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Research Paper

Implementation of Mobile Robots Approach for Autistic Children Media Therapy

Anip Febtriko[1*], Tri Rahayuningsih[2], S Sukri[1], Haris Tri Saputra[3]

[1]*Department of Informatics, Universitas Abdurrab, Pekanbaru, Indonesia*
[2]*Department of Psychology, Universitas Abdurrab, Pekanbaru, Indonesia*
[3]*Department of Informatics, Akademi Manajemen Informatika & Komputer Tri Dharma, Pekanbaru, Indonesia*
**Corresponding author E-mail: anip.febtriko@univrab.ac.id*

Abstract

Autism is neural development disorder which complex and is characterized by difficulties in social interaction, communication, emotion and limited behaviour, repetitive and stereotyped characters. The development of people with autism experienced a very significant increase. Autistic fine motoric development of children with autism is done through the hands by using tools or creative media such as brushes, pencils, paper, scissors, clay, plastisin, foam, and others. One way to improve fine motor in autistic children is to play mobile robot therapy. Mobile robots media is an activity to control and regulate the movement of the robot that involves and requires coordination between the eyes, hands, and concentration. It is necessary to approach and use mobile robot in the effectiveness of play therapy in children with autism. Mobile robot as a medium that becomes a play therapy tool with mobile robot capability that can move and move from one place to another by following the pattern of lines that have been designed. The main purpose of this research is to design creativity according to the level of complexity of mobile robot use for children with autism. Besides the use of mobile robot as a medium of play therapy there is also analysis in research using Pre experimental design. Population in the sampling amounted to 20 children. Autistic children who become samples aged between 6 years to 12 years in Special School Kids Pekanbaru. Data collection to study the fine motor of autistic children, collected data analysed by descriptive analysis and Rank Wilcoxon test. The result of the research is a reciprocal relationship which means there is a difference of reciprocal relationship before and after the approach of using mobile robot in play therapy to improve fine motor in autistic children.

Keywords: *Mobile Robot, Autism, Rank Wilcoxon, Fine Motorics*

1. Introduction

Autism is a polymorphic genetic disorder. As for some of the disturbances are in the areas of speech, language, communication, social interaction, sensory, play patterns, behavior, and emotions. The number of autistic children is also increasing in Indonesia, it can be known from the estimated data of the spread of autism in Indonesia. Based on data from the Statistical Research Agency (BPS) since 2010-2016, there are 140 thousand children under the age of 17 with autism. The development of autism in Indonesia is increasing year by year. The most widely spread in areas with a high population density ratio included in the city of Pekanbaru Riau province. In addition to genetic factors, factors from a strong environment that affect the fetus in the womb can also cause a child to be born with autism.

When faced with the reality that must be faced then the attitude to be taken must be appropriate, because it is a number of ways taken by many parents to optimize the growth and development of children[1]–[5]. Therapies that can be given to autistic children include speech therapy, occupational therapy, play therapy, medical therapy, food therapies, sensory integration therapy, auditory therapy, and biomedical therapy[6]. Play therapy is an attempt to change the behavior of problems, by placing children in play situations. There is usually a special room that has been arranged in such a way that the child can feel more relaxed and can express all feelings freely in this way, it can be known the problem of children and how to cope [7], [8], so with play therapy given to autism children are expected parents can recognize emotional disturbance as well as other distractions.

Therapy media for autism children play with the use of mobile robot, with the mobile robot can do the interaction of movement when playing involves certain body parts and begins by the development of small muscles such as the skills using fingers and hand movements are flexible, eye child coordination. One of the developmental achievements is the ability to control the mobile robot by following the robot path pattern in the form of straight lines, curves, circles, rectangles, triangles and other patterns[9]–[12].

Preliminary study on Special School Kids Pekanbaru with the number of students or students of children with autism from 2015-2017 year increased and in 2017 amounted to 20 students or girls. Based on this, researchers interested to examine the effect of mobile robot play therapy in children aged 2-7 years of autism against fine motor skills.

2. Theory

Autism is defined as developmental disorders that appear in children within the first 3 years of their life caused by developmental brain abnormalities [13]. Autism is a unique neurological disorder, since no medical tests can distinguish the diagnosis of autism [14].

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A. Play Theraphy

Playing for children is an activity consisting of: imitating, exploring, testing and building. Based on this understanding the benefits of playing for children are as a means to channel the tension caused by environmental restrictions on their behavior [8], [15], [16].

B. Fine Motoric

The development of fine motor is the process of growing up the ability of a child's motion. The development of motor skills is the development of coordinated physical movement control between nerve centers, nerves and muscles [17]. fine motorics is defined as movement performed by using smooth muscles such as drawing, cutting, and forming. Fine motor skills that use the right fingers, hands and wrists, the fine motor control of the child is just as important as the rough motor [13]. This skill involves co-ordination (brain nerve) which requires accuracy for the success of this skill [14].

C. Rank Wilcoxon

The Wilcoxon-marked test of levels introduced by Frank Wilcoxon in 1945 is a refinement of the "Test of Signs" in addition to the positive and negative signals, the magnitude of differences is also noted. This test is used to test the condition (variable) in the paired samples with scores of data that are ordinal-scale minimum or also for research with data pretest and posttest [18].

D. Mobile Robots

Robots are mechanical devices that can be controlled by software that uses sensors to guide one or more effects through programmed movement in a workspace in the case of manipulation of physical objects [19]. Based on the tools used to move, the mobile robot is divided into an arm or leg-legged or human-like or animal-shaped robot, Wheeled Mobile Robot (WMR) [20]. This sensor sensing work in the robot navigation always transmits the send and wave waves back after the wave is reflected by a wall/barrier on the left, right or front of the robot [21]. Another example that will be discussed is a mobile robot to perform maze solving. Here is a picture of the system block diagram:

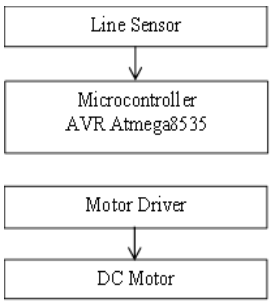


Figure 1. Block Diagram

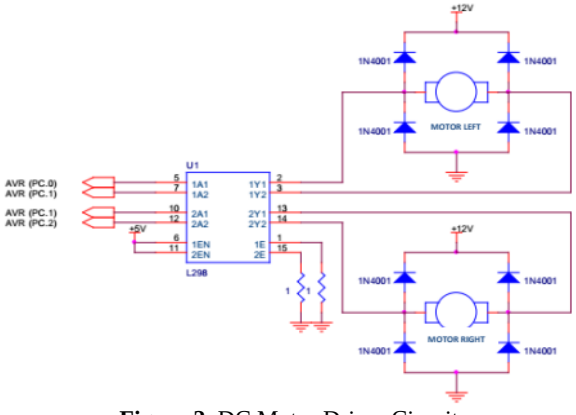


Figure 2. DC Motor Driver Circuit

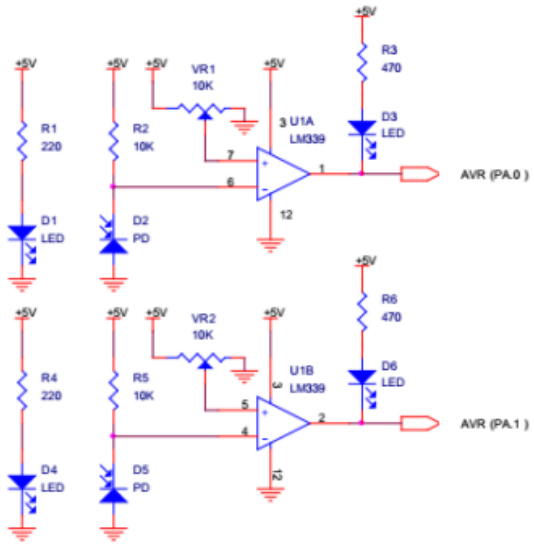


Figure 3. Phototransistor Circuit Series

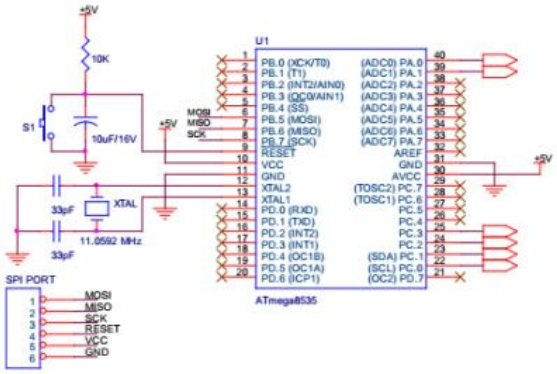


Figure 4. Microcontroller Circuit

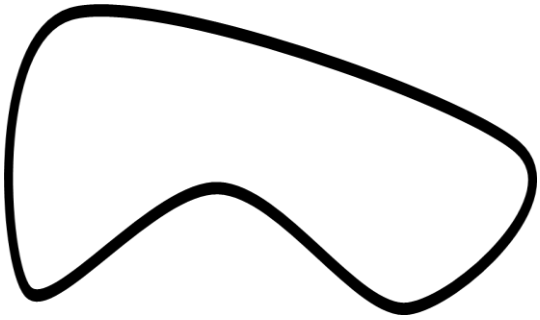


Figure 5. Line Follower

3. Methods

At this stage identify the problems that arise followed by conducting a survey directly at Special School Kids in Pekanbaru Riau Province. The survey was conducted to determine the problem that there is an increasing number of children with autism at Special School Kids in Pekanbaru. Use of various therapies has been done, but prevention and treatment through therapy has not been able to provide a very significant solution. Age ranges identified at the school from age 2 to 11 years. The research was done by observation and interview of the owner of Special School Kids. The results of interviews and interviews resulted in a plan to use play therapy using mobile robot as a play media for fine motor analysis in children with autism.

At this stage the program is tested to ensure the program is free of errors, after which the tool is tested and tested the process works. This test includes several stages, such as:

a. Hardware Testing

Hardware testing aims to ensure there are no errors in the electronic circuit.

b. Software Testing
This test is done by testing the program by giving input and observing the output.

Methods of data collection in market research is done by distributing questionnaires filled by mentors or teachers to 20 respondents or autism children who are in Special School Kids Pekanbaru. This research was conducted to find the difference of research result by giving pretest (preliminary observation) to fine motor level before doing next therapy done posttest (last observation) to fine motor improvement after doing mobile robot play therapy. Data processing becomes the next stage after the required data are collected. Wilcoxon Test Statistics is used as a tool to process the data.

4. Results and Discussion

The results of the testing process carried out are as follows:

Table 1. Characteristics of respondents

Gender	Amount	Percentage
Male	12	60 %
Female	8	40 %
Total	20	100 %

Table 1 shows that many males have autism of 12 children compared with 8 women.

Table 2. Characteristics of respondents by age.

Age	Amount	Percentage
6	5	25 %
7	4	20 %
8	5	25 %
9	0	0 %
10	2	10 %
11	3	15 %
12	1	5 %
Total	20	100 %

Based on age can be seen in Table 2 above, where the most ages are ages 6 and 8 years with 25%.

Table 3. Range of grades of autistic children in Special School Kids

Range	Grades
≤ 0-45	Not Good
> 45-100	Good

The range of values enforced in this study is from 0-100 points. With the category ≤ 0-55 is less good and> 55-100 is good.

Table 4. Number of respondents pretest given intervention

Grades	Amount	Percentage
Not Good	14	70 %
Good	6	30 %
Total	20	100 %

Based on the number and percentage of people with autism who performed pretest interventions were 14 children expressed less well and 6 children get good results.

Table 5. The number of posttest respondents was given intervention

Grades	Amount	Percentage
Not Good	5	25 %
Good	15	75 %
Total	20	100 %

Based on the number and percentage of fine motoric conducted posttest the intervention is 5 children declared less good and 15 children good results.

Table 6. Analysis Results of respondents on pretest and posttest activities

No	Pre	Post	Diff	Positive	Diff	Rank	Signed Rank
1	51	52	1	1	1	1	1
2	54	56	2	1	2	2	2
3	55	59	4	1	4	7	7
4	47	53	6	1	6	10	10
5	63	59	-4	-1	4	7	-7
6	51	60	9	1	9	14	14
7	70	68	-2	-1	2	2	-2
8	40	45	5	1	5	9	9
9	55	70	15	1	15	19	19
10	62	60	-2	-1	2	2	-2
11	43	57	14	1	14	17	17
12	47	50	3	1	3	6	6
13	63	73	10	1	10	15	15
14	51	65	14	1	14	17	17
15	70	72	2	1	2	2	2
16	40	58	18	1	18	20	20
17	55	68	13	1	13	16	16
18	44	50	6	1	6	10	10
19	53	60	7	1	7	12	12
20	66	73	7	1	7	12	12

Based on the results of analysis by using Rank Wilcoxon test data obtained as Table 6 above. The results show there are some items that need to be solved that is difference, positive, negative, Rank and Signed Rank. Table 7 below explains that there is a difference with playing therapy using mobile robot in Special School Kids Pekanbaru. Evident from Z (2.86) and significance value = 0,000 <0.05. This proves that there is the influence therapy to the smooth motor development of children with autism.

5. Conclusion

Patients with autism at special schools kids Pekanbaru as many as 20 children. 12 children of male sex and 8 children are Women and based on using mobile robot as play therapy, seen there are good results from children who experience fine motoris and from wilcoxon test results, positive ranks showed that there were 15 children who experienced an increase of fine motor is less good than 20 children, and after doing play therapy, fine motor response to be good. Evident from Z (2.86) and significance value = 0,000 <0.05.

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