



How Effective Is Toothbrush Education through Environmental Changes in Elementary School Children

Dyah Nawang Palupi Pratomawari^{1,†}, Grandyna Ansya Balties¹, and Yvonne A.B. Buunk-Werkhoven²

¹Department of Community and Preventive Dentistry, Faculty of Dentistry, Brawijaya University, Malang 65145, Indonesia, ²SPOH ARTS – International Optimizing Health Psychology, Amsterdam 1016 NX, The Netherlands

Background: Nowadays, dental health problems in Indonesia are still quite high. It is one of which influenced by low public awareness of the importance of maintaining the health of teeth and mouth that can be measured by toothbrushing behavior. Based on the results of RISKESDAS 2018, only 2.8 percent of the population has a proper toothbrushing behavior. Behavior tends to form at age 6 to 12 years. At this age, children begin to develop habits that tend to settle until adulthood, including toothbrushing behavior. Social cognitive theory is a theory of behavioral change that explains that behavioral changes are influenced by the environment, personal, behavior where these three factors influence each other. This study aims to identify changes in the dental behavior of second grades students before and after the joint toothbrushing at school for 21 days.

Methods: A pre-experimental study-design was conducted on elementary school by pre-post treatment method where there are 2 classes that get intervention and 2 other classes as control. A joint toothbrush is performed every morning before the school activities begin. Before and after the joint toothbrushing, all classes are given questionnaires to see if there are any changes in behavior seen through knowledge, attitudes, and practice.

Results: Respondent group showed increasement on their knowledge, attitudes, and behaviors towards toothbrushing. In contrast, the control groups showed no significant differences in the 3 factors.

Conclusion: In this study the education of toothbrushing through environmental changes is quite effective in elementary school children. Insights into the benefits of this program and refinements of optimally targeted intervention, including longitudinal studies are needed to improve the results.

Key Words: Indonesia, School health services, Social cognitive theory, Student, Toothbrushing

Introduction

Today, the number of oral health problems in Indonesia can still be said to be quite high. Based on data from the Indonesian health profile reported by the Indonesian Ministry of Health (2013), it shows that dental and oral diseases are ranked first in the 10 most common disease groups that people complain about, covering 60 percent of the population¹. Riset Kesehatan Dasar (RISKESDAS) data, e.g., these are data from the Indonesian Basic Health Research in 2018 shows that dental and oral disease is

ranked 8th out of 10 outpatient diseases²). The high number of oral and dental problems are influenced by several factors, one of which is a factor of people behavior that has not yet realize the importance of maintaining oral health³. Public awareness of the importance of maintaining oral health can be measured through their habit of brushing teeth. Based on the results of the RISKESDAS in 2018, the proportion of people with correct toothbrushing behavior in Indonesia was 2.8%²). This shows that toothbrushing behavior in Indonesia is still bad and under average^{4,5}).

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[†]Correspondence to: Dyah Nawang Palupi Pratomawari, <https://orcid.org/0000-0003-4180-6396>

Department of Community and Preventive Dentistry, Faculty of Dentistry, Brawijaya University, Jl. Veteran, Malang 65145, Indonesia
Tel: +62-8123302096, E-mail: dyahnawang.fk@ub.ac.id

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Behavior itself tends to form when someone is still at school age, which is 6 to 12 years old. At this age, children begin to develop habits that tend to persist into adulthood⁶⁾. In addition, this age is the right time to train children's motor skills, including brushing teeth, which can be considered as a habit. Habit formation is a process by which behavior, for instance, toothbrushing, through regular repetition, becomes automatic or habitual⁷⁾. Interventions or efforts related to oral health in schools are believed able to improve children's behavior in maintaining oral health, especially brushing teeth^{8,9)}. Toothbrushing activity is one of the Indonesia Ministry of Health programs which aims to improve the behavior and the awareness of oral health in children¹⁰⁾. Besides, school based toothbrushing program had the effect to reduce the dental plaque and to improve the oral health knowledge¹¹⁾.

The social cognitive theory (SCT) which is a theory from psychological perspective, explains the behavioral change. SCT is an update of the social learning theory which is developed by Albert Bandura in 1999¹²⁾. SCT is a reciprocal interaction between personal factors, environment, and behavior¹³⁾.

Fig. 1 illustrates that the relationship between the 3 factors is reciprocal rather than one-way¹⁴⁾. These factors can interact and influence each other. Environmental factors influence behavior, behavior affects the environment, person/cognitive factors influence behavior¹⁵⁾. Personal in this theory consists of cognitive factors in the form of memory, vision, and planning. Individuals learn a lot about behavior through modeling, even without the reinforcement they receive. This kind of learning process is called observational learning or learning through

observation¹⁶⁾. Most humans learn through selective observation and remembering the behavior of others. The core of this SCT is modeling, and this modeling is one of the most important steps in behavior change¹⁷⁾.

For example, when a mother teaches her child how to tie a shoe by demonstrating it repeatedly so that the child can tie his shoe, this process is called the modeling process. Through the process of role modeling, the behaviors of other people are then stored in someone's memory, which one day will be recalled and imitated. We get a large number of behaviors, thoughts and feelings by observing other people, these observations become an important part of our development¹⁴⁾. The theoretical framework describes how health motivators and behaviors are influenced by the interaction of individual beliefs, environment and behaviors¹⁵⁾. The essence of SCT is imitation (modelling)¹⁵⁾, where most people learn and gain a large amount of behavior, thoughts, and feelings by observing others. These observations are an important part of human development¹⁸⁾.

Therefore, this study conducted on elementary school children because at this age, school becomes a child's core experience and it is the right time to build a positive behavior. Their motoric development are well developed at this age. Elementary school age is an ideal time to train a child's motor skills, including tooth brushing. This period is also referred to as the critical period because at this time children begin to develop habits that usually tend to persist into adulthood. The study was conducted by conducting behavioral interventions in the form of brushing teeth together using fluoridated toothpaste every day at school. It is expected that there will be changes in the behavior of brushing teeth in children.

Materials and Methods

1. Ethics statement

All grade 2 elementary school children participated on voluntary bases, who have received their parents' approval marked by informed consent. Parents and children were informed about what participation entailed, and no pressure was placed on participants to take part in this experimental study. The procedure was conducted in accordance with the Declaration of Helsinki, and the joint toothbrushing

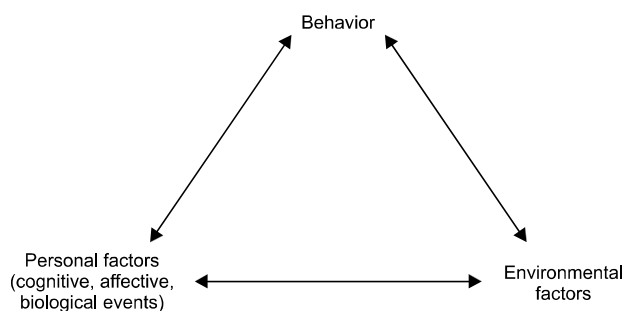


Fig. 1. Social cognitive theory factors. Reused from Pajares (<https://www.uky.edu/~eushe2/Pajares/eff.html>) [15].

activity was done using a natural routine method based on one's professional daily practice experience, without mutual calibration. This is in accordance with the working method during previous studies^{18,19}.

2. Sample and procedure

This pre and post treatment study was conducted at Islamic Global Elementary School, Bandungrejosari, Sukun, Malang, Indonesia in August 2019 to September 2019. Sampling was carried out with total sampling, i.e., the number of samples is equal to the population of 110 grade 2 elementary school children. The 110 children were randomly assigned into two groups, each of which amounted to 55 children. In this study, the control group did not receive any intervention at all, and the respondent group did receive intervention in the form of a 21 days toothbrushing activity. Both groups will be given questionnaires before and after the 21 days toothbrushing activity.

Then, the respondent group was educated about the two-minute, single rinse, tooth brushing method that children would have to do, each day before their class started in the morning. The oral hygiene education included the provision of a tooth brushing kit consisting of toothbrushes, fluoridated toothpaste, and cups, that will be used by the children everyday. Directly, the next day after the education, the 21 days tooth brushing activities began. This activity is done for 21 school days (Monday~Friday), in the school yard every morning. This toothbrushing activity took approximately 5 minutes to complete, and was left entirely to the teacher with regular supervision from the authors. In the class, posters about the correct way to brush your teeth were posted. Whereas the control group was not given any intervention for 21 days. Both the control group and the respondent group were given the same questionnaire as before the 21 days toothbrushing activity started.

3. Questionnaire

The questionnaire was developed by the authors based on several published similar journals. It consists of 3 aspects to be assessed: the children's tooth brushing behavior: knowledge, attitude, and action. 'Knowledge' was measured by 5 questions with 3 answer options. It is scored 1 if the

answer was correct, and scored 0 if the answer was incorrect. Example questions: "How many times a day should we brush our teeth?" and "When is the right time to brush your teeth in the morning?"

'Attitude' was measured by 5 statements with 3 answer options (agree=scored 2, hesitant=scored 1, doesn't agree=scored 0). Example statements: "I need to brush my teeth regularly" and "I will keep brushing my teeth at night even though I'm sleepy"

'Action' was given to children's parents and measured by 5 items with 3 answer options (often=scored 2, seldom=scored 1, never=scored 0). Example items: "How often your child brushes their teeth before they go to bed?"

The questionnaire was given twice. First was given one day before the 21 days toothbrushing activity started to determine the children's tooth brushing behavior before the intervention and 3 days after the toothbrushing activity to know if there are some differences in children's tooth brushing behavior after the toothbrushing activity.

4. Statistical analysis

IBM Statistical Package for Social Science 23.0 (IBM Corp., Armonk, NY, USA) was used for data analysis. Frequency distributions were created from the qualitative variables, and means, including standard deviations, were calculated from quantitative variables. Moreover, by using a helicopter view method, the education was assessed using participatory observation, i.e., the observers – teachers, DN and GA (the first and second author participated in this research) – participated in the situation they were observing. McNemar was used to compare the changes of correct answer rates in oral health knowledge after toothbrushing program, paired t-test was used to compare the changes of oral health attitude and actions after tooth brushing program, and independent t-test was used to compare the changes of total scores after tooth brushing program.

Results

From Table 1 it can be seen the difference in the level of knowledge between the control group and respondents before and after the tooth brushing program. The children in

Table 1. Changes of Correct Answer Rates in Oral Health Knowledge after Tooth Brushing Program

Question	Knowledge					
	Experimental group (n=55)			Control group (n=55)		
	Baseline	21 days later	p-value	Baseline	21 days later	p-value
How many times a day should we brush our teeth?	46 (83.6)	53 (96.4)	0.065	54 (98.2)	52 (94.5)	0.625
When is the right time to brush your teeth in the morning?	15 (27.3)	48 (87.3)	<0.001	6 (10.9)	8 (14.5)	0.754
When is the right time to brush your teeth in the afternoon?	45 (81.8)	54 (98.2)	0.004	47 (85.5)	47 (85.5)	>0.999
When you brush your teeth, how many times should you rinse your mouth?	4 (7.3)	41 (74.5)	<0.001	3 (5.5)	3 (5.5)	>0.999
How much toothpaste do we use when we brush our teeth?	11 (20.0)	53 (96.4)	<0.001	22 (40.0)	21 (38.2)	>0.999

Values are presented as number (%).

Table 2. Changes of Oral Health Attitude after Tooth Brushing Program

Question	Attitude					
	Experimental group (n=55)			Control group (n=55)		
	Baseline	21 days later	p-value	Baseline	21 days later	p-value
I like brushing my teeth	1.95±0.23	1.98±0.13	0.322	1.95±0.30	2.00±0.00	0.182
I need to brush my teeth regularly	1.87±0.34	1.98±0.13	0.033	1.87±0.39	1.96±1.89	0.133
I think it takes a lot of effort to brush my teeth	1.04±0.86	1.05±0.95	0.909	1.02±0.91	0.62±0.83	0.006
Brushing my teeth is an activity that I regularly do	1.95±0.23	1.93±0.38	0.766	1.84±0.37	1.82±0.47	0.799
I will keep brushing my teeth at night even though I'm sleepy	1.60±0.68	1.96±0.19	0.001	1.60±0.74	1.85±0.36	0.022

Values are presented as mean±standard deviation.

Table 3. Changes of Oral Health Actions after Tooth Brushing Program

Question	Actions					
	Experimental group (n=55)			Control group (n=55)		
	Baseline	21 days later	p-value	Baseline	21 days later	p-value
How many times a day do your child brush their teeth?	1.84±0.37	2.00±0.00	0.002	1.87±0.34	1.84±0.42	0.642
My child often forgets to brush their teeth	1.00±0.75	1.27±0.76	0.046	1.04±0.72	1.16±0.74	0.332
My child only brushes their teeth when I remind him	0.89±0.78	1.18±0.12	0.077	0.73±0.71	0.98±0.87	0.104
My child always brushes their teeth after breakfast	0.60±0.60	1.20±0.78	<0.001	0.89±0.76	0.67±0.80	0.129
My child always brush their teeth before they go to bed	1.20±0.73	1.50±0.57	0.014	1.16±0.60	1.11±0.69	0.644

Values are presented as mean±standard deviation.

the respondent group had higher scores after 21 days receiving tooth brushing program.

According to Table 2, it can be seen the differences in

attitudes between the control group and respondents before and after the tooth brushing program.

From Table 3, it can be seen the differences in actions

Table 4. Changes of Total Scores after Tooth Brushing Program

Assessed behavior	Experimental group (n=55)	Control group (n=55)	p-value
Knowledge			
Baseline	2.40±0.53	2.20±0.91	0.163
21 days later	2.38±0.80	4.52±0.57	0.000
Attitude			
Baseline	8.27±1.51	8.40±1.37	0.644
21 days later	8.25±0.89	8.9±0.93	0.000
Actions			
Baseline	5.69±1.69	5.53±1.84	0.628
21 days later	5.76±1.97	7.14±1.74	0.000

Values are presented as mean±standard deviation.

between the control group and respondents before and after the tooth brushing program.

According to Table 4, it can be seen as a whole that there are significance differences in knowledge, attitudes, and actions in the control group and the respondent group after 21 days of tooth brushing program.

Discussion

This increase was due to children brushing their teeth with their peers every day for 21 days. During that time, they saw their peers brush their teeth repeatedly for 21 days, they saw posters about adequate and correct brushing habits that were posted in the classroom, and also the availability of brushing equipment in class which indirectly encouraged the children to do this brushing teeth so that there is a tendency for these behaviors to be recorded in memory and finally there is imitation of tooth brushing behavior in the children. Up to seven days after the intervention was finished, there were 8 children who said to their homeroom teacher, “Miss, let’s brush my teeth again”. This is because at the age of school children (6~12 years) is a time to imitate everything they sees, both the behavior of adults and peers. Children will tend to easily remember and like things they often see everyday²⁰⁾. In addition, the elementary school period is an important period in a child’s development because when health-related behaviors are practiced routinely, these behaviors are more likely to become habits⁸⁾. Both parents and teachers in school who would be influential to students should guide elementary school students to be habituated to the right

toothbrushing. Also it was estimated that the students should understand the importance of toothbrushing through proper oral health education, and they should also become confident in spontaneous toothbrushing by providing them with an environment that could help them practicing the toothbrushing easily²¹⁾.

This is in accordance with the SCT of behavioral change which explains that behavior change is a reciprocal interaction between personal, environment, and behavior¹²⁾. These three factors interact and influence each other. Environmental factors influence behavior, behavior affects the environment, personal factors influence behavior¹⁵⁾. The environmental factors in this study were joint toothbrushing activities at school for 21 days, posters about adequate and correct brushing habits in the classroom, and toothbrush equipment that was always available in the classroom. Personal factors in this study are knowledge, attitudes, and actions that are influenced by memory and vision of the individual. Meanwhile, the desired behavioral factor in this study is the formation of adequate and correct tooth brushing behavior.

In addition, the cause of the increase in this group of children is the imitation (modeling) which is the core of SCT, where most humans learn and acquire a large number of behaviors through selective observation and remembering the behavior of others. This modeling is one of the most important steps in behavior change in this theory¹⁷⁾. The drawback in this study is that the intervention period is too short to make a behavior can be carried out in everyday life automatically without being forced. The minimum number of days to form or improve a new behavior is 21 days and it takes at least 66 to 90 days to make the new behavior into a permanent habit²²⁾. However, this study may prove that the joint toothbrushing activity for 21 days may improve tooth brushing behavior in children, and it takes more time to be able to change this behavior into a habit that is carried out automatically in everyday life.

Notes

Conflict of interest

No potential conflict of interest relevant to this article was reported.

Ethical approval

This study was approved by the Health Research Ethics Committee of State Polytechnic Health Malang (Reg. No: 219/KEPK-POLKESMA/2019) and conducted in line with universal ethical principles.

Author contributions

Conceptualization: Dyah Nawang Palupi Pratamawari and Grandyna Ansyah Balgies. Data acquisition: Dyah Nawang Palupi Pratamawari and Grandyna Ansyah Balgies. Formal analysis: Dyah Nawang Palupi Pratamawari and Grandyna Ansyah Balgies. Supervision: Yvonne A.B. Buunk-Werkhoven. Writing—original draft: Dyah Nawang Palupi Pratamawari and Grandyna Ansyah Balgies. Writing—review & editing: Dyah Nawang Palupi Pratamawari, Grandyna Ansyah Balgies, and Yvonne A.B. Buunk-Werkhoven.

ORCID

Dyah Nawang Palupi Pratamawari,

<https://orcid.org/0000-0003-4180-6396>

Grandyna Ansyah Balgies,

<https://orcid.org/0000-0002-8618-2620>

Yvonne A.B. Buunk-Werkhoven,

<https://orcid.org/0000-0001-8524-9574>

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