

Digital and Graphic Based Self Care Stimulation Methods to Improve Defecation Skills in Children with Autism Spectrum Disorders (ASD)

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Abstract— Defecation skills independence in children with Autism Spectrum Disorders is still a challenge for parents. Independence of defecation skills that can be obtained by children with Autism Spectrum Disorders early on, can improve the quality of life of children in the future. The use of visual media such as pictures with real objects could facilitate children with Autism Spectrum Disorders to understand the material being taught. This study aims to study the effects of self-care stimulation methods on defecation skills in early childhood with Autism Spectrum Disorders (ASD). Inclusion and exclusion criteria were given in this study, with nonprobability sampling technique: total sampling. A total of 50 early children with Autism Spectrum Disorders were divided into two groups: the experimental group (n=25) and the control group (n=25). The control group was given intervention in the form of daily routine training, and the experimental group was given defecation training with digital and graphic-based self-care stimulation methods. The measurement scale for defecation skills was used to evaluate defecation skills before and seven days after treatment. Data analysis using the Wilcoxon test and to assess the effect of interventions provided between the experimental group and the control group using the Mann Whitney Test. Seven days post-intervention, the experimental group showed a significant improvement in defecation skills compared to the control group. Digital and graphic-based self-care stimulation methods were effective for improving defecation skills in early childhood with Autism Spectrum Disorders ($p=0.001$). This research provides knowledge about appropriate methods and media to teach defecation skills, solutions to the problem of independence in defecation skills, and serves as a reference for subsequent studies related to self-care skills in early childhood with Autism Spectrum Disorders.

Keywords—Autism spectrum disorders, self-care, digital, graphic, toilet training.

I. INTRODUCTION

Skills of children with Autism Spectrum Disorders (ASD) in meeting basic human needs, namely defecating independently, is challenging and requires special attention⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾⁽⁵⁾. An increasing number of ASD cases that were not accompanied by independence, can increase stress for caregivers⁽⁵⁾⁽⁶⁾⁽⁷⁾. Reports of children with ASD in the world has increased by more than 15% in the past two years, from 1: 68 cases of children with ASD per 1,000 births in 2016 to 1: 59 cases of children with ASD per 1,000 births in 2018⁽⁸⁾. This is in line with the increase in cases of ASD in Indonesia. Although there is no exact data, it is estimated that every year there are as many as 500 children diagnosed with ASD⁽⁹⁾. One of the

provinces in Indonesia that have received special attention due to the increasing number of ASD cases each year is the Province of West Kalimantan. In 2014, 81 cases of ASD were recorded in West Kalimantan Province, with an increase in 2015 to 130 cases and in 2016 to 277 cases⁽⁶⁾⁽¹⁰⁾. However, there is the possibility that these data are greater than the number presented, considering that the data are the results of data collection on the number of children with ASD attending school, while those who are not in school have not been able to be recorded⁽¹¹⁾⁽¹⁰⁾. Children with ASD include those children diagnosed with clinical diagnostic symptoms that are cognitive, affective, motor, social, communication, and repetitive behavioral disorders, commonly referred to as complex developmental disorders⁽¹²⁾⁽¹³⁾⁽¹⁴⁾. The previous studies revealed children with ASD need help from caregivers to meet daily activities like toilet training: defecate⁽⁶⁾⁽¹⁵⁾. Independence of defecation is the most difficult self-care skill to learn and understand by children with ASD compared to other self-care needs⁽¹⁶⁾⁽⁶⁾⁽¹⁵⁾. Sometimes, the stress experienced by caregivers is from thinking of the child's future, and considering who will help if the caregiver dies while the child is still unable to be independent⁽⁷⁾⁽¹⁷⁾⁽⁶⁾⁽⁴⁾. Toilet training: defecation is one of the skills that must be achieved by a child in a period of growth and development including the children with ASD to improve quality of life⁽¹⁸⁾⁽¹⁵⁾. Early toilet training (3-5 years) in children with ASD has a positive impact on the growth and development of the children to prevent urinary tract infections and improper defecation⁽¹⁹⁾. The provision of toileting training for children conducted for 7 days gradually showed an increase in children's toileting skills⁽²⁰⁾⁽⁶⁾⁽¹⁵⁾. Besides, the use of visual media such as pictures with real objects could facilitate children with ASD to understand the material being taught⁽²¹⁾⁽⁶⁾⁽²²⁾. The results of this study were supported by the results of another study⁽²³⁾ which found that children with ASD who were trained to defecate at an early age (3-8 years) would have a positive impact on the later defecation skills. However, both of the studies had limitations since they were not able to assess how effective was the action of teaching defecation in children with ASD and there was an absence of the use of digital and graphic media to improve defecation skills in children with ASD. Results of a preliminary study conducted by researchers at one of the centers for handling early childhood autism with

8 parents caring for children with ASD revealed that most of the children with ASD were not been able to be independent in defecating. The eight parents also revealed that they did not know how to teach their children how to defecate.

II. OBJECTIVE

This research aimed to study the effects of digital and graphic-based self-care stimulation methods to improve defecation skills in children with ASD.

III. METHODOLOGY

Study design

Quantitative controlled trials without randomization (quasi-experimental with control), with a nonequivalent control group, were conducted in this study. To avoid bias arising from confounding factors, the researchers applied the inclusion and exclusion criteria in determining the sample based on homogeneity⁽²⁴⁾.

Population and Sample

The population in this study were parents of children diagnosed with ASD at the ASD children's schools and the ASD center in Pontianak City, West Kalimantan, Indonesia. The population in this study amounted to 68 children with ASD. Respondents involved in this study had to meet the following inclusion criteria: parents who care for children with ASD aged 3-8 years, willing to become respondents in this study by signing informed consent. This study also used the following exclusion criteria: parents who care for children with ASD with a double handicap, parents who care for children with ASD, and chronic disease. Criteria for drop out were: children who did not take bowel toilet training for 7 days in a row. This study was conducted for 6 months (May-September 2019). This study uses a nonprobability sampling technique that is a total sampling⁽²⁵⁾. A total of 60 respondents met the inclusion criteria, 43 boys and 17 girls.

Instrument

This instrument was developed by researchers after conducting literature reviews on journals and books on toilet training: defecating in children with ASD. After that, the researchers compiled question to measure toilet training skills: defecating in children with ASD, the researcher then conducted a research instrument expertise test on two experts in the field of ASD, after obtaining expert approval, the researcher conducted validity and reliability test on 16 children with ASD, who fulfilled the inclusion criteria at the center for the management and therapy of early children with ASD, Pontianak City, West Kalimantan, Indonesia. The location of the validity and reliability test is different from the research location but has the same criteria. A total of 25 questions in this research instrument in Indonesian were tested for validity using the Pearson Product Moment correlation technique is used in testing the validity of research instruments ($r_{count} > r_{tables}$ (0.444)⁽²⁶⁾. The results of the construct validity test of research instruments are r_{tables} (0.497). The reliability test of the research instrument used Cronbach's Alpha test. Test value > 0.60 , the instrument is reliable⁽²⁶⁾. The

test-retest reliability results of this research instrument were 0.751. The rating scale checklist sheet was used to assess defecation skills.

Intervention

The intervention in this study was given for seven days to complete, in the experimental and control groups with a duration of 60 minutes per day. The location of the intervention in the experimental group was conducted at one of the ASD children's schools in Pontianak City, West Kalimantan, Indonesia, and the location of the intervention in the control group was carried out at the ASD center in Pontianak City, West Kalimantan, Indonesia. The experimental group was given intervention in the form of defecation training with digital media-based self-care stimulation methods, namely exposure to the theory of toilet defecation training through PowerPoint presentation media and graphic media in the form of booklets containing pictures and steps to teach the independence of defecation. After that, the experimental group was given practical training by the researcher to teach the independence of defecation in children with ASD. The control group was given intervention in the form of routine daily training of defecation habits by children with ASD. After this research ended, the control group received the same treatment as the intervention group.

Data collection

The data of this study were collected using a research instrument concerning the stimulation of the self-defecation method consisting of 25 questions in Indonesian. The pretest was conducted on the first day of the study after the respondent signed the informed consent both in the experimental group and the control group. This research has passed the ethical test from the STIK Muhammadiyah Pontianak with registration number 154/II.I.AU/KET.ETIK/V/2019. Post-test was given on day 14 after the intervention was carried out in both study groups. Pre-test and post-test conducted by researchers. Univariate analysis was performed to describe the characteristics of age, gender, parental education level, parents' occupation, and assess defecate skills before and after intervention in the method of simulating self-defecation skills for children with ASD. Bivariate analysis was used in this study to determine the effect of using digital and graphic-based self-care stimulation methods on defecation skills in children with ASD. The control group was given intervention in the form of daily routine training, and the experimental group was given defecation training with digital media-based self-care stimulation methods (digital presentation containing steps to teach defecation skills) and graphic media (booklet with pictures and visual guidance for defecation for children with ASD) equipped with the practice of teaching independence by the therapist. After the research ended, the control group received the same treatment as the intervention group. Data analysis using the Wilcoxon test and to assess the effect of interventions provided between the experimental group and the control group using the Mann Whitney Test.

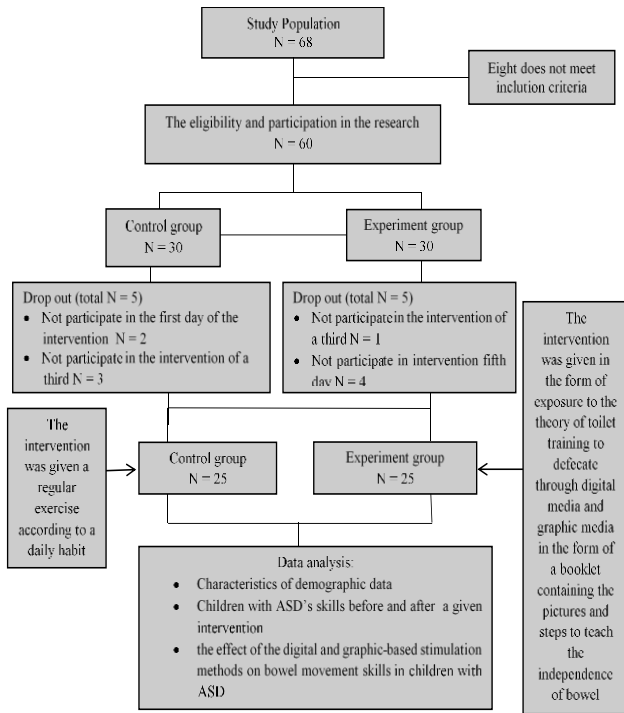


Figure 1. Flow chart of respondents' enrollment and involvement

IV. RESULTS

Social demographic characteristics

The number of boys respondents was more than the girls' respondents. This is due to the population of children with ASD was more boys (70%) than the population of girls (30%). The age distribution of children with ASD who were cared by the parents in this study was uneven, namely 2 children at 3 years of age (4.0%), 6 children at 4 years of age (12%), 14 children at age 5 years (28%), 13 children at age 6 years (26%), 11 children at age 7 years (22%), and 4 children at the age of 8 years (8%). The majority of the parent's education level of respondents was high school education (50%). As many as 60% of the respondents did not work and the toilet type used by children for defecating was 80% using squat toilets. A total of 10 respondents dropped out because they did not participate in the intervention for seven days in a row. The drop out respondents were 5 in the experimental group and 5 in the control group so that the total sample in this study was 50 respondents with experimental group n=25, and the control group n=25.

Self-care skills pre and post-intervention of the defecation skills in the experimental group

A total of 25 respondents in the experimental group used self-care stimulation for defecation skills in children with ASD which obtained $p=0.000$ ($p<0.05$). It can be concluded that there was a positive effect of the use of self-care stimulation on the defecation skills of children with ASD in the experimental group.

Self-care skills pre and post-intervention of the defecation skills in the control group

A total of 25 respondents in the control group used self-care stimulation for defecation skills in children with ASD

who were obtained $p= 0.000$ ($p<0.05$). It can be concluded that there were positive effects of the use of self-care stimulation on the defecation skills of children with ASD in the control group.

Differences between defecation self-care skills score in the experimental group and the control group

The difference between the experimental group and the control group was obtained $p=0.001$ ($p<0.05$), meaning that there were differences in the defecation self-care skills scores between the experimental group and the control group. Giving self-care stimulation methods for defecate skills were effective for defecation skills in children with ASD in Pontianak, Indonesia.

Table 1

Self-care skills pre and post-intervention of defecation skills in the experimental group, self-care skills pre and post-intervention of the defecation skills in the control group, and differences between defecation self-care skills score in the experimental group and the control group.

Self-care skills pre and post-intervention of defecation skills in the experimental group			
	N	Median (Max-Min)	
Pre test	25	13 (2-24)	P= 0.000
Post test	25	21 (9-25)	
Self-care skills pre and post-intervention of the defecation skills in the control group			
	N	Median (Max-Min)	
Pre test	25	13 (2-24)	P=0.001
Post test	25	21 (9-25)	
Differences between defecation self-care skills score in the experimental group and the control group			
	Control	Intervention	
Post test	21 (9-25)	19 (6-22)	P=0.001

The effect of digital and graphic-based stimulation methods of self-care on the defecation skills score in the experimental group and the control group

Based on data concerning defecation self-care skills in children with ASD, a difference in scores was found between the experimental group and the control group. Median scores in the experimental group were increased from 13.00 at the pretest to 21.00 at the posttest (an increase of 8 points after intervention). The control group also increased by 14.00 at the pretest to 19.00 at the posttest (an increase of 5 points after intervention). From the data above, the experimental group results showed an increase that was significantly more than the control group. Based on the data, it could be concluded that there was a more positive effect of the use of self-care stimulation on defecation skills in children with ASD.

Table 2

The effect of digital and graphic-based stimulation methods of self-care on the defecation skills score in the experimental group and the control group.

Group	F	Min-Max		median		P-Value
		Pretest	Posttest	Pretest	Posttest	
Intervention	25	2-24	9-25	13.00	21.00	0.000
Control	25	4-19	6-22	14.0	19.00	

V. DISCUSSION

This study examined the effects of self-care stimulation methods using digital and graphic-media to improve the self-defecation skills in children with ASD aged 3-8 years with two groups, the experimental group, and the control group. Interventions were given to children with ASD, which aimed to improve self-defecation skills in children with ASD. Interventions at an early age of 3-8 years can provide a positive impact on independence and skills in children, indicating that some are more capable of being independent⁽¹⁹⁾. The late intervention has an impact on the independence of children with ASD⁽²³⁾⁽¹⁹⁾. The self-care stimulation method was a manual intervention based on graphical and digital media, developed to improve defecate skills of children with ASD through gradual training⁽¹⁹⁾⁽⁶⁾. This method focuses on families caring for children with ASD.

It is important to note that this study has a broad range of characteristics of respondents from different socioeconomic status, culture, and education. The results of this study also reinforce the trend of cases of children with ASD that indicates the occurrence in boys is greater than the incidence of ASD in girls. The trend of ASD in boys more than the incidence of ASD cases in girls is still valid now. The 4:1 ratio was the most frequently expressed ratio to describe the ratio of the number of children with ASD in the world⁽²⁷⁾⁽²⁸⁾. Researchers have assumed the greater tendency of boys diagnosed with ASD, compared to girls is due to the limited capability of health personnel to classify or recognize ASD disorders in children. This supposition is supported by the fact on the majority of health personnel still use DSM 4 to determine the diagnosis in children. Whereas the DSM 4 does not cover other autistic spectrum disorders such as PDD-NOS, Asperger Syndrome, Heller's Syndrome, and Rett Syndrome. Interestingly, it was estimated the number of children with ASD in Pontianak is still not evenly netted and this possibility can affect the number of data on cases of girls and boys with ASD in this study. Health personnel needs to observe the differences in signs and symptoms of autism that exists in boys and girls so that the diagnosis of ASD in boys and girls could be correctly identified and enforced⁽²⁷⁾⁽²⁹⁾⁽³⁰⁾⁽⁶⁾. The unequal proportion of children with ASD causes this study to be unable to compare the effects of self-care stimulation methods on defecation in children with ASD by male or female genders.

Overall, there was a significant increase in defecation skills shown between the control group and the experimental group in this study. Although both groups showed significant improvement in their results, the difference in median values indicated by the experimental group was higher than the control group. The median value of the experimental group from pretest to posttest increased by 8 points and the median value of the control group from pretest to posttest increased by 5 points. This shows the effect of the use of self-care stimulation methods based on digital and graphic media to improve self-defecation skills in children with ASD. The experimental group experienced a more significant increase compared to the control group due to interventions in the form of stimulation exercises to improve defecation skills that were

given repeatedly and gradually in children with ASD by the help of digital media and graphical gradual learning methods which could make it easier for children with ASD to accept and understand the lessons given⁽⁶⁾⁽³¹⁾. We assumed that the existence of some very important components that are needed to further improve the achievement of self-defecation of children with ASD, namely collaboration between parents, teachers, and therapists of children with ASD. One of the limitations that children with ASD have is they dislike to make changes⁽³²⁾. Differences in how to practice self-defecation in children with ASD may only confuse some children with ASD and lead to not achieving the goal of independence in defecating in children.

Self-defecation treatment for ASD children is one focus of the field of nursing that is given to improve the health and quality of life of ASD children, which is included in one aspect of personal hygiene in the provision of nursing care⁽³³⁾⁽³⁴⁾.

This is in line with Dorothea Orem's (Self-Care Deficit Nursing Theory) nursing theory which is one of the cornerstones of providing nursing care in assessing needs, providing assistance, and supporting self-care for individuals, families, and communities⁽³⁵⁾⁽³⁶⁾. Knowledge and participation of nurses in teaching self-defecation treatment using this method is expected to accelerate defecate skills in ASD children, to improve the quality of life and health of children in the future.

This study has another limitation which is the intervention was only given for seven days for each group. The seven days intervention was only able to see an increase in skills but were unable to see the children complete defecation independence. The time required for the children with ASD to independently defecate is usually 2 months or more⁽⁶⁾. Additionally, this study was unable to analyze and compare the effectiveness of the use of sitting and squatting toilets for children with ASD. It is expected that future researchers will be able to investigate more in-depth aspects by providing a longer intervention, examining the differences in the use of sitting and squatting to children with ASD with a larger and more even sample.

VI. CONCLUSION

The results of this study indicate and support the positive impact of providing stimulation in the form of interventions about defecate independence training in early childhood (2-8 years) on the defecate skills of ASD children. Self-care stimulation for defecation skills in early ASD is the solution to the problem of independence in defecation skills and serves as a reference for subsequent studies related to self-care skills in early childhood with ASD.

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Authors declare there are no conflict of interest and this study has never been published.

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