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Performance of Students' with Learning Disabilities (LD) on Ravens' Coloured Progressive Matrices

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The main objective of the present study was to explore the performance of students with learning disabilities on test of intellectual functioning. Apart from that, this study also focused on observing the difference in intellectual abilities among male and female students with learning disabilities as well. The participants were 80 students within the age ranges of 8- 11 years old; which consist of 47 males and 33 females diagnosed as having learning disabilities from five public schools in Kota Kinabalu, Sabah Malaysia. Raven's Coloured Progressive Matrices (Raven, 1995) was used to assess students' intellectual functioning. It was found that the performance of 12.5% children were on intellectually superior level, 38.5% were on definitely above average, 22.5% were on average, 11.3 % were below average, and 15% were on intellectually impaired level. As for gender difference in scores, the results of non-parametric Fisher Exact test showed that significant association between gender and children intellectual ability ($\chi^2 = 18.94$, $df = 4$, $p < .05$) was found. On the basis of observed cell frequencies, it can be concluded that male students' performance was more towards the extreme of higher and lower ends and female students' performance was more towards average. The differences in basic intellectual abilities determined during the present study can be used as a guideline by the responsible authorities to identify appropriate and individualized interventions which are suitable for different group of children based on their level of intellectual functioning and learning disabilities.

Keywords : Learning disabilities, gender differences, Raven Coloured progressive Matrices

SAPJ Code : 4100,3010,2030

Introduction

In modern society, mastery of basic academic skills such as reading, writing and arithmetic is a necessary pre-requisite for success in school, employment setting and in society at large. However, a large number of children do not master or only partially master these required academic skills as they might be suffering from learning difficulties due to a variety of known and unknown reasons. Sometimes, children's inability to acquire academic skills are due to problems that are very benign in nature such as learning disabilities leading to other people around them to underestimate their intellectual abilities. One common understanding is that the child with learning disabilities might have some inherent cognitive difficulties that make learning some skills more difficult than normal. However, diagnostically, a child with learning disability is one who functions with significant problems in some area(s) of learning despite normal general intelligence (Graziano, 2002). Therefore, we need to look at other difficulties which could be considered as causal factors while

exploring learning disabilities, such as educational or environmental problems that are unrelated to the child's cognitive and intellectual abilities. Ineffective teaching strategies can seriously affect a child's level of achievement. Early school failure can lead to a lack of self-confidence with subsequent detrimental effects on learning. A variety of variables associated with home background can also contribute to learning difficulties. Sometimes all of the different factors are intertwined, but whatever the primary cause, children with learning difficulties have fallen behind their peers in mastering some important aspects of learning. Some children arrive at school lacking in movement skills despite having a range of appropriate pre-school experiences. Learning disabilities (LD) among children have been one of the biggest concerns among parents, teachers and as well as psychologists. According to Lyon and Moats (1988), researchers, clinicians, and teachers face difficulties in identifying and understanding the instructional factors and decisions that must be considered when teaching learning disabled (LD) students.

Researchers have tried to explore the causal factors related to LDs. Many developmental aspects have been explored to understand the nature of learning disabilities. According to Zastrow and Kirst-Ashman (2004), children's disability with reference to their capability to process information and reasoning in problem solving is a factor that holds back their language and literacy, as well as social communication development. While the American Psychiatric Association (2000) suggested that learning disabilities in children occur due to their difficulty in absorbing information and subsequently using the information in communication. Without proper given attention, these difficulties may later result in psychologically effects such as fear of failure, withdrawal, helplessness and low self-esteem. Children with persistent learning disabilities often refuse to learn new things or engage in new experiences, thus, hindering their progress in learning and communication development and will grow-up with fear of failure and refusing to take any new risks (Hallahan & Kauffman, 2000; Rathus, 2008). Their incompetency in reasoning and processing of information will eventually cause them to isolate themselves from the crowd (Meyer, 2000). Thus, most of them choose withdrawal actions in order to avoid humiliation.

Another property of learning disabilities among children is that their disability involves visual perception. Children with this difficulty are incapable to see things as in actual fact and some face incomprehensibility in spatial relationships which facilitate them to determine distance and accuracy (Zastrow & Kirst-Ashman, 2004). Problems may persist since the rate of learning is based on the speed of information being process, and a disability in identifying and understanding the input or seen images will thwart the process of acquiring new information (Regtvoort et. al, 2006). This is due to their inability to recognize and decode the procedure, which is required by them to process in order to produce the information needed (Meyer, 2000). Frustration is always the after-result that will lead them to confusion and later, in withdrawal stage. Although not all children with learning disabilities possess the same disability; some may have advantages on language, reading and verbal memory while others may suffer from lack of non-verbal problem solving, abstract reasoning and arithmetic calculation (Hallahan & Kauffman, 2000; Vellutino, Fletcher, Snowling & Scanlon, 2004). This situation is critical and since it is a lifelong unremitting phenomenon because it will not only prevent the true potential of development in those children, it will be also create an unhealthy environment for others in terms of relationships and communication.

As far as the prevalence of learning disabilities in general population is concerned, according to American Academy of Child and Adolescent Psychiatry (2006), it is found in one of every ten children. The data about the exact number of children with learning disabilities in Malaysia is not available. According to the Social Welfare Department in Malaysia, the total number of children in the category of learning difficulties which includes learning disabilities such as Global Developmental Delay, Down Syndrome, Intellectual Disabilities, Autism Spectrum Disorders, and Attention Deficit Hyper-Activity Disorder (ADHD) have been reported as 165,281 (Annual Report, 2012). However as this data is based on the number of

registrations with the Social Welfare Department, therefore, we can assume that the actual number of children with learning difficulties in Malaysia may be much higher. The growing number of children diagnosed with learning disabilities reach to the point that the fact that there is a need to explore this issue in detail so that steps can be taken to improve services related to assessment, diagnosis and interventions for children with learning disabilities.

Gender differences in intellectual abilities among children with learning disabilities

Traditionally speaking, gender differences have been reported while looking at the number of children who have learning disabilities. It is a common understanding that more males compared to females have learning disabilities. However, recently there has been a change in this perception, and now we see no gender difference in prevalence of learning disabilities. According to Shaywitz et. al (1992) the number of female children with LDs might be underestimated, putting them at risk for social, emotional and academic challenges. The reason for gender differences in learning disabilities can be attributed to the types of behaviors displayed by male and female students. As male students show more externalizing behavior compared to female students, the likelihood of male students to be identified as having learning disabilities is much higher. Many recent researches suggest an equal incidence of LD among girls and boys (Feinstein & Phillips, 2006).

Many researchers have tried to explore gender differences in terms of intellectual abilities. However, it has been universally concluded that there is no difference in the mean scores obtained by males and females while performing on tests of intellectual abilities. Raven (1939) while standardizing sample for Ravens Progressive Matrices, stated that there was no gender difference in scores obtained by males and females. However, it is also suggested by many researchers that males are more variable than females in terms of their performance on measures of intellectual abilities which mean that there are more mentally deficient and gifted males than females.

The objective of the present study was to examine the performance of children with LDs on measure of intellectual abilities, namely Ravens Coloured Progressive Matrices (RCPM). It is assumed that findings of the present study can help to develop the narrative that children with learning disabilities have intellectual abilities that can range from intellectually superior to intellectually impaired. Determination of these variations among childrens' scores can help to better understand the nature of LDs. The research findings can be used to develop and support intervention programs to address the needs of every child with learning disabilities. Apart from that, the present research also tried to examine gender differences in intellectual abilities among students with LDs on RCPM.

Methods

Participants and location

The samples of the present study involved eighty (80) children from five (5) different primary schools around Kota Kinabalu, Sabah. The children were between the age ranges of 8 to 11 years old, including both male and female children. These children were diagnosed as having LDs by multidisciplinary teams including health care professionals, were registered as individuals with learning disabilities with Malaysian social welfare department (Jabatan Kebajikan Malaysia), and were placed in special education classes in public schools. Purposive sampling was conducted and sites for data collection were chosen based on recommendations from Kota Sabah State education department (Jabatan Pelajaran Negeri Sabah).

Instrument

The instrument used in this study was Raven Coloured Progressive Matrices (RCPM). It consists of 36 matrices which divided equally into three sub-tests (A, A_B, B) and each sub-test consists of 12 matrices. In each matrix, there are six options provided to choose from and the items are in order of increasing difficulty. Sub-test A requires participants' ability to find the missing part of each pattern. Sub-set A_B tests on the participants' ability in recognizing associations of patterns and relatedness to the alternatives given whereas sub-test B was designed to test the participants' ability in abstract thinking. Each correct answer provided is given a score of 1 which is made up of 0 to 36 score on the RCPM. The total score is then given a percentile based on the matrix table provided in RCPM test manual. The matrix table consists of groups of score obtained and divided into different clusters of age and percentile point. The percentile point is used as the basis of participant's intellectual abilities level which is categorized as intellectually superior, above average, average, below average and intellectually impaired (Raven, 1995). Studies on reliability of CPM have generally confirmed that it is extremely satisfactory. The split half reliability estimates of .90 were reported with no differences by ethnicity or sex (Jensen, 1974). During present study, assessment of intellectual abilities by using RCPM among children with learning disabilities was carried out by researchers with Masters' degree in Clinical Psychology and had advanced training in assessment and interpretation under the supervision of Professor of Psychology with ample research and measurement experience.

Procedures

Upon approval from the Ministry of Education and Sabah State Education Department, discussions were held between the headmasters, school counselors, special education teachers and the researchers to discuss the number of children identified as having learning disabilities in their respective schools. Apart from that, during meetings, testing schedules were also planned and discussed. Parents' consent letters along with cover letters explaining the objectives of the study were distributed and collected before the assessment of children by using RCPM. The schools' meeting rooms were considered as a suitable place to administer RCPM so that all kinds of noises and distractions could be avoided during testing procedure. Each child was given a set of RCPM booklet, an answer sheet, a pencil and an eraser. They were briefed sufficiently and were ensured that RCPM is not a school examination and they should not be scared of making any mistakes in completing the puzzles. Participants were required to write the correct answers in the answer sheet according to the sub-test and encouraged to complete all 36 matrices. There was no set time limit given to complete the RCPM.

Analysis

The raw data was entered into Program IBM SPSS Statistic version 21.0. Descriptive analysis was carried out for all demographic variables as well as to examine the frequency and percentage of student falling into the category of intellectually superior, definitely above average, average, below average, and intellectually impaired. The reliability of the RCPM was determined by using internal consistency of scores for age groups. Nonparametric chi-square test for independence was conducted to do the analysis of the relationship between gender and classification of intellectual abilities (e.g. ability to find the missing part of each pattern, ability in recognizing associations of patterns and relatedness to the alternatives given and ability in abstract thinking).

Results

The analysis began by estimating frequencies and percentage for all of the demographic variables. Reliability of the scale was determined by internal consistency. After that, non-parametric Fisher's exact test for independence was used to do the analysis of the association between gender and each classification of intellectual ability.

Participants' demographic information

Frequency and percentage of participants demographic information including gender, age and class is presented in table 1 given below.

Table 1: Demographic information of the participants (N= 80)

Variables	Frequency	Percentage
Gender		
• Male	47.0	58.8
• Female	33.0	41.2
Age/ Class		
• 8 years/ Primary 2	19	23.8
• 9 Years/ Primary 3	17	21.3
• 10 Years/ Primary 4	31	38.8
• 11 Years/ Primary 5	13	16.3

Reliability of Ravens' Coloured Progressive Matrices

Reliability of the test for present sample was determined by calculating internal consistency of scales for each age group of participants. Table 2 given below presents the Alpha Cronbach values for RCPM.

Table 2: Alpha Cronbach values for RCPM

Age group	n	Present study
11 Years	13	0.87
10 Years	31	0.85
9 Years	17	0.81
8 Years	19	0.78

Participants Scores on Ravens' Coloured Progressive Matrices

Each correct answer provided is given a score of 1 which made up of 0 to 36 score on the RCPM. The total raw score is then given a percentile based on the matrix table provided in test manual (Raven, 1995). The percentile point is used as the basis of participant's IQ level which is categorized as intellectually superior, above average, average, below average and intellectually impaired. The referred matrix table in Raven manual (1995) consists of group of score obtained and divided into different clusters of age and percentile point. According to the results presented in Table 3, 12.5% of the participant falls into the category of intellectually superior, 38.5% falls into the category of definitely above average, 22.5% were on average, 11.3% were on below average, while 15.2% were considered as falling into the category of intellectually impaired. Overall, 73.75% children performed on intellectually superior, definitely above average, and average categories compare to only 26.25% who performed below average.

Table 3: Participants Scores on Raven Coloured Progressive Matrices

Classification of intellectual abilities	Percentile	Frequency	Percentage
Intellectually Superior	95 th and above	10	12.5
Definitely above average	75 th and above	31	38.5
Average	25 th -75 th	18	22.5
Below Average	25 th and below	9	11.3
Intellectually Impaired	5 th and below	12	15.2

Gender difference on performance on Ravens' Coloured Progressive Matrices

As 3 cells have expected to count less than 5, the nonparametric Fisher's Exact Test for independence was used to investigate the association between children's gender and their performance on RCPM. The Fisher's Exact Test showed that there was significant association between gender and children intellectual ability ($\chi^2 = 18.94$ df = 4, $p < .05$). In the observed cell frequencies, it was found that 11.3% of male students fall into the category of intellectually superior, while only 1.3% of female students falls into this category. In the category of intellectually impaired, the result also showed that more male students (11 or 13.8%) fall into this group as compared to female students, which only had one (or 1.3%) of them falling into this group. In the category of average, more female students (13 or 16.25%) fall into this group as compared to male student (5 or 6.3%). This result indicates that male students' performance was more towards the extreme of higher and lower ends and female performance was more towards average.

Table 4: Association of the Gender of Children and Category of Ability

Gender of Children	Male			Female			χ^2	Sig.
Category of Ability	Frequency	Expected Frequency	Percentage (%)	Frequency	Expected Frequency	Percentage (%)	18.94	.001
Intellectually Superior	9	5.9	11.3	1	4.1	1.3		
Definitely above average	19	18.2	23.8	12	12.8	15.0		
Average	5	10.6	6.3	13	7.4	16.3		
Below Average	3	5.3	3.8	6	3.7	7.5		
Intellectually Impaired	11	7.1	13.8	1	5.0	1.3		

Discussion

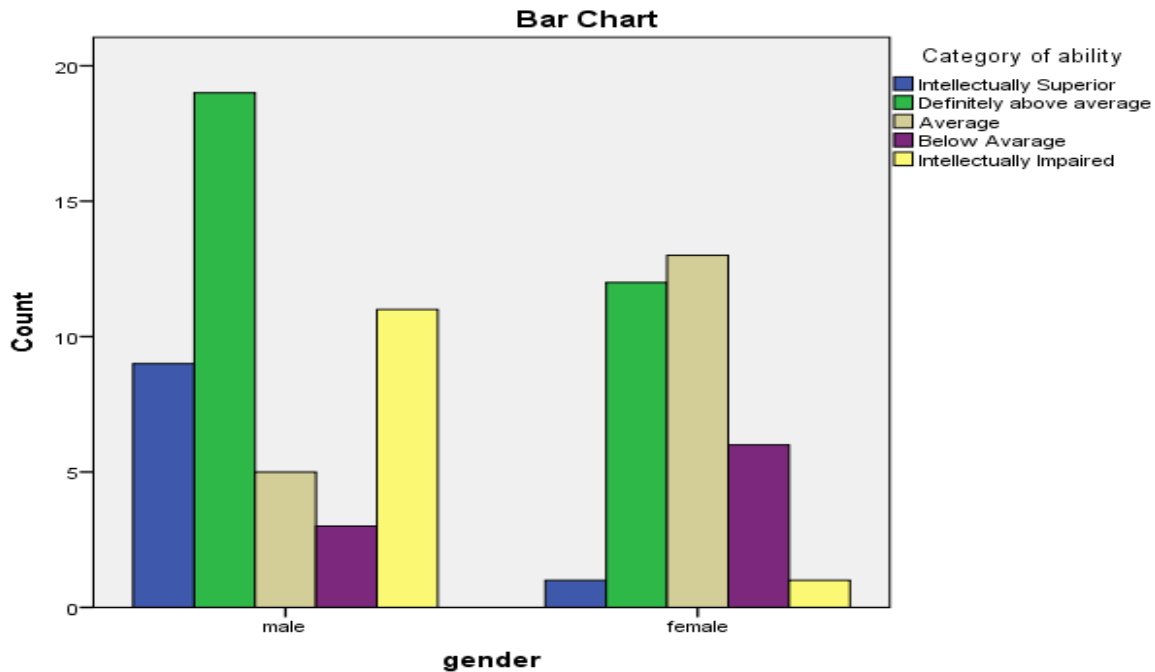
Based on the fact presented above regarding the nature and etiological factors involved with LDs, the goals of the present study were to examine the performance of children with learning disabilities on test of intellectual abilities namely Raven Coloured Progressives Matrices, as well as to examine the gender differences among the scores obtained by children with learning disabilities.

With regards to our first goal related to children with LDs performance on test of intellectual abilities including reasoning and abstract thinking, it was found that there were gross variations among scores obtained by children. The scores obtained by children with learning disabilities on measure of intellectual abilities ranged between intellectually superior to intellectually impaired. The findings are supported by Graziano (2002), saying that there is a confusing variability of characteristics among children with learning disabilities. These disabilities range in severity among persons, the specific disabilities can occur in many different areas of functioning, and the details of each set of problems can vary significantly from one person to another. People diagnosed with LDs can be very different from each other in the number, type, and severity of disorder and may be greatly dissimilar in their educational profiles and general levels of achievement and success. Therefore, the common label as having learning disabilities does not mean that they all have same kind of problem; in fact, people with learning disabilities are very heterogeneous group when it comes to their individual characteristics and intellectual abilities. According to Torgesen (1994), learning disabilities/difficulties is a complex and puzzling phenomenon. It lacks a clear delimiting definition that is necessary if a useful explanatory theory is ever to be developed. Therefore, different types of intervention and educational programs need to be considered for different group of children. This study can provide a clear view to future researchers of the different level of intellectual abilities among children with learning disabilities. According to Taylor (1988), operational criteria for identifying children with learning disability are invariable. Therefore, one of the operational criteria can be used to identify them is based on their level of intelligence which was explored in this study.

On the other hand, it may seem quite contradictory to common understanding but it has been reported in researches that sometimes, children with learning disabilities are intellectually superior and gifted. Baum (In Graziano, 2002), while studying students with learning disabilities and their intellectual abilities found that one third of their sample of students with learning disabilities had superior intellectual abilities, which seems to be quite consistent with the finding of the present study as it was found that 12.5% children scored as intellectually superior and 38.5% had above average scores.

With regard to our second goal related to gender difference in scores on Ravens' Coloured Progressive Matrices, significant differences were found among male and female students. Findings of the present study were consistent with Lynn and Irwing (2004). While conducting meta-analysis of the data available from previous researches, they found that the general trend of the data on the Standard Progressive Matrices and Advanced Progressive Matrices showed that boys obtain slightly, but not significantly higher means over the ages 6 through 9 years. They also suggested that as far the Colored Progressive Matrices was concerned it was found that for the age range 5 through 11 years, boys obtain significantly higher mean scores than girls at ages 6, 7, 8, and 11 years. It was also found in the present study that males obtained scores more towards extreme ends of definitely above average and intellectually impaired compare to females whose scores were more towards average. Deary et al (2003), also reported that when it comes to intellectual abilities, males have greater test score variance than females and usually are overrepresented at both the low and the high extremes. Therefore, based on the performance on test of intellectual abilities displayed by male and female students during

present study, we can suggest that there are more mentally deficient and mentally superior males than females.



However, we can suggest that as far gender differences among scores on Raven Progressive Matrices are concerned, somewhat mixed results have been reported by previous researchers. Looking at many large scale studies we can see that no gender differences on the progressive matrices have been endorsed by numerous researchers (Eysenck, 1981; Mackintosh, 1996; Mackintosh, 1998; Jensen, 1998) and they stated that there was no significant difference in scores while working on Progressive Matrices among boys and girls, men and women, while some other researchers have reported that male and female tend to perform differently tests that measure different abilities. They reported that females are often found to have higher average scores while working on some tests of motor coordination, verbal ability and memory. On the other hand, males are often found to have higher average scores on tests of reasoning and targeting, mathematic, and spatial ability (Halpern, 2000). Therefore, we can say that there is a need to further explore this issue so that definitive conclusions can be drawn about gender difference in intellectual abilities.

The findings of the present study can help to correct common misunderstanding that children with learning disabilities are intellectually deficient and cannot be successful in academics. It can give hope, motivation and empowerment to parents and teachers that even though their children may not be able to perform well in academics at a given time, however with hard work, patience and continues effort they can improve their children's academic achievements. Parents and teachers need to understand that with effective teaching strategies and opportunities for quality education, they can help their children to overcome their academic problems. Findings of the present study also suggested that while designing intervention plans for children with learning disabilities, consideration must be taken to ensure that services and programs are according to individual child needs, focusing more on his/her strengths rather than weaknesses.

Conclusion

Quality education is the fundamental universal right of every child. Every child needs must be taken care of so that they can achieve optimum development. Education for all slogans and policies does not only mean that all children should be enrolled to school systems, but it also refers to achievement of all of the children in an academic setting. Children with learning disabilities should also be provided with opportunities to excel in school. Therefore, proper early diagnosis and interventions is of outmost importance. As it seems that children with LDs are a heterogeneous group when it comes to their intellectual abilities and every individual child's needs are different from others, the intervention should focus on capitalizing their strengths through individualized educational plan to serve every child better. With the help of appropriate intervention and remedial strategies that can help each child to attain his/her maximum educational potential, it will help them to become contributing and productive members of society.

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