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Evaluating a Reading Comprehension Curriculum and Factors Predicting Reading Comprehension Performance

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Abstract

This study comprised two parts. The first was part of a study at the Dyslexia Association of Singapore to monitor the progress of students undergoing literacy intervention with an enhanced reading comprehension curriculum. The reading comprehension performance of primary school students with dyslexia (n = 42) was monitored at three time-points (Time 1: baseline, Time 2: pre-enhanced curriculum and Time 3: post-enhanced curriculum) over the course of two years. Analysis of variance revealed significant improvement in reading comprehension performance from Time 1 to Time 2 and Time 1 to Time 3, but no significant difference between Time 2 and Time 3. Significant improvements were observed only in students with weaker verbal ability from Time 1 to Time 2 whereas students with stronger verbal ability showed no significant changes in reading comprehension performance over time. The second part of the study explored the ability of cognitive factors, namely verbal ability, non-verbal ability, phonological awareness, working memory and rapid naming ability, to predict concurrent (n = 31) and future reading comprehension performance at the end of one (n = 48) and two years (n = 44). There were neither significant correlations between rapid naming ability and reading comprehension performance at any of the time-points, nor between phonological awareness and future reading comprehension performance after one and two years. Verbal ability was a consistent and significant predictor of reading comprehension at the three time-points. Phonological awareness significantly correlated with concurrent reading comprehension performance but did not significantly predict it. Non-verbal ability and working memory significantly correlated with reading comprehension at all time-points but were not significant predictors of reading comprehension across time. Implications and future considerations for reading comprehension intervention were discussed, and theoretical implications with regard to the Simple View of Reading were considered as well.

Keywords: Dyslexia, reading comprehension, curriculum evaluation, reading comprehension predictors

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INTRODUCTION

According to Lyon, Shaywitz and Shaywitz (2003), dyslexia is a neurobiologically-based specific learning disability that is characterised by difficulties with accurate and fluent word reading, as well as weaknesses in spelling and decoding. In Singapore, the prevalence of dyslexia among school-going children is 2.5 to 5 percent (Ng, 2012), and students with dyslexia form the largest group of those with mild special educational needs in mainstream schools (Lim, 2016). As such, there is a need to help students with dyslexia in their learning.

The Main Literacy Programme (MLP), provided by the Dyslexia Association of Singapore (DAS), is a literacy intervention programme that aims to support dyslexic students. Students of the MLP typically receive two hours of literacy intervention per week, over a term of 10 weeks, for a total of four terms in a year. The MLP targets the following areas for intervention: phonemic awareness and phonics, reading fluency, reading comprehension, vocabulary and writing. This study will explore the reading comprehension aspect of literacy intervention for students with dyslexia.

Enhanced Reading Comprehension Curriculum

The earlier iteration of the reading comprehension component of the MLP curriculum was somewhat unstructured and had not been developed with as much depth as the phonics, reading and spelling components. It encompassed utilising Bloom's Taxonomy (Krathwohl, 2002) as a guide for developing reading comprehension skills. In addition, reading comprehension strategies such as charts for students to write what they know, what they want to know and what they learned from a passage (KWL; Ogle, 1986), as well as the Survey-Question-Read-Write (SQRW; Strichart & Mangrum, 2002) method were used to help students process passages before, during and after reading. Bloom's taxonomy provided a conceptual framework in which to approach teaching reading comprehension, and the strategies used guided educational therapists in the implementation of intervention.

While these strategies were useful, they were generic in nature, and there was still a need for educational therapists at the DAS to better understand reading comprehension tasks that their students typically encounter in school. In Singapore mainstream schools, reading comprehension assessment is done through tests or examinations that require students to read a short text and answer accompanying open-ended questions in writing (Singapore Examinations and Assessment Board, 2015). Hence, in addition to helping students understand written text, educational therapists also need to be equipped with strategies to help students: (1) understand the reading comprehension questions that accompany text, and (2) draw links between the questions and parts of the text in order to answer the questions.

Given that students with dyslexia already encounter difficulties with decoding and reading, it is important to develop teaching strategies to support them in understanding and answering questions in reading comprehension tasks. In light of this, the DAS sought to introduce more structure and specificity to the existing reading comprehension curriculum. Benjamin (2015) explained that certain text features within a passage, such as "critical vocabulary or conjunctive expressions", are important for the accurate interpretation of text. A taxonomy of textual features was therefore developed based on analyses of past Cambridge University 'O' Levels English reading comprehension questions that secondary school students in Singapore had encountered. Benjamin (2015) explained that this taxonomy could be used by educators to develop reading comprehension activities that are aligned with what students are likely to encounter in their examinations.

Some of the textual features identified in Benjamin's (2015) study were adapted for use in the DAS enhanced reading comprehension curriculum. The adaptations were made to ensure that the curriculum included text types that primary school level students encounter, and also to cater to the varying language abilities of the students at the DAS. Educational therapists at the DAS were then trained to use these specific text features to teach students reading comprehension skills. An example of a text feature that was included in the enhanced curriculum is "referring expressions", which are noun phrases that function to identify a person or an object mentioned in another part of the text. Students can be taught to identify referring expressions in reading comprehension texts, as well as questions that are relevant to this particular text feature. For instance, a passage may contain the phrase, "it was a large spider," where the word "it" is a referring expression. Students may then be taught to answer the question, "What does 'it' refer to?" by highlighting the referring expression and identifying what it refers to (i.e., "a large spider").

Within the enhanced curriculum, the earlier-mentioned textual features are taught as skills to students using the Presentation-Practice-Production (PPP) method (Harmer, 2007). Through this method, students are first shown examples of the textual features that are present in passages and questions (Presentation). They are then guided by educational therapists in practicing the identification of these textual features in the reading comprehension context (Practice). Finally, students are provided opportunities to apply these skills independently (Production). The implementation of the enhanced reading comprehension curriculum at the DAS is currently in its early stages. As such, investigating its effectiveness is required to inform decisions for improvement. The DAS is conducting an on-going study to evaluate students' progress and teachers' attitudes in teaching reading comprehension following the implementation of the enhanced curriculum. The focus of this study is on monitoring students' progress in reading comprehension before and after the implementation of the enhanced reading comprehension curriculum.

Predictors of Reading Comprehension Performance

Apart from evaluating the progress of students at the DAS, this study also aims to explore the cognitive predictors of reading comprehension. According to the Simple View of Reading (SVR) (Gough & Tunmer, 1986; Hoover & Gough, 1990), reading comprehension is the product of linguistic comprehension and decoding abilities. Support has been found for this framework (Catts, Adlof, & Weismer, 2006; Kendeou, Savage, & van den Broek, 2009), and it has been suggested that the SVR can be used in the context of structuring classroom level reading instruction (Savage, Burgos, Wood, & Piquette, 2015). In view of the consistent support for the SVR, it is expected that verbal cognitive skills and phonological awareness abilities can predict reading comprehension skills. However, researchers have entertained the possibility that other factors can contribute to reading comprehension. Adlof, Catts and Lee (2010) found that in addition to phonological awareness and alphabet knowledge, factors such as naming speed and non-verbal cognitive ability can also predict reading comprehension. Other researchers have also noted that working memory can play a role in reading comprehension as well (Cain, Oakhill, & Bryant, 2004; Georgiou, Das, & Hayward, 2008). Given that working memory deficits have long been associated with dyslexia (Gathercole, Alloway, Willis, & Adams, 2006), it is important to consider its role in reading comprehension performance in students with dyslexia.

Study Objectives

The objectives of this study are twofold. Firstly, the study aims to examine the changes in reading comprehension skills in students with dyslexia, before and after the implementation of the enhanced curriculum. This part of the study is a component of the ongoing research at the DAS to evaluate the enhanced reading comprehension curriculum. Secondly, the study aims to investigate the ability of the identified cognitive factors to predict reading comprehension performance in students with dyslexia. That is, in addition to linguistic comprehension and decoding skills (i.e., oral language comprehension and ability to decode unfamiliar nonsense words) as outlined in the SVR, can non-verbal cognitive ability, working memory, and rapid naming ability also predict reading comprehension in students with dyslexia?

Research Questions and Hypotheses

In accordance with the two main objectives of this study, investigation is conducted in two parts.

Part one

The first part of the study explores the progress of reading comprehension performance of dyslexic students over the course of two years. The research question and hypothesis for part one of the study are as follows:

Research question one
Did the reading comprehension performance of dyslexic students improve following the implementation of the enhanced reading comprehension curriculum?

Hypothesis one
It is hypothesised that following the implementation of the enhanced reading comprehension curriculum, students' reading comprehension performance will change significantly.

Part two
The second part of the study seeks to explore the ability of the following cognitive factors - verbal ability, non-verbal ability, working memory, phonological awareness, rapid naming ability - in predicting reading comprehension performance in students with dyslexia. The research question and hypothesis of the second part of the study are as follows:

Research question two
Can verbal ability, non-verbal ability, rapid naming ability, phonological awareness and working memory predict reading comprehension performance in students with dyslexia?

Hypothesis two
It is hypothesised that the identified cognitive factors can significantly predict reading comprehension performance in students with dyslexia.

Significance of Study

With the enhancements made to the DAS MLP reading comprehension curriculum, it is important that students' reading comprehension performances are examined. Monitoring the progress of students can provide an indication of the utility of the curriculum. In addition, findings from this study can inform curriculum developers and educational therapists at the DAS about possible changes or improvements that can be made.

With reference to the second research question, it appears that there are factors that can predict reading comprehension performance in children beyond the SVR, and it would be useful to explore these in this study. Further understanding of the predictors of reading comprehension performance in students with dyslexia could add to the existing literature about dyslexia in Singapore. It could also provide parents and educators with information regarding the identification and remediation of reading comprehension difficulties in students with dyslexia. For instance, educators could possibly identify, at the point of assessment, which students are likely to struggle with reading comprehension based on their performance on cognitive factors that are identified in this study. This would then inform the focus of remediation for these students.

Operational Definition of Terms

The frequently-used terms in this study are defined as follows:

Dyslexia

Dyslexia is a specific learning disability that has a neurobiological origin. Individuals with dyslexia typically experience difficulties with accurate and fluent word reading, as well as weaknesses in spelling and decoding. Secondary issues associated with dyslexia include limited reading experience that affects the development of reading comprehension skills and the accumulation of vocabulary knowledge (Lyon et al., 2003).

Reading comprehension

Reading comprehension is the ability to understand written discourse. According to the SVR, reading comprehension is a product of linguistic comprehension, which refers to the interpretation of words, sentences or discourse; and decoding, which is the recognition of words without attaching context (Gough & Tunmer, 1986).

Verbal ability

Verbal ability refers to a component of an individual's cognitive ability that involves linguistic comprehension skills. It includes vocabulary knowledge and the ability to identify concepts that underlie words.

Non-verbal ability

Non-verbal ability is a component of an individual's cognitive ability that involves analysis and reasoning with non-verbal concepts such as abstract visual patterns and sequences or quantity comparisons.

Working memory

Working memory refers to an individual's abilities in recalling and mentally manipulating information. A three-component model of working memory was proposed by Baddeley and Hitch (1974), which comprises a central executive component, a visuospatial sketchpad, and phonological loop. Deficits in working memory have been associated with dyslexia (Gathercole et al., 2006).

Phonological awareness

Phonological awareness refers to the ability to perceive and mentally manipulate word sounds. This includes the abilities to segment or break down words into their component sounds, blend sounds to form words, or to isolate sounds within words. Phonological awareness plays a significant role in the development of decoding skills, and the reading difficulties that people with dyslexia experience are usually associated with weaknesses in the area (Lyon et al., 2003).

Rapid naming ability

Rapid naming ability, or rapid automatised naming, refers to the ability to quickly name a series of visually-presented familiar objects or symbols. Deficits in rapid naming ability are associated with difficulties in reading fluently and it is commonly observed in individuals with dyslexia (Norton & Wolf, 2012).

METHODOLOGY

This paper is based on the first author's dissertation submitted in fulfilment of the requirements for the degree of Master of Arts (Applied Psychology) at the National Institute of Education (NIE), Nanyang Technological University, under the same title (Fong, 2018).

Participants

Existing students at the Dyslexia Association of Singapore (DAS) who underwent psychological assessments in 2015 were identified through enrolment records. Participants were recruited through information sheets disseminated to their parents. A total of 55 students, who were previously diagnosed with dyslexia following a psychological assessment, were recruited for this study (41 male, 14 female). At the point of recruitment in June 2016, participants' ages ranged from seven to 12 years (M_{age} = 10.69; SD_{age} = 1.26), and their grade levels ranged from Primary Two to Primary Five.

Over the course of the study, 13 participants withdrew from the study. No formal tracking was done to identify the reasons for withdrawal. However, anecdotally, some reasons cited include scheduling conflicts that made it difficult to attend data collection sessions, and graduation from the literacy intervention programme. It was therefore unlikely that the participants withdrew due to negative perceptions about the programme. The final number of participants was 42 (32 male, 10 female). As such, the statistical comparisons of reading comprehension performance were conducted based on this sample of 42 participants. Their ages ranged from seven to 12 years at the point of recruitment (M_{age} = 10.70; SD_{age} = 1.24).

For the statistical analyses that determined the predictors of reading comprehension performance, it was noted that not all of the participants had available scores for the Working Memory and Phonological Processing factors from their assessments in 2015. As such, those with missing values in the dataset for these factors, as well as those with missing reading comprehension scores due to attrition, were excluded from the analyses. This resulted in a sample sizes of n = 31 (21 male, 10 female; M_{age} = 10.45, SD_{age} = 1.37), n = 48 (35 male, 13 female; M_{age} = 10.75, SD_{age} = 1.22), and n = 44 (34 male, 10 female; M_{age} = 10.78, SD_{age} = 1.21), for the analyses of 2015, 2016 and 2017 reading comprehension performance, respectively.

Measures

Reading comprehension

Measures of reading comprehension were obtained using the Reading Comprehension subtest of the Wechsler Individual Achievement Scale, 3rd Edition (WIAT-III; PsychCorp, 2009a). The WIAT-III is an individually administered test battery commonly used to assess the achievement of children aged four to 19 years of age. Normed in the United States (US), the WIAT-III Reading Comprehension subtest has an established average internal reliability of .88 across age-groups (PsychCorp, 2009b). On the WIAT-III Reading Comprehension subtest, participants were required to read passages and verbally answer questions based on what they had read. Subtest standard scores were used in this study.

Verbal ability

Measures of participants' verbal ability were obtained from their archived assessment data obtained in 2015. Depending on the tests used in their respective assessments, participants' scores were obtained from the either the Verbal cluster of the Differential Ability Scales, 2nd Edition (DAS-II; Elliot, 2007a) or the Verbal Comprehension Index from the Wechsler Intelligence Scale for Children, 4th (WISC-IV; Wechsler, 2003a) and 5th Editions (WISC-V; Wechsler, 2014a).

The DAS-II Verbal cluster comprised subtests that required participants to identify similarities between words and explain the definitions of words. Normed in the US, the DAS-II has established evidence for validity, and the Verbal cluster has an average internal reliability coefficient of .89 (Elliot, 2007b). The WISC-V Verbal Comprehension Index (VCI) subtests also assessed participants on their ability to identify similarities among words and to explain the meanings of words. The WISC-V was normed in the US and evidence was found for its validity (Wechsler, 2014b). The WISC-V VCI has established internal reliability with an average coefficient of .92 (Wechsler, 2014b). The WISC-IV comprised subtests similar to that of WISC-V, with an additional one that assessed participants on their knowledge of general principles and social situations. The WISC-IV has evidence of validity and the WISC-IV VCI has established internal reliability, with an average coefficient of .94 (Wechsler, 2003b).

There is some evidence of the comparability between the composites measuring verbal ability. The correlation between DAS-II Verbal cluster and the WISC-IV VCI had a coefficient of .73 (Elliot, 2007b), whereas the correlation coefficient for the relationship between the WISC-IV VCI and WISC-V VCI was found to be .85 (Wechsler, 2014b). No correlation studies were available that examined the relationship between the DAS-II Verbal cluster and the WISC-V VCI.

Non-verbal ability

Measures of participants' non-verbal ability were obtained from their archived assessment data obtained in 2015. These comprised composite standard scores from the DAS-II, WISC-IV and WISC-V. The DAS-II Non-verbal cluster comprised subtests that required participants to identify the missing figure within a grid pattern and to identify figures or numbers that fit into a sequential pattern. It has established internal reliability with an average coefficient of .92 across age-groups (Elliot, 2007b). The WISC-V Fluid Reasoning Index (FRI) involved subtests where participants had to identify missing figures within grid or sequential patterns, as well as make quantitative comparisons. It has established internal reliability with an average reliability coefficient of .93 (Wechsler, 2003b). The WISC-IV Perceptual Reasoning Index (PRI) included subtests that required participants to use blocks to construct given patterns, to identify commonalities between pictures, and to identify missing figures within grid patterns. It has an average internal reliability coefficient of .92 (Wechsler, 2003b).

Some evidence of the comparability between the composites measuring non-verbal ability was found. The correlation between DAS-II Non-verbal Reasoning cluster and the WISC-IV PRI had a coefficient of .71 (Elliot, 2007b), whereas the correlation coefficient for the relationship between the WISC-IV PRI and WISC-V FRI was found to be .63 (Wechsler, 2014b). No correlation studies were found that examined the relationship between the DAS-II Non-verbal Reasoning cluster and the WISC-V FRI.

Working memory

Measures of participants' working memory were obtained from their archived assessment data obtained in 2015. These comprised composite standard scores from the DAS-II, WISC-IV and WISC-V. The DAS-II Working Memory cluster is made up of subtests that required participants to recall auditory information verbatim or in a specified sequence. It has an established average internal reliability coefficient of .95 (Elliot, 2007b). The WISC-IV Working Memory Index (WMI) comprises subtests that also required participants to recall and mentally manipulate auditory information. It has an average internal reliability coefficient of .92 (Wechsler, 2003b). The WISC-V WMI is made up of subtests that required participants to recall sequences of both auditory and visual information, and it has an internal reliability of .92 (Wechsler, 2014b).

There is some evidence of the comparability between the composites measuring working memory. The correlation between DAS-II Working Memory cluster and the WISC-IV WMI had a coefficient of .74 (Elliot, 2007b), whereas the correlation coefficient for the relationship between the WISC-IV WMI and WISC-V WMI was found to be .65 (Wechsler, 2014b). There were no studies available that examined the relationship between the DAS -II Working Memory cluster and the WISC-V WMI.

Phonological awareness

Participants' phonological awareness was measured using the DAS-II Phonological Processing subtest and the Phonological Awareness composite of the Comprehensive Test of Phonological Processing, 2nd Edition (CTOPP-2; Wagner, Torgesen, Rashotte & Pearson, 2012). The DAS-II Phonological Processing subtest assessed participants on their abilities in rhyming, as well as blending, segmenting and isolating phonemes within words. It has an average internal reliability coefficient of .89 (Elliot, 2007b). The CTOPP-2 Phonological Awareness composite comprised subtests that tested participants on their abilities to delete, blend, and isolate phonemes within words. Evidence had been found to support the validity of the CTOPP-2, and the Phonological Awareness composite has an average internal reliability coefficient of .92 (Wagner et al., 2012). Participants' phonological awareness scores were obtained from their archived assessment data obtained in 2015. Comparability between the DAS-II Phonological Processing subtest and the CTOPP-2 Phonological Awareness composite was not established as there were no studies available that examined the relationship between these two measures.

Rapid naming

Participants' rapid naming skills were measured using the DAS-II Rapid Naming subtest and the Rapid Symbolic Naming composite of the CTOPP-2. The DAS-II Rapid Naming subtest assessed participants on their abilities in naming objects and colours quickly. It has an average internal reliability coefficient of .81 (Elliot, 2007b). The CTOPP-2 Rapid Symbolic Naming composite comprised subtests that tested participants on their abilities to quickly name letters and digits. It has an average internal reliability coefficient of .92 (Wagner et al., 2012). Participants' phonological processing scores were obtained from their archived assessment data obtained in 2015. Comparability between the DAS-II Rapid Naming subtest and the CTOPP-2 Rapid Symbolic Naming composite was not established as there were no studies available that examined the relationship between the two measures.

Reading Comprehension Curriculum

At DAS, reading comprehension is taught as part of the Main Literacy Programme (MLP). The MLP is a literacy intervention programme designed to provide support for students with dyslexia in the areas of reading, spelling and writing. Students of the MLP receive two one-hour sessions of literacy intervention per week, over a term of 10 weeks, and they attend four terms of intervention over the course of a year. This frequency translates to 80 hours of literacy intervention a year. Educational therapists at the DAS are required to include reading comprehension activities for a minimum of five out of the 10 weeks of a term.

It should further be noted that the participants' attendance at the intervention sessions was not formally tracked over the course of this study. However, for students to continue receiving literacy intervention at the DAS, they are required to attend at least 85% of the

sessions in a term. Hence, it is likely that the participants of this study received 68 to 80 hours of intervention with the previous reading comprehension curriculum, as well as with the enhanced curriculum.

The enhanced reading comprehension curriculum comprised a series of skills that enable students to identify various text features in passages and questions, which they could use to aid their comprehension of text. The skills are separated into three categories: Basic, which includes skills such as learning how to identify literal questions and referring expressions; Intermediate, which involves learning about types of vocabulary such as synonyms, metaphors, as well as identifying contextual clues; and Advanced, which involves learning about more complex language features such as irony or connotative phrases.

In addition to the reading comprehension skills described, educational therapists also focus on building listening comprehension skills in students with weaker verbal ability. This is done through strategies such as teaching students how to listen for and identify the main idea in a passage that they hear, such as an audio recording of an advertisement; listening for details, such as having students follow detailed verbal instructions for classroom activities, e.g., colouring pictures in a particular way; and sequencing of events, where students may do activities such as sequencing picture cards according to chronological order.

PROCEDURE

This study was part of a project to evaluate the outcomes of an enhanced reading comprehension curriculum at the DAS, and it is focused on monitoring the progress of reading comprehension performance in students with dyslexia. As such, permission was obtained from the DAS research committee to use the data collected. Approval was also sought and obtained from the Institutional Review Board of the Nanyang Technological University to carry out the study.

It was explained to the participants' parents that data from participants' 2015 assessment would be retrieved, and that the participants would be tested on their reading comprehension skills on two occasions, once in 2016 and another in 2017. It was also indicated that participation in the research study was voluntary and could be withdrawn at any point, and that data would remain confidential and presented at a group level. For joining the study, parents were given the option to attend a complimentary reading comprehension workshop at the DAS Academy. Parents indicated their consent to allow their children to participate in the study by returning the signed consent form to the DAS researchers.

Participants' 2015 assessment scores in reading comprehension, verbal ability, non-verbal ability, phonological processing, working memory and rapid naming ability were

obtained through the DAS online database. Scaled scores from the DAS-II phonological processing and rapid naming subtests were converted to standard scores with means and standard deviations that were comparable to scores from the CTOPP-2 Phonological Awareness and Rapid Symbolic Naming composites, respectively.

Reading comprehension measures were obtained by testing the participants individually on the WIAT-III Reading Comprehension subtest, once over the period of June to September 2016, at the end of receiving a year of literacy intervention that incorporated the previous reading comprehension curriculum. From July to August 2017, participants were tested again on the WIAT-III Reading Comprehension subtest, after receiving a year of literacy intervention that incorporated the enhanced reading comprehension curriculum. Testing sessions were conducted at DAS learning centres by psychologists from the DAS and research assistants who were trained in the administration of the WIAT -III Reading Comprehension subtest. The purposes of the study were explained to the participants, and they were informed about the types of data that would be collected for the study. They then indicated their assent to participate in the study by filling out their names in a form. Participants were administered item sets of the WIAT-III Reading Comprehension subtest that corresponded to their grade level at each time of testing. Raw scores were then converted to standard scores for analysis.

It was anticipated that the participants of this study may be taught by different educational therapists over the years, and it is likely for educational therapists to have individual differences in the teaching of the enhanced reading comprehension curriculum. As such, information from the evaluation of the participants' educational therapists was obtained to determine if educational therapists had implemented the reading comprehension curriculum as per their training. During these evaluations, videos and lesson plans that were submitted by educational therapists were reviewed by the DAS quality assurance team.

Research Design and Data Analytic Plan

The present study adopted a within-subject, action research design for the analysis of participants' progress in reading comprehension before and after the implementation of the enhanced reading comprehension curriculum. An observational research design involving standard multiple regression was used to determine whether reading comprehension performance was predictable by cognitive factors (i.e. verbal ability, non-verbal ability, working memory, phonological awareness and rapid naming ability).

To compare participants' reading comprehension performances over the three years, a one-way repeated measures analysis of variance (ANOVA) was done to compare the participants' reading comprehension performance at three time points over three years. The independent variable was the time of testing (i.e. 2015, 2016 and 2017), and the dependent variable was the participants' WIAT-III Reading Comprehension subtest

scores. To get a further understanding of how verbal ability may impact reading comprehension progress, the data obtained was split according to "High" and "Low" verbal ability and analysed again using a one-way repeated measures ANOVA. The "High" group comprises those who obtained verbal ability standard scores of 90 and above in 2015, and the "Low" group was made up of those who obtained standard scores of below 90. The standard score of 90 was used in accordance to the DAS guidelines for determining the placement of students with weaker verbal ability in classes that place a stronger emphasis on language development.

Multiple regression analyses were used to determine if the five cognitive factors (i.e. verbal ability, non-verbal ability, working memory, phonological processing and rapid naming ability) were significant predictors of concurrent and future reading comprehension performance. Participants' scores on these five factors during their 2015 assessments were identified as potential predictors for reading comprehension performance in 2015, 2016 and 2017, as measured on the WIAT-III Reading Comprehension subtest.

All analyses were conducted using the IBM SPSS statistics software, version 20. An alpha value of .05 was used for all statistical tests.

RESULTS

Progress in Reading Comprehension

To answer the first research question of whether the reading comprehension performance of students with dyslexia improved following the implementation of the enhanced reading comprehension curriculum, a one-way repeated measures ANOVA was conducted to compare participants' (n = 42) performance at three time points over two years: Time 1, which refers to a baseline measure of reading comprehension; Time 2, when reading comprehension performance was measured pre-enhanced curriculum; and Time 3, when reading comprehension was measured a year after the enhanced

Table 1. Descriptive Statistics for Reading Comprehension Performance at Three Time-points

Time of testing	*n*	*M*	*SD*
Time 1 (Baseline)	42	91.19	9.67
Time 2 (Pre-enhanced curriculum)	42	94.90	8.84
Time 3 (Post-enhanced curriculum)	42	95.31	11.56

curriculum was implemented. There was a significant effect for time of testing, Wilk's Lambda = .82, $F(2, 40) = 4.38$, $p = .02$, multivariate partial eta squared = .18. Pairwise comparisons, using the Least Significant Difference t-test, revealed that there was significant increase in mean reading comprehension performance from Time 1 to Time 2 ($p = .01$), and from Time 1 to Time 3 ($p = .03$). There was no significant difference in reading comprehension scores from Time 2 to Time 3. Descriptive statistics from this analysis are summarised in Table 1.

To provide further insight into how verbal ability may impact participants' progress in learning reading comprehension, two separate ANOVA analyses were done to compare the reading comprehension scores over three years, of participants with "Low" verbal ability (i.e. those who obtained a verbal ability score below 90; $n = 13$), and with "High" verbal ability (i.e. those who obtained a verbal ability score of 90 and above; n = 29). For participants with "Low" verbal ability, significant effect of time was found, Wilk's Lambda = .28, $F(2, 11) = 14.10$, $p = .001$. Pairwise comparisons, using the Least Significant Difference t-test, showed significant increase in reading comprehension scores from Time 1 to Time 2 ($p < .001$). No significant differences in scores were found from Time 1 to Time 3 and Time 2 to Time 3. For participants with "High" verbal ability, no significant effects of time were found. A summary of the group means is provided in Table 2.

Table 2: Descriptive Statistics for Reading Comprehension Performance

	Low verbal ability			High verbal ability		
Time of testing	***n***	***M***	***SD***	***n***	***M***	***SD***
Time 1 (Baseline)	13	85.54	8.84	29	93.72	9.05
Time 2 (Pre-enhanced curriculum)	13	93.15	9.97	29	95.69	8.35
Time 3 (Post-enhanced curriculum)	13	88.92	9.07	29	98.17	11.54

Predictors of Reading Comprehension

The second research question of this study was whether cognitive factors such as verbal ability, non-verbal ability, working memory, phonological awareness and rapid naming ability could predict reading comprehension performance. To establish if there were linear relationships between the measures of the five cognitive factors taken in 2015, with participants' reading comprehension performances in 2015, 2016 and 2017, correlation analyses were done using Pearson product-movement correlation coefficient. Correlation

coefficients are summarised in Table 3. Reading comprehension performance in 2015 showed significant, positive correlation with participants' verbal ability, non-verbal ability, working memory and phonological awareness at the $p < .01$ level, with r ranging from .46 to .63. There was no significant correlation between participants' 2015 reading comprehension and rapid naming scores.

Table 3. Correlations of Measures of Cognitive Factors with Reading Comprehension Performance

Measures	1	2	3	4	5	6	7	8
Verbal ability (2015)	-	.51**	.46**	.34*	.14	.63**	.56**	.67**
n		55	52	34	37	53	50	46
Non-verbal ability (2015)		-	.48**	.17	.14	.52**	.47**	.46**
n			52	34	37	53	50	46
Working memory (2015)			-	.32	.44**	.46**	.43**	.45**
n				31	34	51	48	44
Phonological awareness (2015)				-	-.14	.49**	.31	.28
n					30	33	32	27
Rapid Naming (2015)					-	.09	.28	.15
n						35	34	31
Reading Comprehension (2015)						-	.63**	.45**
n							49	46
Reading Comprehension (2016)							-	.49**
n								42
Reading Comprehension (2017)								-

* $p < .05$; ** $p < .01$

Participants' reading comprehension performances in 2016 and 2017 showed significant, positive correlations with their 2015 measures of verbal ability, non-verbal ability and working memory, at the $p < .01$ level. Pearson r values ranged from .43 to .56 for correlations between measures of cognitive factors with 2016 reading comprehension scores, and from .45 to .67 for correlations with 2017 reading comprehension scores. Cognitive factors that did not show significant linear relationships with reading comprehension scores were omitted from the multiple regression analyses. As such, rapid naming ability was excluded from the analysis using 2015 reading comprehension scores as a dependent variable. In addition, rapid naming ability and phonological awareness were excluded from analyses using 2016 and 2017 reading comprehension performance.

Multiple regression was used to investigate the ability of four measures of cognitive factors taken in 2015 (i.e., verbal ability, non-verbal ability, working memory, and phonological awareness) to predict reading comprehension performance in the same year. In addition to the assumption of linearity, preliminary analyses were conducted to ensure no violation of assumptions of normality, multicollinearity and homoscedaticity. This procedure was also applied to all subsequent regression analyses. Given that phonological awareness is often associated with dyslexia, predictors were entered into the regression model in a hierarchical fashion. Phonological awareness was entered in the first step of the regression model to control for its influence. Verbal ability, non-verbal ability and working memory were entered at the second step. A summary of the regression statistics is provided in Table 4.

Table 4. Predictors of 2015 Reading Comprehension Performance

Predictors	*N*	*B*	*SE B*	*β*	*t*	*p*
Step 1						
Phonological awareness	31	.52	0.17	.49	3.06	.005
Step 2						
Phonological awareness	31	0.29	0.16	.27	1.78	.09
Verbal ability	31	0.29	0.14	.33	2.12	.04
Non-verbal ability	31	0.06	0.12	.08	0.45	.66
Working memory	31	0.33	0.20	.29	1.60	.12

After entry of phonological awareness at Step 1, phonological awareness contributed significantly to the regression model, $F(1, 29) = 9.38$, $p = .005$, and explained 24.4% of the variance in reading comprehension performance. After entry of verbal ability, non-verbal ability and working memory at Step 2, the total variance in reading comprehension performance explained by the model as a whole was 50%, $F(4, 26) = 6.49$, $p = .001$. Verbal ability, non-verbal and working memory explained an additional 26% of variance in reading comprehension after controlling for phonological awareness, R2 change = .26, F change $(3, 26) = 4.43$, $p = .012$. In this final regression model, only verbal ability was found to be a statistically significant predictor ($\beta = .33$), $p = .044$.

To investigate whether 2015 measures of cognitive factors (i.e., verbal ability, non-verbal ability and working memory) could significantly predict reading comprehension performance in 2016, standard multiple regression was used. The total variance in reading comprehension performance explained by the model as a whole was 40.1%, $F(3, 44) = 9.82$, $p < .001$. In this regression model, only verbal ability was found to be a statistically significant predictor ($\beta = .40$), $p = .004$. A summary of the regression statistics is provided in Table 5.

Table 5. Predictors of 2016 Reading Comprehension Performance

Predictors	*N*	*B*	*SE B*	β	*t*	*p*
Verbal ability	48	0.31	0.10	.40	3.02	.004
Non-verbal ability	48	0.13	0.08	.22	1.59	.12
Working memory	48	0.13	0.10	.17	1.24	.22

For reading comprehension scores obtained in 2017, participants' 2015 scores in verbal ability, non-verbal ability and working memory were entered as predictors in a standard multiple regression analysis.. The total variance in reading comprehension performance explained by the model as a whole was 49.1%, $F(3, 40) = 12.87$, $p < .001$. In this regression model, only verbal ability was found to be a statistically significant predictor ($\beta = .54$), $p < .001$. A summary of the regression statistics is provided in Table 6.

Table 6. Predictors of 2017 Reading Comprehension Performance

Predictors	*N*	*B*	*SE B*	*β*	*t*	*p*
Verbal ability	44	0.47	0.12	.54	4.10	<.001
Non-verbal ability	44	0.07	0.09	.10	0.75	.46
Working memory	44	0.19	0.11	.21	1.63	.11

DISCUSSION

This study was carried out to evaluate an enhanced reading comprehension curriculum following its implementation at the DAS, and to find out if specific cognitive factors could predict reading comprehension performance in students with dyslexia.

Progress in Reading Comprehension

Findings

Participants showed significant progress in reading comprehension performance following a year of intervention with the original curriculum, but did not show significant improvement after receiving a year of intervention with the enhanced reading comprehension curriculum. In addition, further analysis showed that significant improvement between Time 1 and Time 2 was only evident in students with lower verbal ability. Based on the findings from this part of the study, the first hypothesis that students' reading comprehension performance would improve following the implementation of the enhanced reading comprehension curriculum was rejected.

Implications

The lack of improvement in reading comprehension performance between the time-points before and after the enhanced reading comprehension curriculum was implemented seems to suggest that the enhanced curriculum may not be effective in improving reading comprehension. This outcome is also not in line with research studies showing the utility of reading comprehension strategies such as question asking (NRP, 2000) and reciprocal teaching (Duke & Pearson, 2009; Pilonieta & Medina, 2009), which have elements similar to strategies used in the enhanced reading comprehension curriculum. Nonetheless, it should be noted that, given that age-based standard scores were used in the analysis, having no significant differences in mean performance

suggests that participants did not lag further behind their age-matched peers in reading comprehension skills despite having reading difficulties associated with dyslexia, and in some cases weaker verbal ability as well.

There are some possible explanations for the lack of improvement in students' reading comprehension performance following the implementation of the enhanced curriculum, and three in particular are discussed. Firstly, give that this was the first year of implementation, educational therapists may not have achieved familiarity with using the reading comprehension curriculum. Findings from the NRP (2000) report suggested that improvements in teacher knowledge and practice conferred benefits to student achievement. It is also unclear whether the educational therapists implemented the new curriculum as planned. As the current study did not look into educational therapists' knowledge and familiarity with the curriculum, and that information on instruction fidelity was unavailable, it would be useful for future studies evaluating the curriculum to take teacher knowledge and understanding of the material into consideration.

Secondly, the intensity of reading comprehension intervention could affect reading comprehension outcomes as well. In their meta-analysis of one-to-one teaching programmes for elementary school students at-risk for reading failure, Elbaum, Vaughn, Hughes and Moody (2000) found evidence to suggest that instructional time for intervention was more effective when delivered more intensely than when spread out. In addition, Rose (2009) suggested that once-weekly sessions of reading intervention may not be enough to ensure progress, and recommended daily sessions instead. At the DAS, literacy intervention is taught at a frequency of twice a week over a term of 10 weeks, and reading comprehension is only taught for not more than 50% of the lessons in a term. The intensity at which reading comprehension intervention is delivered may therefore be insufficient for students to show improvement in their performance.

Thirdly, the use of the WIAT-III as an assessment tool of reading comprehension skills in this study may not have been in line with what was taught through the enhanced reading comprehension curriculum. It is unclear whether the passages and questions in the WIAT-III Reading Comprehension subtest contained the specific textual features that were taught to students through the enhanced reading comprehension curriculum. While the use of the WIAT-III was useful in providing information about participants' reading comprehension skills in general, it would be useful for future studies to include curriculum-based measures, developed based on specific elements of the enhanced reading comprehension curriculum, to find out if students had understood what was taught and were able to apply the skills that they had learnt. Findings from curriculum-based measures can also be compared with that from standardised tests of reading comprehension to provide a fuller picture about the utility of the enhanced curriculum.

Another interesting finding is that while students showed improvement in their reading comprehension performance between Time 1 and Time 2 (i.e. before and after a year of

intervention with the previous reading comprehension curriculum), the improvement was found only in students with lower verbal ability. A possible explanation for this is the use of the WIAT-III Reading Comprehension subtest as the measure for reading comprehension performance. Keenan, Betjemann and Olson (2008) found that listening comprehension explained more variance than decoding skills for reading comprehension performance on tests that required reading of medium to long passages and for students to provide responses to answers in a multiple-choice format, giving short answers to questions or using retell. Conversely, decoding skills explained more variance than listening comprehension for reading comprehension performance on tests that required students to read single sentences or short passages, and for them to respond by selecting pictures, or completing cloze sentences. As the WIAT-III requires passage reading and the provision of short-answer questions, it appears similar to the former type of assessment, which seems to be more sensitive to students' listening comprehension skills. At the DAS, educational therapists focus on building listening comprehension skills in students with weaker verbal ability. As such, the changes in reading comprehension performance could reflect students being more sensitive to an increased focus on developing language skills rather than decoding skills.

Predictors of Reading Comprehension

With regard to second part of this study, findings only partially supported the hypothesis that all five factors would significantly predict reading comprehension performance.

Findings

In the regression analyses for this study, verbal ability was found to consistently predict concurrent and future reading comprehension performance in the participants of this study, and the regression models in this study predicted 40.1 to 50% of variance in reading comprehension performance. The significance of verbal ability as a predictor is in line with previous studies showing the association between verbal ability and reading comprehension performance (Cain & Oakhill, 2006; Cain, Oakhill, & Bryant, 2004; Oullette, 2006; Ricketts et al., 2007). In comparison, although non-verbal ability and working memory showed significant correlations with the measures of reading comprehension at all three time-points, they did not significantly predict reading comprehension at any of the time-points. These findings are consistent with some studies that did not support the abilities of non-verbal ability in predicting reading comprehension (Cutting & Scarborough, 2006; Oakhill & Cain, 2012; Tighe & Schatschneider, 2014). However, they are in contrast to the findings in other studies that showed non-verbal ability (Pammer & Kevan, 2007) and working memory (Cain et al., 2004; Seigneuric et al., 2000) to be significant predictors of reading comprehension.

Phonological awareness taken at the first time-point (i.e. 2015) was only found to be significantly correlated with reading comprehension performance measured in the same

year. It was also found to be a significant predictor of reading comprehension performance when entered as a sole predictor in the first step of the hierarchical regression model. However, the ability of phonological awareness to predict concurrent reading comprehension became insignificant when verbal ability, non-verbal ability and working memory were included in the second step of the regression model; suggesting that, like non-verbal ability and working memory, its contribution to the variance in reading comprehension performance may be subsumed under the contribution of verbal ability. Correlation-wise, the relationships between phonological awareness taken at Time 1 and future reading comprehension performances (taken at Time 2 and Time 3) were no longer significant. This suggests that phonological awareness does not co-vary with future reading comprehension.

It was noted that rapid naming ability only showed significant correlation with working memory, and not with any of the other predictors, nor with participants' reading comprehension scores at the three time-points. Rapid naming ability was therefore excluded from the regression analyses. This is inconsistent with findings from previous studies that demonstrated the role of rapid naming in reading comprehension (Cutting & Scarborough, 2006; Georgiou et al., 2009; Johnston and Kirby, 2006; Manis et al., 1999).

Implications. In this study, verbal ability was shown to predict concurrent and future reading comprehension performance in student with dyslexia. This highlights the importance of verbal ability in the identification of students who may have difficulty with reading comprehension. Once identified, children with weaker verbal ability can be supported in the development of reading comprehension skills through intervention. Specifically, intervention strategies to increase students' vocabulary knowledge and verbal language skills could encourage the development of their reading comprehension skills. Teaching new vocabulary has long been noted to improve reading comprehension performance in students (Beck, Perfetti, & Mckeown, 1982; Bos & Anders, 1990). In addition, a randomised controlled trial conducted by Clarke, Snowling, Truelove and Hulme (2010) revealed that oral language intervention, which included elements of vocabulary training and verbal reasoning activities, improved reading comprehension performance in eight- and nine-year-old children. It was further noted that students who received oral language training performed better than those who underwent text-comprehension training or a combination of text-comprehension and oral language training at the end of intervention and at follow-up testing after 11 months.

Apart from the role of verbal ability in predicting reading comprehension, the finding that non-verbal ability and working memory are significantly correlated with concurrent and future reading comprehension performance but are insignificant predictors supports the idea proposed by Cutting and Scarborough (2006) that non-verbal ability and working memory do not make unique contributions to reading comprehension performance over and above oral language abilities and decoding skills. With this in mind, it appears that the reasoning skills needed in reading comprehension are verbal in nature, rather than

attributed to general non-verbal reasoning abilities. In addition, while the contribution of working memory was insignificant, it may be related to the type of reading comprehension task used in this study. In the WIAT-III Reading Comprehension subtest, students can refer to the passages while answering the questions. Hence, load on working memory is reduced as well. It may be interesting to explore the impact of working memory on other types of reading comprehension tasks in future studies.

The finding that phonological awareness was significantly correlated with concurrent reading comprehension performance but not future reading comprehension skills is consistent with Scarborough's (1998) finding that phonemic awareness does not seem to be a good indicator of the prognosis of reading comprehension ability in children with reading disabilities. Scarborough (1998) further suggested that phonemic awareness was only important to reading development in children up until the second grade. This has implications for the Simple View of Reading (SVR) in that its ability to explain reading comprehension performance may be affected by age. Indeed, Martin, Claydon, Morton, Binns and Pratt (2003) found that younger students relied more on phonological strategies to read, while older readers relied more on orthographic strategies (i.e. visual processing of words). As such, there might be more to reading comprehension than the SVR suggests. In addition, even though phonological awareness was significantly correlated with concurrent reading comprehension performance, it was not a significant predictor of reading comprehension in the regression model when entered with verbal ability. This suggests that the variance in reading comprehension explained by phonological awareness may be subsumed under that explained by verbal ability. This is in line with the findings of a study done by Näslund and Schneider (1991), who used structural equation modeling to demonstrate how the inter-relationships between verbal ability, memory capacity, phonological awareness and decoding speed could predict reading comprehension in German children. It was shown that verbal ability significantly predicted reading comprehension performance, and its influence was exerted both directly as well as indirectly through phonological awareness.

It should further be noted that in this study, regression models only explained a portion of the variance of reading comprehension. Hence, the predictors included in this study did not fully explain reading comprehension in students with dyslexia. In terms of the SVR, it further suggests that listening comprehension and decoding skills may not fully explain reading comprehension as well. Gersten et al. (2001), as well as Quinn (2016), highlighted the importance of background or domain-specific knowledge in contributing to reading comprehension. It has also been demonstrated that prior knowledge has direct and indirect influence (through mediation of inference) on reading comprehension performance in seventh graders (Tarchi, 2010). It may therefore be useful for future studies to further explore the role of background knowledge.

Rapid naming ability was excluded from the regression analysis due to the lack of significant correlations between rapid naming and reading comprehension. This outcome

suggests that rapid naming, or the ability to quickly identify names associated with symbols, is not related to reading comprehension performance, or that the relationship is negligible. It is also possible that the lack of significant relationship was due to the type of stimulus used to measure rapid naming. Majority of the participants' rapid naming scores were derived from the DAS-II Rapid Naming subtest, which assessed purely non-alphanumeric rapid naming ability, where participants named colors and pictures. Although Johnston and Kirby (2006) used a non-alphanumeric rapid naming task and found significant relationship between rapid naming and reading comprehension, other studies reviewed used rapid naming tasks that involved naming letters and digits (Cutting & Scarborough, 2006; Georgiou et al., 2009; Manis et al., 1999). Georgiou et al. (2009) further noted that alphanumeric rapid naming correlated significantly with reading comprehension, while non-alphanumeric rapid naming did not. The ability to make associations between non-meaningful symbols and their names, as is needed in alphanumeric naming, may be more relevant to reading comprehension than non-alphanumeric rapid naming, where associations are made between meaningful colors and pictures to their names. It would therefore be important to consider the nature of the rapid naming task in future studies of reading comprehension.

LIMITATIONS OF STUDY

The findings from this study have provided some insight into the area of reading comprehension. However, there were some limitations that impacted the interpretation of the results. For the first part of the study, where students' progress in reading comprehension was measured, there was no control group available for comparison. As such, a definitive conclusion about the effects of the previous and enhanced reading comprehension curriculum could not be made, and possible explanations for the outcome were generally speculative in nature. Secondly, there was a lack of information about the fidelity with which educational therapists utilised the enhanced reading comprehension curriculum over the period of the study. Additionally, due to operational factors, several participants in this study experienced a change in educational therapists who might have had different teaching styles or rapport with students. Students' attendance at the intervention sessions was also not formally tracked. As a result of these, participants may not have received a consistent delivery of intervention using the enhanced reading comprehension curriculum across and within individuals. Finally, the possibility that participants in this study may have received prior or concurrent reading support was not accounted for, and was a possible confound of this study as well.

Some factors that possibly limited the findings of the second part of the study were also identified. Firstly, archived assessment data are vulnerable to the impact of consolidating scores from different test batteries. Although the scores were matched in terms of the similarities of the skills measured and method of administration, comparability between the DAS-II and WISC-V measures of verbal ability, non-verbal ability and working memory, as well as between DAS-II and CTOPP-2 measures of phonological awareness and rapid

naming were not established as no correlation studies on these relationships were available. Hence, differences across batteries may still exist. For instance, scores were derived from rapid naming tests that utilised alphanumeric stimuli, non-alphanumeric stimuli, or a mix of both. This could have diluted the relationships between variables and impact the outcome of the study. Secondly, the sample size obtained for the regression analyses was small due to missing data and attrition. The sample size for the regression analysis with reading comprehension performance at Time 2 (i.e. 2016) as the dependent variable barely met the minimum suggested requirement (Pallant, 2010) for three predictors, while the other regression analyses did not meet the recommended minimum sample sizes. This reduced the power of statistical analysis. According to Pallant (2010), this could affect how generalisable the findings from the study were to the target population of children who have dyslexia.

AREAS FOR FUTURE RESEARCH

The outcome of the current study provided some basis for further exploration in the area of reading comprehension. First of all, it would be useful for future studies to consider the limitations of this study in the design of future research. Comparing students who receive intervention with the enhanced curriculum with either a control group from a waitlist or a separate group receiving a different form of intervention with established empirical support can help to elicit more concrete outcomes about the effectiveness of the enhanced curriculum. Additionally, including fidelity checks and controlling for student factors such as the presence of concurrent or prior intervention can help to strengthen the validity of the study. It would be useful to replicate the regression analyses with a larger sample size to establish if consistent results can be obtained, and to improve the generalisability of the outcome to what is observed in the population.

Apart from addressing the limitations of this study in future research in the area of reading comprehension, it would be interesting to explore other factors that relate to reading comprehension going forward. In the evaluation of enhancements to reading comprehension curriculum and intervention, it would firstly be important to look into teacher factors, such as teachers' knowledge of the curriculum and their beliefs about how the changes in curriculum may impact the efficacy of the reading comprehension intervention. Next, factors relating to the curriculum itself should be further explored and analyzed for their impact on the efficacy of the intervention. For instance, specific components of the enhanced reading comprehension curriculum should be identified (e.g. skills taught, delivery method or intensity) and investigated in order to ascertain the utility of each component. Thirdly, the current study showed that differences in verbal ability can translate to differences in how students' respond to reading comprehension intervention. It would therefore be useful to see if this finding can be replicated in future studies, and other student factors could be explored as well. For example, given that Singapore is a multi-racial society, students come from different language backgrounds and may not always be most comfortable with communicating in the English language.

Hence, it may be helpful to see if students' home language can impact their reading comprehension performance and affect how they respond to intervention.

In terms of the factors that predict reading comprehension performance, consideration of the outcomes of the current study suggest that it may be useful to ascertain if different methods of measuring skills can produce different results. For instance, if reading comprehension is measured using retell fluency of passages read (Roberts, Good, & Corcoran, 2005), the contribution of working memory and rapid naming may be found to be more salient. In addition, further studies can also investigate whether there are differences between the influence of alphanumeric and non-alphanumeric rapid naming abilities on reading comprehension performance.

Apart from exploring the use of different tools to measure cognitive factors, it would be important to explore the contribution of other factors to reading comprehension. Factors such as age, orthographic/visual processing abilities, as well as prior knowledge appear to be likely candidates that may impact reading comprehension performance. Additionally, environmental factors such as the home literacy environment have been found to be associated with reading competencies, including reading comprehension, in Singaporean preschoolers (Yeo, Ong & Ng, 2014), and print exposure has been found to predict future reading comprehension performance in French children (Sénéchal, 2006). Such factors can be included in future analyses of the predictors of reading comprehension. With thorough exploration, a deeper understanding of what contributes to reading comprehension can be developed. Consequently, educational professionals can be better informed in their decisions for the identification of and intervention provided for students who have difficulties in this area.

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