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Effect of Occupational performance Visuo-Auditory imitation Intervention (OPVAII) on Visual perception among children with Autism: Pilot study

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Abstract

The children with autism have deficit in visual perception (VP) which affects their ability in occupational performance area. Imitation is also one of the deficits among autism. A new intervention Performance Visuo-Auditory Imitation Intervention (OPVAII) was developed to improve visual perception for children with autism. This study aimed to investigate the effects of the Occupational Performance Visuo-Auditory Imitation Intervention to improve visual perception among autism. A total of 5 participants consist of 4male and 1 female participated on 10 week intervention. A pre and post test was done to measure the participant score on visual perception using DTVP-2. There was significant effect ($p<0.05$) on visual perception in children with autism. There was an improvement seen among autism in visual perception. In the future, a larger sample of autism children can be done on this study.

Keywords: Imitation, occupational performance, visual perception and activity daily living.

Introduction

"American Psychiatric Association[1], stated that the autism is generally characterized of having deficit in social interaction, communication and also have restricted pattern of behavior, interest and activities". Besides that, children with autism also impaired in early social and communication skills, cognitive, visual perspective, social skills, language, play, adaptive, and motor skill[2-4].

Imitation is a process when a modeled action by demonstrator was being reproduces both the form and intention or any other action that can also be known as mimicry and emulation of any life form[5]. "*Soorya, Arnstein, Gillis, and Romanczyk*[6] stated when a child is having imitation skill, it indicate that they understands the link between themselves and the environment and between themselves and other people around them, an important ability to learn new skill". According to *Ganz, Bourgeois, Flores and Campos*[7] autism children display impairment in imitation compare to typically developed child.

The visual perception itself defines as ability of the brain to understand and interpret what the eyes see[8]. Visual processing has two specialized extra-striate area; ventral stream and dorsal stream[9-10]. The ventral stream is implicated the both face and object recognition while dorsal stream is concerned on spatial location of object and their relation in each other[11-12] and to be more specific, the dorsal ventral is required in processing information for visual task[13]. *Spencer et al.*[13] also stated that autism show deficit on task that attribute to the dorsal stream. According to *Rumiati et al*[14], the direct imitation mechanism of non meaningful action will be activated by dorsal stream by the visuospatial transformation process.

Visual perception is needed in as to provide information for both social and cognitive process. Some component in the visual perceptive such as visual attention[15] and visual acuity[16] and fast moving visual or saccadic eye movement[17] are impaired for autism children. According to *Blair et. al.*[18], children with autism have deficit in visual memory for unknown faces. They also impaired in object recognition and visuo-motor[13]. Beside that they also have problem in visual-motion integration[19] and visual fixation on social target[20].

Study that conducted by *Elbasan, Atasavun and Dűger*[21] stated that, visual perception is needed to connect to the environment. It also mentioned that component in visual perception play role for activities of daily living functioning such as to locate the position of item (space visualization), figure ground perceptions to differentiate the table cloth and plate during meal and to match pairs of shoe visual discrimination is needed. According to *Loikith*[22], children that impaired in visual perception will affect their ability to perform in activity daily living, games or recreational activities, schoolwork or anything that related to the children age. The children also have problem in reading, writing and math due to visual perception impaired[23]. If the children have impaired in poor visual memory, they may have difficulty in learning the alphabet and number in sequential number or difficulty remembering the shopping list or action that made in sequence[24].

Even though there have less study been conducted on aspect of imitation effect visual perception, according to Meltzoff and

Decety[25], for imitation to occur, it require an individual to maps their own behavior based onto the behavior that they observe on other individual. That's why; to match an individual own body to other individual visual perspective transformation is a crucial aspect[26].

In previous, there had been many research conducted on the intervention for visual perception among autism children. According to Smith[27] adapted puzzle activity and velcro matching board is used to improve visual attention and visual spatial problem. Previous studies done intervention on visual perception; however it does not include imitation to improve the component in visual perception.

Performance Visuo-Auditory Imitation Intervention (OPVAII) in Imitation Learning: New treatment was developed for the autism children specific in imitation problem. This is combination of visual and auditory which were effected the spontaneous imitation, social imitation, motor imitation, object imitation, symbolic imitation, facial imitation, body imitation and vocal imitation.

According to the normal development of imitation to occur, after observation, visual perception is the first component follow by cognitive then sensory motor and only then imitation can occur[16-17, 28-37]. In each component for imitation to occur there are underlying component of imitation. For visual perception to occur, 8 underlying component are visual spatial[38], visual attention[31], visual recognization[39], visual constancy[40], visual memory[18], visual motor processing[41], visual motor coordination[42] and visual motor integration[19]. After that, cognitive component which are planning, sequencing[43], attention[35], working memory[44], short-term memory[30] and procedural memory[45] take place. Based on the normal development, after cognitive component, it is sensory motor component. The underlying components are gross motor[37], motor coordination[37], motor execution[46] and fine motor[47]. After all the underlying components of imitation, can imitation occur[43].

Occupational Performance Visuo-Auditory Imitation Intervention was used in this study. In domain of Occupational Therapy consist of Occupational Performance Area (OPA), Occupation Performance Component (OPC) and Occupational Performance Context (OP Context). All the activities and occupation can be divided into "areas of occupation" such as activities of daily living, work, play or leisure, sleep and rest, for student education, instrumental activities of daily living and lastly is social participation. "Occupational Performance is defines as an action of doing and completed a selected activity or occupation that form from the dynamic transaction among the client, the context, and the activity"[48]. The OPVAII is a bottom-up approach. In the OPVAII, it consists of type of learning which are both observed/visual imitation training and listening/auditory imitation training. This intervention was used to improve visual perception skill in children with autism.

Imitation is important for children to learn new skill. There has been study conducted where children with autism indicated that they have deficit in imitation. There have been previous study conducted that support children with autism have problem in visual perception. OPVAII may improve imitation and visual perception ability in children with autism. Therefore, current study aimed to investigate the effect changes of OPVAII on visual perception in children with autism.

Methodology

Participant: There were 5 participants that participated in this study. It consists of 4 male and 1 female age range from 48 to 72 month old. Children were included in the study was diagnosis specified in the medical reports that received from a qualified hospital. Prior to the study, the family's participants were given their consent for participating in the study and prior to that, screening test was done by child psychiatrist and pediatrician. The participant have few requirement that needed to fulfill the criteria of screening, mild to moderate as assess by Childhood Autism Rating Scale (CARS)[50], mild and above mild level of Stanford-Binet Intelligence Scale[51-52] and participant needed to have good visual and auditory function. The participant also had adequate motor function (adequate score in Peabody Developmental Motor Scale (PDMS-2)[53] and good medical condition (without any other complication). They also scored probably or typical on Short Sensory Profile[54].

Test: Development Test of Visual Perception (DTVP-2)[49] was used to assess participant ability in visual perception.

The DTVP-2 consist battery of 8 subtest that measure visual perceptual and visual motor abilities. The age range of this test is for children age from 4-10 years old. DTVP-2 is to measures types of visual perceptual ability that can be categorize into position in space, form constancy, figure ground or spatial relations. All 8 subtests are categorized in to 3 which are, General Visual Perception (GVP), Motor-Reduced Visual Perception (MVP) and Visual-Motor Integration (VMI). The reliability of DTVP-2 of score objective test is high and there is coefficients of subtest which are, EH (.93), PS (.97), CO (.92), FG (.97), SR (.94), VC (.98), VMS (.95) and FC (.99). The test objective is high for validity of DTVP-2, all coefficients are significant are significant ($p<.01$)[49].

Procedure: Prior to the study conducted, ethical approval was obtained from review board. Consent form was given to participant's family after the participants completed and fulfill all inclusion criteria and pass the level of screening measure by DSM-IC[1], PDMS-2[53], Short Sensory Profile[54], Standford-Binet Intelligence Scale[51-52] and CARS[50]. Before the beginning of the 10 week intervention, participant ability in visual perception was assessed using DTVP-2[49].

The subject was given intervention in the OPVAII that had 2 parts, which are observed/visual imitation training and

listening/auditory imitation training. Both part of the Occupational Performance Visuo-Auditory Imitation Intervention (OPVAII) needed to be finish in one session and repeat the same intervention for 10 week. The first part of the intervention was visual imitation training which took time around 45 minutes to complete the entire component in the intervention. For second part of the intervention was the auditory imitation training that taken about 10-15 minutes to complete. Before the OPVAII intervention start, all the subjects need to be participate in the visual and auditory stimulation. After 2-3 minutes of the stimulation the child need to observed/visual imitation training and listening/auditory imitation training can be implemented. After subject able to complete the task in both part of the intervention, examiner needs to praise subject for job well done. Through compliment and praise after each task completed, it was motivated to subject.

Statistical analysis: To analyze the data that has received from pre test and post test of the DTVP-2. To analyze the data gather SPSS 18.0 was used in this current study. Wilcoxon Signed Rank test was used to analyze the data due to small sample of this study. The level of significant difference was set ($p<0.05$).

Results and Discussion

Demographic: Basic demographic information (age, gender, and race) is provided in table-1, for all participants. There were only 5 samples that able to fulfill the inclusion criteria of the study and able to provide time to participated in the study. The median of age for the participant was 5. For the gender and race the percentage was the same, 80% for male and 20% for female participant. As point of interest, there were only 2 races that participated in the study, which were Malay and Chinese, there were no other participant from other races.

Table-1
Demographic Data of Visual-Auditory Imitation

	Visual-Auditory Imitation (*n*=5)	
	N	***%***
Gender		
Male	4	80
Female	1	20
Age, median (IQR)	5 (1)	
Race		
Malay	4	80
Chinese	1	20

Visual Perception (VP): In the visual perception, Developmental Test of Visual Perception Second Edition (DTVP-2) was used to measure the participant ability in visual perception. In the DTVP-2, the assessment measure 3 different components in visual perception which are General Visual Perception (GVP), Motor-Reduced Visual Perception (MVP) and Visual-Motor Integration (VMI).

Table-2 showed that there was a significant change in the entire 3 component in DTVP-2, which were GVP ($z=-2.0.32^a$, $p=0.042$, $df^a=-0.525$), MVP ($z=-2.0.23^a$, $p=0.043$, $df^a=-0.522$) and VMI ($z=-2.0.32^a$, $p=0.042$, $df^a=-0.525$). All the p-value of the component was less than 0.05 which indicates that there was significant changes in pre and post test in the DTVP-2. The effect size also show more than 0.5 indicated the effect of the OPII in children with autism. Based on the table-2, it also indicate there was improvement in Visual Perception in the 3 component of DTVP-2 where the median score of the components increase compare to the pre-test scoring.

Table-2
Pre and Post Test Score of Activity Daily Living (ADL) and Visual Perception in Occupational Performance Visuo-Auditory Imitation Intervention (OPVAII) Wilcoxon Signed Rank Test

Variable	**(N=5)**	**Median (IQR)**	**df[a]**	**Z value**	**p value[a]**
Visual Perception (VP)	5				
GVP					
Pre-Test		99 (20.0)	-0.525	-2.032[a]	0.042
Post-Test		112 (13.0)			
MVP					
Pre-Test		93 (32.5)	-0.522	-2.023[a]	0.043
Post-Test		110 (13.5)			
VMI					
Pre-Test		105 (34)	-0.525	-2.032[a]	0.042
Post-Test		120 (15.5)			

p- value <0.05

Discussion: To investigate the change of OPVAII in visual perception among autism is the objective of this current study. Other than that, the implementation of OPVAII was also the aims of this current study. Based on the result of visual perception, the GVP (p=0.042), MVP (p=0.043) and VMI (p=0.042), it shows that there was significant change after 10 week of intervention of OPVAII. There was less study conducted on aspect of visual perception will affect imitation, however according to Jackson, Meltzoff and Decenty[26], for imitation to occur visual perception is needed. There was relationship between visual perception and imitation to occur. The Occupational Performance Visuo-Auditory Imitation Intervention (OPVAII) was to improve the visual perception skill. Based on this finding, the null hypothesis was rejected and alternative hypothesis was accepted. There was a significant change of Occupational Performance Visuo-Auditory Imitation Intervention in visual perception among autism.

Occupational Performance Visuo-Auditory Imitation Intervention (OPVAII) was a new intervention develops based on the process of imitation to occur and due to deficit of imitation among autism. The OPVAII was all activity that needs to be done by imitating the researcher. As mention above there was relationship between imitation and visual perception. By improving the imitation, visual perception would also be improved. There was a significant change for visual perception after 10 week of intervention of the OPVAII of the visuo-auditory imitation training.

The current study had few weaknesses, such as; the study was conducted on 10 week timeline, for 1 week per session and 60 minutes each session (the intervention period was too short). The study could be more effective if the frequency of the intervention was increase from 1 to 3 sessions per week. It also noted from the study, there was no follow-up was done on the sample after the post –test conducted. Due to time consume, there was no follow-up.

Second limitation of the study, the sample size was too small. 5 samples were too small to see the total effective of the intervention among autism. Larger samples could see the significant different for the effectiveness of the treatment on improving visual perception among autism. Next limitation was that, the study was only single blinded study. There could be increase of bias between the researcher and the participant during the intervention and assessment. Other than that, the sampling was convenient sampling methods as the sample was not pick in random.

In the future, a larger sample can be implemented to see the effectiveness of the Occupational Performance Visuo-Auditory Imitation Intervention (OPVAII) among autism. By increase the number of sample and doing a Randomized Control Trial (RCT) on the future study, more information can be obtained and more precise result can be gain. A future study needed to investigate the effectiveness of the Occupational Performance Visuo-Auditory Imitation Intervention (OPVAII) on improving the Activity Daily Living (ADL), work/school and play in children with autism.

Conclusion

In conclusion, Occupational Performance Visuo-Auditory Imitation Intervention (OPVAII) has an effect on visual perception in children with autism. Although the sample size was small, it still shows significant changes on the improvement of visual perception after implementation of OPVAII.

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