

# *Ball Toothbrush* as an Effort to Improve Teeth Brushing Skills and Debris Index Status in Stroke Patients

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**Abstract:- Background:** The proportion of correct tooth brushing behavior is only 2.8% of the population. Apart from dental health problems in the community, stroke problems are also still encountered, based on 2013 Basic Health Research (Riskesdas) data, the prevalence of stroke in Indonesia is 10.9% of those diagnosed with stroke, stroke patients often experience long-term disability, so good oral hygiene is difficult to maintain. So innovation is needed in changing teeth brushing skills, namely through the "Ball Toothbrush" which is expected to improve teeth brushing skills and debris index status in stroke patients. **Objective:** To produce a "Ball Toothbrush" effective and feasible to improve tooth brushing skills and debris index in stroke patients. **Method:** The method used in this research is Research and Development (R&D) with 5 research stages, namely needs identification, engineering design, expert validation, model/product testing, and model/product results. This research used a pre-experimental design with a one-group pre-post-test design. The sampling technique was purposive sampling consisting of 30 stroke patients who were given intervention for 14 days. **Results:** Ball Toothbrush is feasible and effective in improving tooth brushing skills and debris index in stroke patients. The results of the effectiveness test of using the Ball Toothbrush model on tooth brushing skills obtained a value of 0.000 ( $p < 0.05$ ) and a debris index of 0.000 ( $p < 0.05$ ). **Conclusion:** The Ball Toothbrush model is feasible and its application effectively improves tooth brushing skills and debris index status in stroke patients.

**Keywords:-** "Ball Toothbrush", Stroke, Tooth Brushing Skills, Debris Index.

## I. INTRODUCTION

Dental and oral health according to Minister of Health Regulation number 89 of 2015 is a healthy condition of the hard tissue and soft tissue of the teeth as well as related elements in the oral cavity which allows individuals to eat, talk, and interact socially without dysfunction, aesthetic disturbances and discomfort due to disease, deviations in occlusion and loss of teeth to be able to live a socially and economically productive life [1].

The hope of achieving optimal dental health conditions has not yet been realized, dental health problems are still encountered as the results based on the 2018 RISKESDAS noted that the proportion of dental and oral problems was 57.6% and one of the dental health problems was based on the Results of Basic Health Research (RISKESDAS) in 2018 stated that the largest proportion of dental problems in Indonesia were damaged/cavities/caries (45.3%). The largest proportion of dental problems in Indonesia are damaged teeth/cavities/caries (45.3%) [2].

Stroke is also a health problem in Indonesia. Basic Health Research (RISKESDAS) in 2013 stated that the prevalence of stroke in Indonesia was 10.9%. Stroke patients often experience long-term disabilities, making it difficult to maintain good oral hygiene. The results of the Riskesdas show that people who brush their teeth well and correctly are still very few, namely 2.8% of the population.[3],[4].

RISKESDAS said that one of the causes of dental health problems is caries. The cause of caries is carbohydrates. The presence of carbohydrates in the oral cavity can be cleaned by brushing your teeth. Brushing your teeth can remove plaque and soft bacterial deposits that stick to the teeth and cause cavities. Therefore, maintaining proper oral hygiene can help reduce dental caries [5].

To be able to improve the ability to brush teeth properly and correctly, dental health education is needed to form good behavior. [6]. In dental health education, apart from increasing knowledge, it can also improve skills. Skills are basic abilities that continue to be developed until they become trained, while tooth brushing skills are the ability to carry out or carry out the action of brushing teeth which is carried out with practice to obtain good dental hygiene. By brushing your teeth well it is hoped that you can improve dental hygiene [7]

Dental and oral health problems in stroke sufferers still need attention because stroke sufferers with motor disorders will have difficulty carrying out oral hygiene care independently so oral hygiene in stroke patients becomes uncontrolled [8]. Limited movement and muscle control in stroke patients create obstacles in carrying out effective dental hygiene practices. Research states that dental hygiene status in stroke is in the poor category. Therefore, efforts are needed to train muscle strength so that they can maintain dental hygiene independently [9].

To be able to improve motor skills, including brushing teeth, stroke sufferers, exercise therapy is needed, namely Range of Motion (ROM) therapy in the form of grasping movements or clenching the hands tightly, which is applied in rubber ball gripping exercises, stimulating an increase in neuromuscular and muscular chemical activity. This will stimulate the nerve fibers of the extremity muscles, especially the parasympathetic nerves, to produce acetylcholine, resulting in contractions [10].

The existence of the Range of Motion (ROM) effect requires interventions that can help with stimulation, namely using a tool in the form of a rubber ball. Rubber ball gripping therapy is one of the active therapy exercises that can be done by non-hemorrhagic stroke patients with spherical grip exercises to stimulate the hand or upper extremities by holding an object placed in the palm so that it can help the recovery of the hand or extremity [11].

To develop a dental and oral hygiene tool that has never been created before, the author is interested in creating a tool that is different from a conventional toothbrush for stroke patients. The design this tool will be specifically designed to improve teeth brushing skills more optimally, the innovation that can be carried out is modifying the toothbrush via a Ball Toothbrush because with the Ball Toothbrush, the electric toothbrush is designed with a rubber ball-shaped handle which can make it easier for stroke patients to grip at the same time. Can help improve motor skills for brushing teeth properly and correctly as well as increase muscle strength and movement in the hands or upper extremities, so that patients can maintain dental hygiene independently. With this modification, it is

hoped that the Ball Toothbrush can improve teeth brushing skills and debris index status in stroke patients.

**II. RESEARCH METHODS AND SAMPLE**

The method in this research uses the Research and Development (R&D) development method. This research and development method is used to produce a product and test the effectiveness of the product. There are 5 (five) main steps in the research and development procedure, namely: 1) information collection, 2) product design, 3) expert validation and revision, 4) product testing, and 5) product results. The following is a picture of the Research and Development (R&D) research development flow.

This research uses a pre-experimental research design with a one-group pretest-posttest design, which only uses one group of subjects, measurements are taken before and after treatment. The difference between the two measurement results is considered a treatment effect. The sample in this study was 30 respondents who had a stroke with moderate severity through the NIHSS (National Institute of Health Stroke Scale) assessment at Roemani Hospital, Semarang City.

**III. RESULTS AND DISCUSSION**

*A. Validity test*

Validity tests were carried out using Aiken V to test the suitability of the model so that model trials could be carried out. There are 3 expert validators in testing eligibility. This validation was carried out with a questionnaire containing 10 questions from each expert validator.

**Table 1 Validity Test**

No	Test results	Interpretation	Follow-up
1	0.66	Valid	Accepted/used
2	0.58	Valid	Accepted/used
3	0.75	Valid	Accepted/used
4	0.75	Valid	Accepted/used
5	0.66	Valid	Accepted/used
6	0.75	Valid	Accepted/used
7	0.58	Valid	Accepted/used
8	0.66	Valid	Accepted/used
9	0.75	Valid	Accepted/used
10	0.75	Valid	Accepted/used
The total assessment average is 0.6917			

*\*Aiken-V*

The average feasibility value is 0.6917 with a high validity category, which means that the Ball Toothbrush model can be used as an effort to improve teeth brushing skills and debris index in stroke patients.

*B. Reliability Test*

**Table 2 Reliability Test**

	Intraclass Correlation	Sig
Single Measures	0.828a	,000
Average Measures	0.980c	,000

*\*Intraclass Correlation Coefficient*

The results of the expert validation reliability test on one expert had an Interclass Correlation value of 0.828. Because the value is > 0.50, the reliability has adequate stability, and overall the 3 experts have an Intraclass Correlation value of 0.980 because a value ≥ 0.80 can be interpreted as having high reliability.

C. *Univariate Analysis*

**Table 3 Average Frequency Distribution Before Intervention**

Variable	Mean
Skills	64.3
Debris Index	1.8

Based on Table 3, the results obtained from the average frequency distribution before intervention in stroke patients as a variable obtained an average skill of 64.3 and a debris index of 1.8.

**Table 4 Average Frequency Distribution After Intervention**

Variable	Mean
Skills	74.6
Debris Index	0.6

Based on Table 4, the average frequency distribution results obtained after intervention on stroke patients as a variable obtained an average skill of 74.6 and a debris index of 0.6.

D. *Bivariate Test*

Bivariate analysis is used to test the differences between two variables. In the initial stage, model testing is carried out by carrying out a normality test first and then testing the effectiveness of paired and unpaired variables.

➤ *Effectiveness Test*

The effectiveness test is a test carried out to determine whether it is appropriate to continue testing the model results in this research which are explained in the following table:

**Table 5 Test the Effectiveness of Improving Teeth Brushing Skills**

Variable	Mean ± SD pretest	Mean ± SD posttest	Delta(Δ)	p-value
SkillsBrushing teeth	64.33 ± 5.833	74.67 ± 7.063	10.34 ± 1.23	0,000

Based on Table 5, the pre-test scores for tooth brushing skills are with an average score of 64.33 to 74.67. Where the category 80-100 is very good, 70-79 is good, 60-69 is sufficient and <60 needs guidance, so the results of the tooth brushing skill score increase between pre-post-test in stroke sufferers, and the p-value is 0.000 (p < 0.05), meaning that "Ball Toothbrush" is effective in improving the tooth brushing skills of stroke sufferers, the difference between the initial data (pre-test) and the final data (post-test) of the tooth brushing skills of stroke patients is 10.34.

**Table 6 Test the Effectiveness of the Debris Reduction Index**

Variable	Mean ± SD pretest	Mean ± SD posttest	Delta(Δ)	p-value
Debris Index	1.843 ± 0.7305	0.693 ± 0.2033	1.15 ± 0.5272	0,000

Based on the table above, it describes the results of the pre-test scores on the debris index variable with an average pre-test score of 1.84 to 0.69, where the good category is 0.0-0.6, medium is 0.7-1.8, and bad 1.9-3.0. and the p-value is 0.000 (p < 0.05) so it means that "Ball Toothbrush" is effective in reducing the debris index score in stroke patients, the difference between initial data (pre-test) and final data (post-test) debris index stroke patients was 1.15.

**IV. DISCUSSION**

Dental health problems in stroke patients are due to less than optimal gripping of the toothbrush which makes their dental health tend to be poor, and limitations in gripping which make it less than optimal in maintaining the health of their teeth and mouth. Therefore, sometimes you need help when brushing your teeth. So an educational effort is needed to maintaining dental and oral health by the qualifications of stroke patients [12], [13].

The existence of the Range of Motion (ROM) effect requires interventions that can help with stimulation, namely using a tool in the form of a rubber ball. Rubber ball gripping therapy is one of the active therapy exercises that can be done by non-hemorrhagic stroke patients with spherical grip exercises to stimulate the hand or upper extremities by holding an object placed in the palm so that it can help the recovery of the hand or extremity [10].

#### A. Effectiveness of Ball Toothbrush on Teeth Brushing Skills

The results of this study show the difference between the scores of tooth brushing skills in stroke patients before the intervention and after the intervention. The difference between initial data (pretest) and final data (post-test) on the tooth brushing skills of stroke patients is 10.34 and the p-value is 0.000 ( $p < 0.05$ ) which means that the Ball Toothbrush model is effective in improving tooth brushing skills in stroke patients. The increase occurs because the Ball Toothbrush has many advantages, namely that there are rubber balls that can stimulate the nerve fibers of the extremity muscles, especially the parasympathetic nerves, to produce acetylcholine, resulting in contractions.

Grasping the hand on the Ball Toothbrush will move the muscles thereby generating brain control over the muscles. The rubber ball can make it easier for stroke patients to grip and can also help improve motor skills for brushing teeth properly and correctly as well as increasing muscle strength and movement in the hands or upper extremities so that patients can maintain dental hygiene independently [10]

#### B. Effectiveness of Ball Toothbrush Against Debris Index

The results of this study show that the difference between the debris index value in stroke patients before the intervention and after the intervention decreased to 0.6. This means that the Ball Toothbrush model is effective in reducing the debris index in stroke patients.

The Ball Toothbrush model was declared successful in improving tooth brushing skills and debris index in stroke patients, by improving the tooth brushing habits of stroke patients. This can be seen because after the 14 days have ended, stroke patients become more understanding and more active in brushing their teeth twice a day according to the knowledge provided. Stroke patients are also able to perform good and correct teeth brushing skills so that the score on the debris index decreases.

The success of the Ball Toothbrush model was because it had been implemented for 21 days, provided a lot of stimulus in the process of carrying out teeth brushing skills, and was also implemented at home because, during the intervention, stroke patients were given instructions to continue to carry out good and correct teeth brushing skills at home.

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