

Analysis On TOMON (Tooth Monster Hunter) - A Gaming Tooth Brush In Improving Dental Hygiene Status and Behavior Of Children

Research Article

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Abstract

Background: Tooth brushing is increasingly becoming a vital factor for keeping dental and oral hygiene. Children at five first years have a golden period of their development for learning skills. Parents face a barrier on the implementation of tooth brushing to their children. This paper outlines a new approach to presents “TOMON” or ‘Tooth Monster Hunter for assisting the parents or medical staffs to help children for learning proper brushing skills through wearable tooth brush and its virtual game.

Method: The research is an experimental study with a pre-test and post-test control group design. Our research used a technological approach to create educational wearable sensor for children. This experimental method is testing cause and effect. The cause in this research is the TOMON game and the effect is dental hygiene status. We also analyse the brushing behaviour change of the children. The research was done in TK (kindergarten) Islam Al-Azhar 14, TK PGRI 75 Kramas and TK Nurus Sunnah Semarang.

Results: The results show that Debris Index of the experimental group change from the moderate category which is 66.7% and poor category which is 33.3% to all good category. In the control group, there is a change from the poor category which is 66.7% and the moderate category in 33.3% to all good category. The statistical analysis show that there is a significant change influence of TOMON in the brushing behaviour of children and dental hygiene status.

Keywords: Children; Debris Index; Dental And Oral Hygiene; TOMON.

Introduction

Damaged and untreated teeth and gums can cause dental and oral diseases such dental caries and tooth decay which interferes with other bodily health [1, 2]. Globally, dental caries is the main prevalent disease and more common in children. Dental caries is preventable, and can be overcome by performing twice tooth brushing with fluoridated toothpaste [3]. In order to prevent dental caries, the control of plaque and debris is therefore essential since plaque is the primary etiological factor of dental caries. Tooth brushing has been identified as the most frequently used method of dental and oral hygiene and to prevent dental caries

[4]. Childhood has a golden period for the development especially for future learning skills, social and emotional abilities at first five years. Their brain constitute a “blossoming” period along with elaborative developmental action [5, 6]. Parents, in general, possess knowledge of tooth brushing for the children, yet many experience barriers to implement it to their children by not brushing the teeth of their children as recommended [7, 8].

It was reported in Indonesia National Basic Health Research (Riskesmas) that Indonesia’s proportion of dental and oral problems in 2018 reached 57.6% with only 10.2% of medical staff. In general terms, it is known that the proportion of daily tooth

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brushing behaviour in the population aged more than 3 is 94.7% yet the proper tooth brushing behaviour showing only 2.8% [9, 10].

Health education consists of learning experiences planned to form a voluntary action conducive to health. The scope of health education may include intervention, including to children. The goal of oral health is to improve knowledge, subsequently adopted to daily behaviour which contributes to better dental and oral hygiene [11]. A number of studies of maintaining dental and oral hygiene comprises leaflet method [12-15], flip book [16-18] or counselling [19, 20] have been done so far. However, an issue of knowledge was addressed that the methods have influence on attitude yet not to the change of knowledge or at certain time, it does not have influence when the treatment is stopped [18].

Along with the development of technology, gaming has become one method to support children's cognitive, physical, social and emotional well-being. Game also can increase the intrinsic motivation of the player. It is generally accepted that game can be preparation for children to improve their creativity, develop problem-solving skill. Game is potential for learning environment [21, 22]. Dental game have been used as one method to help teach things about dentistry, such as dental practice management game [23], tooth morphology [24, 25], toothbrushes game [26, 27]. Smart Toothbrush has been made as an assistant in detecting human behaviour in maintaining healthy teeth in a vision-based system. This system cannot classify good and proper brushing of teeth [28]. The dental plaque estimation system using camera images has also been carried out as healthcare management. This method is used as a teaching tool for brushing teeth. The tool used is compatible with all types of cameras. However, it is still difficult to maintain individual dental health [29]. Children need a tool to play in order to develop their abilities [30].

The design of dental hygiene program should be performed to increase tooth brushing skill of children [31, 32]. In an attempt to do tooth brushing teaching, we made a tooth brushing game named TOMON (Tooth Monster Hunter) as an educational aid for dental hygiene game for children and analyse its influence to the dental hygiene status and the change of behaviour of children at kindergarten.

Materials and Methods

We undertook this research to an experimental study conducted in 2019 in which the participants are TK (kindergarten) students. We used a pre and post-test design. There were two groups that are given different treatment with the aim to test the dental hygiene status both for the TOMON game treatment or not. This

research was conducted at TK Islam Al-Azhar 14, TK PGRI 75 Kramas and TK Nurus Sunnah located in Semarang City, Indonesia. All the sample were 18 students in which experimental and control group consist of 9 students each.

Changes that were measured in this study are first, the status of dental hygiene with the standard Debris Index, second, is tooth brushing behaviour. The research was analysed by doing the calculation tabulation process. Next, an analysis of comparative studies on the results of dental health status was produced. We used paired sample T test analysis with MINITAB software. The T test was used to test the effect of independent variable on the dependent variable. This test is done by comparing T arithmetic with T table. If the p-value is less than 0.05, then H_0 is rejected, which means there is an influence of TOMON on dental hygiene. If the p-value is more than 0.05, then H_0 is accepted which means there is no TOMON influence on dental hygiene status. In addition, the dental behaviour and health was analysed based on observations.

Results

Our game called TOMON (Tooth Monster Hunter) is an educational game based on android, which aims to stimulate the correct movement of brushing teeth. This game is played by 1 player (single player) and consists of 7 steps. Figure 1 shows one step of brushing the bottom left teeth. The player will be faced with monsters that stick to their teeth. The tooth image on the screen represents the player's teeth. Players are required to clean the entire surface of the teeth from monster attacks. Players are considered to win the game if they successfully clean the entire surface of the teeth from monster attacks.

The results comprise univariate and bivariate analysis. Univariate analysis tells about the frequency distribution of Debris Index and tooth brushing skill of experimental and control group. Subsequently, the bivariate analysis consist of Debris Index and tooth brushing skill analysis on experimental and control group.

Dental and oral hygiene can be measured using an index. The Index is a clinical condition which is obtained when an examination is held. The first set of analyses examined the status of dental and oral hygiene by OHIS (Oral Hygiene Index Simplified) score before and after the treatment is given. To assess OHIS, the standardization in calculating OHIS score is used according to the Ministry of Health of Republic of Indonesia Year 1995 through examination of debris on certain teeth and on certain surfaces of the teeth. The examination was divided in to 6 sextants in the buccal, lingual and palatal sections. The Debris Index assessment standards classified into good, moderate and poor category. Good

Figure 1. Brushing step: the monsters represent the dirty part of teeth and the gun shoots according to the movement of brushing.



category stands on score 0 to 3.333. Moderate category stands on score 3.444 - 6.666 while Poor Category stands on 6.777 - 10. The following tables show the statistical number related to this research.

Univariate analysis was done and details in Table 1-4. Table 1 shows the Debris Index of experimental group. The highest category of Debris Index of the experimental group before the treatment using TOMON game media is moderate in as much as 66.7%, while after the treatment using TOMON, the highest percentage is in good category.

Table 2 shows the Debris Index of control group. Almost all of the frequency is categorized poor as much as 66.7%. After the manual brushing, which means without treatment, the category change in to good, in 100%.

Table 3 shows the brushing skill of experimental group. Before the treatment using TOMON, most of the category is moderate in 66.7%, while after the treatment, the highest category is good with percentage of 77.8%.

From the table 4, we can note the brushing skill of control group without using TOMON. Before brushing, most of the criteria is poor in 66.7%, while after manually brushing, the criteria are still in poor category in 44.5%.

Bivariate analysis details in Table 5 and 6. Table 5 lists the bivariate analysis on brushing skill. The first output on experimental group summarize that the mean treatment before treatment is 6.65 with a standard deviation of 1.52 while after the treatment is 0.257 with a standard deviation of 0.275. Then the Mean value is greater before the treatment with difference of 6.393. The T value is 12.41 with a degree of freedom of 16 and a P-value of 0.000 where this result is less than the critical limit of 0.05 so that the hypothesis answer is rejecting H_0 , meaning that there is a significant difference between before and after the treatment.

From the control group, the output shows that the mean treatment before is 7.41 with a standard deviation of 1.33 while the

after treatment is 1.028 with a standard deviation of 0.727. Then the Mean value is greater in the treatment before the difference of 6.382.

It can be seen that the result at t-arithmetic is 12.61 with a degree of freedom of 16. It is seen that the p-value produced is 0,000 where the value is less than 0.05 so it is concluded that there is a significant difference between the Debris Index values before and after brushing teeth. As detailed can be seen, the significant differences before and after treatment in both the experimental and control groups give an idea that brushing has an effect on dental and oral hygiene.

Changes in the value of dental hygiene status affect the skill of brushing. The change in behaviour was assessed from a questionnaire filled out by the research team. The indicators used are the stages of brushing teeth from the right, left, top, bottom and front. The results of the ability to brush teeth are given in the form of tooth brushing practice. Skills are measured by adding up scores on the observation sheet with a score technique of yes = 1 and no = 0. Figure 2 presents TOMON game visual which has 7 game steps, so that a block of yellow dental reports will reduce the number of teeth that are brushed correctly. This tooth brushing skill assessment are brushing skills between the experimental groups that were given TOMON with the control group.

To indicate the results whether there is a significant comparison between Debris Index of the post-test of the experimental group and the control group, we conducted p-value test that produces the value detailed in Table 6.

Turning on now to the calculation results, it shows that the post Debris Index score on the experimental group is 0.257 with a standard deviation of 0.275. While on post Debris Index score on the control group shows 1.028 with a standard deviation of 0.727. The difference between the experimental and control group is -0.771 and the resulting T value is -2.98, not to mention the p-value is 0.009. This value is less than the critical standard of 0.05. That is, there is significant difference between the experimental and control group, meaning that Tooth Monster Hunter game

Table 1. Frequency Distribution of Debris Index Score of Experimental Group.

| Category | Before | | After | |
|----------|-----------|------|-------|-----|
| | Frequency | % | f | % |
| Good | 0 | 0 | 9 | 100 |
| Moderate | 6 | 66.7 | 0 | 0 |
| Poor | 3 | 33.3 | 0 | 0 |
| Total | 9 | 100 | 9 | 100 |

Table 2. Frequency Distribution of Debris Index Score of Control Group.

| Category | Before | | After | |
|----------|-----------|------|-------|-----|
| | Frequency | % | f | % |
| Good | 0 | 0 | 9 | 100 |
| Moderate | 3 | 33.3 | 0 | 0 |
| Poor | 6 | 66.7 | 0 | 0 |
| Total | 9 | 100 | 9 | 100 |

Table 3. Frequency Distribution of Brushing Skill of Experimental Group.

| Category | Before | | After | |
|----------|-----------|------|-------|------|
| | Frequency | % | f | % |
| Good | 0 | 0 | 7 | 77.8 |
| Moderate | 6 | 66.7 | 2 | 22.2 |
| Poor | 3 | 33.3 | 0 | 0 |
| Total | 9 | 100 | 9 | 100 |

Table 4. Frequency Distribution of Brushing Skill of Control Group.

| Category | Before | | After | |
|----------|-----------|------|-------|------|
| | Frequency | % | f | % |
| Good | 0 | 0 | 3 | 33.3 |
| Moderate | 3 | 33.3 | 2 | 22.2 |
| Poor | 6 | 66.7 | 4 | 44.5 |
| Total | 9 | 100 | 9 | 100 |

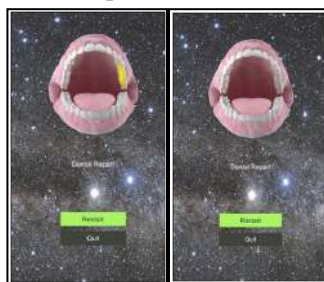
Table 5. Brushing Skill Analysis on Experimental and Control Group.

| Variable | Pre-test | | Post-test | | Mean Treatment Gap | P -value |
|--------------------------------------|----------------|--------|----------------|--------|--------------------|----------|
| | Mean treatment | Std. D | Mean treatment | Std. D | | |
| Brushing skill on Experimental Group | 6.65 | 1.52 | 0.257 | 0.275 | 6.393 | 0.000 |
| Brushing skill on Control Group | 7.41 | 1.33 | 1.028 | 0.727 | 6.382 | 0.000 |

Table 6. Debris Index Analysis on Experimental and Control Group.

| Variable | Pre-test | |
|------------------------------------|----------------|--------|
| | Mean treatment | Std. D |
| Debris Index on Experimental Group | 0.257 | 0.275 |
| Debris Index on Control Group | 1.028 | 0.727 |

Figure 2. Dental Report in Tooth Monster Hunter.



have an effect on children's dental hygiene status compared with a control group that was not given Tooth Monster Hunter game treatment.

Discussion

Dental caries affects 60-90% of school children as well as adults and more increasingly prevalent in developing countries including to some area in Asia and Latin America countries and the increase of information can boost the health status of patients [33, 34].

OHIS has designed primarily to quantify the status of oral health and one factor determining general health which includes Debris Index as determiner [35-37].

Further analysis showed that there is a change of Debris Index of the experimental group from the moderate category in 66.7% and poor in 33.3% to overall good. In the control group there is a change from the poor category of 66.7% and moderate which is 33.3% to all good. However, the percentage of reduction is significantly found in the experimental group, reaching 100%.

To prove whether there is a significant influence on the experimental group on pre and post-test, p-value analysis was used. The results of paired T test statistic obtained p -value less than 0.05. This confirms that there is a significant difference to the Debris Index when TOMON is given. The results of this study indicate that the educational media of the game TOMON has an effect on decreasing the children's Debris Index score compared to manual brushing. This is supported by the theory that game has a function that is useful in children, that is, children can understand computer technology so they can follow directions and rules, practice solving problems and logic, train motor nerves and spatial abilities [38].

The results of the study of tooth brushing skill on the experimental group show that there is a change from most in the moderate category of 66.7% to a good category in 77.7%. On the control group, there is a change from the sufficient category of 66.7% to a good number of 33.3%. The percentage increase in the group given Tooth Monster Hunter game is higher than the group that was not given counselling using Tooth Monster Hunter. To prove whether there is a significant influence on the experimental group before and after the Tooth Monster Hunter treatment was given; p -value analysis was used. The results of paired T test statistic obtained p -value less than 0.05, which means reject H_0 , so it is concluded that there is a significant influence on teeth brushing skill using the TOMON game. This shows that the group given counselling using the TOMON game media has better skills than in the control group, because the TOMON game can increase children's active participation through game play so that the skills increase. The use of emerging tools in education are needed for educators. It is one of the effort to increase students' motivation as well as to enable them to practice in the real-world situation. [39, 40]. So in fact, TOMON is effective to improve the status of dental hygiene and behaviour of tooth brushing. It enable the children to have a picture of proper tooth brushing in order to keep their dental hygiene.

Conclusion

Our work has led us to conclude that there is a significant influence on the dental hygiene status of children indicated by Debris Index with treatment using the game media TOMONS (Tooth Monster) in to the good category by the p -value test that produces a value of 0.009. Besides, there is a significant influence on the behaviour of tooth brushing in to the good and fair category with the p -value test producing a value of 0.014. Taken together, these results suggest TOMON as educative media for teaching tooth brushing to children.

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