

# Improving Counting Skill in Children With Autistic Spectrum Disorder Using Android-Based Bamber Educational Games

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## ABSTRACT

The purpose of this study was to determine the effectiveness of android-based Bamber educational games for children with autism spectrum disorders (ASD) in improving the aspect of counting, especially reduction. This research uses quantitative research methods with a pre-experimental research design. The design model used was one group pre-test post-test. Data were collected through observation and written tests. Data were analyzed using descriptive statistics. The findings reported that there was an increase in the ability to count (reduction) in children with autism spectrum disorders (ASD) after being given 8 interventions with android-based Bamber educational game media. This is evidenced by the results of the pre-test the ability to count (reduction) is still low, the subject shows the behavior of refusing to learn to count. Then after being given treatment 8 times with the bamber educational game media, the results of the post-test showed the development of the ability to count (reduction) with a written test score that was higher than the pre-test written test score, and the subject showed an enthusiastic response in counting with Bamber education. It can be concluded that the android-based Bamber educational game is very effective for improving the ability to count in children with ASD.

**Keywords:** ability to count (reduction); a educational game; and children with ASD

## 1. INTRODUCTION

Autism comes from the word 'auto' which means self. The terms are used because it is found that a group of children often looks like someone who lives alone and regardless of social contact that is around him [1]. Leo Kanner and Leon Eisenberg were the first to introduce the term autism. They encountered a group of children who had the same characteristics, namely unable to communicate and interact with the surrounding environment, and showed a tendency for repetitive activities [2]. Autism is a complex developmental disorder due to neurological disorders that cause brain function that cannot work properly so that it affects growth and development, communication, and social interaction.

There is no certainty from the government regarding the prevalence of the number of children with autism in Indonesia. BPS (Statistics Research Agency) with a reference to the prevalence in Hong Kong, from 2010 to 2016 the estimated number of autism sufferers in Indonesia is around 140 thousand with age less than 17 years [3]. This opinion is not much different from the estimation from the Research and Consultation Agency (SPIRE), which is 139,000 people with autism out of 400,000 Children with Special Needs (ABK) [4]. The increase in people with autism in Indonesia continues to increase, one of them due to public awareness about autism and it is increasingly easy to get information.

A child's symptoms with ASD can occur before the child is three years old and cannot form normal social relations or communication [5]. Individuals with ASD can only show limited and repetitive patterns of behavior, interests, and

activities [6]. They experience obstacles in growth and development, communication, and social interaction so that it affects daily activities, self-care activities, and academics. It is agreed that abnormalities in children with ASD impact on several obstacles, one of which is academic [7]. Apart from difficulties in socializing and communicating as well as rigid and repetitive behaviors, there are additional reasons for children with ASD academic difficulties that are intellectual that are below normal [8]. It is agreed that cognitive abilities, receptive language, and the ability to express children with ASD are lower than children in general [9].

Teaching counting to children with ASD who have low concentrations is not easy. Therefore, special education services are appropriate and appropriate. Teaching to count with a variety of media and the right methods and taught continuously with conducive and happy will make it easier for children to understand the material [10]. It is agreed that in implementing learning it is better supported by the media because it can improve the learning process and student learning outcomes [11].

Children with ASD in general have a visual learning style [12]. So do not be surprised if children with ASD are more interested in images and colors. It is agreed that someone who has a visual learning style will more easily understand the lesson with posters, pictures, graphs, and diagrams [11]. The picture card method can be used to solve cognitive problems in children with ASD [13]. Furthermore, visual media learning activities are preferred for children with ASD because they can respond better [10].

Through observation in one of the special schools, there are still many teachers who do not pay attention to the media given to children with ASD. The media provided bore children with ASD because only that media is used. The teacher is also confused about how to teach the concept of counting (reduction) to children with ASD so that the child has difficulty counting (reduction). Unattractive media and less fixed methods are the cause of children with ASD difficulty counting (reduction).

In modern times like now, the role of technology is very important. Technological developments have penetrated the world of education as a medium of learning [14]. One of the rapidly developing technologies is Android-based mobile technology. The use of cellphones to play games creates the addiction to children because they have interesting features. Not only normal children, but children with special needs are also able to operate cellphones to play games. Games are activities carried out to have fun, and getting rid of boredom [15]. It takes directions to play games that have positive functions and benefits for children. With the development of technology, it must be utilized appropriately such as utilizing educational games based on android as a learning medium [16]. In learning situations, children will be happier and will be able to accept learning if learning is interesting and fun. In learning, teachers need to be creative in using learning media such as educational games.

Therefore, the purpose of this study is to determine the effectiveness of Android-based Bamber educational games to improve the ability to count (reduction) in children with ASD.

## 2. METHOD

This research was approved by the school principal. The principal and teachers agreed to participate in assisting this research. This research was approved by the Faculty of Education, Deputy Dean of Academic and Student Affairs.

This study uses a quantitative approach. The quantitative method is a method that has been used long enough so that this method has been entrenched as a method for research [17]. This research was conducted at one of the special schools in Sidoarjo, Indonesia. This school was chosen because it has problems that are by the research. Children with ASD have difficulty understanding reduction counting, shouting behavior, biting hands are shown when asked to count. The teacher is still having trouble providing media for counting because children with ASD are not interested and are easily bored. The teacher also has difficulty giving the concept of counting (reduction). The subjects in this study were 4 children with ASD.

The research process starts with preparation (research permission, observation at school, determining the research schedule), then data collection, data analysis, and concluding. Data collected through observation and written tests. The written test is carried out twice, that is before being given treatment and after treatment is given. The treatment was carried out for 8 meetings by giving a Bamber educational game to children with ASD.

The design used in this study was a pre-experimental design and the design model used in this study was a one-group pretest-posttest design, because it was to compare conditions before and after treatment. There are three steps in taking the one-group pretest-posttest design, namely: Providing pretest to measure the ability to count before being given treatment (pretest), Providing treatment (Educational Game) to the research subjects, and Providing more tests to measure the ability to count after being given treatment (post-test) [19].

The data analysis used in this research is the statistical description. Description statistics are statistics that are used to analyze data by describing or describing the data into clearer and easier to understand information from the collected data [16].

### 3. RESULT AND DISCUSSION

The main obstacle experienced by children with ASD makes it difficult for teachers to provide count material, especially reduction. Sometimes, teachers are frustrated with the media that will be given because it is less attractive to children with ASD. The use of this bumper educational game shows that the bumper educational game is effective in the development of the ability to count (reduction) in children with ASD. This can be seen from the increase in written test results after being given treatment (post-test) on each subject.

**Table 1.** Result of Pre-Test and Post-Test

No	Name	Pre-Test (O1)	Post-Test (O2)
1	M	30	80
2	R	30	70
3	A	20	80
4	Y	20	60
Avarage		25	72,5

From the table above and the arithmetic aspect instrument, the researcher can describe the numeracy ability of each subject as follows:

#### 3.1. Subject M

##### 3.1.1. Initial Ability Counting (reduction)

M is a grade 3 elementary school student who has an ASD disorder. The results of observing the instrument and the written test (pre-test) of the initial ability of subject M are: children can mention in order and good numbers 1-20, children can show 1-20 numbers according to instructions, children can write 1-20 numbers according to instructions with well, the child can count the number of objects that have been drawn correctly, the child can count the sum with the object, the child has difficulty calculating the reduction with the object. When calculating the reduction of objects that are crossed still counted. Subject M had low eye contact, and repetitive behaviors such as hitting the head, nodding the head. Furthermore, subject M tends to daydream and stretch out on the floor when the teacher does not notice, or when other friends have activities. It has been explained that children with ASD exhibit behavioral characteristics namely: lack of social interaction, difficulty in verbal and non-verbal communication, as well as stereotypes of behavior and limited interests [18]. Subject R will close his ears when the audio in the educational gameplays loudly. The results of the written test subject R before being given treatment were 30.

##### 3.1.2. Final ability counting (reduction)

During learning with the Android-based Bumper educational game, subject M followed well. Subject M who

has a longitudinal behavior in lanai such as lazing tends to win the cellphone to play the Bumper educational game. Beginning when given an educational game subject M was very enthusiastic with interesting pictures and colors. So researchers are very easy to provide learning. Subject M tends to only move the lips and not make a sound when counting objects. The response of subject M when learning to use the positive Bumper educational game, when learning the fourth subject M can easily calculate the subtraction. When the researcher carries out observation and a written test (post-test) the subject M can calculate the reduction well. Subject M can understand when calculating the reduction in images that are crossed does not need to be counted. the results of the written test subject M after being given treatment were 80.

#### 3.2. Subject R

##### 3.2.1. Initial Ability Counting (reduction)

R is a grade 3 elementary school student who has an ASD disorder. The results of observing the instrument and the written test (pre-test) of the initial ability of subject R are: children can mention in sequence and good numbers 1-20, children can write numbers 1-20 well, children are quite capable of counting objects, children have difficulty calculating subtraction. When counting objects subject R does not focus so the number of numbers written does not match the number of objects. The subject's behavior R will run away after working on 1 problem. When the researcher gave a sitting instruction, subject R kept running away from all the classrooms after sitting. The running behavior occurs after subject R does the problem. The results of the written test subject R before being given treatment were 30.

##### 3.2.2. Final ability counting

During the learning eight learning meetings with the Android-based Bumper education game subject A which has a very positive response. Subject A often presses the audio button to listen and say repeatedly. A subject has a very good response to the media of this educational game Bumper. This can be seen when subject A is more concentrated in counting, the duration of counting is longer, and not easily bored. the results of the written test subject R after being given treatment were 70.

#### 3.3. Subject A

##### 3.3.1. Initial ability counting (reduction)

A is a grade 4 student who has an ASD disorder. The results of the observation of the instrument and the written test (pre-test) of the initial ability of subject R are: children are able to mention in sequence and good numbers 1-20, children are able to show numbers 1-20 well, children are able to write numbers 1-20 well, children are sufficient able to count objects well, children have difficulty calculating subtraction.

Subject A's behavior is like hitting the bench, and has low concentration by speaking the same word and repetitively. Children get bored easily when instructed to count and always bite their hands when forced. write test results subject A before being given treatment 20 because it does not work and bring up the behavior of biting hands.

### 3.3.2. Final ability counting (reduction)

During the learning eight learning meetings with the Android-based bamber eduation game subject A which has a very positive response. Subject A often presses the audio button to listen and say repeatedly. A subject has a very good response to the media of this educational game Bamber. This can be seen when subject A is more concentrated in counting, the duration of counting is longer and not easily bored. the results of the written test subject R after being given treatment were 80.

## 3.4. Subject Y

### 3.4.1. Initial ability counting (reduction)

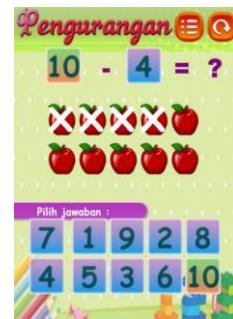
Y is a grade 3 student with ASD. The results of the observation of the instrument and the written test (pre-test), the initial ability of subject Y, namely the child can sort 1-15 well, the child can write numbers 1-15, the child can point to numbers according to the instructions, the child can count objects well, the ability to count additions good, and do not understand the concept of arithmetic (subtraction). Subject Y always cries when he arrives at school, in class children like to climb the table, and if not under supervision the child can go up the classroom window. Children love to write on the board and scribble on pictures. When counting objects, children will no longer want to count objects with the same object. When the researcher did the pre-test on subject Y did not want to do it, and cried even more when forced by hitting the head and table. The results of the written test subject Y before being given treatment were 20.

### 3.4.2. Final ability counting (reduction)

In learning with Android-based bamber educational game media, subject Y is not optimal because of the habit of skipping school. There were only 4 learning meetings, and during learning with educational games, subject Y had to be forced first. When he found out that the contents of educational games had interesting pictures, colors, and audio, subject Y became enthusiastic about playing the game. Children are more silent when given educational games and children do not feel bored when learning to count because the objects displayed are not the same. The ability to count (subtraction) is quite understood by subject Y, this is shown by subject Y being able to count (subtraction) by not counting objects marked with a cross. However, because subject Y

rarely attended school, his numeracy (reduction) ability was not optimal. Subject Y did not want to write in the book so during the writing test (post-test) the researcher gave the questions on the blackboard and only 6 questions were done because they preferred to count on the Bamber educational game.

Children with ASD show a very positive response because in the Android-based Bamber educational game there are interesting pictures, interesting colors, and there are sounds that appear in these educational games. Children with ASD find it difficult to accept material without stimulation in the form of media. With this Bamber educational game will make it easier for children to understand the counting material (subtraction). Most autistic children have visual learning [12]. Someone who has a visual learning style will more easily capture the lesson through pictorial material, posters, graphs, diagrams, and so on [11].



**Figure 1.** Printscreens android-based bamber educational games

Changes in ability to count in children with ASD can be seen by the difference in the pre-test results and the post-test scores. In the post-test result, the false score is more than the correct score, which indicates that the numeracy (reduction) ability of children with ASD is still lacking. Learning activities and interesting learning media such as providing android-based bamber educational games will help improve the numeracy (reduction) ability of children with ASD so that the post-test result scores are more correct than false scores. This is also evidenced by changes in the behavior of children with ASD when learning to use educational games. The subject is very enthusiastic, does not easily get bored, and is happy with being given cool new media that makes it easier to understand the material. Educational games have learning activities while playing which aims to make it easier for children to understand the material [19].

The negative findings in this study are subject A to follow and pronounce the words that appear in educational audio games. Furthermore, subject Y is dependent on educational games so that when crying the teacher persuades by giving educational games, Bamber. Subject M always pressed the audio button on the educational Bamber game to make a sound, but covered his ears and laughed.

## 4.CONCLUCION

Therefore, it can be concluded that the Android-based Bamber educational game is very effective in improving the ability to count (reduction) of children with ASD. This is based on the results of research before being given treatment with an android-based bamber educational game (pre-test) getting a low average score, children easily bored, low concentration, biting behavior, and lack of understanding of the concept of counting (reduction) when taught to count. After being given treatment with an android based educational game bamber (post-test) getting an average score higher than the pre-test, it was seen that they were very enthusiastic about learning with new learning media, and the children's concentration while counting increased. This shows that there is an increase in the ability to count (reduction) in children with ASD after using the android-based bamber educational game. It is recommended that future researchers focus on the capabilities of other counting operations and on a broader subject.

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