Pass Cognitive Processing: Comparison between Normal Children with Reading Difficulties

Ooi Boon Keat, MSc
Khaidzir bin Hj. Ismail, PhD

School of Psychology and Human Development Department
Faculty of Social Science and Humanities
National University of Malaysia
Bangi, Selangor, Malaysia
E-mail: gunehmia@yahoo.com,* izay@ukm.my**

Abstract

This study compared 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. CAS was administered individually to 50 normal readers and 50 children with RD of primary Standard 3 English as the second language (ESL) learners in Selangor, Malaysia. This study was a descriptive design that aimed to obtain profiles of the CAS and to determine the specific weakness of cognitive processing among the subjects. There were distinct PASS cognitive profiles among the normal children and children with RD. There was significant differences for both PASS cognitive processing and reading processes between the normal readers and children with RD. Overall, the poor readers were significantly low for Simultaneous processing identified as cognitive weakness. While the normal readers didn't show any significant weakness or strength in their overall cognitive processing of PASS. The findings were also suggested the consideration of cognitive functioning to enhance reading among Malaysian children.

Keywords: Child Psychology, PASS, Cognitive Assessment System (CAS), Reading Difficulties (RD), English as the Second Language (ESL)

1. Introduction

Cognitive development typically refers to age-related changes in knowledge and acts of knowing, such as perceiving, remembering, problem solving, reasoning, and understanding. The development of cognition is studied most frequently in infants, children, and adolescents, where changes often are relatively rapid and striking. Since the 1890s, when researchers such as James Mark Baldwin and Alfred Binet established cognitive development as a substantive area of inquiry, two overlapping goals were evident. One goal is to provide insights into how complex, organized knowledge systems develop an issue with a long history in philosophy and science (Cohen 1997). The other goal is to provide insights into optimizing human development, especially with respect to education. Luria's PASS cognitive processes theory explains cognitive processes from three major perspectives which are the information processing, cognitive processing and neuropsychological functioning. These processes refer to the mental activities which involved attention (first unit of brain), simultaneous and successive processing (second unit of brain), and planning (third unit of brain) cognitive processes that called as PASS theory.Naglieri et al (2006) suggested that a cognitive approach to reconceptualizing intelligence offers a viable alternative to a traditional general intelligence approach that g factor.

The study was particularly important because the PASS scales do not use achievement-like subtests (e.g., Vocabulary and Arithmetic) that would affect the correlation between tests of ability and achievement. Naglieri & Bornstein (2003), the more similarity in content between ability and achievement tests, the more contaminated the correlation between the two. Moreover, measures of cognitive processing without achievement-like subtests are more appropriate than achievement-laden tests for children with a history of school problems and especially for culturally and linguistically diverse populations (Suzuki & Valencia 1997). McCrea (2007) used the Cognitive Assessment System (CAS) to measure the performance of the patient at 1 and 6 months after traumatic brain injury. The study indicated on the basis of cognitive functions of PASS theory which is suggestive of lasting frontal-executive dysfunction in this patient. At the same time, the findings explained that the functions of frontal lobe which had caused to some degree of bilateral representation of linguistic functions. It was quite relevant to explain the cognitive functions of Planning for regulating and problem solving which has connection with arithmetic and verbal linguistic abilities. It supported the facts that the cognitive abilities depend on the cognitive functions and processing rather than overall abilities.

Naglieri et al. (2007) compared the performance of referred bilingual Hispanic children on the Planning, Attention, Simultaneous, Successive (PASS) theory as measured by English and Spanish versions of the Cognitive Assessment System (CAS; Naglieri & Das 1997a). Small mean differences were noted between the means of the English and Spanish versions for the Simultaneous and Successive processing scales. The findings showed that these children performed consistently as cognitive processing despite the language difference. Fein and Day (2004) studied the PASS theory of intelligence and the acquisition of a complex skill by examining the criterion-related validity of CAS scores with respect to the acquisition of a complex skill. It was acceptable to link the successive processing with overall performance of all learning for computer-based task. This is because the Successive process is the systematic process that require a person to process information in order which is the must process in aviation. The simultaneous processing provides the overall understanding of the links for every task to perform at the better effect of the task. While, attention is the process of cognition that requires focus, a selective and sustainable effort in completing a task and it was relevant to the skill-based learning measure. The non-significant score of Planning processing might be the reason of the dynamic aviation environment itself that need not much strategy and meta-cognitive processing compare to systematic and order processing for carrying out the tasks.

On the other hand, Rosadah (2004) found that overall performance of PASS cognitive processing was lower for average students compared to talented students. The findings showed that talented students and average students at secondary level were determined by the Successive and Simultaneous processing in their academic performances rather than the Planning and Attention processing of PASS. This was relevant to the previous findings that explained the Successive and Simultaneous processing were related with learning Difficulties (LD). Kroesbergen, Van Luit & Naglieri (2003) suggested that students with mathematical learning difficulties (MLD) were indeed show relatively lower scores on the four PASS scales and on the CAS Full Scale as well. It revealed a relation between specific math difficulties and specific PASS processes. Naglieri et al. (2005) examined the relationships between intelligence, ratings of behavior, and continuous performance test scores in a specialty clinic. The study suggested that children with self-regulation problems like ADHD differ in their response to academic interventions designed to teach them to be more self-controlled. Naglieri & Gottling (1995, 1997), Naglieri & Johnson (2000), and Haddad et al. (2003) found that children with and without planning deficits responded differently to the same academic instruction. Those with low Planning scores on the CAS benefited considerably more than children with adequate Planning scores when given an instruction that helped them learn to be more self-regulated.

Van Luit, Kroesbergen & Naglieri (2005) found that both Dutch and American children with ADHD demonstrated relatively low scores on the Planning and Attention scales of the CAS, but average scores on the Simultaneous and Successive scales. These findings are similar to previously published research suggesting that the PASS theory, as operationalized by the CAS, has sensitivity to the cognitive processing difficulties found in some children with ADHD. It is also consistent with Barkley (1994) described ADHD as "delay in the development of response inhibition and profound disturbance in self regulation and organization of behaviour across time". Furthermore, most of the children with ADHD in the study were in a school for children with special educational needs. The most important feature of these children was their hyperactivity and attention problems were reported. It was possible that these children also had minor learning problems which were not examined. Cognitive remediation is important to impose in learning. Kamps et al. (2008) suggested that children with direct intervention of whether cognitive processing remediation or curriculum based interventions are needed in critical early literacy skills and some even advanced to grade-level performance.

Elleman (2009) explained that providing early intervention for children with poor comprehension is crucial on accurate remedial. There is a concern that the insensitivity of reading comprehension level may be impeding early identification and intervention of reading comprehension deficits. This is an important implication for CAS as an alternative and possibility to provide appropriate identification for the cognitive processing factor of reading comprehension. Dirks et al. (2008), children with combined reading and arithmetic disabilities seem to have more generalized achievement difficulties than single-deficit groups. Shapiro et al. (2008) reported the importance of speech processing skills and other baseline skills such as IQ and memory, motor, rhyme, speed and accuracy were correlated with the crucial predictive skills. These findings are relevant to discuss the successive process of PASS theory which involves speech and auditory processing as the basic required skills in reading and phoneme skills. Also, previous studies reported children who have difficulties in reading such as Dyslexia are having weakness in successive cognitive processing. Siegel & Lipka (2007) found that English as a Second Language (ESL) children developed strong reading skills and their status as ESL speakers did not put them at risk for reading difficulties in Standard 3.

It is considerable to explain ESL children who are facing difficulties in reading are most probably caused by the cognitive processing problems rather than literacy level. These findings have given support to the PASS theory of cognitive processing in identifying deficits especially for academic tasks.

2. Method

2.1 Participants

This study selected a national primary school which is SK Bandar Tun Hussein Onn as research location. This study involved ESL poor achievers from remedial classes and the ESL normal readers who performed well among the standard three primary children. The selection of the children with RD was based on the classroom assessment who obtained below passing 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% or graded A for the marks in English language based on classroom assessment. The children were at the average age between the youngest 8 years 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.

2.2 Procedures

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. 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. All samples were first assessed for the PASS cognitive functioning profiles by CAS individually. It took about 45 minutes for administrating CAS. The collected data was processed by computer based program for CAS which is *CAS Rapid Score*. The data then was analysed statistically by using SPSS program.

2.3 Instruments

The instrument used is Cognitive Assessment System (CAS) in this study. 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 (*Bahasa Malaysia*) 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. 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).

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 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. *BLUE, YELLOW, GREEN*, and *RED*) 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 *BLUE, YELLOW, GREEN* and *RED* 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, "Which picture shows an arrow pointing toward a circle that is in a square?" 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., "The purple yellow are green and the reds are white. Who are green?"). 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.

3. Results

Table 1 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 two groups. 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 which 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.

Insert table (1) about here

Statistical significance of *pairwise comparisons* was used in order to identify the significant strengths or weaknesses of the PASS cognitive processing among the children with RD. The *d* value of Simultaneous processing scale was 10.5 which the higher *d* value among the PASS subscales as shown in the Table 2. The Simultaneous processing was then identified as the significant weakness of the PASS scales of CAS with confidence level $p = 0.10$ with $d > 9.7$. It was slightly not a significant cognitive weakness of PASS scales at the $p = 0.05$ significant level with $d < 10.8$. The mean and standard deviation of the Simultaneous scale (M = 79.00, SD = 9.56) which was the lowest score of the four PASS subscales as mentioned earlier. While others subscales of as Planning (M = 95.82, SD = 10.31), Attention (M = 95.32, SD = 11.25), and Successive (M = 91.88, SD = 10.53) were at the average level. The score of Simultaneous scale caused the full scale score falling at the lower average (M = 86.80, SD = 9.64) of all. These results indicated that the Simultaneous processing was the significant cognitive weakness of PASS cognitive processing identified by CAS among the children with RD. It was considered as a major influent upon the difficulties in reading among the subjects. However, the other three cognitive processing Planning, Attention and Successive were the relatively low to some of the children with RD who scored the Full Scale standard scores of PASS lower than average level of CAS as stated 28% or 14 of the poor readers or children with RD.

Insert table (2) about here

While the results show no significant strengths or weaknesses of PASS cognitive processing identified among the normal readers. The *d* values of four PASS cognitive processing scales were Planning ($d = 7.65$), Simultaneous ($d = -6.23$), Successive ($d = 1.97$) and Attention ($d = -3.41$) which lower than the standardized *d* values with confidents level of either $p = 0.05$ or $p = 0.10$ as shown in the Table 3. However, the results depicted the slightly difference of Simultaneous and Successive processing which were relatively weak among the PASS scales. The mean and standard deviation of the Simultaneous processing (M = 100.84) score and Successive processing (M = 103.66) score which were lower than the compared mean (M = 107.07) score. In contrast, the Planning processing (M = 79.00) was slightly higher compare to the compared mean score (M = 107.07). It was to say that the Planning processing for the normal readers was stronger among the PASS scales which were not significant. These results indicated that there was not significant cognitive strengths and weaknesses found among the normal readers; Planning processing was relatively better, but Simultaneous processing and Successive processing were relatively weak among the PASS cognitive processing identified by CAS.

Insert table (3) about here

4. *Discussion*

The outcome of the study showed significant differences between normal readers and children with RD for all subtests of CAS. The main finding revealed that the scores Planning, Attention, Simultaneous, and Successive Processing scales were significantly different between normal readers and children with RD. These results indicated that the normal readers scored significantly one level higher in their PASS cognitive processing than children with RD based on the American standardization sample. 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 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. 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 processing was 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.

5. Conclusion

In a nut shell, The purpose of this study was to explore the PASS profiles of cognitive processes among the ESL poor achievers and normal readers. The profiles were obtained and compared. There were distinctions that differentiate among the normal readers and poor readers in terms of cognitive ability and reading performance. The Simultaneous processing appears most responsible for the lower overall CAS Full Scale score among children with RD. Planning score was relatively high that depicts the advantage of normal readers in the overall cognitive ability. This finding warrants further corroboration given the size and characteristics of current sample. Providing early intervention for children with poor reading skills is dependent on accurate identification. Recently, researches 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 that best predicted difficulties in learning the language. 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.

Table 1: The differences of CAS and WRAT- 4 between normal readers and children with R

	Normal (N=50)		RD (N=50)		Independent *t*-test	
	M	SD	M	SD	*t*	*p value*
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	$p < 0.001$

$p < 0.001$

Table 2 : Comparison of discrepancies between each combination of PASS Scale standard score and the average PASS score required for significance for the Basic Battery among children with RD.

PASS Subscales	**M**	**SD**	***d values***	**Significance value**		**PASS Difference**
				p = 0 .10	***p =0.05***	
Planning	95.82	10.31	5.5	11.6	13.0	Non Significant
Simultaneous	79.00	9.56	-11.5*	9.7	10.8	Significant Weakness
Attention	95.32	11.25	4.5	12.0	13.4	Non Significant
Successive	91.88	10.53	1.5	9.5	10.6	Non Significant
Compared Mean	90.50					
Full Scale	86.80	9.64				

* $p < 0.05$

Table 3 : Comparison of discrepancies between each combination of PASS scale standard score and the average PASS score required for significance for the Basic Battery among normal readers.

PASS Subscales	M	SD	*D values*	Significance value		PASS Difference
				$p = 0.10$	$p = 0.05$	
Planning	114.72	10.42	7.65	11.6	13.0	Non Significant
Simultaneous	100.84	11.79	-6.23	9.7	10.8	Non Significant
Attention	109.04	8.74	1.97	12.0	13.4	Non Significant
Successive	103.66	13.31	-3.41	9.5	10.6	Non Significant
Compared Mean	107.07					
Full Scale	109.46	8.32				

* $p < 0.05$

References

Barkley, R. A. (1994). *ADHD in the schools: Assessment and intervention strategies*. New York: Guilford.

Cohen, D. (1997). *The secret language of the mind: A visual enquiry into the mysteries of consciousness*. London: Mitchell Beazley.

Das, J.P. (2009). *Reading Difficulties and Dyslexia: an interpretation for teachers*. New Delhi: Sage.

Das, J.P., Naglieri, J.A. & Kirby, J.R. (1994). *Assessment of cognitive process*. Needham Heights, MA:Allyn & Bacon.

Dirks, E., Spyer, G., Van Lieshout, E.C., & De Sonneville, L. (2008). Prevalence of combined reading and arithmetic disabilities. *Journal of Learning Disabilities*, 41(5):460-73.

Ellemen, A.M. (2009). Exploring dynamic assessment as a means of identifying children at-risk of developing comprehension difficulties. Dissertation of Dr. of Phil. in Special Education, Vanderbilt University.

Fein, E. C., & Day, E. A. (2004). The PASS theory of intelligence and the acquisition of a complex skill: a criterion-related validation study of Cognitive Assessment System scores. *Personality and Individual Differences, 37*(6), 1123-1136.

Haddad, F. A. (2004). Planning versus speed: an experimental examination of what Planned Codes of the Cognitive Assessment System measures. *Archives of Clinical Neuropsychology, 19*(2), 313-317.

Kamps, D., Abbott, M., Greenwood, C., Wills, H., Veerkamp, M. & Kaufman, J. (2008). Effects of small-group reading instruction and curriculum differences for students most at risk in kindergarten: Two-year results for secondary- and tertiary-level interventions. *Journal of Learning Disabilities*, 41(2), 101-114.

Khaidzir bin Hj. Ismail & Ooi Boon Keat. (2008). The Intelligence of Children with Reading Difficulties (RD) by Cognitive Assessment System (CAS). *e-Bangi, Journal of Social Sciences and Humanities*, 3(3):10.

Kirby, J. R., & Williams, N. H. (1991). *Learning problems: A cognitive approach.* Toronto, ON: Kagan and Woo.

Kirby, J. R., & Das, J. P. (1990). A cognitive approach to intelligence: Attention, coding and planning. *Canadian Psychology/Psychologie canadienne, 31*(4), 320-333.

Kroesbergen, E. H., Van Luit, J. E. H., & Naglieri, J. A. (2003). Mathematical Learning Difficulties and PASS Cognitive Processes. *Journal of Learning Disabilities*. 36(6), 574-582.

McCrea, S. M. (2007). Measurement of Recovery after Traumatic Brain Injury: A Cognitive-Neuropsychological Comparison of the WAIS-R with the Cognitive Assessment System (CAS) in a Single Case of Atypical Language Lateralization. *Applied Neuropsychology*. 14(4), 296-304.

Naglieri, J. A., Delauder, B. Y., Goldstein, S. & Schwebach, A. (2006). WISC-III and CAS: Which correlates higher with achievement for the clinical samples? *School Psychology Quarterly, 21*(1), 62-76.

Naglieri, J. A., Goldstein, S., Delauder, B. Y., & Schwebach, A. (2005). Relationships between the WISC-III and the Cognitive Assessment System with Conners' rating scales and continuous performance tests. *Archives of Clinical Neuropsychology, 20*(3), 385-401.

Naglieri, J. A., & Bornstein, B. T. (2003). Intelligence and achievement: Just how correlated are they? *Journal of Psychoeducational Assessment*, 21, 244-260.

Naglieri, J.A. & Johnson, D. (2000). Effectiveness of a cognitive strategy intervention in improving arithmetic computation based on the PASS theory. *Journal of Learning Disabilities*, 33(6), 591-597.

Naglieri, J.A. (1999). *Essentials of CAS Assessment*. New York: John Wiley & Sons.

Naglieri, J.A. & Das, J.P. (1997a). *Cognitive Assessment System*. Itasca, IL: Riverside Publishing.

Naglieri, J.A. & Das, J.P. (1997b). *Cognitive Assessment System Administration and Scoring Manual*. Itasca, IL: Riverside Publishing.

Naglieri, J.A. & Das, J.P. (1997c). *Cognitive Assessment System Interpretive Handbook*. Itasca, IL: Riverside Publishing.

Naglieri, J. A., & Gottling, S. H. (1997). Mathematics instruction and PASS cognitive processes: An intervention study. *Journal of Learning Disabilities, 30,* 513-520.

Naglieri, J. A., & Gottling, S. H. (1995). A cognitive education approach to math instruction for the learning disabled: An individual study. *Psychological Reports, 76,* 1343-1354.

Ooi Boon Keat dan Khaidzir Hj Ismail (2010). Sistem Penilaian Kognitif (CAS) : Satu Alternatif kepada Pengukuran Kecerdasan Minda. *Jurnal Psikologi Malaysia*, 24: 81-92.

Ooi Boon Keat & Khaidzir Hj Ismail (2010). The PASS cognitive functions of children with reading difficulties: a Malaysian study. *Procedia Social and Behavioral Sciences Journal*, 5: 2182-2193.

Rosadah Binti Abd Majid. (2004). *Satu Kajian Perbandingan Profil Pelajar Pintar Cerdas Akademik Dengan Pelajar Sederhana Akademik*. Ph.D Tesis UKM.

Shapiro, L.R., Hurry, J., Masterson, J., Wydell, T.N. & Doctor, E. (2008). Classroom implications of recent research into literacy development: from predictors to assessment *Dyslexia*, 15(1), 1-22.

Siegel, L.S. & Lipka, O. (2007). The development of reading skills in children with English as a second language. *Scientific Studies of Reading*, 11, 105-131.

Suzuki, L. A., & Valencia, R. R. (1997). Race-ethnicity and measured intelligence. *American Psychologist*,52, 1103-1114.

Van Luit, J. E. H., Kroesbergen, E. H., & Naglieri, J .A. (2005). Utility of the PASS Theory and Cognitive Assessment System for Dutch Children With and Without ADHD. *Journal of Learning Disability*, 38(5), 434-439.