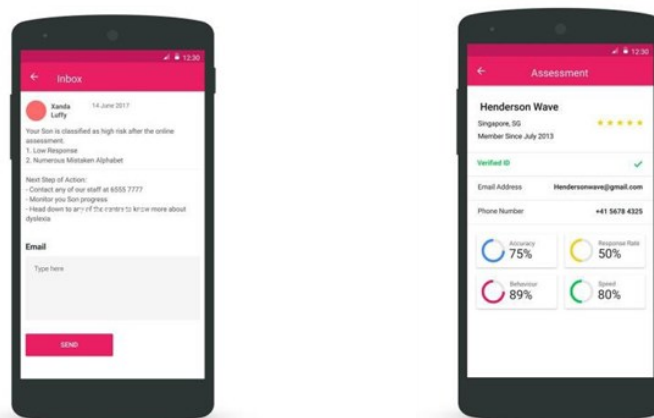
**APPENDIX C: Sign Up and Menu Features**



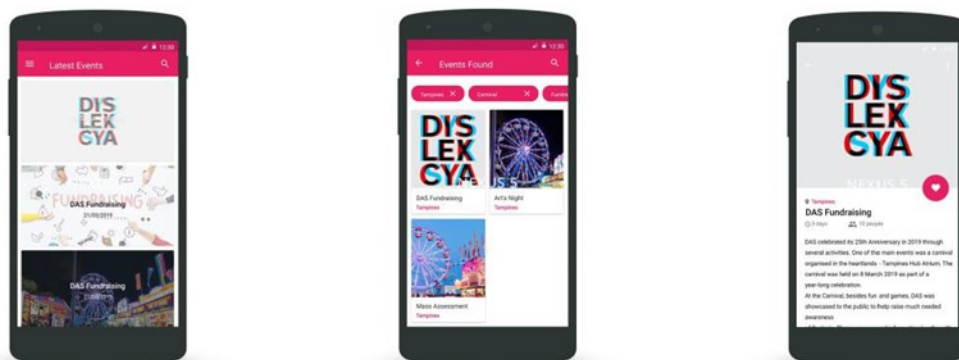
## APPENDIX D: On the Go, Online Assessment Feature



## APPENDIX E: Learner's Profile, Assessment Result Feature



## APPENDIX F: Event Alert Feature





## APPENDIX G: Roadshow Awareness Booth



## APPENDIX H: Awareness Booth for Information



## APPENDIX I: Simulation Booth for Experience



## ABOUT THE AUTHORS



### **MYA THE PWINT**

*Mya is a Sophomore at the Singapore Management University. She is pursuing a Bachelor's of Social Science degree. She was a freshmen during the time of the paper.*



### **CHOW RUI PING DEXTER**

*Dexter is a Sophomore at the Singapore Management University. He is pursuing a Bachelor's of Law degree. He was a freshmen during the time of the paper.*



### **PRIYA TRIGUNAYAT**

*Priya is a Sophomore at the Singapore Management University. She is pursuing a Bachelor's of Social Science degree. She was a freshmen during the time of the paper.*



### **EDWARD PHUA ZHENG YI**

*Edward is a Sophomore at the Singapore Management University. He is pursuing a Bachelor's of Information Systems degree. He was a freshmen during the time of the paper.*



### **YIN SHIQI**

*Shiqi has graduated from the Singapore Management University. She graduated with a Bachelor's of Business Management degree. She was a senior during the time of the paper.*



### **TEO JEE TI**

*Jee Ti is a Sophomore at the Singapore Management University. He is pursuing a Bachelor's of Business Management degree. He was a freshmen during the time of the paper.*



### **LIM YONG YIN**

*Yong Yin is a Sophomore at the Singapore Management University. She is pursuing a Bachelor's of Accounting degree. She was a freshmen during the time of the paper.*