

# The Intervention of Effective Playdough Activity on The Increase of Cognitive Development of Autistic Children

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**Abstract---** *Cognitive delay is one of the problems that occur in autistic children. If not immediately addressed, the children's cognitive ability will not develop properly. One of the stimulations to improve the cognitive abilities of autistic children is by playing. This study aimed to examine the effect of the intervention of playdough activity on the cognitive development of autistic children. This study applied a quasi-experiment method using the pretest-posttest control group design. The population of this study was all autistic children in one foundation in Surabaya. The number of samples was 16 children, namely eight children for the treatment group and eight children for the control group. Data were analyzed using the Wilcoxon signed-rank test and Mann-Whitney U test with the significance level  $\alpha = 0.05$ . The intervention of playdough activity had a significant effect ( $p = 0.014$ ). By giving the intervention of playdough activity, it can improve the cognitive development of autistic children. The playdough activity trains children to recognize the colors and shapes of fruit or animal. They are also taught to make shapes. They can also communicate and interact well during the activity.*

**Keywords---** *autistic children, cognitive development, the intervention of playdough activity*

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## I. INTRODUCTION

Cognitive is one of the development aspects related to knowledge, correct language usage, interaction with the surrounding objects or environment, and assessment or consideration on certain events [1]. Cognitive development in autistic children is slightly hampered signed by the difficulty of focusing their attention while doing a task or talking, the inability to concentrate, and the difficulty when working on tasks that require perseverance [2]–[4]. Autistic children need uncomplicated play as a form of therapy [5]. Playdough activity is a simple and easy game for autistic children. This activity teaches autistic children to recognize colors and shapes. Those children are also able to express their creativity by making shapes [6], [7]. However, it needs more studies to investigate the effects of playdough activity on the cognitive development of autistic children.

The WHO recorded that, in 2013, there were 35 million people with autism worldwide [8]. Autism is more often found in boys, namely four times higher than in girls. A study in the United States reported that the ratio of 8-year-olds children diagnosed with autism was 1:80 [9]. The issue of autistic children in Indonesia emerged in the 1990s [10]. Based on the data of the prevalence of autism disorder patients in Indonesia [11], it was estimated more than 112,000 children who suffered from autism at the age of 5-19 years in 2013. Tandian stated that autistic sufferers in Surabaya continued to increase in the last five years. No less than 4,000 residents of Surabaya were identified as suffering from autism [12].

The preliminary observation conducted by the researcher in one of foundation in Surabaya showed that based on the data of the cognitive scores of 23 children, 19 boys (82.61%) and four girls (17.39%) were indicated to have the

cognitive delay. Based on the results of cognitive observations, four children (17.39%) gave responses when called, were able to distinguish objects with different sizes, and understood several pictures of vegetables, fruits, and animals even though they had to be asked repeatedly. Seven children (30.43%) had been able to recognize numbers, to distinguish larger and smaller objects, and to recognize several pictures of fruits, vegetables, and animals with the help of a teacher. Twelve children (52.17%) had not been able to point the larger object, not recognized pictures of vegetables, fruits, and animals, although helped by the teachers. The results of interviews with the head of the foundation, 10.25% of autistic children started attending elementary school at the age of over ten years because their parents did not realize that their children had autism. Some parents also said that they rarely engaged their children to play to improve their cognitive development. Parents only relied on lessons and activities from school.

Autism is caused by some brain cells that are not fully developed or are damaged during the development process. This disorder occurs since the fetal period during organ formation phase (organogenesis) in the first trimester of pregnancy (0-4 months) which affected the neuro-anatomy in the brain so that it is not fully developed and the cognitive development is delayed [13]. Piaget stated that cognitive abilities and development were the results of the relationship between the development of the brain and the development of the nervous system that formed someone to able to adapt to their environment. Cognitive is an important aspect to help children during their learning process, to develop logic abilities, and to develop thinking abilities [14]. According to experts, autistic children tended to process unreasonable beliefs so that their behavior was abnormal. If autism was not treated immediately, it would have an impact on the children's development and threaten children's intelligence in the long run, which would cause them to be unproductive [15].

The treatments that must be given to autistic children are occupational therapy, speech therapy, Applied Behavior Analysis (ABA) therapy, image-media therapy used to communicate, and medication therapy. These therapies can be successful if applied repeatedly. Autistic children can recover because of certain conditions, such as treated early on and still in the mild spectrum. However, there are some problems when giving therapy. One of them is that children will often get angry, speak meaninglessly during the therapy process, and be difficult to focus so that it will make the therapy process is not optimal [16]. To reduce children's uncontrolled behavior, parents can provide repeated therapy at home. One of the therapies that are easily conducted by parents at home is by playing. Playing is an activity conducted to make children happy, which is carried out voluntarily. The purpose of playing is to change children's deviant behavior by putting children in playing situations or activities [4], [17].

Developing children's cognitive ability can be carried out by providing various kinds of stimulation to influence the development of children's brain [18]. The stimulation used by researchers is the intervention with playdough activity. Playdough refers to the dough that resembles clay [19], [20]. Based on a study conducted by Khanastren, playdough activity can be used as stimulation in developing the cognitive abilities of autistic children. By playdough activity, children can recognize colors or shapes, can express their imagination in the shape of playdough, and can interact when playing with their friends [21].

Based on the theory of goal attention initiated by Imogene M. King in 1971, the goal of nursing can be achieved through interactions between nurses and clients resulting from the provision of action and reaction processes [22]. The problem of lack of cognitive development in autistic children can be overcome by providing stimulation through the intervention of playdough activity [23]. By giving of the intervention, it is expected that there will be a reaction and interaction between the researcher as a nurse and the autistic children as clients in achieving a goal that is to improve the cognitive development of autistic children. In addition, King also mentioned that the intensity of interaction between nurses and clients was the key to setting and achieving nursing goals. The more often the nurse interacts with clients, the easier the nursing goals to be achieved are [22].

Similarly, this study required repeated interactions between the researcher and the autistic children. By the more frequent actions taken by the autistic children in recognizing colors or making shapes, it is hoped that the cognitive development of autistic children can increase optimally. Based on the description above, the researcher is interested in conducting a study of the intervention of playdough activity on the increase of cognitive development of autistic children at one of Foundation in Surabaya by using the theory of goal attainment by Imogene M. King.

## II. METHODS

This study applied the quasi-experiment method using the one-group pretest-posttest design. The population in this study was autistic children at one of Foundation in Surabaya, namely 23 children. The number of samples taken was 16 respondents divided into two groups, namely eight respondents to the treatment group and eight respondents to the control group. The applied sampling technique in this study was the purposive sampling technique. The independent variable was the playdough activity, while the dependent variable was the cognitive development of autistic children.

The instruments to measure the independent variable were the play dough mixed with various colors, a table as a base during the process of production, scissors, and molds. The applied techniques were rolling, squeezing, and cutting. These techniques were chosen because they could increase the psychomotor and cognitive stimulation. Meanwhile, the instruments to measure the dependent variable were an observation form modified from Galuh Handayani Foundation Surabaya's cognitive observation form. The assessment for color recognition was reflected in the item numbers 1-6; the assessment for fruit recognition was reflected in the item numbers 7-9; the assessment for animal recognition was reflected in the item numbers 10-12; the assessment for size recognition was reflected in the item number 13; the assessment for being able to make original shape creation was reflected in the item number 14; the assessment for being able to interact, to recognize the face of the researcher, to communicate, to be not angry, to be able to cooperate with their friends, and to able to concentrate during playing was reflected in the item numbers 15-22.

This study was conducted at one of foundation in Surabaya. At first, respondents were led to take the pretest. After that, they were given the intervention of playdough activity for six meetings. At the first meeting, children were taught to recognize colors and taught the rolling technique to make a sphere model. At the second meeting, children were expected to have been able to mention and recognize colors and to have been able to make a sphere model from small to medium sizes by the rolling technique without the help of the researcher. At the third meeting, the researcher introduced various forms of fruits (grapes, strawberries, and oranges) using the available molds. At the fourth meeting, children were expected to have been able to mention and differentiate the shape of fruits and to have been able to make their original shape created using the molds without the help of the researcher. At the fifth meeting, the researcher introduced various forms of animals (horses, cats, and fish) using the available molds. At the last meeting or the sixth meeting, children were expected to have been able to mention and differentiate the shape of animals and to have been able to make their original shape created using the molds without the help of the researcher.

Furthermore, data were collected and then analyzed using the Wilcoxon signed-rank test and the Mann-Whitney U test. The Wilcoxon signed-rank test was used to examine the hypothesis with two samples if the data were ordinal, namely data of the increase of cognitive abilities in autistic children before and after given the intervention of playdough activity with the significance level  $p \leq 0.05$ . Meanwhile, the Mann-Whitney U test was used to examine the hypothesis of two independent samples in which the data were ordinal with the significance level  $p \leq 0.05$ . This study has implemented the ethical principle and received consent from participants.

### III. RESULTS

Table 1. Demographic characteristics of respondents

| Demographics             | Category  | Treatment group |      | Control group |      |
|--------------------------|-----------|-----------------|------|---------------|------|
|                          |           | n               | %    | n             | %    |
| Gender                   | Male      | 6               | 75   | 6             | 75   |
|                          | Female    | 2               | 25   | 2             | 25   |
| Gestational age          | Premature | 1               | 12,5 | 3             | 37,5 |
|                          | Full-term | 7               | 87,5 | 5             | 62,5 |
| Age of initial diagnosis | 2-3 years | 6               | 75   | 5             | 62,5 |
|                          | > 3 years | 2               | 25   | 3             | 37,5 |

Based on table 1 above the characteristics of respondents, it showed that the treatment group respondents were mostly male, namely seven children (75%). Most of the respondents were born full-term, namely seven children (87.5%). Most of the parents knew their children had autism at the age of 2-3 years, namely six children (75%). Meanwhile, the control group respondents were mostly male, namely seven children (75%). Most of the respondents were born full-term, namely five children (62.5%). Most of the parents knew their children had autism at the age of 2-3 years, namely five children (62.5%).

Table 2. Data of education and employment of parents

| Demographics   | Treatment group |      |         |      | Control group |      |         |      |
|--|-----------------|------|---------|------|---------------|------|---------|------|
|  | Fathers         |      | Mothers |      | Fathers       |      | Mothers |      |
|  | n               | %    | n       | %    | n             | %    | n       | %    |
| Latest Education Level and Working Status of Parents |                 |      |         |      |               |      |         |      |
| Junior High School                                   | -               | -    | -       | -    | -             | -    | -       | -    |
| Senior High School                                   | 4               | 50   | 4       | 50   | 6             | 75   | 3       | 37.5 |
| College  | 4               | 50   | 4       | 50   | 2             | 25   | 5       | 62.5 |
| Total  | 8               | 100  | 8       | 100  | 8             | 100  | 8       | 100  |
| Government Employee                                  | 3               | 37.5 | -       | -    | 3             | 37.5 | 2       | 25   |
| Private Employee                                     | -               | -    | 2       | 25   | 2             | 25   | 1       | 12.5 |
| Entrepreneur   | 5               | 62.5 | 3       | 37.5 | 3             | 37.4 | -       | -    |
| Not Working  | -               | -    | 3       | 37.5 | -             | -    | 5       | 62.5 |

Based on table 2 above, it showed that most of the parents (mothers and fathers) of treatment group respondents were high school graduates, namely four people (50%) while most of the fathers of control group respondents were high school graduates, namely six people (75%) and most of the mothers of control group respondents were college graduates, namely five people (62.5%). In addition, most of the professions of the fathers of treatment group respondents were entrepreneurs; namely five people (62.5%) and most of the professions of the mothers of treatment group respondents were entrepreneurs, namely three people (37.5%) and housewives, namely three people (37.5%). Meanwhile, most of the professions of the fathers of control group respondents were government employees; namely, five people (31.25%) and most of the professions of the mothers of control group respondents were housewives, five people (31.25%).

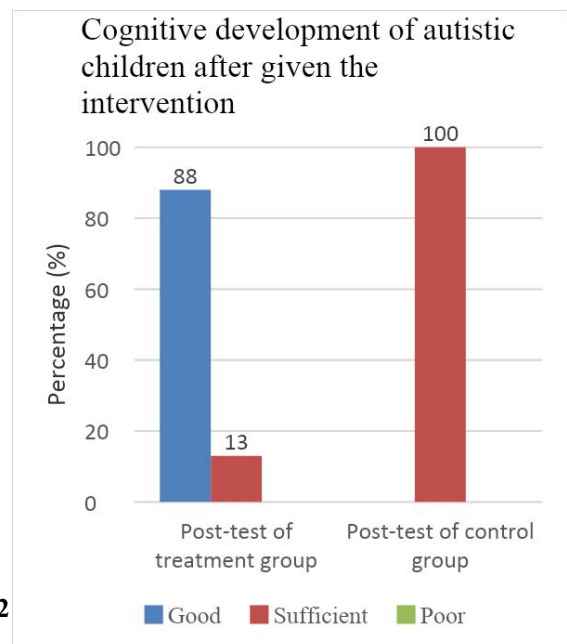
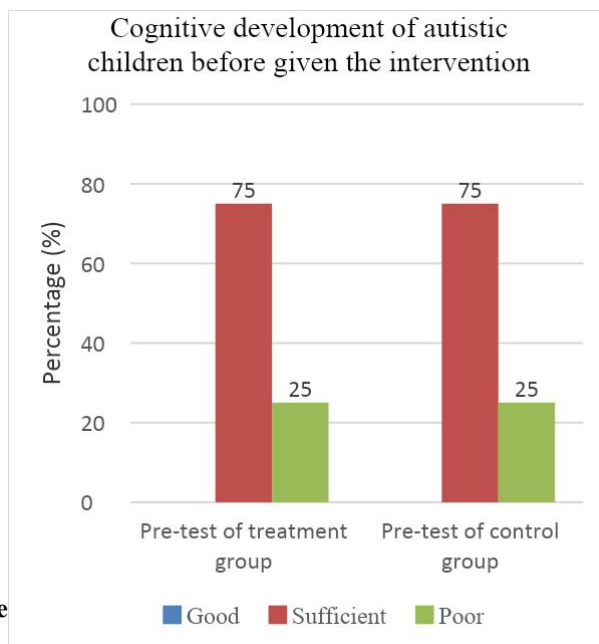


Figure 1. Cognitive development of autistic children between those given intervention and those not given intervention

Figure 1 showed that after the pre-test was conducted, the results of the treatment group and the control group were the same, in which they were in the sufficient category, namely six children (75%). However, after post-test was conducted, there were significant changes in which on the treatment group, almost all of the scores of its respondents increased to the good category, namely seven children (87.5%) and on the control group, all of the scores of the respondents increased as well but was still in the sufficient category.

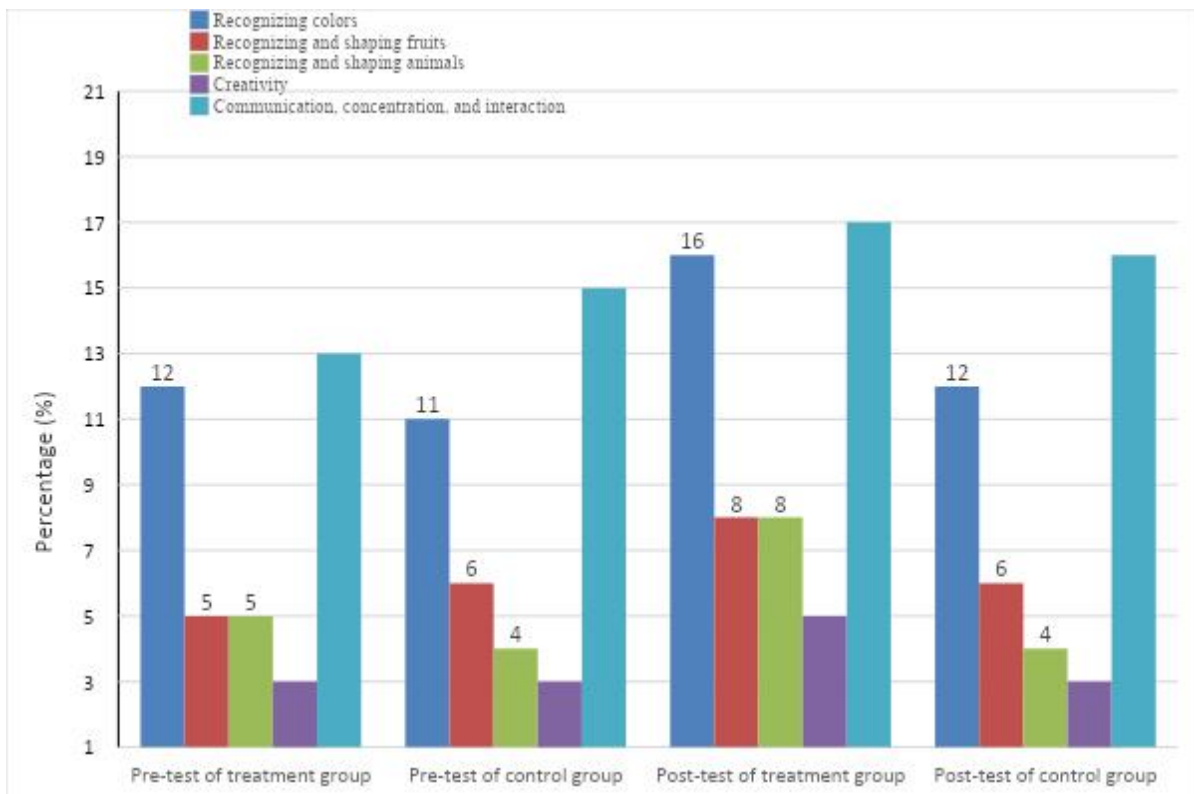


Figure 2. Cognitive development of autistic children in each item

Figure 2 showed that the treatment group before given the intervention had the highest score in the communication, interaction, and concentration aspects, namely 13%; however, the score per each item was still in the sufficient category. This was the same for the control group, namely 15%, in which their highest score was in the communication, interaction, and concentration aspects, but the score per each item was still in the sufficient category. After given the intervention, the score from the treatment group increased in all items, however, the highest score was in the communication, interaction, and concentration aspects followed by color-recognizing aspects. Meanwhile, on the control group, their score increased in the communication, interaction, and concentration aspects; however, if compared with the treatment group, their increase was lower than the treatment group.

Table 3. The analysis of pretest and posttest of cognitive development of autistic children

| Category   | Treatment group |    |           |      | Control group |    |           |     |
|------------|-----------------|----|-----------|------|---------------|----|-----------|-----|
|            | Pre-test        |    | Post-test |      | Pre-test      |    | Post-test |     |
|            | Total           | %  | Total     | %    | Total         | %  | Total     | %   |
| Good       | -               | -  | 7         | 87.5 | -             | -  | -         | -   |
| Sufficient | 6               | 75 | 1         | 12.5 | 6             | 75 | 8         | 100 |
| Poor       | 2               | 25 | -         | -    | 2             | 25 | -         | -   |

|                                       |  |  |
|---------------------------------------|--|--|
|                                       | Negative Ranks = 0<br>Positive Ranks = 7<br>Ties = 1 | Negative Ranks = 0<br>Positive Ranks = 2<br>Ties = 6 |
|                                       | Wilcoxon signed-rank test<br>$\rho = 0.014$          | Wilcoxon signed-rank test<br>$\rho = 0.157$          |
| Mann-Whitney U test<br>$\rho = 0.001$ |  |  |

Based on table 3 above, it showed that the majority of the treatment and control group respondents had cognitive abilities in the sufficient category. After given the intervention of playdough activity, the majority of the treatment group respondents experienced an increase in cognitive development from sufficient to good categories. Meanwhile, in the control group, the majority did not experience an increase and only two children who experienced an increase from the poor to sufficient categories.

In the treatment group, after being given the intervention of playdough activity, it indicated that there was a significant relationship between the intervention of playdough activity and cognitive development by considering the result of the Wilcoxon signed-rank test which showed the significance value  $\rho = 0.014$ . The control group that was not given the intervention of playdough activity indicated that there was no significant relationship between the given conventional activity and cognitive development. The results of the Mann-Whitney U test showed that there was a significant difference between the values obtained in the treatment group and the control group in which the value  $\rho = 0.001$ .

#### IV. DISCUSSION

The cognitive development of autistic children in the treatment group before given the intervention of playdough activity was included in the sufficient category. Autistic children had lower cognitive abilities compared to normal children. This was indicated by the children's inability in terms of perception, memory, thinking, concentration, focus, and understanding of symbols, reasoning, and problem-solving [24]. The cognitive aspect was students' intellectual abilities in thinking, understanding, and solving problems [25]. According to a study at the Virginia University in the United States, it was estimated that 75% - 80% of people with autism had the below-average mental retardation abilities while the remaining 20% had normal or above normal intelligence for certain fields [26]. A small portion of autistic people had a very strong memory, especially related to visual objects. Their memory capacity tended to require more repetition so that it could come into the long term memory.

The data from the treatment group and the control group indicated that there were two children in each group who had low scores. According to data obtained from respondents, they were cared for by the caregiver at home so that their time with parents was less, and their parents only relied on lessons or therapies from school. Therefore, if comparing cognitive abilities of children who were cared for by caregivers and children who spent their time more with parents and were often given the training to learn and play, there would be a significant difference. The main factors affecting cognitive abilities were environment and stimulation [27]. Environmental factors played an important role in the growth and development of children. The level of intelligence was determined by the experience and knowledge gained from the environment [28]. Parents had a very important role in improving children's development.

The education and socioeconomic level of parents also influenced the provision of stimulation to develop their children's cognitive development. Stimulation was needed to improve their cognitive abilities so that the role of parents was needed to guide their children in practicing their cognitive abilities. There were various types of stimulation, such as visual, verbal, and tactile stimulations, which would further be able to assist the children's development [29]. Most of the respondents' parents were high school graduates. More than half of the respondents' fathers were entrepreneurs, and most of the respondents' mothers were housewives. The educational and occupational backgrounds of parents were often linked to developmental problems. In addition, the lack of parental awareness on

the importance of early education and the lack of knowledge in providing positive stimuli during the children's development could be one of the causes which hampered the children's development.

After given the intervention of playdough activity, the data obtained from the treatment group indicated that they experienced a significant cognitive increase. The treatment group respondents mostly experienced an increase from the sufficient to good categories. Most of the children had been able to recognize colors. When asked for color, they were able to answer without the help of the researcher. They were also able to recognize animal and fruit shapes without the help of the researcher. They could already make animal and fruit shapes. There were only a few children who needed to help to make shapes. Most of them were able to make their shapes creation. They could distinguish sizes. Almost all of them could communicate with their friends and the researcher. Some children could share their toys with their friends. However, two children could not interact with their friends. They preferred to play if they mixed all colors into one. After the colors were mixed, they made shapes using molds or made their creations. The highest development occurred in communication and making shapes aspects. However, one child had a score that was not increased, which meant that it remained in a sufficient category. According to data obtained, that child was born prematurely, and both of his/her parents graduated from high school in which his/her father worked as private employees, and his/her mother did not work. Furthermore, based on a study, the level of education and lack of knowledge were related to how parents take care of and educate their children [30]. Lack of knowledge in providing positive stimuli during the children's development could be one of the causes that hampered children's development.

Meanwhile, in the control group that was not given the intervention, there was no cognitive improvement. Most of the children remained in the sufficient category, and two children showed an improvement, namely from the poor to sufficient categories. In the control group, some children showed improvement in several aspects, such as recognizing colors, fruits, and animals. However, they were unable to mold shape and unable to cooperate with their friends. This was because those children participated in the school studying and learning activities so that the children's ability to recognize the colors, animals, and fruits could increase. However, the difference between respondents in the treatment group and the control group was that in the control group, they were not able to make a shape and not able to work together with their friends.

Playing is one of the main social activities for children. Playing for children is one of the fun activities carried out for the sake of self-entertaining [31]. In addition, according to Hurlock, he stated that active playing for children had benefits for brain development. Playdough was very important to help children's brain development [32]. Playdough was conceptualized as a playing and learning tool for children. During playdough activity, children would learn about the techniques of making a shape. Furthermore, they would memorize and be able to distinguish the shapes they made. They could also play with their friends. By using the playing technique repeatedly, children would get used to and would remember the technique or the form taught [33].

The increased cognitive development from each child was different so that there were differences in the increase of the score gained by each respondent. The intended cognitive development was that the individual was able to develop abilities such as perception, attention, memory, thinking, concentration, focus-understanding of symbols, reasoning, and problem-solving [34]. The results of demographic data from respondents who experienced a significant increase showed that respondents had gone through ABA therapy for > 1 year, which could also be a supporting factor for children's cognitive. In accordance with the theory proposed by Lovaas, ABA therapy proved that there was a permanent improvement [35].

The results of the pretest for respondents in the treatment group and the control group were almost the same, namely in the sufficient category, there were six children (75%), and in the poor category, there were two children (25%). Most of the children were still having difficulties and still needed the help of the researcher to recognize colors,

animals, and fruits. Furthermore, almost all of the children were still unable to interact and communicate with the researcher or their friends.

After given the intervention, there was a significant difference between respondents in the group given intervention and in the group not given intervention. Respondents in the group given intervention showed a significant score increase in which all of the respondents' scores increased to the good category meaning that they were able to recognize colors, animals, and fruits and were able to make shapes using available molds. From interventions given gradually, children were able to interact with their friends and the researcher. They were also able to make their shape creation. Meanwhile, for autistic children who were not given intervention, it indicated that there were only two children in which their scores increased from the poor to sufficient categories. Most of them had an increased score in the aspect of recognizing colors, fruits, and animals because they had a lesson about it at the school. However, they were not able to make animal or fruit shapes. They were also more individual and could not cooperate with their friends.

This study reported that by applying playdough activity for the cognitive development of autistic children, it showed a significant result using the Wilcoxon signed-rank test. This study also showed that there were differences in the cognitive development of autistic children who were given the intervention and who were not given the intervention in which the scores gained by children who were given the intervention were higher than the scores gained by children who were not given the intervention.

Playing can train children in the process of their cognitive development. Training children's abilities consistently would result in increased memory [4], [17]. Cognitive development could be conducted by providing various kinds of stimulation. Stimulation could have a major influence on the development of children's brains. The stimulation applied by the researcher was the intervention of playdough activity. Playdough referred to the dough that resembled clay [19], [20]. Playdough could be used as stimulation in developing cognitive abilities of autistic children. By playdough activity, children could recognize colors and shapes. They could also express their imagination in the form of shaping. They could interact with their friends when playing.

The intervention of playdough activity given by the researcher to respondents could be related to the cognitive development process on children in the pre-operational stage in which it could be achieved by playing. Before autistic children were playing, the researcher would introduce the playdough and introduce different types of colors with fruit and animal shapes. After that, the researcher taught how to play with playdough. This aimed to explore autistic children's knowledge and understanding of what had been explained. After they understood, they were asked to apply what the researcher had said that were started from squishing the dough, making a shape using molds, and making a shape using their creativity.

During the playing activity, children were required to work together with their friends so that they were accustomed to communicating well and were able to interact with others. After given the intervention for one week, most of the children were able to recognize colors. They were also more interested and easier to understand the lesson about color recognition if using the media of shapes or symbols compared to if using the media of the colored papers. Gradually, for one week, children could be able to interact and communicate well compared to their previous condition. It could be concluded that the intervention of playdough activity could improve the cognitive development of autistic children if applied frequently.

## V. CONCLUSION

The cognitive abilities of autistic children before given the intervention of playdough activity were still in the sufficient and poor categories. Meanwhile, after given the intervention of playdough activity, it increased from the sufficient to good category. The intervention of playdough activity can improve the cognitive development of autistic



children at Galuh Handayani Foundation Surabaya. In addition, it indicates a significant result. For further studies, it is expected to study the cognitive development of autistic children by involving respondents with mild to severely autistic children. Those children are expected to be able to become semi-independent through the provision of training with good stages, scheduling, and matching processes for all respondents to get good results.

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