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Dental Montessori Model as Effort to Improve Teeth Brushing Skills and Reduce Debris Index for Pre-scholars

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ABSTRACT: Only 0.68% of pre-schoolers aged 3-4 years brush their teeth properly, because the dental health education received were only 6.16%. General health education byconverses, demonstrations and existing education models are considered to make children less training their motoric skills, causing children to be less skilled in brushing their teeth, so that their dental hygiene is poor. The Dental Montessori Model was developed as an alternative dental health education model that is feasible and effective to improve tooth brushing skills and reduce the debris index of pre-schoolers.

The study uses Research and Development method and the application of Quasi Experiment and Pre-testPost-test with Control Group design. Sampling amount is 78.That feasibility was analysed using the statistic Aiken's V and Intraclass Correlation Coefficient.Analysed the effectiveness of modeluse Wilcoxon test and the comparison effectiveness model use Man Whitneytest.

The results of expert validation of the Dental Montessori model are feasible to apply with Validity value is 0.867 and p-value 0.030. The results fromimplementation ofDental Montessori Model during 21 days were more effective in increasing dental health knowledge with a significance value of 0.004 and tooth brushing skills with a significance value of 0.000 and reducing the debris index with a significance value of 0.000 compared by the converse and demonstration education models.

Conclusion of development Dental Montessori Model is feasible and more effective to improve brushing teeth skills and reduce the debris index than the model educationwithconverse methods and tooth pantomime demonstrations.

KEYWORDS: Pre-schoolers, Motoric, Brushing, Dental.

I. INTRODUCTION

The early childhood group is a group that is vulnerable to dental health problems due to their lack of ability to maintain dental health, causing high cases of caries in children seen from the def-t index which is still in the high category of 4.9[1]. The age around 3-4 years old group has a habit of brushing their teeth every day of 92.12% but only 0.68% do it correctly[2]. This causes children's dental hygiene to be poor and suffer from dental health problems.

The problem of dental caries in children is caused by risk factors such as consuming cariogenic foods, frequency of tooth brushing, brushing method, dental visits, knowledge, attitudes, dental hygiene, stunting, dietary habits, social practices, BMI, tooth brushing time, oral hygiene index, dental plaque index, salivary acidity, and oral health education[5]. Therefore, efforts are needed to improve children's behaviour and increase the important role of parents or teachers at school in guiding the maintenance of children's dental and oral health[3].

The dental health efforts received are still uneven. In Central Java, only 44.9% received dental health services in the form of dental hygiene counselling or education[1], the percentage of the 3-4 years old age group in Central Java who received dental health counselling or education was only 6.16%[2]. According to the Theory of Plan Behaviour, information received by individuals can influence beliefs, motivation and behavioural control to create behavioural intentions so that behaviour is formed, facilities in a person's environment help individuals get information or knowledge, the school environment that implements routine dental and oral health counselling programs finally makes them more motivated to maintain dental health[4]. The quality and attributes of information shape the will to behave, therefore good media are needed to provide information[5].

Health education in schools generally does not use media, only converse methods in front of the class, centred on the person providing education, this causes a less effective atmosphere and children are less active, the converse method is often seen as a less effective method because the interaction that occurs in the learning process tends to be centred only on the teacher, while students can only listen without wanting to express their creativity but their activeness is also lacking[6]. The 5DAYS GOSGI education model that has been implemented only uses pantomime and there is no child motor stimulus activity. In fact, the learning model with the aim of forming tooth brushing skills needs to stimulate children's motor skills because brushing teeth is an activity that is closely related to motor skills.

The development of the Dental Montessori Model as an innovation in the Dental Health education model in an effort to improve tooth brushing skills and reduce debris index of early childhood teeth that are integrated with early childhood learning, according to the development and character of children and can train children's motor skills.

II. METHOD

The study used the R&D (Research and Development) method which consisted of several steps, namely collecting information through interviews with parents, media experts, Principals and Kindergarten Teachers and conducting literature studies to support the interview results. The design of the Dental Montessori Model product was made by researchers, then validated by experts. Model improvements were made according to suggestions and input from experts, then a trial was conducted using the application of Quasi Experiment and Pre-testPost-test with Control Group design during 21 days to analysed the effectiveness of the Dental Montessori Model as a dental health education model in improving children's tooth brushing skills and reducing debris index in early childhood targets with a sample size of 78 divided into 2 groups, namely 39 control groups given education using the converse method and dental pantomime demonstration and 39 intervention groups given education with the Dental Montessori Model. Data analysis to test the effectiveness of the Montessori dental model using the Wilcoxon test while to determine the comparison of the effectiveness of the two groups using the Mann-Whitney test because the data was not normally distributed.

III. RESULT

Before theDental Montessori Model was applied, researchers doing validation tests of model on several experts to test the feasibility the result developmentof model, namely Montessori expert, preschool education expert, health promotion expert, psychologists and dentists specializing in pediatric dentistry.Below are the validation results from experts:

Table 1. Assessment of Model Feasibility By Experts

Analysis	Score	Criteria
Mean	86,67%	Very feasible
Aiken’s V	0,867	Highly
P-value	0,030	Significant
Intraclass Correlation Coefficient (ICC)	0,511	Adequate

The assessment results from 5 experts are shown in Table 1. The average feasibility value given is 86.67%, indicating that the Dental Montessori Model has a very good value. The score Aiken’s Vfor validity value is 0.867, indicating that the Montessori Dental Model, as an effort to improve skills and reduce debris index in early childhood, has high validity.

The expert validation reliability test using the Interclass Correlation Coefficient (ICC) yielded a result of 0.511, indicating adequate reliability of the Dental Montessori Model. The ICC p-value was 0.030, or <0.05, indicating significance. The validity and reliability tests, as well as the feasibility assessment of the model by experts, indicate that the Dental Montessori Model is considered suitable for use as a dental health education model for early.

Table 2. Respondent Characteristics

No	Characteristic	Group			
		Control		Intervention	
		n	%	n	%
Teacher					
1	**Gender**				
	Male	0	0%	1	25%
	Female	4	100%	3	75%
2	**Age**				
	<35 years old	0	0%	0	0%
	>35 years old	4	100%	4	100%
3	**Education**				

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	Senior High School	2	50%	2	50%
	Bachelor	2	50%	2	50%
Parents					
1	**Age**				
	<35 years old	19	48.71%	10	25.64%
	>35 years old	20	51.28%	29	74.36%
2	**Education**				
	Junior High School	2	5.1%	0	0%
	Senior High School	24	61.5%	4	10.3%
	3-year diploma	4	10.3%	5	12.8%
	Bachelor	9	23.1%	26	66.7%
	Master	0	0%	4	10.3%
3	**Jobs**				
	Housewife	22	56.41%	10	25.64%
	Government Employees	0	0%	9	23.08%
	Police	0	0%	1	2.56%
	Teacher	0	0%	2	5.13%
	Converser	0	0%	1	2.56%
	Privat	11	28.21%	14	35.90%
	Self-employed	6	15.38%	2	5.13%
Child					
1	**Age**				
	4 years old	5	12.8%	2	5.1%
	5 years old	24	61.5%	10	25.6%
	6 years old	10	25.6%	27	69.2%
2	**Gender**				
	Male	22	56.4%	17	43.6%
	Female	17	43.6%	22	56.4%

Table 2 shows that 100% of teachers teaching early childhood in the control group were female, while 1 was male in the intervention group. Based on age, teachers in both the control and intervention groups were over 35 years old, and 50% of each group had a high school diploma and 50% a bachelor's degree.

The majority of parents were over 35 years old in the control group (20 respondents (51.28%) and in the intervention group (29 respondents (74.36%). The highest educational level of parents in the control group was high school graduates (24 respondents (61.5%), while in the intervention group, the highest educational level was 26 (66.7%). The highest occupation of parents in the control group was housewives (22 respondents (56.41%), while in the intervention group, the highest number were private sector employees (14 respondents (35.90%).

The majority of early childhood children in the control group were male, 22 children (56.4%) and aged 5 years, 24 children (61.5%), while in the intervention group the majority of children were female, 22 (56.4%) and aged 6 years, 27 children (69.2%).

Table 3. Results of Normality Test

Variable	**Sig.**
Control	
Pre-test Knowledge	0.002
Post-test Knowledge	0.000
Pre-test Skills	0.000
Post-test Skills	0.000
Pre-test Debris Index	0.011
Post-test Debris Index	0.156
Intervention	
Pre-test Knowledge	0.001
Post-test Knowledge	0.000
Pre-test Skills	0.000

Post-test Skills	0.000
Pre-test Debris Index	0.045
Post-test Debris Index	0.000

The results of the normality test in table 3 above show that the data only contains one variable that is normally distributed, namely the post index debris with a sig value>0.05, namely 0.156. Apart from that, the variable shows data that is not normally distributed with a sig value <0.05. Therefore, the effectiveness test used is the non-parametric test, namely the Wilcoxon and Man Whitney.

Table 4. Result of Effectiveness Test

Variable	$\bar{x} \pm SD$		(Δ)	p-value*
	Pre-test	Post-test		
Control				
Knowledge	73.58 ± 13.27	83.33 ±14.20	9.75	0.005
Skills	40.00 ± 11.47	49.23 ± 20.44	9.23	0.059
Debris Index	1.27 ± 0.41	1.11 ± 0.38	0.16	0.053
Intervention				
Knowledge	78.97 ± 9.67	97.43 ±4.98	18.46	0.000
Skills	42.56 ± 7.15	91.02 ±7.87	48.46	0.000
Debris Index	1.43 ± 0.41	0.16 ± 0.17	1.27	0.000

*Wilcoxon Test

Based on table 4 the change value (Δ) in the variables of knowledge, tooth brushing skills and debris index before and after in the intervention group given the Dental Montessori Model has more big change than control group was 18.46, 48.46 and 1.27 with p-values in the Wilcoxon test of 0.000, 0.000 and 0.000 or p-values<0.05, meaning that the Dental Montessori Model is effective in increasing children's dental health knowledge, children's tooth brushing skills and reducing the debris index.

Table 5. Results of Comparison Test

Variable	p-value*
Dental Health Knowledge	0,004
Tooth Brushing Skills	0,000
Debris Index Status	0,000

*Man Whitney Test

Based on table 5 above, the p-value in the Man Whitney test of the change value shows that children's knowledge, tooth brushing skills and debris index status are 0.004, 0.000 and 0.000 or <0.05, meaning that the Dental Montessori Model is effective as an effort to increase knowledge and skills and reduce the debris index compared bydental education models using converse and demonstration methods using dental pantomimes.

IV. DISCUSSION

The results of initial observations obtained data on the level of children's tooth-brushing skills still require guidance with an average of 42.56% or it can be described as children only doing 4 to 5 steps of brushing their teeth correctly out of a total of 10 steps observed. Preschool children need to be trained in their motor skills because brushing their teeth is closely related to children's fine motor skills[7].

Fine motor skills are the use of small muscle groups such as the fingers and hands to accomplish skills[8]. So this Montessori dental model is designed to improve tooth brushing skills through Montessori activities that stimulate children's fine motor skills.

This Montessori dental model is a development of the Maria Montessori learning model which was developed into dental health education consisting of 5 Montessori activity media with the aim of training early childhood motor skills in tooth brushing skills with the content of the material namely the number and arrangement of primary teeth with the concept of puzzles, identifying healthy, dirty and sick teeth with a labyrinth track, knowledge of tooth brushing equipment with the concept of sticking, knowledge of healthy and unhealthy foods for teeth with the concept of sensory sand and grouping, as well as a tooth brushing practice board that is adapted to pre-schoolerslearning and accompanied by direct practice of maintaining dental hygiene at school.

The results of expert validation obtained an average feasibility score of 86.67% (very feasible) and based on the Aiken's V calculation, it was obtained 0.867 with a high validity category and in the ICC test 0.511 with a p-value of 0.030, which means that the DentalMontessori Model is relevant and feasible as an educational model in an effort to improve the skills and debris index of early childhood.

The Montessori model is considered suitable as an educational medium for pre-schoolersdental health education because, based on expert validation assessment indicators, this model aligns with the desired objectives and uses media appropriate to the characteristics and learning needs of preschool children. Model suitability is crucial to ensure the accuracy of the model developed, as learning outcomes are largely influenced by the learning model used[9].

Montessori experts suggested adding barcodes for access to materials and images so teachers could use the model long-term. Psychologists also suggested adding a user manual for the toys and materials to ensure teachers understood the materials. Based on the experts' input, the researchers revised the manual and created barcodes attached to each Dental Montessori game.

Researchers revised the model so that teachers would find it easier to understand how to use game media and easier to explain instructions to children.

Analysis the level of children's dental health knowledge after being given education using the Dental Montessori Model at school during 21 days experienced an increase of 18.46 from the initial average of 78.97 to 97.43 with a p-value of 0.000. The control group also experienced an increase but only 9.75 from the initial average of 73.58 to 83.33 with a fairly significant p-value of 0.005, meaning that the application of the Montessori dental model and the conventional model are equally effective in increasing knowledge, this occurs because children's knowledge before being given education already has quite good knowledge.

The good level of knowledge possessed by teachers from both the control and intervention groups supports the improvement of good knowledge in children, because teachers have been given direction and education by researchers, because teachers have a very important role in transferring knowledge and skills about brushing teeth to students so that this model can be used according to its objectives[10].

The educational model with converses and pantomime demonstrations is quite effective in increasing knowledge, but has not been able to improve children's tooth brushing skills. In this case, the Montessori dental model is more effective because the conventional model does not include activities to train children's motor skills.

The analysis of changes in skills in the intervention group showed an increase of 48.46 from the average before the Montessori dental model was 42.6 to 91.02 after the intervention. Meanwhile, the increase in tooth brushing skills in the control group was only 9.23. The results of the effectiveness analysis using showed that the tooth brushing skills of the intervention group were significantly higher with a p-value of 0.000, while in the control group it was 0.059.

These skill improvements can occur due to the appropriateness of the Montessori dental model, which is suited to the characteristics of preschool children, namely, it contains play activities that can stimulate motor skills, thus practicing tooth brushing skills. In learning strategies, media must meet the criteria of suitability to the characteristics of the target. The more appropriate the characteristics of the material and the target, the more effective it will be[11]. The use of the Montessori dental model, which is in accordance with the learning strategy, can achieve the goal of improving tooth-brushing skills. Meanwhile, in the control group, not given motor activities like those in the Montessori dental model, children still practiced tooth-brushing. This resulted in an increase in skills, although not significantly because the stimuli received by the children were not as comprehensive as those in the intervention group.

Children who are skilled at brushing their teeth are related to the child's increasing level of knowledge, this is because a person's knowledge really supports their life activities, one of which is maintaining dental and oral health[12].

Montessori activities include holding sensory sand in the "feed me" game and the "toothbrushing" board. Sand play can develop small muscles by squeezing, molding, and shaping the sand[13]. This media is also the most engaging for children and contributes to Montessori-style play activities, helping them develop their motor skills and brushing skills. Furthermore, the habit of brushing teeth every day at school after meals also effectively improves children's brushing skills[14].Repeated practice activities train children's motor skills in doing something, activities such as drawing lines and grasping objects are activities that can be given to support children in stimulating their fine motor skills[15].

In the control group, the results of the analysis of the effectiveness of tooth brushing skills showed a p-value of 0.059, meaning that education using the converse method and phantom demonstration was not significantly effective in improving tooth brushing skills, because pre-schoolers in the control group did not have motor activities like those in the Montessori dental model. The control group also received the habit of brushing their teeth every day, but the educational method they received was only paying attention to the instructor conveying knowledge and demonstrating how to brush their teeth.

The results of the comparative analysis of the control and intervention groups showed that the Montessori dental model was more effective in improving tooth brushing skills compared to the converse and pantomime demonstration methods with a p-value of 0.000. This is because the Montessori model is more suited to the habits of children who enjoy activities, play, work in groups, and enjoy hands-on practice[16].Montessori dental activities carried out for 21 days also encourage children to develop a good habit of brushing their teeth. Actions carried out repeatedly will become habits so that children become skilled at brushing their teeth properly and correctly[10],[17].

The results of the analysis of changes in the debris index score before and after being educated with the Montessori dental model decreased by 1.27 from the initial average of 1.43 to 0.16 and based on the effectiveness test showed a significant decrease with a p-value of 0.000. While in the control group the change in the debris index was only 0.16 from the initial average of 1.27 to 1.11 and based on the effectiveness test showed an insignificant p-value of 0.053>0.05 meaning that the Montessori dental model was more effective in reducing the debris index of early childhood with a p-value of the comparison test of 0.000.

This significant decrease in the debris index score can occur because the intervention group has higher tooth brushing skills, one of the factors that can influence the success of maintaining dental and oral health is brushing teeth properly, the better the tooth brushing skills, the lower the plaque index score[18].

Motoric exercises in the Montessori dental model such as grasping and holding activities in Montessori dental games which are applied as stimulation can strengthen the finger and wrist muscles, this activity is also able to create coordinated and controlled movements precisely, making children more skilled at brushing their teeth[15],so that children are more trained and stimulated to do the movements or techniques of brushing their teeth correctly and can clean their teeth from debris stuck to their teeth.

V. CONCLUSION

The Montessori Dental Model is effectively implemented as an effort to increase the knowledge of early childhood with a significance value of 0.004<0.05 and improve the tooth brushing skills of early childhood with a significance value of 0.000<0.05 and effectively reduce the debris index of early childhood with a significance value of 0.000<0.05 compared to the converse and demonstration models.

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