A Mobile App (Smart Dental Alarm) on Improving Tooth Brushing Skills among Early Childhood

Dewi Ratna[1*], Masrifan Djamil[2], Tri Wiyatini[3], Supriyana[4], Lanny Sunarjo[5]

Master of Applied Dental Health Therapist, Poltekes Kemenkes, Semarang, Indonesia

Article info	Abstract
	The problem regarding dental caries in children aged 5-9years reaches 90.1%. This situation is caused by the poor tooth brushing skills of the children. The present paper aims to take a new look at our findings on an application "Smart Dental Alarm" as a media for dental and oral hygiene education to improve tooth brushing skills in the early childhood stage. Research and Development (R&D) with experimental tests, Pre-test, and post-test were applied in this study. We opted for a random sampling technique with 33 respondents in each group. Smart Dental Alarm was prepared for the intervention group while the control group was done using Power Point media. This research was conducted for 21 days. As a result, the Mann-Whitney test obtains a p-value of 0.000 (0 <0.05), which means that Smart Dental Alarm effectively improves early children's toothbrushing skills than PowerPoint. Smart Dental Alarm effectively improves early childhood tooth brushing skills so that the plaque value declines. **Keyword:** early childhood, smart dental alarm, tooth brushing skills

INTRODUCTION

Caries is a complex developmental disease resulting from foods containing sugar, bacterial metabolism, demineralization, and organic degradation (1). Children aged 5-6 years who have dental caries suffer from a negative impact on their quality of life (2).

World Health Organization (WHO) in 2012 stated that caries is the most common disease affecting children at 60-90%(3). Only 19% of Indonesian children are free from caries at the age

of 3-4 and only 9.9% at the age of 5-9. Although 86.7% at the age of 3-4 and 93.2% of age 5-9 brush teeth every day, each age group is only 1.1%, and 1.4% perform it on time(4).

According to Riskesdas (Indonesia National Basic Health Research) data in 2018, children's dental hygiene is still very far from Indonesia's 2030 target of caries-free (5). One of the causes of dental caries is compliance with dental and oral hygiene care. (6). An effort to increase tooth brushing skills requires innovations, and this concern has arisen the development on existing media to prevent from prolonging the problem.

Smart Dental Alarm is an android-based application that comprises features to improve every aspect of early childhood tooth brushing behavior. Smart Phone was chosen as a media for dental hygiene education because it is commonly used in urban and rural communities (7).

In applying Smart Dental Alarm, children are assisted by parents and monitored by dental workers. Along with improving the knowledge, this application is equipped with materials to guide children in brushing their teeth. While attempting to enhance the behavior, the application is equipped with a series of pictures about tooth brushing that the child can choose within an answer for each picture selection. Concurrently, the effort to increase application use action is equipped with a checklist of a-must tooth brushing steps. Parents assisting their children in brushing their teeth are then capturing these activities through a camera feature, subsequently sent to the server to perform monitoring by dental workers.

OBJECTIVE

This research aims to build and test the Smart Dental Alarm application's effectiveness as a media for dental and oral hygiene education to improve tooth brushing skills in early childhood.

METHOD

The research was conducted using the Research and Development (R&D) method. The R&D process includes five essential stages, namely: 1) Information collection, 2) model design, 3) expert validation and revision, 4) model testing, 5) finished model (8).

The research was conducted in three Kindergarten (TK) schools, i.e., TK Dharma Wanita Kebun Dadap Timur, Sumenep Regency as an intervention group, and TK PGRI Saroka, Sumenep Regency as a control group. The number of samples used in this research was 33 students. A random sampling technique did this. Conversion and ration scale were undertaken for the research data. In investigating the feasibility of the model, ISO 9126 test was used. The data normality test used Shapiro Wilk because the number of respondents was less than 50. The paired abnormal group's effectiveness test was identified using Fredman, and the unpaired group was with the Mann-Whitney.

Smart Dental Alarm intervention was carried out with the assistance of parents. Before the intervention, the application was installed on the parent's Smartphone, and the alarm was set. The alarm time was developed according to the time the child usually finishes breakfast and before bed. Once the alarm rings, the parents accompany the children to brush their teeth. While children were brushing their teeth, the parents guided them in each step of brushing according to what is informed in the application. The parents fill out a checklist of tooth brushing steps in the application. As soon as the children finished with the brushing, the parents captured their children through the in-app camera sent to the server. Oral and dental therapists can access these activities through photos that parents have sent to the server via the application's in-app camera. This activity was carried out for 21 days.

RESULT
Information Collection

The instruments employed were interviews and the Systematica Literature Review. It was concluded that to increase tooth brushing skills in early childhood, innovative dental hygiene education methods and media were needed to attract children's attention and involve the role of parents in the implementation.

Model Design

The results of the data obtained from information collection were used for the construction of the product. According to the information received, early childhood still needs parental assistance in brushing their teeth. Researchers built a product tailored to children's needs at an early age, namely Smart Dental Alarm, to shape tooth brushing skills.

Expert Validation

Table 1. Assessment Based on Expert Validation

No	Respondent	Score	Average Criteria
1	Pedagogy expert	97,3	
2	Dental Hygiene Promotion expert	94,67	Excellent criteria
3	Information Technology expert	94,6	(No revision)
	Average	95,5	

*ISO 9126

The validator assessment results show that the average score is 95.5, which includes excellent criteria and no revision needed. Therefore, "Smart Dental Alarm" is relevant as a media for early childhood dental and oral hygiene education.

Model Assessment
Table 2. Normality Test

No	Variable	p-value	
		Intervention	Control
1	Action *Pre test*	0.003	0.005
2	Action*Post test 1*	0.000	0.034
3	Action*Post test 2*	0.000	0.049
4	Plaque *Pre test*	0.003	0.070
5	Plaque*Post test 1*	0.025	0.000
6	Plaque *Post-test 2*	0.000	0.012

*Shapiro-wilk

The results of the data normality test show that the p-value is less than 0.05. In conclusion, the data is not normally distributed. Then it was respectively performed a non-parametric test.

Table3. Paired Data Effectivity Test

Group	Pre-Test Mean±SD	Post-Test1 Mean± SD	Post-Test2 Mean± SD	p-value
Skills				
Intervention	11.2727±1.23168	212121±1.0234	21.9091±.29194	.000
Control	11.3333±1.21621	13.3939±1.95159	16.2121±2.01180	.000
Plaque				
Intervention	52.0606±2.82776	19.9091±1.64628	6.8485±1.93845	.000
Control	52.7879±2.63104	30.0909±2.84345	20.1212±1.45253	.000

* Fredman

The paired data effectiveness test results obtain a p-value of intervention and control group in 0.000 (p <0.05), which means that Smart Dental Alarm and PowerPoint media effectively increase tooth brushing skills of children at an early age.

The paired data effectiveness test results obtain a p-value for intervention and control in 0.000 (p <0.05), which means that Smart Dental Alarm and PowerPoint media effectively reduce plaque in early age children.

Table4. Unpaired Data Effectiveness Test

Group	Pre-Test Mean ± SD	Post-Test1 Mean ± SD	Post-Test2 Mean ± SD
Skills			
Intervention& Control	11.303±1.2149	17.303±4.23164	19.0606±3.20518
p-Value	.807	.000	.000
Plaque			
Intervention& Control	52.4242±2.73474	25±5.62412	13.4848±6.89982
p-Value	.288	.000	.000

* Man-Whitney

The unpaired effectiveness test results between the intervention and control groups at post-test one and post-test 2 got a value of 0.000 (p <0.05), which means that Smart Dental Alarm is more effective in improving early childhood tooth brushing ability than PowerPoint media.

The unpaired effectiveness test results between the intervention and control groups at post-test one and post-test 2 reveal a value of 0.000 (p <0.05), which means that Smart Dental Alarm is more effective in reducing plaque in early childhood than PowerPoint media.

Model Result

The model's result is an Android-based Smart Dental Alarm application, as the output of method and media development for early childhood dental and oral hygiene education.
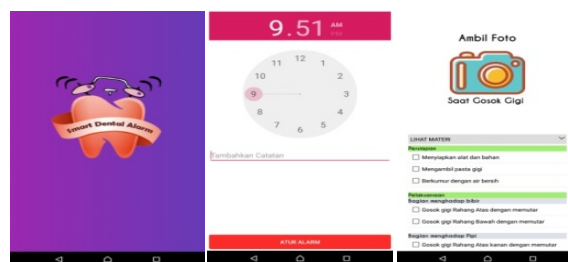
Figure 1. Smart Dental Alarm
Application

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DISCUSSION

"Smart Dental Alarm" is a dental hygiene education media used to improve tooth brushing skills and decline early childhood plaque score. To achieve this goal, the intervention group used the "Smart Dental Alarm" for 21 days. Behavioral change theories state that any attempt to change behavior requires a certain consistency period (9).

Dental hygiene education is an effort to improve community awareness in maintaining dental hygiene. Thus, it motivates them to enhance tooth brushing skills(10). We have managed to show that the "Smart Dental Alarm" intervention, which was given continuously for 21 days, has a significant impact on improving tooth brushing skills and declining the plaque score in children. This follows the theory of behavior change, which states that changing a person's behavior requires consistency in specific periods(9).

Tooth brushing skills of children at an early age are improved due to the intervention of the effective application of "Smart Dental Alarm." It has something to do with the system. The system comes complete with a step-by-step guide for tooth brushing. The children will brush their teeth according to the guidelines automatically if it is done regularly and sustainably. The correct tooth brushing motions will carry clean and healthy teeth. The concept of healthy living will form a healthy lifestyle (11)."Smart Dental Alarm" effectively reduces plaque of children at an early age because this media has succeeded in improving their tooth brushing skills. The better tooth brushing skills, the better dental, and oral hygiene would decrease problem on tooth(12).

Notably, "Smart Dental Alarm" has high effectiveness because besides it is recommended media, there is a role of parents taking part in carrying it out to their children. Parents' knowledge of dental hygiene enabled them to maintain their children's dental hygiene(13). Parents who are active in guiding their children will get maximum results in improving tooth brushing in early childhood.

"Smart Dental Alarm" is equipped with a critical feature in improving behavior, namely an alarm to remind the children about tooth brushing. The alarm is handy to remind a predetermined time and cope with forgetfulness, particularly tooth brushing (14).

CONCLUSION

We have presented the Smart Dental Alarm as a medium to teach tooth brushing for children at an early age. The evidence from this study indicates that our work of Smart Dental Alarm effectively improves children's toothbrushing skills at an early age.

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