The Remediation of Pass Cognitive Processing in Helping Children with Reading Difficulties

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Abstract

This study examined the effectiveness of Cognitive Assessment System (CAS) in measuring PASS cognitive functions of children with Reading Difficulties (RD). The PASS cognitive functions that represent human intelligence were based on the Luria's three functional units of brain which are Planning, Attention, Simultaneous and Successive (PASS). Cognitive Assessment System (CAS) was used to measure the PASS cognitive functions, while Wide Range Achievement Test-4 (WRAT-4) was used to determine reading processes Word Reading, Reading Comprehension and Spelling. CAS and WRAT-4 were administered individually to 50 normal readers and 50 children with RD from the primary Standard 3 English as the second language (ESL) learners. First part of this study aimed to obtain profiles of the CAS and WRAT-4, and to determine the specific weakness of cognitive functions and reading processes of children with RD. There were distinct PASS cognitive profiles among the children with RD, but gender was not the determinant. There were also significant differences for both PASS cognitive processing and reading processes between the normal readers and children with RD. There was no significant difference between girls and boys in term of cognitive functioning except one which female significantly outperformed male on Word Reading among children with RD. However, girls scored higher on Planning and Attention processing while boys scored higher on Simultaneous and Successive processing. Overall, the poor readers were significantly lower for Simultaneous processing. Result of WRAT-4 indicated that both groups of readers had low scores on reading comprehension. Besides, there was significant relationship between PASS cognitive functions and reading composite ($r = 0.381$, $p < 0.01$) among the children with RD and ($r = 0.412$, $p < 0.01$) among the normal readers. While, the simultaneous processing was significantly correlated with reading comprehension ($r = 0.395$, $p < 0.01$). Second part of this study was an experimental design that revealed the intervention of PREP program which had effectively enhanced the Simultaneous processing.

Keywords: PASS, Cognitive Assessment System (CAS), Reading Difficulties (RD)

INTRODUCTION

Gephart (1970) defined reading as an interaction by which meaning encoded in visual stimuli by an author becomes meaning in the mind of the reader. The interaction always includes three facets: (1) the material to be read; (2) the knowledge processed by the reader; and (3) physiological and intellectual activities. The variability apparent when the interaction is viewed at different points in time is a result of the variability possible in each of the several facets. Reading is the process of reconstructing from the

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printed patterns on the page the ideas and information intended by the author that is also interrelated with all communication abilities like thinking, listening, speaking, and writing (Hittleman 1978).

The cognitive aspect in reading is interrelated to the phonological processes. Torgesen, Wagner & Rashotte (1994) defined phonological processing as 'an individual's mental operations that make use of the phonological or sound structure of oral language when he or she is learning how to decode written language. Das (2009) explained that children first learn words by listening to them and only later by reading them. Thus, children learn vocabulary and pronounce words by listening, but phonological coding is a process of learning to reading. Reading activities are not only the basic knowledge of vocabulary that determine the reader to comprehend text, but also the decoding ability which related to phonological coding of words in the text. According to Naglieri & Das (1997), the PASS processes were rather strongly related to basic reading skills and reading comprehension, especially for children in the upper-elementary and middle-school grades.

The process of reading certainly involves the cognitive functions that can be assessed and identified. The Cognitive Assessment System (CAS) based on Luria's PASS cognitive processing theory is one of the ways in assessing cognitive ability that also able to determine specific weakness of certain cognitive processing. This study aimed to examine the PASS cognitive processing the ESL children with reading difficulties. Beside that, we also wish to study the effectiveness of PASS Remediation Program (PREP) in helping children with reading difficulties.

PASS THEORY

The theoretical framework of this study is derived from PASS theory which is simulation from neuropsychology and cognitive psychology on the work of Luria (1966,1973,1980). According Luria, there are three types of cognitive processes responsible for mental activity associated with three functional units of the brain. These processes refer to the mental activities which involved attention (first unit), simultaneous and successive processing (second unit), and planning (third unit) cognitive processes. The first functional unit, located in the brain stem and reticular activating system (Luria,1973), provides the brain with the appropriate level of arousal or cortical tone for focused attention and resistance to distraction. The second functional unit (occipital-parietal and frontal-temporal areas of the brain) is responsible for "receiving, analyzing and storing information" (Luria, 1973, p. 67) using simultaneous and successive processing. The third functional unit is located in the frontal lobes of the brain (Luria, 1973) and is responsible for planning, including the programming, regulation, and verification of behavior (Luria, 1973). This provides the capability for behavior such as asking questions and problem solving and the capacity for self-monitoring (Das et al., 1994). These processes provide a different perspective that redefines intelligence within the context of cognitive processes (Naglieri, 1999).

Planning is a cognitive process that involves selecting and using strategies decision making and problem solving. This process is off cause interrelated to other process of PASS. It acquires efficient solution methods and best strategies which can be used in planning ways to solve problems. According to Naglieri and Das (1997c), "planning is a mental process by which the individual determines, selects, applies, and evaluates solutions to problems". This process requires the ways to solve problems of varying complexity and may involve attentional, simultaneous, and successive processes as well as knowledge. Naglieri (1999), planning is central to all activities in which there are both intentionality and a need for some method to solve a problem. This process includes self-monitoring and impulse control as well as plan generation. Planning processes are involved in many school tasks. For instance, children works out the ways to learn to memorise words that given by teachers in spelling task. This activity

facilitates a planful approach to learning and at the same time encourages the children to learn to spell specific words.

Attention is a cognitive process that involves focus and concentration to stimulus when there are distractions. This functional unit concerns self directing, information selecting and persistent of responding. Naglieri and Das (1997c) describe Attention as "a mental process by which the individual selectively focuses on particular stimuli while inhibiting responses to competing stimuli presented over time". This process stresses on the demand of the tasks that involve focused, selective, sustained and effortful activity. According to Naglieri (1999), *focused attention* refers to directed concentration toward a particular activity. While *selective attention* requires the inhibition of responses to distracting stimuli. *Sustained attention* refers to the variation of performance over time, which can be influenced by the different amount of effort required. Example of attention task in academic is illustrated by the tasks grammar task of selecting correct pronounce (he, his or him) in sentences such as "This bag is belong to ____. and This is ____bag." This creates the environment with targets (the him) and the distrators (the he or the his) for the first sentence and vice versa.

Simultaneous is a cognitive process which integrating several different stimuli into a whole. In this process, individual have to acquire the ability of making connections between the pieces to be an overall concept. According to Naglieri and Das (1997c), "Simultaneous processing is a mental process by which the individual integrates separate stimuli into a single whole or group". The important key of this process is that the person must see how all the separate elements are interrelated in a conceptual whole. Simultaneous processing has strong spatial and logical dimensions for both nonverbal and verbal content. The spatial aspect refers to the perception of stimuli as a whole. In academic setting, Simultaneous processing is involved in understanding grammatical statements that demand the integration of words into a whole idea. This integration involves comprehension of word relationships, prepositions, and inflections so the person can obtain meaning based on the whole idea (Naglieri, 1999).

Successive is a cognitive process which applying existing information in more specific requirements. This process demands respondents to remember or use information that follows in a strict, defined order, especially serial and syntactical information. Naglieri and Das (1997c), describe Successive processing as "a mental process by which the individual integrates stimuli into a specific serial order that forms a chain-like progression". The emphasis on the steps or successive processing is also involved in reading, especially in initial reading or decoding of unfamiliar words. This can be illustrated in the use phonics of English language or "*suku kata*" in Malay language. Children must learn the association of the sounds, in order, with the letters of the words. While in a sentence, children learn the order of words to form a grammatically correct sentence. For example "Who is this man?" and "This man is who?"

LITERATURE REVIEW

Das et al. (1979) studied the simultaneous and successive processing that reviewed as processes related to certain linguistic functions and 'mental abilities'. It was reported that in comprehending ambiguous sentences, successive processing appears to be involved in surface structure and underlying structure ambiguities whereas simultaneous processing is related to lexical ambiguity. Successive processing had also been found to be involved in the syntactic organization of expressive speech. The research reported that successive processing is important for the development of elementary decoding skills whereas simultaneous processing is related to the development of advanced levels of comprehensive skills in reading.

The difficulty of any level's coding for the individual reader determines the locus of that reader's attention in a given task, and thus the processing factor upon which the given task primarily depends. Any given task, for instance word recognition or sentence comprehension will be aimed primarily at a certain level of the hierarchy, and that is the level at which the difficulty level of the task is most likely to be. It is also possible for a lower level to have problem when interfering with higher-level of processing. Thus, even though both types of processing are involved at every level of the hierarchy, any given task in reading may have its difficulty level determined by level of processing. Kirby & Das (1977) correlated simultaneous and successive processing factor scores with the Vocabulary and Comprehension subtests of the Gates-MacGinitie reading test, measures of global reading ability. Both reading measures were correlated significantly with both processing measures, in the 0.3 to 0.5 range. It was also consistent with the description in the preceding paragraph, the two achievement measures could not be distinguished by processing correlates.

Subsequent studies have employed less global measures of reading skills, and have been able to differentiate between them in terms of processes. McLeod (1978) found simultaneous processing to be significantly related to the drawing of inferences which was related a particular comprehension skill and it was consistent with the definition of simultaneous processing as a relating and integrating process. Several studies have shown word decoding which use of a phonic approach to be correlated with successive processing (Cummins & Das 1977; Kirby & Robinson 1987). This was because phonic word attack requires the sequential recognition of sound elements and the holding of them in sequence while the word is recognized; this finding was consistent with the definition of successive processing. Kirby & Gordon (1988) found the integration of phrase-level units to be related to simultaneous processing, consistent with the definition of simultaneous processing.

RESEARCH METHODS

This study was mainly an experimental study that aimed to examine the effectiveness of PASS cognitive processing remediation. This study involved ESL poor achievers from remedial classes and the ESL normal readers who performed well among the standard three children from a public primary school. The selection of the children with RD was based on the classroom assessment who obtained below 50 marks of the mean score in language subjects especially English language. Moreover, the children with RD had also been identified and recommended by their English teachers regarding their reading difficulties. On the contrary, the 50 normal readers were selected randomly among the high achievers who obtained above 80 marks or Grade A in English language based on classroom assessment. The children were at the average age between the youngest 8years and 5 months and the oldest 9 years 2 months old. The different of the youngest and the eldest was 9 months old. They were 28 males and 22 females children were selected as respondents for the group of the children with RD. On the other hand, 29 males and 21 females were selected among the ESL high achievers. The total of one hundred samples was confirmed by their class teachers. Approval was obtained from the teacher supervisor who was the person in-charge foe afternoon school session. The parents of respondents were then given consent letters by their class teachers. The participation of respondents was on the voluntary basis.

The samples involved have attended at least 2 years formal pre-school curriculum in kindergarten. They have also exposed to the English language since attending the early education. However, none of the children spoke English as their first language at home and all of them were ESL children. This study had chosen standard three children as subjects study because this group of children had received a certain

amount of English language input. Besides, they were expected to have adequate exposure in the ESL through out the first three years of formal primary education under the Malaysian education system. This academic level would be a crucial period for identifying children with learning difficulties especially in reading, mathematical calculation and writing skills.

RESEARCH INSTRUMENTS

There were two instruments used that are Cognitive Assessment System (CAS) and Wide Range Achievement Test Fourth Edition (WRAT-4) in this study. First, the cognitive functions of PASS were operationalised by CAS in assessing the cognitive functions that consists of four subscales Planning, Attention, Simultaneous and Successive. The four subscales comprise of three subtests for representing the whole score of the cognitive functions. There were 5 subtests which have translated into Malay language that involved 2 subtests of Simultaneous subscale Nonverbal Matrices (NM) and Verbal-Spatial Relations (VSR); 2 subtests of Successive subscale Words Series (WS) and Sentence Repetition (SR); and 1 subtests of Attention Expressive Attention (EA). This study utilised the basic battery of CAS that only involves 8 subtests out of total 12.

In the Planning Scale, the first subtest Matching Numbers that consists of four pages contains eight rows of six numbers per row of each page. The subjects are instructed to underline the two numbers in each row that are the same. Numbers increase in length from one digit to seven digits across the four pages, with four rows for each digit length. Each item has a time limit. The subtest score is based on the combination of time and number correct for each page. Secondly, Planned Codes subtest contains two pages, each with a distinct set of codes and arrangement of rows and columns. An example is shown at the top of each page how letters correspond to simple codes (e.g., A, B, C, and D correspond to OX, XX, OO, and XO, respectively). Every page contains seven rows and eight columns of letters without codes to be filled by subjects. The subjects are instructed to fill in the appropriate code in the empty box beneath each letter. On the first page, all the As appear in the first column, all the Bs in the second column, all the Cs in the third column, and so on. On the second page, letters are configured in a diagonal pattern. The subjects are permitted to complete each page in whatever fashion he or she wishes. The subtest score is based on the combination of time and number correct for each page.

For the Attention Scale, the first subtest Expressive Attention uses two different sets of items depending on the age of the subjects. Subjects with 8 years and older are presented with three pages. On the first page, the subject reads color words (i.e., *BIRU*, *KUNING*, *HIJAU*, and *MERAH*) presented in quasi-random order. Next, the subjects name the colors of a series of rectangles (printed in blue, yellow, green, and red). Finally, the words *BIRU*, *KUNING*, *HIJAU*, and *MERAH* are printed in different colors than the colors of the words itself. The subjects are instructed to name the color ink of the words rather than to read the words of colours. The first two pages are to familiarise the subjects with the words and colours patterns. The score will be counted on the last page which is used as the measure of attention. The subtest score is based on the combination of time and number correct. The second subtest Number Detection consists of pages of numbers that are printed in different formats. On each page, the subjects are required to find a particular stimulus (e.g., the numbers 1, 2, and 3 printed in an open font) on a page containing many distractors (e.g., the same numbers printed in a different font). There are 180 stimuli with 45 targets or 25% as targeted numbers on the pages. The subtest score reflects the ratio of accuracy (total number correct minus the number of false detections) to total time for each item summed across the items.

In Simultaneous Scale, Nonverbal Matrices a 33-item subtest uses shapes and geometric designs that are interrelated through spatial or logical organization. The subjects are required to decode the relationships among the parts of the item and choose the best of six options to match a missing space in the grid. Every item is scored as correct or incorrect for 1 score or 0 score. The subtest score is based on the total number of items correctly answered. Secondly, the Verbal-Spatial Relations subtest consists of 27 items require the comprehension of logical and grammatical descriptions of spatial relationships. The items contain six drawings and a printed question at the bottom of each page. Items involve both objects and shapes that are arranged in a specific spatial manner. For example, the translated item, "*Gambar manakah menunjukkan bulatan di atas segiempat sama yang di sebelah kanan segitiga dan sebelah kiri palang*?" includes six drawings with various arrangements of geometric figures, only one of which matches the description. The examiner reads the question aloud, and the subjects are required to select the option that matches the verbal description. The subjects must indicate his or her answer within a 30 seconds time limit. The subtest score reflects the total number of items correctly answered within the time limit.

In Successive Scale, Word Series the first subtest requires the subjects to repeat words in the same order as stated by the examiner. The test consists of the following 9 single-syllable and high-frequency words such as *Book, Car, Cow, Dog, Girl, Key, Man, Shoe, Wall*. The examiner reads 27 items to the subjects. Each series ranges in length from 2 to 9 words. Words are presented at the rate of 1 word per second. Items are scored as correct if the subjects reproduce the entire word series. The subtest score is based on the total number of items correctly repeated. Secondly, Sentence Repetition requires the subjects to repeat 20 sentences that are read aloud. Each sentence is composed of color words (e.g., "*Kuning itu menghijau biru*"). Words are presented at the rate of 2 words per second. The subjects are required to repeat each sentence exactly as presented. Color words are used to reduce the influence demands of the syntax of the sentence in order to contain little semantic meaning. An item is scored as correct if the sentence is repeated exactly as presented. The subtest score reflects the total number of sentences repeated correctly.

The second instrument used in this study was WRAT- 4. WRAT-4 consists of four subtests that measure the academic skills namely, Word Reading, Sentence Comprehension, Spelling, and Math Computation. In this study, there were three reading skills that involved representing the measure of reading processes such as decoding, comprehension and retention. The first subtest of WRAT – 4 is Word Reading that measures letter and word decoding through letter reading (15 items) and word reading (55 words). The letter reading section was administered to children who do not meet the basal scoring guidelines for the Word Reading subtest. It assumed to measure letter and word recognition rather than speech or dictation that representing the decoding process in reading.

Secondly, the Sentence Comprehension subtest measures an individual's ability to gain meaning from words and to comprehend ideas and information contained in sentences through the use of a modified cloze technique. The Sentence Comprehension subtest contains 50 items of one to two sentences each, where the participants fill in the blank with one or two words to indicate their comprehension of the sentence. The third subtest of reading skills in WRAT-4 is Spelling subtest. It measures an individual's ability to encode sounds into written form through the use of a dictated spelling format containing both letters and words. The Spelling subtest is made up of two parts. The first part, administered to children aged 7 years or younger, includes letter writing (i.e., 13 letters must be written); the second part consists of 42 words that must be spelled correctly. Finally, Reading Composite is the score which combines the standard scores of the Word Reading and Sentence Comprehension subtests to provide a more comprehensive measure of reading achievement.

Both, the instruments obtained high reliability which according to Naglieri (1999), a CAS reliability coefficient for standard full scale is 0.96 and basic full scale is 0.87. The full average reliability coefficients for the four subscales are Planning (0.88), Attention (0.88), Simultaneous Processing (0.93), and Successive Processing (0.93). On the other hand, Wilkinson & Robertson (2006) had conducted an analysis in reliability for the WRAT – 4 that showed high levels of ranging from 0.92 to 0.98.

REMEDIATION PROGRAMME

The PASS Reading Enhancement Program (PREP) was identified and used as the remediation program or intervention following their pre-tests and grouping. The PREP is a remedial program for primary school-aged children who are experiencing difficulties with reading, spelling, and comprehension. It is based on the PASS theory of intelligence and should be understood within the framework provided by the PASS theory (Das 2009). The experimental group was given PREP program and its tasks included four mainly successive processing enhancement tasks and four mainly simultaneous processing enhancement tasks. According to Das (1996), the training tasks in PREP are aimed at improving the information-processing strategies that underlying reading, namely Simultaneous and Successive processing, while avoiding the direct teaching of word-reading skills. However, Das (2005) stressed on the Attention and Planning are also important where Attention processing required for performing each task and Planning processing encouraged for discussing strategies and solutions both during and following the tasks.

The PREP program consists of eight tasks which vary considerably in content and in what they require for children. Each task involves both a global training component and a curriculum-related bridging component. The global component consists of structured non-reading tasks that require the application of Simultaneous and Successive strategies. The bridging component involves the same cognitive demands as its global component, and provides training in Simultaneous and Successive processing strategies that are closely linked to reading and spelling (Das, Naglieri & Kirby 1994). The following explanation describes the eight tasks of PREP in detail.

a. Successive Processing Tasks

Joining shapes. The global component of the task requires the participant to join a series of geometric shapes following a series of verbal instructions and a set of rules provided by the facilitator. Difficulty is increased by number of shapes and number of instructions induced. The bridging component requires the participant to join a series of letters following a set of rules to make words. Difficulty is increased by increasing word length. This task facilitates the development of successive processing. Working memory for rules is demanded in this task.

Connecting letters. The global component of this task involves lines of differing colours connecting a letter on the left side of the page to a letter on the right side. The participant is required to follow these lines and find their corresponding letters; the difficulty level of the task is increased by changing the coloured lines to black lines and then including distracter lines among them. The bridging component again requires the participant to follow lines, but this time there are 2-4 lines intercepted on each line. The participant connects the letters mentally and says/writes the word spelled by the letters. In this task, word decoding is the salient reading skill enhanced by successive processing.

Window sequencing. In the global component of this task, the participant produces a series of shapes (colour is held constant), colours (shape is held constant) or coloured shapes (colour and shape

vary) presented by the facilitator. The difficulty level of the task is increased by increasing the number of items in the series. In the bridging component, the participant reproduces a series of letters in the same order presented by the facilitator and says/writes the word produced by the letters. The difficulty level of the task is increased by increasing the phonetic complexity of the words used. The task facilitates the development of successive processing. Short-term memory is utilized for phonemic awareness.

Transportation matrices. In the global component, various transportation pictures are presented along with some distracters (pictures) in a changed sequence after the original presentation by the facilitator. The participant is to find and rearrange the originally seen pictures. Difficulty level of the task increases by increasing the number of pictures in the series. The bridging component involves two tasks. The first one requires the participant to reproduce a series of letters in the correct order and state the word formed by the letters. The difficulty level corresponds to the phonetic complexity of the words. The second task requires the participant to memorize and recall sets of words made up of semantically related word pairs. Difficulty level increases by increasing the number of words in the series. This task facilitates the development of both simultaneous and successive processing.

b. Simultaneous Processing Tasks

Tracking. There are two versions of the global component of this task. In the first version, the participant is presented with a "village map," with "numbered houses" and "lettered trees" and tracking cards that illustrate a path from a starting point to either a house or a tree. The participant is to survey each card and map and locate the number of the house or the letter of the tree on the map. In the second version, the participant is presented with a "letter map" and tracking cards with squares identified by a letter of the alphabet and is to locate the appropriate lettered square. The house and tree identification are the tasks of difficulty level 1 and level 2, respectively, whereas the level 3 task involves identification of lettered squares. Both parts encourage the use of planning and simultaneous processing. In the bridging component, the participant is given a printed text consisting of two separate story segments. The task is to study the illustration, read the printed text, and answer a number of questions related to each segment using some of the cues in the illustration. This task facilitates the development of simultaneous processing as well as its application in *text comprehension*.

Shape design. In the global component of this task, the participant is required to study a design presented for 10 seconds and reproduce the design with the coloured shapes provided. The shapes are presented in three colours (red, blue, and yellow) and two sizes (big and small). The difficulty level increases with the complexity of the design. In the bridging component, the participant reads a phrase or story from a card that describes how animals are arranged in relationship to one another. The participant visualizes the scene with the animals positioned appropriately and then arranges the animals to correspond with the scene as described in the phrase or story. Three difficult levels are presented, each corresponding to the number and complexity of relationship. This task involves the use of simultaneous processing, and its bridging part, *verbal planning* and *comprehension*.

Shapes and objects. In the global component of this task, the participant is given a series of pictured objects and is required to match the general shape of the items to one of three abstract geometric shapes. In the bridging component, the participant is presented with sets of sentences belonging to certain categories along with a distracter in each set. The participant reads the sentences with or without the support of the facilitator, groups them into categories based on their semantic content, and identifies the distracter in each set. Clearly, the task facilitates the development of simultaneous processing and encourages forming verbal categories, abstraction, and *comprehension*.

Sentence verification. In the global component of this task, the participant is shown a set of photographs that have similar themes. Each set is accompanied by a short printed passage that the participant reads with or without the facilitator's support and chooses the photograph that best matches the passage; this has three levels of difficulties. In the bridging component, the participant is shown a single photograph and given 3-4 short passages to read after which he or she chooses which passage best matches the photograph. The bridging task is completed in three sessions. This task demands *text processing* in both its global and bridging part.

Based on the details about Simultaneous, it was evident that the tasks encourage reading words for meaning, inference generation after reading a passage, increasing awareness when children do not understand what they have read, and enhance the working memory to form mental representations of text—these are the skills mentioned earlier in the introduction and are designed to increase the comprehension level. Most of the strategies that are associated with comprehension—which we list again as a reminder—are found in these Simultaneous PREP tasks. These strategies include readers activating relevant background information, generating inferences while reading, being less aware of when they do not understand what they read, and combining information in working memory to form mental representations of text (Yuill & Oakhill 1991).

RESEARCH PROCEDURE

This study had started upon identification of children with RD and normal readers. The descriptive study at the first stage was to obtain the cognitive ability and reading performance of normal readers and their differences with the children with RD. Therefore, it involves 50 normal readers and 50 children with RD. Later part of this study is a quasi experimental study which was estimated only the 50 children with RD from this study to be randomly selected and equally allocated to the two subgroups groups with 25 children each of experimental group and control. For the first study, all samples were first assessed for the PASS cognitive functioning profiles by CAS and reading profiles by WRAT-4. Cognitive Functions of PASS processes are Planning, Attention, Simultaneous and Successive; while reading processes are Word reading, Reading Comprehension and Spelling. Children who were identified and chosen for participation were placed on a schedule for testing and intervention purposes. It took about 45 minutes for administrating CAS while about 30 minutes for administrating WRAT – 4. In the second part of study, the experimental group received 15 to 20 minutes of intervention session daily, 4 to 5 sessions per week, for a total of 20 sessions of instruction. Intervention was instructed by 2 trained instructors who handled 1 session daily for 3 groups each one while control group remained in the regular school classes as usual. These instructors were selected from those who had at least 2 years teaching experience especially handling school children. They were trained with 5 session module instructions, video demo presentation and hand-on experience in handling PREP. Five days of initial training occurred before program implementation. Additional monitoring by experimenter occurred during the actual intervention program. A conference occurred between the instructors and the experimenter after each session of intervention. This aimed to reduce any distinct of instructions and determined coordination during the intervention activities. The intervention program had taken about 2 months for completing all the PREP tasks. Teacher fidelity to program implementation with every group was checked at the end of each session. The discussion with the researcher in this brief helped in coordinating and reduced the possibility in Type 1 and Type 2 errors. Besides, there were 10 minutes meeting session conducted on the instructors for regular problems checking and information sharing for that particular session. After the intervention program, post-test was conducted as pre-test procedure for CAS and WRAT-4. The collected data of pre-test and post-test was processed by computer based program for CAS which is *CAS*

Rapid Score and manually for WRAT-4. The data then was analysed statistically by using SPSS program.

RESULTS

Table 1.0 shows the differences of four PASS subscales of CAS and the reading processes of WRAT-4 mean scores between normal readers (N = 50) and children with RD (N = 50). Statistical measure of independent sample t-test was used in the analysis of significant differences. For the Full Scale of CAS, normal readers obtained higher mean scores (M = 109.46, SD = 8.32) than children with RD (M = 86.80, SD = 9.64), and it shows significant difference between these two groups with t=12.58 and $p < 0.001$ at 95% level of confidence. The results shows that all the cognitive processing of PASS was significantly distinguished the normal readers. Planning (M = 114.72, SD = 10.42), Simultaneous (M = 100.84, SD = 11.79), Attention (M = 109.04, SD = 8.74) and Successive (M = 103.66, SD = 13.31) of PASS scales scores of normal readers were significantly higher than children with RD where the four subscales were Planning (M = 95.82, SD = 10.31), Simultaneous (M = 79.00, SD = 9.56), Attention (M = 95.32, SD = 11.25) and Successive (M = 91.88, SD = 10.53). The most significant different value of t-test for the four PASS scales was Simultaneous subscale (t = 10.17) following with Planning (t = 9.17), Attention (t = 6.81) and Successive (t = 4.91) at $p < 0.001$ significant level. However, all the CAS subtests shows significant difference between normal readers and children with RD. The subtest of Nonverbal Matrices of Simultaneous depicted the highest significant difference with the results t = 9.17, $p < 0.001$ and the lowest significant difference was Sentence Repetition t = 3.91, p = 0.0002 of Attention respectively.

Table 1.0 : The differences of CAS and WRAT- 4 between normal readers and children with RD

	Normal (N=50)		RD (N=50)		Independent *t*-test	
	M	SD	M	SD	*t*	*p value*
WRAT-4 Subscales						
Word Reading	121.30	14.94	85.78	14.26	12.16	$p < 0.001$
Comprehension	89.90	10.51	66.64	5.12	14.07	$p < 0.001$
Spelling	110.20	11.02	68.00	12.07	18.25	$p < 0.001$
Reading Composite	105.44	12.19	74.20	7.40	15.49	$p < 0.001$
CAS Subscales						
Planning	114.72	10.42	95.82	10.31	9.17	$p < 0.001$
Matching Numbers	12.54	2.30	8.82	2.17	8.30	$p < 0.001$
Planned Code	12.42	1.74	9.78	1.85	7.34	$p < 0.001$
Simultaneous	100.84	11.79	79.00	9.56	10.17	$p < 0.001$
Nonverbal Matrices	11.38	2.81	6.54	2.43	9.21	$p < 0.001$
Visual-spatial Relation	8.92	2.07	7.00	2.25	4.44	$p < 0.001$
Attention	109.04	8.74	95.32	11.25	6.81	$p < 0.001$
Expressive Attention	12.78	1.79	9.96	2.15	7.12	$p < 0.001$
Number Detection	10.24	1.85	8.46	2.48	4.08	$p < 0.001$

Successive	103.66	13.31	91.88	10.53	4.91	$p < 0.001$
Word Series	12.66	3.26	9.88	2.21	4.99	$p < 0.001$
Sentence Repetition	8.64	2.15	6.94	2.19	3.91	$p = 0.002$
Full Scale	109.46	8.32	86.80	9.64	12.58	$p < 0.001$

$p < 0.001$

The comparison of means and SD for the CAS and WRAT-4 in the between and within the groups of experimental group and control group for pre-test and post-test was conducted. Both experimental groups and control groups were found to be "average" with respect to their overall intellectual functioning (Full Scale score on CAS was within the range of 91-98), but varied in respect to their weakness in individual cognitive process which was simultaneous process to be "low average"(within the range 86-87). However, there was an increase for both groups from "low average" to the "average" level. This was an interesting improvement within certain the time frame with and without the intervention. In order to understand the effect of the PREP program on these processes as whole, a MANOVA with the difference scores (post-test minus pre-test) for the four PASS processes as dependent variable and group as the between-subject factor was performed. The MANOVA results indicated the significant difference between the scores, Wilks' $\Lambda = 0.817$, $F(4, 45) = 5.22$, $p < 0.001$, but the differences between the groups were not, Wilks' $\Lambda = 0.950$, $F(4, 45) = 1.236$, $p = 0.301$.

Table 1.1 : CAS and WRAT-4 standard score mean and standard deviations of pre-test and post-test for experimental and control groups among children with RD

	Experimental Group (n=25)				Control Group (n=25)			
	Pre-test		Post-test		Pre-test		Post-test	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CAS Subscales								
Planning	98.08	10.31	101.56	10.99	93.56	10.00	97.84	10.15
Simultaneous	76.48	9.93	86.56	9.08	82.60	9.20	84.52	10.08
Attention	97.52	12.50	95.32	14.74	93.72	10.11	96.56	11.33
Successive	93.00	11.37	98.62	12.35	91.32	9.84	97.68	12.78
Full Scale	87.92	9.84	93.72	11.84	86.48	9.48	92.00	8.78
WRAT-4 Subscales								
Word Reading	85.24	13.85	94.80	16.18	85.32	16.02	90.60	15.12
Comprehension	66.56	5.50	78.04	3.08	66.48	4.89	76.24	5.06
Spelling	67.56	11.64	71.60	7.92	67.36	12.66	74.00	11.32
Reading Composite	74.00	7.22	85.12	8.91	73.84	8.30	82.00	9.02

$p < 0.001$

Table 1.2 Analysis of variance for pre-test and post-test of CAS and WRAT-4 by groups

	(Within Tests)		(Between Groups)		(Groups x Tests)	
	F	*Sig*	F	*Sig*	F	*Sig*
Cognitive Processes						
Planning	3.671	0.060*	3.841	0.053*	0.049	0.825
Simultaneous	10.677	0.002**	0.302	0.584	4.698	0.033**
Attention	0.042	0.838	0.484	0.488	1.221	0.272
Successive	6.354	0.013**	0.650	0.422	0.024	0.878
Reading Processes						
Word Reading	6.262	0.014**	0.128	0.722	0.521	0.472
Comprehension	126.584	0.000**	0.584	0.447	0.872	0.353
Spelling	4.56	0.035**	0.508	0.478	0.100	0.753
Reading Composite	35.03	0.000**	0.440	0.509	0.826	0.366

* **p* < 0.05,
* *p* < 0.10

The ANOVAs indicated that the scores were significantly different from zero for Planning, $F(1, 48) = 3.671$, $p = 0.060$, $\eta_p^2 = 0.036$; Simultaneous processing, $F(1, 48) = 10.677$, $p = 0.002$, $\eta_p^2 = 0.96$; and approached significance for Successive processing, $F(1, 48) = 6.345$, $p = 0.013$, $\eta_p^2 = 0.62$. While Attention processing was not significant, $F(1, 48) = 0.042$, $p = 0.838$, $\eta_p^2 < 0.001$. The group differences, there was no one subscale of CAS significant excepted Planning, $F(1, 48) = 3.841$, $p = 0.053$, $\eta_p^2 = 0.038$. On the contrary, group differences for Planning processing, $F(1, 48) = 0.05$, $p = 0.82$, $\eta_p^2 = 0.001$; Attention processing, $F(1, 48) = 5.92$, $p = 0.019$, $\eta_p^2 = 0.11$ and Successive processing $F(1, 48) = 0.06$, $p = 0.79$, $\eta_p^2 = 0.001$ which were not significant. When the equivalent group by time interaction was counted for significance, only Simultaneous processing, $F(1, 48) = 4.698$, $p = 0.033$, $\eta_p^2 = 0.047$ was

significant. The significant group difference suggests that the PREP program brought about improvement specifically in simultaneous cognitive process in the experimental group.

Besides, the effect of PREP program upon reading processes was also analysed using a factorial analysis of variance with two between-groups factors (experimental group vs. control group) and time factor (pre-tests vs. post-test). The analysis of ANOVAs revealed that the significant difference score before and after the intervention program; but not significantly distinguish between experimental group and control group on all the reading processes. The results of main effect for time shows that word reading $F(1, 48) = 6.262$, $p = 0.014$, $\eta_p^2 = 0.61$; reading comprehension $F(1, 48) = 126.584$, $p < 0.001$, $\eta_p^2 = 0.569$; spelling $F(1, 48) = 4.56$, $p = 0.035$, $\eta_p^2 = 0.45$; and approached significance for reading composite $F(1, 48) = 35.03$, $p < 0.001$, $\eta_p^2 = 0.267$. The results of main effect for group show no significant effect on any of the reading processes. Moreover, the group difference, equivalent group by time interaction, was not significant for all the reading processes which the results obtained that wording reading $F(1, 48) = 0.521$, $p = 0.472$, $\eta_p^2 = 0.05$; reading comprehension $F(1, 48) = 0.872$, $p = 0.353$, $\eta_p^2 = 0.09$; spelling, $F(1, 48) = 0.100$, $p = 0.753$, $\eta_p^2 = 0.001$ and reading composite $F(1, 48) = 0.366$, $p = 0.826$, $\eta_p^2 = 0.009$. This significant scores difference but not groups difference suggests that children with and without the PREP intervention program has improved in reading performance of WRAT-4.

DISCUSSION

The outcome of the study showed significant differences between normal readers and children with RD for all subtests of CAS and WRAT-4. The main finding of this portion of the study was that the scores Planning, Attention, Simultaneous, and Successive Processing scales were significantly different between normal readers and children with RD. These results indicated that normal readers performed not only better in the PASS cognitive processing that represents general intellectual ability; but also better in reading processes which include decoding, comprehension and retention processes than children with RD. The findings for the both groups showed that the normal readers scored significantly one level higher in their PASS cognitive processing and two levels above children with RD based on the U.S. standardization sample. The Simultaneous processing appears most responsible for the lower overall CAS Full Scale score for the children with RD. Planning score was relatively high depicts the advantage of normal readers in the overall cognitive ability. This finding warrants further corroboration given the size and characteristics of current sample.

The second finding of this comparison was the comprehension process of reading among children with RD was extremely low compare to normal readers who obtained a slightly average score. This difference yields a large effect on the overall performance between the two groups. It has been well documented that success in reading comprehension requires, for example, the use of strategies such as a) looking back at the information given, (b) distinguishing relevant from irrelevant information, (c) resisting the distraction caused by irrelevant information, and (d) using good methods to analyze the passage and answer the specific questions asked (Pressley 1998; Pressley & Woloshyn 1995). These could be the reasons which differentiate these two groups. There was also a wide significant difference on spelling scores which represented retention process of reading between the two groups. Normal readers scored substantially above average while children with RD scored extremely low for spelling subtest. This difference is consistent with the finding of Dirk et al. (2008) that implied reading disabilities had the difficulties to process the relationship with spelling and reading comprehension that measure different functions of cognition instead of a particular cognitive processing. This finding also

merits further research, particularly regarding the characteristics and the categories of the children with RD.

Children with RD earned CAS Full Scale mean score of 87 which is within the average classification based on norms. The Simultaneous scale was found to be a significant cognitive weakness. This means that children with RD performed poorly on tests that required them to see how parts of the tasks were related to complete the Simultaneous tests. These children's poor performance in Simultaneous is especially important because it is a weakness both in relation to her overall PASS score and in relation to standardization sample. This cognitive weakness has important implications for diagnosis or eligibility determination and remediation of children with difficulties in learning especially in reading.

According to Das (2009), poor readers show intellectual or cognitive processing problems in many areas, and not only in putting things in sequence. They may also experience problems in seeing relationships among words, objects or pictures, in sustaining attention, and/or in the ability to organise and plan ahead. This explained the cognitive processing ability as the indicator among these poor readers who distributed lower than average level of Full Scale scores of CAS. Furthermore, the single deficit in the particular processing which was Simultaneous processing caused majority of the poor readers difficulties of cognitive processing. The essential ingredient of Simultaneous processing is that ones must see how all the separate elements are interrelated in a conceptual whole. Naglieri (1999), Simultaneous processing involved in understanding grammatical statements that demand integration of words into a whole idea. This mean the children with RD at the age of average nine years in Malaysian primary school have difficulties in learning language especially ESL might have the major problem of Simultaneous processing of intellectual ability. Children with RD who are in the mid standard in primary have difficulties in understanding the language rather than reading the words of the language. It is quite relevant to say that Malaysian education requires children in standard three to form sentences could be one of the tasks that determine the children's ability in learning language with intellectual processing. As if the children do not have the ability in Simultaneous processing would have problems specifically integrating words in constructing sentences that requires grammatical rules and logical relationship and learning the language as a whole.

Besides the cognitive weakness of Simultaneous, Successive processes were identified weaker than the other two processes of Planning and Attention. According to Naglieri (1999), the reading disabled group had poor performance on the Successive Scale. These results are consistent with the view that children with reading decoding failure and phonological coding problems perform poorly in Successive processing (Das, Naglieri & Kirby 1994). These authors suggest that Successive processing problem and poor reading decoding are associated because assembly of correct sounds in order for example, sounding out words demands Successive processing. However the Successive processing was not identical cognitive weakness that significantly affected the overall functions of PASS processes. This finding provides clues to the questions why some children can read but they do not understand. It may explain that some children with RD have the ability in decoding words which involved the Successive processing, but lacking in Simultaneous processing causes the children fail to comprehend the words or sentences.

In contrast, the cognitive processing ability of normal readers was generally average based on norms. This finding explained the overall PASS cognitive processing for this group of children was relatively fine and almost half of the subjects even higher were at high average and superior level of cognitive ability. The profiles of these children show the overall intellectual ability or cognitive

processing was the indicator to equip them for better achievement. However, the Simultaneous and Successive processes were identified slightly lower than the Planning and Attention processes were similar to the finding of children with RD. They could share the same reasons that might be the contribution to the finding. The Simultaneous and Successive coding are being the processes which operate within levels and allow transitions between levels (Kirby & Williams, 1991). Some of the levels which have been described are those of letter features (the units of which letters are composed), letters, letter groupings associated with syllables, words, syntactic phrases, ideas or micro-propositions, and main ideas or macro-propositions (Kirby & Das 1990).

The important finding from the result among the normal readers was the Planning processing which had obtained higher than average for almost all the respondents. According the Naglieri & Das (1997c), Planning processing is a mental process by which the individual determines, selects, applies, and evaluates solutions to problems. For school children, planning processes are involved in many tasks of academic requirement. Naglieri (1999) explained children consider the ways to learn words and grammatical rules by various methods. Kirby & Das (1990) found that in skilled reading, the lower levels must operate automatically to allow attention to be devoted to the higher levels, and planning is required to keep the reader oriented toward the level at which the current task is focused. This supported the finding that normal readers obtained better ability in Planning processing in reading.

Providing early intervention for children with poor reading skills is dependent on accurate identification. Recently, researchers have turned a critical eye toward standardized measures of cognitive ability and reading achievement asking important questions about what these tests are actually measuring. CAS has the ability to provide the profiles of the general cognitive and the specific deficiency of single cognitive processing in reading. There is a concern that the insensitivity of intellectual ability (IQ) and reading proficiency at the primary level may be impeding early identification and intervention of reading deficits. The last part of this study report the findings of the effectiveness of CAS in providing the PASS related remediation to help to enhance the reading proficiency among children with RD.

The findings of the results showed significant increase before and after the intervention of PREP among the experimental group of children with RD. This increase was happened to all the subtests of WRAT-4 which were word reading, reading comprehension and spelling. It also showed the increase of scores for the PASS cognitive processing who received the PREP remediation program, except the Attention processing with $p = 0.164$. None significant result showed reverse effect for the Attention scale among the experimental group of children. While, the Attention processing among the normal readers did not show significant difference even there was a slight increase. However, the Full Scale score of PASS was significantly increased after the intervention of PREP program to experimental group.

On the other hand, control group showed that significant increase before and after the intervention without receiving PREP program also for all the subtests of WRAT-4 which were word reading, reading comprehension and spelling. By the way, the result showed the significant increase of scores for two of the PASS cognitive processing that were Planning and Successive processing without intervention program. While the Simultaneous ($p = 0.349$) and Attention ($p = 0.087$) processing were not significantly increased without receiving PREP remediation program among the normal readers. Similarly, the Full Scale score of PASS was significantly increased even though there was no intervention program involved among these children. The comparison between the experimental and control groups found that the increase of mean scores for every subtest in reading was higher for experimental group than control group after intervention. Further analysis of ANOVA was conducted on this particular processing to determine the actual effect of the interaction between the groups before and after intervention. The finding explained that experimental group tremendously outperformed control group for the mean score of

Simultaneous processing after intervention of PREP program. This might be the effect of the training of PREP program that stressed on the Simultaneous processing. There was no correlation for readings subtests with the school based English test and that might be the tentative reason of no significant differences for the reading performances before and after the intervention.

CONCLUSION

In a nut shell, the PREP remediation program has effectively enhanced the Simultaneous processing among the children with RD. The Attention processing might be one of the determinants to the problem of reading difficulties among the children. Moreover, the effect of PREP upon reading processes were not significantly distinguished the experimental group and the control group, but it had given better effect to the experimental group compared to control group in terms of overall reading performance that comprised of both word reading (decoding) and reading comprehension (comprehension). This finding concluded that the increase of the Simultaneous processing might help to enhance the overall reading among children with RD. Similarities in the cognitive processes relevant to reading comprehension have been found for monolingual and ESL readers. Specifically, phonological processing, verbal working memory, and syntactic awareness can explain reading comprehension performance for native English speakers and ESL speakers (Low & Siegel 2005). Vocabulary knowledge may play a key role in reading comprehension performance for ESL readers as well. Specifically, weaker vocabulary knowledge of children learning a second language is likely to have an impact on their reading comprehension abilities (Hutchinson et al. 2003; Sen & Blatchford 2001).

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