



Effectiveness of Animated Video on Tooth Brushing Skills of Children with Down Syndrome



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ABSTRACT

Background: Down syndrome is a congenital disorder caused by chromosome 21 failing to separate during cell division, causing impaired physical and mental development. Children with Down syndrome often have difficulty taking care of themselves, including brushing their teeth. This can increase the risk of developing dental and oral health problems. Education using animated video media can increase children's attention so that the material presented is easy to understand. Therefore, animated videos are expected to improve the brushing skills of children with Down syndrome.

Objective: To determine the effectiveness of animated video on tooth brushing skills of children with Down syndrome at 6 Special Schools in Semarang City.

Methods: : This study was a quasi-experimental nonequivalent control group design involving 48 children with Down syndrome at 6 Special Schools in Semarang City as the sample. The sample was divided into two groups, each consisting of 24 children. One group received intervention using animated videos, while the other group received intervention using conventional media (dental phantom). Assessment of oral hygiene skills was conducted before and after the intervention using observation sheets that had undergone validity and reliability testing. Data analysis was performed using paired t-test and independent t-test.

Results: The results showed a significant difference in the average tooth brushing skills of children with Down syndrome ($p < 0.001$) between the animated video and dental phantom media groups.

Conclusion: Oral health intervention using animated video media is effective in improving tooth brushing skills of children with Down syndrome at 6 Special Schools in Semarang City.

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1. Introduction

Down syndrome is a congenital disorder caused by chromosome 21 failing to separate during cell division, causing genetic information to be disrupted. Children with Down syndrome have a distinctive physical appearance, such as narrow eyes, a large tongue, and a tendency to be short in stature.¹ This syndrome can also affect various body systems, especially the musculoskeletal, neurological, and cardio-vascular systems.²

The prevalence of Down syndrome cases increases along with global population growth. According to the results of the basic health research, Down syndrome cases in Indonesia in 2013 reached 0.13%, then increased to 0.21% in 2018. The percentage of Down syndrome cases in children aged 24-59 months in Central Java in 2013 was 0.25%, then increased in 2018 to 0.81%.³

Children with Down syndrome experience delays in sensory and motor development due to abnormalities in chromosome 21. This condition causes children to have difficulty in caring for themselves, including brushing their

teeth. This can increase the risk of several dental and oral health problems.⁴ Dental and oral health problems can be prevented by providing a self-help program for brushing teeth.

The self-help program for brushing teeth aims to develop a habit of brushing teeth. New behavior needs to be practiced for 21 days consistently so that it can develop into a habit.⁵ This is proven by research by Habibah et al. which showed a change in behavior after brushing teeth every day for 21 days.⁶ Self-help for brushing teeth can be done by providing education on correct brushing techniques.

The use of media in education is needed to facilitate the explanation of educational materials. Media with audio and visual elements such as animated videos are suitable for use in learning, so that children do not get bored easily. This is supported by research by Punitha et al. which shows that animated videos are effective in increasing children's attention.⁷ Animated videos can also help children understand the material more concretely, so that they do not just imagine it.⁸

Based on the description, further research is needed on the effectiveness of animated videos on Down syndrome

children's tooth brushing skills. This research will be conducted on Down syndrome students in 6 SLB in Semarang city. Based on a preliminary survey conducted by the researcher, it was found that the majority of Down syndrome students in the school were not yet skilled in brushing their teeth. The school has also never provided dental and oral health education using animated video media.

2. Methods

The type and design of this study is a quasi-experimental nonequivalent control group design. The study began from August 26 to October 28, 2024 in 6 SLBs in Semarang City, including Semarang City State SLB, Putra Mandiri SLB-C, Pelita Ilmu SLB-C, Widya Bhakti SLB-C, Widya Bhakti SDLB-C1, and Widya Bhakti SDLB-C.

Sampling was conducted using consecutive sampling technique. The samples were then divided into two groups, namely the intervention group which was given education using animated video media and the control group using conventional media (dental phantom).

The animated video used in this study, 2 minutes and 30 seconds long, provided educational material on oral health, including images of healthy and unhealthy teeth, brushing frequency, selecting a good toothbrush and toothpaste, and the correct brushing duration and procedure using the Fones technique. The video was taken from Reno Wiska Wulandari's YouTube channel and then subjected to validity and reliability tests by the researchers.

Data collection was conducted by assessing the toothbrushing skills of Down syndrome children before and after the intervention. The assessment used an observation sheet that had previously undergone validity and reliability tests. The 21-day toothbrushing calendar was then distributed to guardians to control the formation of children's toothbrushing habits during the study.

Data analysis was performed using the Saphiro-Wilk normality test. Data is considered normal if the p-value > 0.05 and can be continued with a homogeneity test with Levene's Test. The homogeneous data was then subjected to a parametric paired t-test to determine the differences in the level of tooth brushing skills of Down syndrome children in the intervention and control groups that were paired. The statistical test was continued with an independent t-test to determine the difference in the average of 2 unpaired samples.

3. Results

Selection of research samples

The number of samples that met the inclusion criteria in this study was 50 Down syndrome children. During the study, 1 child was unable to attend due to illness and 1 other child was uncooperative in participating in the activities, so that the 2 samples were included in the drop-out category and the number of samples that met the inclusion criteria was 48 people. The samples were then divided into two groups consisting of 24 children given education with

animated videos and 24 children given education with conventional media (dental phantom).

Subject characteristic

The characteristics of the subjects in this study consisted of age, sex, and school of origin.

Table 1. Characteristics of research subjects based on age

Age (years old)	Intervention		Control		Entirety	
	Freq	%	Freq	%	Freq	%
7	3	12,5%	0	0%	3	6,3%
8	3	12,5%	2	8,3%	5	10,4%
9	2	8,3%	2	8,3%	4	8,3%
10	3	12,5%	5	20,8%	8	16,7%
11	3	12,5%	2	8,3%	5	10,4%
12	2	8,3%	4	16,7%	6	12,5%
13	1	4,2%	4	16,7%	5	10,4%
14	1	4,2%	1	4,2%	2	4,2%
15	3	12,5%	2	8,3%	5	10,4%
16	1	4,2%	1	4,2%	2	4,2%
17	1	4,2%	1	4,2%	2	4,2%
18	1	4,2%	0	0%	1	2,1%
Total	24	100%	24	100%	48	100%

The data in Table 1 shows that the age of the study sample varied from 7 to 18 years. The overall frequency distribution of age was most common at 10 years old, with 8 samples. The least common age distribution was 18 years old, with 1 sample.

Table 2. Characteristics of research subjects based on sex

Sex	Intervention		Control		Entirety	
	Freq	%	Freq	%	Freq	%
Male	12	50%	14	58,3%	26	54,2%
Female	12	50%	10	41,7%	22	45,8%
Total	24	100%	24	100%	48	100%

The frequency distribution of sex in the intervention group was balanced between the number of males and females, namely 12 samples each. Meanwhile, in the control group, there were more males, namely 14 samples, while there were 10 female samples.

Table 3. Characteristics of research subjects based on school of origin

School of origin	Entirety	
	Freq	%
Semarang City State SLB	32	66,7%
Putra Mandiri SLB-C	3	6,3%
Pelita Ilmu SLB-C	5	10,4%
Widya Bhakti SLB-C	3	6,3%
Widya Bhakti SDLB-C1	3	6,3%
Widya Bhakti SDLB-C	2	4,2%

The largest number of samples came from Semarang City State SLB, namely 32 samples, while the fewest samples came from Widya Bhakti SDLB-C, namely 2 samples.

Pre-test and post-test data collection

Data collection using an observation sheet consisting of 12 aspects of proper tooth brushing. Each aspect will be given a certain score and then added up. The difference (delta/ Δ) between the total score before and after the education is then calculated.

Table 4. Tooth brushing skill scores of Down syndrome children

Groups	Tooth Brushing Skill	
	Mean	Δ value
Intervention	Pre-test	10,5
	Post-test	25,71
Control	Pre-test	9,29
	Post-test	19,71

The data shows that there was an increase in tooth brushing skills in both groups, but the intervention group produced a greater increase compared to the control group.

Statistical test results

Table 5. Results of paired t-test for intervention and control groups

Groups	Tooth Brushing Skill	
	Mean $\pm$ SD	P-value
Intervention	Pre-test	10,5 $\pm$ 2,798
	Post-test	25,71 $\pm$ 5,996
Control	Pre-test	9,29 $\pm$ 3,793
	Post-test	19,71 $\pm$ 6,551

These results show that education using animated video media and conventional media is effective in improving the tooth brushing skills of Down syndrome.

Table 6. Results of the independent t-test of the treatment group with the control

Groups		Tooth Brushing Skill		P-value
		Mean $\pm$ SD	mean difference (Δ)	
Intervention	Pre-test	10,5 $\pm$ 2,798	15,63 $\pm$ 4,726	< 0,001
	Post-test	25,71 $\pm$ 5,996		
Control	Pre-test	9,29 $\pm$ 3,793	10,42 $\pm$ 3,361	< 0,001
	Post-test	19,71 $\pm$ 6,551		

The results state that education using animated video media is more effective than conventional media in improving the tooth brushing skills of Down syndrome children.

4. Discussion

The results of the paired t-test of the animated video media group before and after education obtained a p-value < 0.001. This value shows significant results, so that education using animated video media is effective in improving the toothbrushing skills of Down syndrome children in 6 SLBs that were used as research sites. This is in line with the research of Asri et al. which states that animated videos are effective in improving the toothbrushing skills of children with intellectual disabilities.⁹

The results of the paired t-test of the conventional media group before and after education obtained a p-value < 0.001. This value shows significant results, so that education using conventional media is also effective in improving the toothbrushing skills of Down syndrome children in 6 SLBs that were used as research sites. This is in line with Wijayanti's research which shows that dental health education using tooth phantoms can improve children's toothbrushing skills.

The results of the independent t-test between the animated and conventional video media groups obtained a p-value < 0.001. This value indicates that there is a significant difference in the average tooth brushing skills between the animated and conventional video groups. Based on this, it can be concluded that education using animated videos is more effective than conventional media in the 6 SLBs used as research sites.

The use of animated video media in delivering dental health education tends to be more interesting and not boring for children compared to tooth phantoms. The appeal of this animated video can increase children's attention and concentration in listening to education, so that the material presented becomes easier to understand.¹⁰ When children do not understand the material presented in the video, repetition can be done until the child really understands.¹¹

Education related to brushing teeth for children aims to increase knowledge, so that it can have a positive effect on children's brushing skills.¹² This tooth brushing education does not only need to be delivered to normal children, but also to children with special needs such as Down syndrome children. Children with Down syndrome experience abnormalities in the central nervous system which result in a lack of cognitive and motor skills, including brushing teeth.¹ This is the basis for the need for tooth brushing education with effective media, so that it can be easily accepted and understood by children.

The selection of effective media in delivering education is important to achieve educational success. Children with Down syndrome tend to learn more easily by seeing, imitating, and then applying it in everyday behavior.¹ Based on this, the type of media that is suitable for use in providing education that aims to change the behavior of children with Down syndrome is visual media.

Animated video is an audio-visual media that displays moving animated images accompanied by audio.⁸ This media utilizes 2 sensory sensors, namely the eyes (sight) and ears (hearing), so that stimuli can be easily received and

converted into electrochemical signals which are then transmitted to the brain by nerves.¹³

Dental phantom media is also suitable for use as a medium for educating children on brushing their teeth in Down syndrome because it is visual. This media is often used to deliver dental and oral health education to children conventionally. Education with dental phantoms in children can build two-way communication during educational sessions, so that the material delivered becomes easier to understand and can increase children's knowledge.¹⁴

Management of dental health behavior in children involves three main factors, namely personal factors, dental factors, and external factors related to the role of parents and the child's environment.¹⁵ The role of parents in this study can affect the level of tooth brushing skills of Down syndrome children. Parents can guide, provide attention, and train children in brushing their teeth properly and correctly.¹⁶ This study involves parents to control the formation of optimal tooth brushing habits in children by filling in a 21-day tooth brushing calendar.

5. Conclusion

Dental health education using animated video media is effective in improving the tooth brushing skills of Down syndrome children. This is proven by the average score of tooth brushing skills of Down syndrome children after being given education using animated videos which are more skilled than before being given education.

Ethical Approval

This research was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Diponegoro (Protocol Number: 432/EC/KEPK/FK-UNDIP/VIII/2024).

Conflicts of Interest

The authors declare no conflict of interest.

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Author Contributions

Conceptualization, LFZ and ILV; methodology, LFZ, ILV, and IAK; software, LFZ; validation, LFZ, ILV, IAK, and THS; formal analysis, LFZ; investigation, LFZ; resources, LFZ; data curation, LFZ; writing-original draft preparation, LFZ; writing-review and editing, LFZ, ILV, IAK, THS; visualization, LFZ; supervision, ILV, IAK; project administration, LFZ; funding acquisition, LFZ.

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