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USING ORIGAMI TO ENHANCE VISUAL AND MATHEMATICAL THINKING SKILLS AMONG THE AUTISTICS

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Abstract: *Autism is a general term for a group of complex disorders that affects brain development (Autism Society of America, (2014). "Autos" means 'you in your own self' which is described as 'a runaway from reality' (Leo Kanner, (1943). Autism has its own specializations which are mathematical (Baron Cohen et al 2001), and visual thinkers (Karren Piece, 2010). They can follow steps and create designs in more creative ways than others. This paper will deliberate on how origami technique helps escalate the development of mathematical and visual thinking skills of the autistic people. Three autistics namely Che' Suria Aishah Farhana binti Che' Mat, an Asperger Syndrome Autistic, Muhamad Aliff Najmi bin Che' Kamarudin, a Classic Autistic and Mohamad Aizuddin, a Pervasive Developmental Disorder Autistic were selected. They are from a special inclusive class of SMK Kadok, Kelantan in the eastern part of West Malaysia. Based on the objectives of this research paper a qualitative study was implemented. The triangulation method comprising of observation, interview and analysis were applied. The results revealed that the Asperger Syndrome Autistic has a very systematic way in learning. Her ability to develop new ideas and new designs indicates that she is a mathematical and visual thinker. The Classic Autistic too has a systematic way of learning and is able to innovate new designs proves that he is a mathematical and visual thinker. On the other hand, the Pervasive Developmental Disorder autistic was not interested in origami. He just stared at the origami and showed no interest in it. Future research can be implemented on how to capture the interest of the Pervasive Developmental Disorder autistics.*

Keywords: *Autism (Complex Disorders In Brain Development), Classic Autism (Lack of Interest and Attention but Good in Socializing Skills), Asperger Syndrome (High Functioning Autism) and Pervasive Developmental Disorder (Delays in The Development of Socialization and Communication Skills Do Not Meet the Full Spectrum of This Disorder)*

Introduction

Autism is a general form of complex disorders that affects brain development (Autism Society of America, 2014). “Autos” taken from the word Autism alone means you (your own self) and Leo Kanner (1943) explained that Autism is running away or detachment from reality. Autism relates to neurological impairment and not psychiatric disorders.

Individuals with autism have difficulties in social interaction, verbal and non-verbal communication and also display repetitive behaviours (Linden Bridge School, 2014). Autism is an intellectual disability and autistics have difficulties in motor coordination, attention and physical health issues such as poor sleep and gastro intestinal disturbances. By contrast, the brain stem serves as a relay station for messages between brain areas and controls involuntary movements such as breathing and heartbeat. This suggests that there are long lasting effects of delayed language onset on the brain of an autistic. It is estimated that autism involves 2 to 6 cases per 1000 population and autism frequently occurs in boys compared to girls (Autism Society of America, 2014)

Literature Review

There are 3 main types of Autism. They are Classic Autism, Asperger’s Syndrome and Pervasive Developmental Disorder.

Classic autism displays signs of difficulties in interpreting body language, lack of facial expressions, delay or lack of speech, difficulties in making eye contact, abnormal tone of voice when speaking, being detached in group settings, lack of empathy for other emotions, difficulty in understanding their own emotions, lack of awareness of personal space, little interest in playing with other children and being unable to successfully play with other children. In other words, the Classic Autistic subject prefers to be on his own and is anti-social.

People with Asperger’s Syndrome have normal to above average intelligence but have difficulties with social skills and often have absorbing interest in certain topics. Abnormalities in the subtle use of language are common with Asperger’s Syndrome although language development is normal. Positive characteristics of people with Asperger’s Syndrome has been described in many professions including the increasing ability to focus on details, the capacity to persevere in certain interests without being swayed by others’ opinion, the ability to work independently, the recognition of patterns and the original way of thinking. (Conrad Stoppler, 2019).

The pervasive developmental disorder refers to a group of disorders characterized by delays in the developmental of socialization and communication skill and a limited range of activities and interests. Literature on pervasive developmental disorder states the need to address the behaviour problems related to inattentiveness and impulsivity, aggressiveness self-injurious behaviours and temper tantrums. (American Psychiatric Association, 2000).

Recent studies on the brains of people with autistic spectrum disorders (ASD) has shed light on the physiological underpinnings of their thought and emotions. These studies have given a better understanding on how neuropath ways are formed to an extent to which biology influences behaviour. All minds of autism spectrum disorders are detail oriented, but how they specialize varies according to different individuals. There are three different types of

specialized thinking in autism. They are mathematical thinking, visual thinking and cognitive thinking.

Mathematical thinking is a whole new way of looking at things, stripping them down to their numerical, structural or logical essentials and analysing the underlying patterns. Moreover, it involves adopting the identity of a mathematical thinker who looks at the principle of the subject matters and uses straight forward strategy to solve it. Due to the research done by Hsu Munching and Yuen Hsian Lin (2007) the majority of individuals with Asperger Syndrome have average mathematical ability. Research shows that autism is found more often among mathematics students than those of other disciplines. (Baron Cohen, Wheel Right, Burtenshaw and Hobson 2007). Autistic are systematic thinkers who analyse and build a system based on input-operation-output rules. Baron Cohen (2001) researched and proved that the Asperger Syndrome autistic performs at a normal or high level on tests of systemizing. Autism involves systematic thinker which is part of behaviour in mathematical thinking skills. A few researchers have done studies on autism showing this fact. Baron Cohen et al (2001) had done studies on autistics with Asperger's Syndrome who perform at a normal or high level on tests of systemizing. It is shown, too, that Asperger's Syndrome is not a barrier to achieving maximum potential in systemizing domains. Obsession is an autism cluster in the domain of their systems. This will affect their motivation to work on something in detail.

Visual thinking is the ability to think in pictures (Temple Grand, 2006). Words is like a second language to them. They translate the words both spoken and written, into full colour movies, complete with sound, which run like a video tape recorder. Visual thinking is also frequently known as visual – spatial learning or picture thinking. The phenomenon of thinking through visuals is described as a series of pictures. Brain imaging studies have provided more insights into the autistic's brain spectrum processing of information. Nancy Minshew (2007) from the University of Pittsburgh has found that in autistic people, the only part of brain which is normal is the visual cortex and the rear of the brain that keeps memories. This finding helps in the explanation of visual thinking in autism. Words that autistic hear are translated into full colour movies complete with sound, running like a video tape recorder in their head. Then they build stories in their imaginative world. Thus, they create new designs, retrieve bits and pieces of memory and combine them into a new image. (Grandin 2010).

Children with autism show strong preference towards the geometric patterns. About 40% of the autistic children spend more than half of their time staring at the shapes than 2% of the normally developing toddlers. (Karen Piece 2010).

Due to this, there are three important factors that arise in autism which are mathematical thinking, visual thinking and the interest in geometric patterns that interrelate to each other. There is a dire need for the researchers to combine the three factors and apply a special teaching methodology to enhance the ability of the autistics in their thinking skills. Few researchers have done research on teaching geometry to autistics. They find that there is no special media for children with autism used by mathematics teachers in Indonesia (Widayati et. al.2017). In the Philippines a research was done to improve the attention span of children with Autism using origami, (Luke Santamaria, 2008). The study aimed to determine whether an origami intervention program added to the typical special education program which could increase the levels of attention span and impulse control of selected children with Autism (CWA). The four respondents in the control group maintained their typical special education program while the other four in the experimental group had an additional 20 sessions of origami intervention.

The participants were chosen through purposive sampling to make each group comparable in age, functionality, auxiliary services received, and initial levels of attention and impulse control. A two-part observation scale validated by a special education expert and a statistician was used in both the pre- and post-tests of both groups. Results were analysed by obtaining the means and statistically compared using the Man Whitney U test. The six experts rated the origami manual highly satisfactory on all four categories of concepts, instructions, activities and appropriateness. Pre-test results indicate that both the experimental and control group displayed low levels of attention and impulse control.

Based on the post-test results, both groups displayed higher levels of attention and impulse control. When the pre-tests and the post-tests of each group were compared, both groups had a significant increase in their levels of attention and impulse control. The experimental group, however, had a significantly higher increase in attention span than the control group when both the post-tests were statistically analysed and compared. Both group levels of impulse control, on the other hand did not differ significantly.

The conclusion that can be drawn is that the origami instructional manual is valid for Children with Autism (CWA) aged four to seven years old. CWA improved their levels of attention span and impulse control when provided with typical special education programs. CWA demonstrates significantly higher levels of attention span when additional origami intervention is included.

In a sequence to the research done by Luke Santa Maria (2008) which focused on improving the attention span of the autistic children by using origami, there is again a dire need for the researcher to do research on how origami technique will enhance the visual and mathematical thinking skills of the autistic children.

Methodology

This is a qualitative research. The subjects were three children namely Che Suria Aishah Farhana bt Che Mat, suffering from Aspergers Syndrome, Muhamad Aliff Najmi bin Che Kamarudin identified as suffering from Classic Autism and Mohamad Aizuddin Bin Azman classified as suffering from Pervasive Developmental Disorder by the experts from Hospital Universiti Sains Malaysia Kubang Kerian. Method of collecting data was observation, interview and analysis of the students' work. Data validation technique used is triangulation technique.

Interviews were conducted with the teachers of SMK Kadok for the background of the students. The teacher then gave the students' profile and showed us the card given by the experts of USM who identified Che Suria Aishah Farhana (19 years old) with Aspergers Syndrome, Muhamad Aliff Najmi (17 years old) as suffering from Classic autism and Mohd Aizuddin Azman (13 years old) as suffering from Pervasive Developmental Disorder. We started by focussing on happiness by playing children's music videos such as Baby Shark Doo and Gummy Bear. After that, we continued to analyse their mathematical thinking skills by teaching them to fold origami of a bird. Then we let them make it in their own way to test their ability in creating something unique.

Data Analysis / Discussion

An interview was conducted with the teachers of SMK Kadok to obtain information about the background of the students. The teacher then gave the students' profile and showed us the cards that were given by the experts of Universiti Sains Malaysia (USM) who identified Che Suria

Aishah Farhana (19 years old) as suffering from Aspergers Syndrome, Muhamad Aliff Najmi (17 years old) as suffering from Classic autism and Mohd Aizuddin Azman (13 years old) as suffering from Pervasive Developmental Disorder. The researchers started working on cultivating the subjects' happiness by playing some children's music videos such as 'Baby Shark Doo' and 'Gummy Bear'.

Che Suria Aishah Farhana and Muhamad Aliff Najmi danced happily while Muhamad Aizuddin started showing his withdrawal symptoms by sitting still near the white board. His teacher tried to console him but he showed his tantrums. After that, the researchers continued analysing the subjects' mathematical thinking skills by teaching them to fold origami of a bird. Then we let them to make it on their own to test their ability in creating unique ideas.

An analysis on the video of how the students followed the steps taught to them clearly showed there was a distinctive range of difference between Asperger Syndrome, Classic autism and Pervasive Developmental Disorder. Asperger Syndrome subjects can follow the instructions very well, the Classic Autism too can follow the instructions in a step by step manner while Pervasive Development Disorder showed no interest in origami as applied to them. The Asperger Syndrome Autism subjects have mathematical thinking skills. She too, was able to create new design using her own imagination indicated that she had the characteristics of visual thinking skills. The Classic Autism has to analyse properly the steps taught by the instructor and at last can follow the steps and create new designs. The Pervasive Developmental Disorder showed no interest to the activity showing that the origami activity is not of his interest.

Conclusion

The origami is a special technique of folding origami paper to enhance the mathematical and visual thinking skills of the autistics. It is very important for the researchers to capture the interest of the autistics first before applying the origami technique to them. After identifying their interest, different types of design can be created for the autistics. A distinctive range of abilities in mathematical thinking skills and visual thinking skills can be created from this activity. It can be concluded that the Aspergers Syndrome autistics have the highest ability of mathematical and visual thinking skills while the Classic Autism autistics have a fair ability of mathematical and visual thinking skills. On the other hand, the Pervasive Developmental Disorder autistics showed no interest in these activities. Future research needs to be carried out to capture the interest of the Pervasive Developmental Disorder autistics.

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