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THE INTELLIGENCE OF CHILDREN WITH READING DIFFICULTIES (RD) BY COGNITIVE ASSESSMENT SYSTEM (CAS)

(Kecerdasan Minda Kanak-kanak yang Mempunyai Masalah Membaca Dengan Berdasarkan Sistem Penilaian Kognitif (CAS))

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ABSTRACT

This case study discusses one of the latest technology based instrument, the Cognitive Assessment System (CAS) in assessing cognitive functioning of Luria's three functional units of brain or theoretical base of *Planning, Attention, Simultaneous and Successive* (PASS). CAS is capable of measuring not only the cognitive ability and process but also of determining intervention purposes for children with specific needs. Therefore, this study aims to examine the PASS cognitive functions and the use of CAS to subjects with Reading Difficulties (RD). Profiles of the CAS were firstly obtained from children with RD, and then the PASS scale standard scores were compared by using United State norms. The specific weakness of cognitive functioning was detected from the children with ESL reading difficulties. CAS was administered individually to 50 ESL poor achievers in standard 3 at Sekolah Rendah Kebangsaan Bandar Tun Hussein Onn (SRKBTHO). There were distinct PASS cognitive profiles among the poor achiever of ESL children and gender was not the determinant. The PASS scale standard scores showed 41% (n=20) is at average level, 30% (n=16) at low average level, 26% (n=13) at below average level and only 2% (n=1) at well below average level. There was no significant difference between girls and boys in term of cognitive processing. However, the poor achievers of English as Second Language (ESL) children were significantly low for simultaneous processing which is highly related to the ability of comprehension.

Key words: Cognitive Assessment System (CAS), Reading Difficulties (RD), English as Second Language (ESL), PASS

ABSTRAK

Kajian kes ini membincangkan satu alat pengukuran baru Sistem Penilaian Kognitif (CAS) berasaskan rangka teoritis PASS Luria berkenaan fungsi otak manusia yang terdiri daripada 3 unit fungsi otak yang utama, iaitu Perancangan, Perhatian, Keserentakan dan Keberturutan. CAS bukan sahaja berkeupayaan mengukur process dan kecerdasan kognitif, tetapi juga boleh mengenal pasti tujuan intervensi bagi kanak-kanak istimewa. Kajian ini menggunakan CAS bagi mengukur fungsi kognitif dalam kalangan kanak-kanak yang mempunyai masalah membaca (RD) dalam Bahasa Inggeris sebagai bahasa kedua. Kelemahan kognitif tertentu telah dikenal pasti daripada skor dan profil CAS. CAS telah dijalankan di kalangan 50 orang dalam kanak-kanak darjah 3 dari Sekolah Rendah Kebangsaan Bandar Tun Hussein Onn (SRKBTHO). Data CAS diperolehi dan dibandingkan berdasarkan norma Amerika Syarikat. Data itu menunjukkan terdapatnya perbezaan profil pemprosesan kognitif PASS dalam kalangan subjek kajian tetapi tidak terdapat perbezaan yang signifikan mengikut jantina. Keputusan kajian menunjukkan bahawa 41% (n=20) kanak-kanak RD berada pada tahap purata, 30% (n=16) pada tahap purata rendah, 26% (n=13) pada tahap bawah purata dan 2% (n=1) pada tahap paling bawah purata. Walau bagaimanapun, kanak-kanak yang terlibat dalam kajian ini mempunyai kelemahan proses kognitif bagi fungsi Keserentakan yang mempunyai kaitan dengan kebolehan kefahaman dalam pembelajaran bahasa berkenaan.

Katakunci: Sistem Penilaian Kognitif (CAS), Masalah Membaca (RD), Bahasa Inggeris sebagai bahasa kedua (ESL), PASS

INTRODUCTION

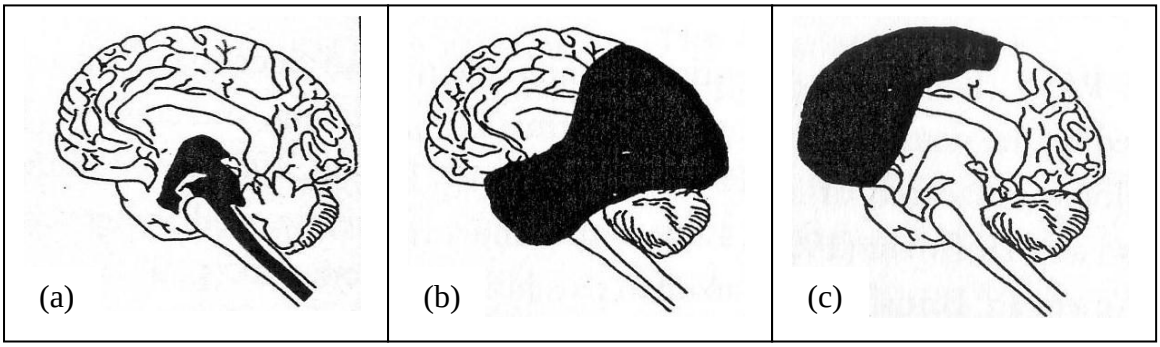
Human intelligence has been discussed from a general mental ability of Spearman and Cyril Burt, the British psychologists, to characteristics of Howard Gardner's multiple-intelligence. The focus of discussions on intelligence is on the abilities that ones own through physical presentation as the product of mental processes. All of us agree that every individual is born with innate cognitive abilities. These abilities serve as mental assets in order to perform their life tasks throughout every stage of development. Malaysian primary school children are always burden with academic tasks that are highly correlated to cognitive abilities. Those who are high achievers in school would be labelled as high intelligence, while low achievers are problematic to teachers and parents. "Are the low achievers really low intelligence?" and "what are the patterns of cognitive processing among the low achievers?" These questions elicit more doubts of intelligence and academic achievements. Children with poor academic achievement might be poor in higher level learning if environment does not provide supportive educational opportunities. This group of children need another method of assessment in order to provide better understanding of their cognitive abilities for the purposes of upbringing their academic performance.

Reading is one of the major dimensions in learning language and that covers receptive as well as expressive skills. The process of reading is not just pronouncing words but also to understand what have been read. Reading Difficulties (RD) is one of Learning Disabilities (LD). It refers to the dysfunctioning of decoding, reading comprehension and retention problems of reading process. According to DSM-IV, RD normally accounted for children population of preschool children to lower primary grade children. However, there is still a wide range of children with mild and moderate RD which have not been identified or reported by local authority or mental health organisation. There are a number of school children that not only in primary level but also in secondary level that have been identified by teachers and parents with RD. They have been sent to special education training programmes or courses. The commercial institutions that provide training have several teaching methods to deal with the problems faced by this group of children. But the effectiveness of teaching techniques and approaches is yet to be proven. However, some children are reported to have improved after attending those programmes. Some remained unchanged in reading.

Children's reading programme, such as Smart Kids Readers and Vital Years has been introduced to the Malaysian publics through various franchised educational centres around the country. But the parents reported that their children have not improved in their reading ability. The children who have the ability in reading a text do not have the ability in understanding it. In contrast, children who have the vocabulary strength tend not be able to read a text. These can be explained by several factors. Das (2009) said 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 enable the readers to comprehend text but also the decoding ability which is related to phonological coding of words in the text. The process of reading involves the whole cognitive functions that can be assessed and identified through the Cognitive Assessment System (CAS) based on Luria's PASS cognitive processing theory. Therefore, this study examines the cognitive functions of Planning, Attention, Simultaneous, and Successive of PASS theory for poor achievers of ESL children.

THEORETICAL FRAMEWORK

The theoretical framework of this study is derived from PASS theory which is simulated from neuropsychology and cognitive psychology based 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: 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). Figure 1 illustrates the three functional units of the human brain that explains the PASS cognitive processing.



Source: Naglieri 1999.

Figure 1: PASS functioning of Human Brain

Planning is a cognitive process that involves selecting and using strategies in decision making and problem solving. This process is interrelated to other process of PASS. It acquires efficient solution methods and best strategies which can be used in planning the 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 attention, simultaneous, and successive processes as well as knowledge. According to 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

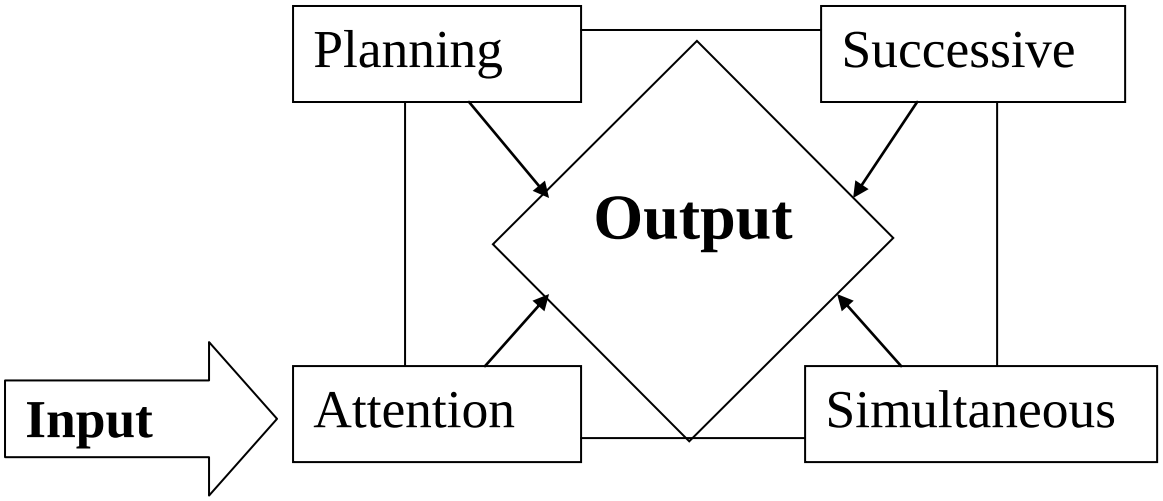
teachers in spelling task. This activity facilitates a planful approach to learning and are at the same time encourages the children to learn to spell specific words.

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 persistence 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 academics is illustrated by the grammar task of selecting correct pronounce (he, his or him) in sentences such as "This bag belongs 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 integrates 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 that 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 of phonics in English language or *suku kata* in Malay language. Children must learn the association of the sounds, in correct 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?"

It is important to remember that all PASS processes are involved in most things people do. In reading as an example, planning is needed for organising how the task will be completed and for exerting impulse control. The ability to differentiate the letters or words requires heavy demand on attention. While simultaneous processing requires the individual to connect the meaning of each words in the sentences or the meaning of each sentence in the passage. Finally, successive process requires a person to have the ability to identify orderly words from a sentence or ideas of the sentence in the passage. These processes are shown in the Figure 2.



Adapted from: Naglieri 1999

Figure 2: PASS Theory Chart

LITERATURE REVIEW

Learning to read in English can be a challenge because unlike the writing system of many other languages, like Malay, Chinese and Hindu, the sounds associated with particular letters in English are not entirely predictable. Students who are learning English as a second language usually do so in an environment where other individuals predominantly speak English. What is unique to the current study is that students are learning English as a foreign language in an environment with predominantly non-English speaking individuals. The primary students who most of them are Malays and some Indians in the present research speak their mother tongue fluently. Their exposure to English reading and writing began when they entered kindergarten. What influence such a multilingual literacy and language environments might have on English reading and comprehension was examined by Mishra and Stainthorp (2007) in a longitudinal study beginning at kindergarten. In fact, the objective of that project was to determine cross-linguistic development in regard to reading. As the authors observed, learning to read English consistently requires more fine-grained phonological analysis at the level of phonemes than does learning to read Oriya. On the other hand, learning to speak, read, and writes Oriya equips children with the skills to analyze words at the level of syllables and whole words. Other research also has suggested that cross-language transfer exists for ESL readers (e.g. Lesaux, Lipka & Siegel 2006).

Das, Naglieri & Kirby (1994) found that children with reading decoding failure and phonological coding problems perform poorly in successive processing and are associated with assembly of correct sounds in order which demands successive processing. On the other hand, student who scores high in planning is aware of the task-strategy relationship and monitors strategic success which are two essential aspects of metacognition.

Children with Specific Learning Disability (SLD) in reading decoding earned low scale scores on the Successive processing (Naglieri and Das, 1997a). According to Naglieri (1999), Gutentag, Naglieri and Yeates (1998) children with Traumatic Brain Injury (TBI) displayed significant deficits in planning and attention. This explains why they experience cognitive and physical disorientation which the functions of the forebrain and midbrain among the children with TBI.

According to Naglieri (1999), PASS processes are being associated with phonological components of spoken and written language. Planning is said to be associated with the efficient execution and verification of speaking and reading words. Attention corresponds to the alertness to discrete sounds and letters, and inhibiting irrelevant stimuli. Successive processing is associated with sequentially decoding the sounds of words or making one to one correspondences with letters and sounds. Simultaneous processing is associated with surveying all the elements of a word and acquiring the sound and letter patterns in a rather hierarchical manner (i.e. understanding that certain letters cue the sounds of other letters in words – such as 'e' at the end of the word 'came' cues the reader to say the 'a' as a long vowel sound).

Joseph, McCachran and Naglieri (2003) studied the relationship among cognitive processing, phonological processing and basic reading skill performance. The study also aimed to determine which PASS cognitive processes best predicted phonological processes, which were best predictors of basic word-recognition performance. The study involved 62 primary-grade children (40 males and 22 females) with ages range from seven years to nine years. The sample children are referred for reading problems and they were given measurement of cognitive process (CAS), phonological processes (comprehension Test of Phonological Processing) and basic reading achievement (Woodcock-Johnson Tests of Academic Achievement-III). In general, the subjects of study showed the same characteristics of lower successive processing score. This could be explained by the predictor of phonological memory which was strongly related to the successive processing. The study also indicated that there were significant relationships between simultaneous processing, letter-word identification and word attack. There were also significant relationships between planning and letter-word identification. Moreover, it also showed that the two cognitive processes (successive and simultaneous processes) are related to decoding process in reading which comprises phonological processing.

Kroesbergen, Van Luit and Naglieri (2003) studied the relationships between mathematical learning difficulties (MLD) and the planning, attention, simultaneous, successive (PASS) theory of cognitive processing. The Cognitive Assessment System (CAS) was used to measure the PASS processes for a group of 267 Dutch students with MLD who attended either general or special education. The study found that students with MLD had weak attention and successive processing. This finding was supported by the results of a study conducted by Naglieri & Das 1997b who identified that planning is an important cognitive process in mathematics. This indicates that there exists a relationship between cognitive abilities and mastery of basic mathematical facts and problem solving.

Van Luit, Kroesbergen and Naglieri (2005) examined 51 Dutch children without ADHD and compared to the scores to a group of 20 Dutch children with ADHD based on US standardization. The findings showed that children with ADHD in both countries 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 findings of previous research, suggesting that the PASS theory, as operationalised by CAS, has sensitivity to the cognitive processing difficulties found in some children with ADHD. It is also consistent with Barkley (1994) who described ADHD as "delay in the development of response inhibition and profound disturbance in self regulation and organization of behavior across time".

RESEARCH METHODS

(a) Cognitive Assessment System

The cognitive functions of PASS were operationalised by Cognitive Assessment System (CAS), one of the latest technology based instrument in assessing the cognitive functions of brain. It was built in 1997 by Dr. Jack A. Naglieri and Dr. J. P. Das. According to Naglieri (1999), "the single most important goal of the CAS is to encourage an evolutionary step from the traditional Intelligence Quotient (IQ), general ability approach to a theory-based, multidimensional view with constructs built on contemporary research in human cognition". CAS consists of four subscales Planning, Attention, Simultaneous and Successive which are the process of Luria's three functional units of brain or the theory of PASS. The four subscales comprise three subtests for representing the whole score of the cognitive functions.

These are described below according to the PASS scale to which they belong. In Planning Scale, the first subtest Matching Numbers consists of four pages that contain 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 of correct answers for each page. The second subtest, Planned Codes 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 allowed to complete each page in whatever fashion he or she wishes. The subtest score is based on the combination of time and number of correct answers for each page. The third subtest Planned Connections contains eight items. The first six items require the subjects to connect numbers appearing in a quasi-random order on a page in sequential order. The last two items require the subjects to connect both numbers and letters in sequential order, alternating between numbers and letters (e.g., 1-A-2-B-3-C). Items are constructed so that the subjects never complete a sequence by crossing one line over the other. The subtest score is based on the total amount of time in seconds used to complete the items.

The fourth subtest Attention Scale comprises subtest Expressive Attention which uses two different sets of items depending on the age of the subjects. Subjects who are eight years old and older are presented with three pages. On the first page, the subject reads colour words (i.e. *BIRU, KUNING, HIJAU* and *MERAH*) presented in quasi-random order. Next, the subjects name the colours of a series of rectangles (printed in blue, yellow, green and red). Finally, the words *BIRU, KUNING, HIJAU* and *MERAH* are printed in a different colour than the colours the words name. The subjects are instructed to name the colour ink of the words rather than to read the words of colours. The first two pages are to familiarise the subjects with the word and colour 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 of correct answer. 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 answer minus the number of false detections) to total time for each item summed across the items. The third subtest Receptive Attention is a two-page paper-and-pencil subtest. On the first page, letters that are physically the same (e.g., TT but not Tt) are the targets. On the second page, letters that have the same name (e.g., Aa but not Ba) are the targets. Each page contains 200 pairs of letters with 50 targets or 25% as targeted letters and the same set of distractors. The subtest score reflects the ratio of accuracy (total number of correct answer minus the number of false detections) to total time for each page summed across the pages.

In Simultaneous Scale, Nonverbal Matrices, comprising 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 1 as correct or 0 as incorrect. The subtest score is based on the total number of items correctly answered. Secondly, the Verbal-Spatial Relations subtest that consists of 27 items requires 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. Figure Memory is the third subtest of that consists of 27 items. The subjects are shown a two- or three-dimensional geometric figure for five seconds and the figure is then removed. The subjects are presented with a response page that contains the original design embedded in a larger, more complex geometric pattern. The subjects are asked to identify the original design embedded within the more complex figure. All lines of the design must be indicated without any additions or omissions to be scored correctly and score reflects the total number of correct items.

In Successive Scale, the first subtest Word Series requires the subjects to repeat words in the same order as stated by the examiner. The test consists of the following nine 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 two to nine words. Words are presented at the rate of one 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. The second subtest Sentence Repetition requires the subjects to repeat 20 sentences that are read aloud. Each sentence is composed of colour words (e.g. *Kuning itu menghijau biru*). Words are presented at the rate of two words per second. The subjects are required to repeat each sentence exactly as presented. Colour 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 third subtest is Sentence Questions is a 21-item subtest that uses the same type of sentences as those in Sentence Repetition the aged 8-17 is read to the subjects and then they are asked a question about the sentence. For example, the examiner says, *Merah itu membiru hijau* and asks the following question: *Apakah yang merah buat*? The correct answer is *Membiru hijau*. Responses are scored correct if the subjects successfully answer the question regarding the sentence. The subtest score reflects the total number of questions answered correctly.

Table 1 shows the subtests of the four subscales summary of the CAS which are theoretically based on the PASS theory. Each of the subscales consists of three subtests that measured the standard battery and basic battery with only two subtests. Planning is measured by Matching Number (MN), Planned Codes (PCd) and Planned Connections (PCn); Attention is measured by Expressive Attention (EA), Number Detection (ND) and Receptive Attention (RA); Simultaneous is measured by Nonverbal Matrices (NvM), Verbal-Spatial Relations (VSR) and Figure Memory (FM); and Successive is measured by Word Series (WS), Sentence Repetition (SR) and Speech Rate (SpR)/Sentence Questions (SQ). 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).

Table 1: Subtest Summary of CAS.

Subtest	*Ages 5-7*	Ages 8-17
Planning		
Matching Numbers (MN)*	Demonstration, Samples A-B, Items 1-2	Demonstration, Samples A-B, Items 3-4
Planned Codes (PCd)*	Samples A-B, Items 1-2	Samples A-B, Items 1-2
Planned Connections (PCn)	Demonstration, Samples A, Items 1-5	Samples A, Items 4-6, Sample B Items 7-8
Simultaneous		
Nonverbal-Spatial Relations (VSR)*	Samples, Items 1-D	Samples, Items 7-D
Verbal-Spatial Relations (VSR)*	Samples, Items 1-D	Samples, Items 7-D
Figure Memory (FM)	Demonstration, Samples, Items 1-D	Demonstration, Samples, Items 3-D
Attention		
Expressive Attention (EA)*	Demonstration, Samples A-C, Items 1-3	Samples D-F, Items 4-6
Number Detection (ND)*	Samples A-B, Items 1-2	Samples C-D, Items 3-4
Reception Attention (RA)	Samples A-B, Items 1-4	Samples C-D, Items 5-6
Successive		
Word Series (WS)*	Sample, Items 1-D	Sample, Items 4-D
Sentence Repetition (SR)*	Samples A-B, Items 1-D	Samples A-B, Items 1-D
Speech Rate (SpR)	Sample, Items 1-8	-
Sentence Questions (SQ)	-	Samples A-B, Items 1-D

*The subtests noted with an asterisk comprise the Basic Battery. The Standard Battery includes all subtests.
Note. D = until discontinue rule is met. Das, J.P. and Naglieri, J.A. 1997

(b) Research Procedure

This study starts with identifying randomly the ESL poor achiever in primary standard three children from remedial classes at Sekolah kebangsaan Bandar Tun Hussein Onn (SRKBTHO). Standard three children are also considered having better exposure to ESL through out the first three years of formal education. This level would be critical for children facing difficulties in learning especially reading, mathematical calculation and writing (3M). School based assessment was used to select 50 poor ESL children. The subjects were among the low achievers who obtained 30 to 50 marks of the mean score in English subject and had been identified by their English teachers as having reading difficulties.

The Cognitive Assessment System (CAS) (Naglieri & Das 1997) was administered individually to assess cognitive processes. The administration time is approximately one hour. In order to establish adequate rapport with each participant, the work was carried out in a separate room in the schools and maximum care was taken to avoid from any external disturbances during task administration. Although English is the second language (ESL) in Malaysia education system, the CAS instructions and some items had been translated into Malay Language for better understanding of children in completing their tasks. CAS consists more of pictorial exposures, but some subtests of Simultaneous and Successive had been translated into Malay Language and its reliability and validity were tested. However, some minor but important determinants of understanding such as technical instructions and conceptual explanations were considered during the test. Pilot study was conducted to test the original CAS and the translated version using 10 samples in their respective school. The basic battery was used in testing and scores were obtained by rapid score software of CAS. Standard scores *(M* = 100, *SD* = 15) were obtained from the test manuals and used in all data analyses. Means and standard deviations were computed by gender and for the total sample. The full scale standard scores were based on the 7-level standardization of American norms as shown in Table 2. The data were collected and analyzed by using SPSS software. The profiles of CAS were identified from the scores distributions. The differences between the mean standard scores earned by girls and boys were computed by analysis of t-test.

Table 2: Descriptive Categories of PASS and Full Scale Standard Scores

Score	Classification	Theoretical Normal curve	Standardization sample
130 and above	Very Superior	2.2%	1.8%
120-129	Superior	6.7%	7.8%
110-119	High Average	16.1%	17.6%
90-109	Average	50.0%	49.0%
80-89	Low Average	16.1%	14.5%
70-79	Below Average	6.7%	6.8%
59 and below	Well Below Average	2.2%	2.5%

Note: The percentages shown are for the Full Scale and are based on the total standardization sample (N=2,200). From Naglieri & Das, 1997c.

DISCUSSION

CAS profiles among the ESL poor achievers are at distinct level of cognitive processing ability based on American standardization scores. The PASS scale standard scores showed 41% (n=20) of the subjects is at average level, 30% (n=16) at low average level, 26% (n=13)

at below average level and only 2% (n=1) at well below average level. These differences show that there are different cognitive abilities among the ESL poor achievers in terms of PASS cognitive processing. This explains that the level of cognitive processing is one of the significant determinants among the ESL poor achievers who make up 60% of these who are below the low average level and have difficulties in learning the language. Table 3 shows the distribution of each CAS scale by levels.

Table 3: Distribution of each CAS Scale by Level

CAS Subscales	Average (n=20)		Low Average (n=16)		Below Average (n=13)		Well Below Average (n=1)	
	M	SD	M	SD	M	SD	M	SD
Planning	102	11.50	95	5.25	87	5.66	88	-
Simultaneous	84	9.99	78	8.49	74	7.26	76	-
Attention	105	7.91	92	6.93	86	6.00	71	-
Successive	98	7.94	93	8.12	83	9.15	72	-
Full Scale	97	4.18	86	1.71	75	2.68	67	-

With statistical significance of *pairwise comparisons*, the *d* value of Simultaneous processing scale is 10.5 (Table 4). The simultaneous processing was identified as the significant weakness of the PASS scales with $d > 9.7$ at the $p = 0.10$ significant level. It is only considered as cognitive weakness of PASS scales with $d < 10.8$ at the $p = 0.05$ significant level. The mean and standard deviation of the Simultaneous scale (M=79, SD=9.56) is the lowest score of the four PASS scales. While others subscales of as planning (M=96, SD=10.31), Attention (M=95, SD=11.25), and Successive (M=92, SD=10.53) are at the average level.

The score of Simultaneous scale causes the full scale score falling at the lower average (M=87, SD=9.67) of all. This finding indicates that the cognitive weakness of Simultaneous processing is considered as a major influence on the difficulties of reading among the poor achievers of ESL. This is supported by the study of Shamita, Das, Stack-Cutler and Parrila (2009) who investigated the pattern of relationships between two reading skills and the four cognitive processes. They study found that the relationship between word reading and reading comprehension significant ($r = 0.81$, $p < 0.001$), but both skills were significantly related to simultaneous processing ($r = 0.62$ and $r = 0.75$, $p < 0.001$, respectively) as well as to the overall intellectual functioning (Full Scale) of the children ($r = 0.44$, $p = 0.02$ and $r = 0.48$, $p = 0.01$).

These results suggest that reading proficiency, as well as improvement in reading proficiency, is partly determined by one's proficiency in specific cognitive processes as reported in previous studies (e.g. Das et al. 1994). However, when both word reading and reading comprehension reach levels above the norm for the appropriate grade, as in the normal reading group, the two skills may become more independent of one another.

Table 4: Comparison of discrepancies between each combination of PASS Scale standard score

CAS Subscales	Mean Score	*d values*	$p = 0.10$	$p = 0.05$	Significance
Planning	96	5.5	11.6	13.0	
Simultaneous	79	-10.5	9.7	10.8	Significant at the 0.10 level
Attention	95	4.5	12.0	13.4	
Successive	92	1.5	9.5	10.6	

Compared Mean Full Scale	90.5 87			

Note: Difference scores (d values) were obtained by subtracting the compared mean PASS standard score from each of the PASS Scores.

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, weak vocabulary knowledge of children learning a second language is likely to have an impact on their reading comprehension abilities (Hutchinson, Whiteley, Smith, & Connors 2003, Sen & Blatchford 2001).

Table 5 shows the distribution of each CAS scale by gender. Planning and Attention subscales show females obtain higher mean scores which are M=97 and M=96 compare to males that are M=95 and M=94. While males obtain better mean scores on Simultaneous and Successive subscales which are M=80 and M=94 compared to female mean scores M=78 and M=90. This finding is quite consistent with the result of Naglieri and Rojahn (2001) who studied the differences in PASS cognitive processes and achievement. The result of the study shows girls outperformed boys on the Planning and Attention scales of the Cognitive Assessment System by about 5 points *(d* - 0.30 and 0.35, respectively).

Table 5 : Distribution of each CAS Scale by Gender

CAS Subscales	Male (n=28)		Female (n=22)		Total (n=50)	
	M	SD	M	SD	M	SD
Planning	95	9.98	97	10.90	96	10.31
Simultaneous	80	9.69	78	9.51	79	9.56
Attention	95	12.05	96	10.43	95	11.25
Successive	94	10.43	90	10.43	92	10.53
Full Scale	87	9.73	86	9.68	87	9.64

CONCLUSIONS

The purpose of this study was to explore the PASS profiles of cognitive processes among the ESL poor achievers. At the same time, the study tries to determine which PASS cognitive processes best predict reading difficulties in language learning. Generally, the cognitive characteristics of low simultaneous processing among the sample of referred primary grade children in the current study seemed to be consistent with the findings of Kirby and Williams (1991) who suggested that acquiring parts of speech demands processing elements of spoken language in a serial manner as well as perceiving words as a whole. Clay (1993) emphasised the importance of not exclusively attending to the sounds of oral language but also grasping its sequential structure and detecting common sound patterns.

Reading as discussed above is the key to learning which involved the whole process of cognition. The distinctive profiles of CAS show the children who are having reading difficulties and are not certain as to be coded as low cognitive processing group. They might be almost half of the low achievers in ESL and are at average level of cognitive processing. But they are abandoned and which part of their cognitive weaknesses has not been identified.

It will be late for intervention or remediation when the children proceed to higher level of learning. The cognitive strengths of the low achievers can be supportive asset to master skills in learning by appropriate facilitation and guides. Thus, CAS is one of the alternatives in providing such capabilities and in helping children with reading disabilities. When intelligence is defined and measured as cognitive processes, it becomes relevant to performance on reading-related activities. Cognitive ability measures of the CAS have relevance to our understanding of reading disabilities. Teachers and educational psychologists should consider using CAS rather than the general or traditional intelligence tests in order to detect processes that are related to determine whether or not children demonstrate consistent or inconsistent patterns of processing information. Besides, CAS has detectable abilities in identifying defects of cognitive functions and it is correlated with reading difficulties and other corresponding learning difficulties among children at primary and secondary schools. Furthermore, research on cognitive approach to reading remediation by PASS processes will be essential in helping children with reading difficulties, especially for determining intervention at early primary level.

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