

Centered Concentration for ADHD Children via Educational Game

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Abstract—Attention Deficit-Hyperactivity Disorders (ADHD) is a symptom that appears by showing treatment of concentration, hyperactivity and impulsivity. If not paid attention carefully ADHD children will look like other normal children. One of the handling that can be done is to provide educational games by using the application on the gadget. This study will discuss how the effect of educational games in improving concentrations in early childhood will be described by describing 5 children who have ADHD symptoms. The results of observation states that there is an increase in concentration in children after the stimulus given the form of educational games.

Keywords—attention deficit-hyperactivity disorders, concentration, education game, gadget, early childhood.

I. INTRODUCTION

Education is carried out along life span which will never end until the end of life. Start from early life, all of humans have been educated to become human beings who know the rules. Early childhood education programs start from 0 – 6 years to stimulate every aspect of development. This period is a sensitive period in which child is very easy to absorb what they see and hear. Neurologists say variability of brain growth and intellectual function in humans develop 80% until 8 years and 20% after reaching 18 years. That's why at this age, it is very good to give stimulus to stimulate every child growth. But, not all children can do their growth tasks well. Especially in children who cannot concentrate and require high concentration. This is called Attention Deficit-Hyperactivity Disorders (ADHD).

ADHD is one of the most common disorders among school-age children with a prevalence of 3% to 7% in public [1]. In day life, children will look normal and not have significant differences with other children [2]. But if it is better to note that children with symptoms of ADHD have less attention span, excessive impulsivity and hyperactivity [3]. To enter the level of further education, the child must have a stock in knowing the numbers and letters not to mention the demands of parents who do not require that their children are able to count and read before entering primary school. Of course this becomes a burden for teachers, especially if in the class there are ADHD children who are difficult to focus their attention in the learning process. To get attention from children ADHD in a long time span in the learning process must be started from their interest.

Advanced Technology are growing rapidly making children familiar with gadgets and smartphones that provide a variety of games applications that are easily accessible and played by children. The phenomenon that is happening today is children are very close to the advanced technology. In their age is still somewhat early child is able to operate the tablet /

gadget. This is evidenced by several OECD 2014 studies Sweden has one of the most advanced IT infrastructure in the world and one of the highest internet penetration rates. Fifty-nine percent of the population have tablets in their homes, and 87% of families with children have multiple computers, smartphones and tablets [4]. The same report said that about two-thirds of two-year-olds have used the internet and about a third of them use it every day.

The endless advanced of technology must be utilized properly. Children like tablets / gadgets because there are many games that are very loved by children . Just by installing from application then the child is free to play anything [5], [6]. Because essentially the world of children is playing then we must also be able to balance the advanced of technology by developing games that increase concentration in children [7][8]. A Swedish study, children learn to have used gadgets / tablets by making closed apps to be taught to children every day. However, giving inappropriate games to children will also give a fatal result and make addicted especially without parental control [9]. Many parents make gadgets a solution when the child is in an unhappy mode, crying or showing hyperactive behavior.

In a case study said that playing games using computers can centered the concentration of children and stimulate cognitive work to give a positive impact for children ADHD [7], [8], [10], [11]. Nevertheless, being gadgets as a technology tool that is easy to carry anywhere, easily available and closer to children can be a new solution in focusing and concentrating children through educational games that are easily accessed. For that, researchers try to give an educational game which is given regularly to ADHD children in learning process to see how it affects centered focusing of children's attention and the effectiveness of using educational games in children.

The rest of this paper is organized as follow: Section II describes the literature review. Section III describes the material and proposed methodology. Section IV presents the obtained results and following by discussion. Finally Section V concludes this work.

II. LITERATURE REVIEW

Attention Deficit Hyperactive Disorder is a centered concentration disorder that is accompanied by hyperactivity. It is not a disease but a symptom that looks different from other normal children. ADHD children show symptoms such as lack of concentration, hyperactivity and impulsivity that caused to an imbalance in child activity patterns. If give attention carefully then ADHD child will look like other children. What distinguishes is intensity and level shown in the above behavior. Some of the symptoms that children show

are chaotic, forgetful, easily confused, difficult to give attention to every teacher's job or while playing, restless, disturbing other children and always moving cannot be silent in a long time [12]. In teaching and learning activities that are in the classroom, ADHD children are usually not differentiated in class groups and join other normal children. The educator must have extra sensitivity and role to focus the attention of the ADHD child over the long term by not disturbing the other students. Lack of attention and low concentration of children will affect different cognitive growth of peers. Educators must have the right strategy to develop a lesson that attracts the attention and interest of the child. Essentially children will have a high level of enthusiasm if given something that interests theirs.

The ADHD occurs due to dysfunctional growth of the brain's work system [13] that is influenced by dopamine as an introduction to nerve cell stimulation signals in other cells that form in the brain and organs that have a role in regulating movement, learning, memory, emotion and cognition. The thickness of the cortex which is the impulse control and concentration in normal children will be perfect at 7.5 years of age while ADHD children require 3 years longer to reach the thickness of their cortex at the age of 10.5 years. Research suggests the main cause of ADHD is in brain function and can get worse with wrong handling and parenting. Parents and educators should be able to detect symptoms in ADHD children to be able to provide the right stimulus.

Playing for children is a serious activity but fun. The child will feel relaxed and enjoyed without any pressure and intimidation. Through playing, children can explore and discover their own new knowledge. There are two types of playing that is active and passive playing. Active playing is a condition where children are free to do anything and anywhere in accordance with children likes, using large muscles that stimulate motor growth. No rules are bound because children are playing according to their wishes without any order until they are bored and tried to play. While, passive playing is a condition where children do not do a lot of movement but enough to focus attention and cognitive growth. One example of passive playing is reading, watching TV and also videogames. Increasingly advanced technology, IT activists continue to develop kinds of games that can stimulate the growth of children's brain. Already found many educational games are games designed for educational purposes or games that contain the value of education in it as well as stimulate cognitive [7][10][11]. Many games are designed for ADHD children through technology. Average research makes the game using the computer as the main device. There is an article that summarizes many video game-based studies to serve as a therapy in developing every aspect of development in ADHD children from cognitive, social, hyperactive and impulsive behavioral controls, enhanced memory acuity and concentration and self-control [1] These studies prove video games as educational games have a positive effect on ADHD children. Research in Spain designed an educational game for ADHD children to stimulate children's cognitive abilities through computer devices connected with smartphones. The results of this study indicate a significant increase in focus attention on ADHD children with 80% success rate [7]. But the disadvantage is that this game requires

multiple devices, from computers, smartphones and interconnected picture cards. Researchers also stated that with the game the educator does not have to always close to the child during play. Of course as an adult who must know every development in children to know how far the child has developed and guidelines to provide further stimulus.

The rapidly evolving advanced technology resulted in a study where children were very interested in gadgets / smartphones. The results of interviews with parents of children 3 to 4 years (N=731 in 2014) in United Kingdom show that 65% of children have access to tablets at home, 11% have their own tablets and 41% play games on tablets. A more recent UK survey of 2,000 parents showed that 36% of 3-5 year olds had their tablets with children aged 0-5 using tablets for 79 minutes per day. Half of the ages 0-2 years and two-thirds of 3 to 5-year-olds can independently open the applications, swipe and flip e-book pages and trace the shape on a tablet screen with a finger [14]. A smaller Australian parent survey (N=4109) found that 61% of 3-5 year olds had one or more tablets at home and used them on average 20 minutes per day. The most popular applications used by children are game apps (e.g. Angry Birds, Fruit Ninja) followed by other educational game apps (e.g. Pocket Phonics, Sesame ABC) [5]. From the data above can be seen that children really enjoy the time when playing with gadgets / tablets. This will be bad if there is no control from parents and children are given unlimited option. But it can be positive if the rapidly advanced technology is put to good use. Not only for teachers, but also for parents who have more time with their children.

The use of technology-based gadgets / tablets have begun to apply in the school environment with educational games contained in the gadget / tablet [15]. This is one of the strategies that teachers do to focus attention and concentration on children with ADHD. This will certainly facilitate educators and parents to provide stimulus to ADHD children. In this study the researchers provide a stimulus with educational games called "*marbel*" numbers and letters that display a variety - how to play a fun way. The game is a match between letters and numbers that have the same shape, breaking the same balloon letters and numbers, following the dotted lines form letters and numbers, guessing an image. If the child performs correctly then the child will immediately get rewards from his own work in the form of a lot of stars, with the sound of applause heard from the gadget / tablet [4]. If the feedback given does not match the child's expectation, the child feels challenged to keep trying to get applause. This certainly makes the child more enthusiastic and feel happy. The child will easily remember letters and improve other early literacy skills. If studied more in learning using gadgets / tablets have the same technical with traditional learning. But what makes it more interesting is the bright colors that look, and learning is done by playing that is basically the age of early childhood is the age of play.

The use of technology such as gadgets and tablets can be a medium that can improve the cognitive development of children but still must be in the attention and supervision of parents and other adults [16][17] Furthermore, this paper will discuss about the behavior of children ADHD found and observed in the field and changes that occur after being

treatment in children.

III. MATERIAL AND METHODOLOGY

This study used qualitative descriptive method that will describe the results of research from an observation made in a continuous way by looking at changes and improvements of the subject after the stimulus given. Technique of collecting data using observation and interview to 5 respondent. The observation guidelines were filled out by teachers from the results of observing the child and subsequently researcher interviewed teacher. The contents of the observation guidelines are behaviors that show symptoms of ADHD that appear prominent and sustainable.

The criteria set forth by the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) are used as the standardized clinical definition to determine the presence of ADHD (see DSM-IV Criteria for ADHD). A person must exhibit several characteristics to be clinically diagnosed as having ADHD [3] :

Severity. The behavior in question must occur more frequently in the child than in other children at the same developmental stage.

Early onset. At least some of the symptoms must have been present prior to age 7.

Duration. The symptoms must also have been present for at least 6 months prior to the evaluation.

Impact. The symptoms must have a negative impact on the child's academic or social life. Settings. The symptoms must be present in multiple settings as shown in Table I below :

TABLE I. TYPE ADHD

No	Type ADHD	Act
1	<p>Less Concentration</p> <ul style="list-style-type: none"> a. Frequently fail to take good care of something detail or make careless mistakes in school work and other activities b. Frequently have difficulty focusing on tasks or play activities c. Frequently do not listen when spoken to directly d. Frequently do not follow well instructions and fail in completing school work e. Frequently experience difficulties in performing tasks and activities f. Frequently loses important things g. Frequently avoid schoolwork that requires mental effort h. Frequently confused gets the stimulus from the outside <p>Frequently forget in completing daily tasks</p>	
2	<p>Hyperactivity and Impulsivity</p> <ul style="list-style-type: none"> • Hyperactivity <ul style="list-style-type: none"> a. Frequently anxious with their hands or feet and often twisting in chairs b. Frequently leave a seat in the classroom or in other situations where children are expected to remain seated c. Frequently runs or rises excessively in situations where this is inappropriate d. Frequently have difficulty playing or engaging in leisure activities quietly 	

<ul style="list-style-type: none"> e. Frequently moves or acts as if - by being controlled by a motor f. Frequently Talking Excessively 	
<ul style="list-style-type: none"> • Impulsivity <ul style="list-style-type: none"> a. Frequently give answers before the question is finished b. Frequently have difficulty waiting for the turn Frequently interrupting or disturbing others 	

From Table I above, it can be note that:

- On these criteria, ADHD sufferers have at least six or more of the following symptoms and last for at least six months to a level that is maladaptive and inconsistent with the rate of growth
- There is an interruption in two or more settings/situations
- There should be clinically significant disturbances in social, academic or occupational functions
- These symptoms do not occur during the enactment of PDD, schizoprenia or other psychotic disorders and are not explained better by other mental disorders.

A. Research Procedure

This study begins by identifying the symptoms that appear in children with ADHD who are in the environment of other normal children. After finding the object to be examined then the teacher began to approach. ADHD children have difficulty in setting their action so that in giving action it should be really in good psychological state. This study was conducted in the last three months before children enter the elementary school stage by using educational games on the gadget as a stimulus to centered concentration in introducing letters and numbers in ADHD children.

- Children are introduced "marble" educational games on gadgets
- Children are required to choose the game to be played
- The game consists of guess numbers / letters, burst balloons, guess pictures, guess shadows, bubble figures / letters and dexterity
- Children play in guidance and communication
- It is given repeatedly every day and it would be better if parents play a role by applying it at home

IV. RESULT AND DISCUSSION

Based on the research that has been done about centered concentration of ADHD children via educational game on 5 children as object then obtained the result:

- Objects A, B, and D have symptoms of less concentration in the teaching and learning process. In the classroom, this object is unable to sit idle watching teacher who is speaking in class. Children look fun play with the world created in their own fantasy by not disturbing other children. This behavior indicates children have ADHD symptoms that are difficult to focus on for a long period of time. The difference each object is the intensity of each object's constraint time. Object A has a very low centered concentration then compared to B and D. If object B and D can sit up to 15 minutes in the classroom and watch the teacher in front,

then object A within 6 minutes has begun to agitate and show other movements. Of course, the object has begun to focus and is unable to absorb the learning provided by the teacher. However, after being given a gadget with educational games the object is able to sit still more than that time. Activities in this game is powerful enough to make children sit and concentrate longer on one activity. The activity of choosing numbers and balloon numbers is a favorite of children due to the sounds and suggestions of praise that arise when the child successfully answers the question. This arises because the object's curiosity in this game which, if reviewed again has a high curiosity is a characteristic of early childhood. Children show interest even at the time of learning without using gadgets. When given a worksheet containing numbers and letters the object begins to follow the teacher's direction to work on it and recall based on the game being played.

- In object C shows symptoms of hyperactivity. Children are not able to sit still in place even just 3 minutes, like disturbing friends, out of class carelessly and have no focus at all. Object C is very happy to play outside the classroom, playing with other friends but if there is something that children do not like toys taken or forbidden to do something then the object is not able to control his emotions well, will not be afraid to hit and do other things. Object C cannot be scolded or be reproved when he makes a mistake, the object will show a more "resistance" attitude. These behaviors show symptom ADHD which has difficulty in controlling its motion. In learning process, if it has done a preferred activity such as cutting or sticking the object is able to do it, it just needs mentoring because often the object did not work according to the instructions. If accompanied and directed children can follow but it also will not last long if he saw his friend is done first, then the child will also leave his job immediately and will not care about it again. Object C dislikes learning by using stationery such as doing LKS, writing, and counting. After being given learning with educational games, children seem enthusiastic in playing the game. Unwittingly, the object can sit quietly and concentrate on playing for almost 15 minutes. The object tries all kinds of games and finds himself the game he likes best. And this is given repeatedly every day so that children memorize all the numbers and letters. At the time of learning in class, there is a change in the movement of children. When given a worksheet to answer the numbers and letters the object begins to focus his attention, focus more and answer correctly. This is because he found the form of letters and numbers he had played before, so the object feels capable and challenged.
- Difference with other children, Object E has ADHD symptoms with behaviors that show impulsivity. Children have a very low level of patience and difficulty paying attention to others. If the object is talking more dominant and prominent. Object E shows behavior according to his wishes. Children who have impulsive

symptoms have advantages and disadvantages in behavior that result in behavior and mindset. Impulsive children tend not to notice when doing excessive activities and just happen. Excess symptoms in impulsive children that tend to be smart in terms of easy to receive learning or stimulus. But the weakness, the object impressed careless and unfocused that resulted in the wrong child in taking action in every decision. At the edges of educational games do not have a too significant impact on changes in concentration of children because impulsive children have been able to manage concentration level in a long time in an activity. But this educational game can be used as a object's exercise to learn more carefully in making decisions and not in a hurry when doing activities.

V. CONCLUSION

Attention Deficit-Hyperactivity Disorders (ADHD) is symptoms that often appear in early childhood. This is because the ADHD children looks just like any other children. ADHD behavior that appears divided into 3 part that is Difficulty concentrating, hyperactive and impulsive. Because it often happens, then it attracts attention to find the right handling. One of the handling that can be done on ADHD children is to use educational games that can be easily installed on gadget applications. By playing educational games children can focus his concentration and provide a good stimulus in focusing attention of children. This proved to be effective in increasing the concentration time in ADHD children. This research is also related to research that has been done before. There are several things that the authors recommend in giving the game of gadgets / tablets in children, that is:

- Keep giving children restrictions - time limits and watch out not to be accessed apps are applications that do not educate
- Parents and teachers should be emphatic in order not to become addicted to gadget / tablet
- give children a space to interact with others so that their social skills keep growing well so that children are not only fun with their own world.
- give the child a stimulus in another way so as not to focus on one way alone in improving the child's concentration.

The use of game education-based gadgets can clearly be felt to increase in children with ADHD. This game can be a means to accommodate children's needs in cognition and creativity. Children can focus their attention and concentration with the game given and build the process of thinking. This educational game provides information about number and letter recognition and mapping of the shapes of each symbol. Symbols - the symbols are made in color and in accordance with the child's interests, making it easier for children to remember the shape of symbols. Various games make it easier for children to understand the concepts of numbers and letters so that when given when learning in the classroom the child can answer correctly. Children can form their own perception with the stimuli provided by the game. When studying in class and given learning about letters and

numbers children will feel enthusiastic because they feel familiar and have seen something like that before. Repeating his memory to foster children's interest and be able to focus his attention better.

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