

Effectiveness of reminder sticker books at increasing dental health knowledge and oral hygiene

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ABSTRACT

Background: Health education games can be an effective way for elementary school children to increase their dental health knowledge and oral health. **Purpose:** This study aims to test the effectiveness of using reminder sticker books by showing the increase in dental health knowledge and improvement in the Simplified Oral Hygiene Index (OHI-S) in seven- to eight-year-olds. **Methods:** The study was quasi-experimental with a pretest-posttest group design and descriptive analysis method. It involved 54 elementary school students. A reminder sticker book was used to measure the levels of knowledge and oral hygiene. Intraoral examinations were conducted, and the children's frequency of attaching stickers in the morning and afternoon was measured. Frequency was divided into three categories. A questionnaire measured the children's levels of knowledge, which were divided into five categories. **Results:** The reminder sticker game increased dental health knowledge, with the mean of the control group at 64.4, and the treatment group at 92.5. OHI-S means were 1.68 for the control group and 0.78 for the treatment group. An independent t-test measured the levels of knowledge before and after the study. OHI-S and ANOVA tests measured the increase of dental health knowledge, which was divided into five categories, and decrease in the OHI-S index (divided into three categories). **Conclusion:** Reminder sticker books can increase oral health knowledge and reduce OHI-S scores in seven- to eight-year-old children.

Keywords: educational game; oral hygiene index simplified; reminder sticker

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INTRODUCTION

The global dental caries rate is 60–90% for school-aged children and almost 100% for adults. This decay causes pain and discomfort.¹ Dental and oral problems were found in 57.6%, and 10.2% of the general population received services from dental professionals. Proper toothbrushing behaviour was found in 2.8% of the general population, starting at 3 years of age.² Game features such as tasks, rewards and achievements challenge the players, which motivates them to achieve their goals.³ Games are also a tool for learning and forming healthy habits, owing to an increase in awareness, resulting in improved oral health and tooth and gum quality.⁴ Educational games are an

effective way to provide health education for elementary school children.⁵

Oral hygiene must be taught and practiced at early ages since it is one of the determinants of health conditions in later life.⁶ Causes of dental and oral health problems in the community include behavioural factors and a lack of knowledge of the importance of maintaining oral health.⁷ Habits form as people pursue goals in daily life. When repeatedly performing a behaviour in a particular context, people develop implicit associations in their minds between contexts and responses.⁸ Learning is a type of communication, and the message senders, the messages themselves and the recipients are all factors. According to the concept of edutainment, learning will not succeed if it

occurs in tense or frightening conditions. For children, this means that learning will only be effective if the children are relaxed.⁹

The Simplified Oral Hygiene Index (OHI-S) is an index that measures the surface area of teeth covered by oral debris and calculus. Oral hygiene is assessed by the presence of food scraps and calculus (tartar) on the surface of a tooth using OHI-S measurements as described by Greene and Vermillion.¹⁰ The degree of plaque reduction when brushing teeth can be examined in 30-second to three-minute time spans. Plaque removal when brushing teeth can be performed quickly, but optimal results come from longer brushing.¹¹

The reminder sticker books used as morning and afternoon play tools in this study were designed to measure the effectiveness of games and to increase dental and oral knowledge while reducing the OHI-S scores of seven- to eight-year-old children. There is no previous research into the use of reminder sticker books as a helpful and fun way to teach children about oral hygiene.

MATERIALS AND METHODS

The study is quasi-experimental, with a pretest-posttest group design. Inclusion criteria are that the children are seven to eight years old at the time of the study, willing to participate by asking their parents for informed consent, and cooperative. Exclusion criteria are children with behavioural disorders, such as oppositional defiant disorder (ODD), conduct disorder (CD), attention deficit hyperactivity disorder (ADHD), autism, cerebral palsy (CP) and epilepsy; children without parental permission; and children who use orthodontic brackets. Before the study was conducted, parents were asked to provide informed consent. The study started with 63 students but, due to qualification factors, only 54 participated in the research.

The study was conducted at the Ketawanggede Elementary School in Malang. The research focused on seven- to eight-year-olds because this age range is the most susceptible to dental caries and, therefore, needs to understand the importance of dental health, treatment and prevention.¹² The study meets the ethical feasibility requirements set by the Ethics Commission of the Faculty of Medicine, Universitas Brawijaya through Ethical Eligibility Statement No.225/EC/KEPK-S1-FKG/08/2019.

A reminder sticker book is a tool for developing children's interest in brushing their teeth more effectively and efficiently while playing. The use of the reminder stickers in the morning and in the afternoon was expected to help children remember to brush their teeth regularly. Based on preliminary studies, the frequency indicators of morning and afternoon toothbrushing were divided into three categories by counting the number of stickers posted in the sticker book: very routine (40–60 stickers total, with 20–30 in the morning and 20–30 in the afternoon), routine (20–39 stickers total, with 10–19 in the morning and 10–19

in the afternoon) and not routine (0–19 stickers total, with 0–9 stickers in the morning and 0–9 in the afternoon). The goal was to associate toothbrushing with the fun activity of putting their stickers in the books.

The reminder sticker books were given to the treatment group after counselling on how to maintain dental and oral hygiene, including toothbrushing. The books, which were 21.6 by 26.5 centimetres large and printed on wood-free paper (HVS) weighing 70 grams per square meter (GSM) with 180 GSM art paper covers, were given to 27 students. The two-centimetre by three-centimetre stickers were made with chromo paper (Figure 1). The books were designed as games, which have long been used as innovative and challenging teaching tools in both child and adult education to promote autonomous learning and participation. Through repetition and reiteration, games appear to increase retention and application.¹³

The books (Figure 1) include the following pages: the front cover (A); a book ownership page (B); a Sticker Corner page for three games –Teeth Sudoku, Count It Up and Find the Missing Me (C); a Sticker Corner page for the game Copy and Stick (D); a children's story about how dental caries are formed (E); the game Teeth Sudoku, which consists of boxes of different sizes and requires players to put stickers into the boxes (F); the game Copy and Stick, played by placing stickers in accordance with the images in the box (G); the game Count It Up, played by adding the values of the pictures (H); the game Find the Missing Me, featuring empty boxes that players fill by attaching matching pictures (I); a story about a diligent child who goes to the dentist (J); a page for attaching sun-shaped stickers in the morning – there are 30 boxes, meaning it must be used for 30 days (K); a page for attaching moon-shaped stickers in the afternoon, also with 30 boxes and a 30-day commitment (L); a sticker page (M); and the back cover of the book (N).

The students were randomly divided into two groups, each with 27 students, by drawing numbers. Students who drew odd numbers became the control group (K), while students who drew even numbers became the treatment group (P). A 10-minute pretest was conducted with each group to ascertain their dental and oral hygiene knowledge (Table 1). After the pretest, the children received counselling about maintaining their oral and dental hygiene, with a similar focus to the pretest. The counselling used a phantom teeth, toothbrush and toothpaste. Counselling topics included dental and oral functions and dental anatomy (five minutes), ways to maintain oral and dental hygiene (10 minutes) and the importance of maintaining oral and dental hygiene (five minutes), with a question and answer session included after each topic. A 10-minute posttest followed the counselling. Pretest and posttest results were recorded and assessed. Each answer was worth 10 points, with possible scores ranging from 0 to 100. Based on the preliminary studies, pretest and posttest results were divided into five categories: very good (80–100), good (60–79), acceptable (40–59), poor (20–39), and very poor (0–19).

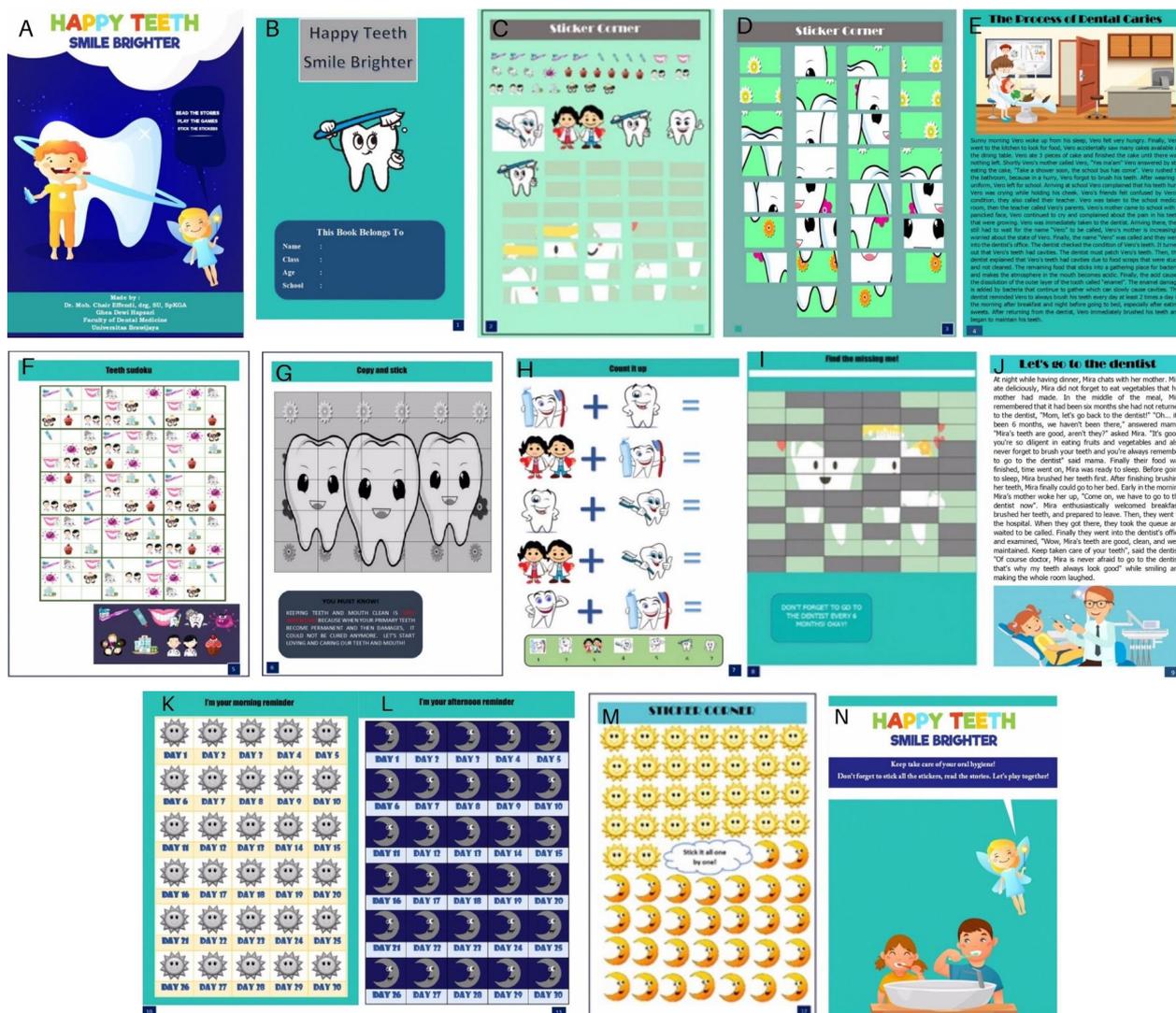


Figure 1. Reminder sticker book.

Table 1. Pretest and Posttest Knowledge Questions

Question	Answer	
	A	B
How many times per day should you brush your teeth?	Once	Twice*
When should you brush your teeth?	In the morning after breakfast and at night before sleeping*	Anytime
When should you go to the dentist?	Every six months*	When I have a toothache
Which of the following is a tool for cleaning teeth?	Toothbrush*	Spoon
Which of the following foods can cause caries?	Spinach	Candies*
Which of the following techniques should you use to brush your teeth?	Rubbing technique	Rolling technique*
How much toothpaste should you use?	The size of a bean *	As much as possible
How long does it take to brush your teeth?	1-3 minutes*	10-15 minutes
What is the name of a tooth's outer layer?	Gum	Enamel*
Which of the following foods can cause toothaches?	Apple	Ice cream*

*: Correct answer

Before giving the reminder sticker books to the treatment group, both groups' OHI-S scores were measured. The treatment group then received the books, which were meant to be used routinely as a reminder to maintain oral hygiene. Students in the treatment group attached stickers every morning and afternoon after brushing their teeth. After 30 days, both groups' OHI-S scores were measured again to compare the differences between the two groups. OHI-S scores include debris and calculus. Debris is leftover food that remains in the form of soft deposits on the surface of the teeth after eating,¹⁴ and calculus is a mineralised bacterial plaque that is formed on natural teeth surfaces where there is a constant supply of saliva. There are two types of calculus: supragingival and subgingival.¹⁵ Each component of the debris index (DI) and calculus index (CI) is scored on a scale of 0 to 3. The examination only uses a mouth mirror and a dental explorer, with no disclosing agent. These criteria are scored based on the state of soft deposits, or debris, and calculus tartar.

Index calculation for each individual includes two components (debris index and calculus index). The debris index (DI) is the total number of debris scores divided by the total number of examined teeth, and the calculus index (CI) is the total number of calculus scores divided by the total number of examined teeth. The DI and CI scores are then added to determine an OHI-S score. The categories of dental and oral hygiene based on OHI-S scores are as follows: good (0.0–1.2), fair (1.3–3.0) and

poor (3.1–6.0).¹⁶ OHI-S examinations are conducted on six teeth: 16, 11, 26, 36, 31 and 46. In teeth 11 and 31, the labial section is examined; in teeth 16 and 26, the buccal section is examined; and in teeth 36 and 46, the lingual section is examined.¹⁷

An independent t-test measured the differences in knowledge test scores and OHI-S scores between the control and treatment groups, while an ANOVA test assessed the differences between the treatment group's frequency of attaching the stickers and brushing their teeth (with three categories: very routine, routine and not routine). The ANOVA test result was significant, so a Pearson's correlation was calculated to determine the relationship between the frequency of attaching the stickers and brushing teeth and OHI-S scores. The frequency of attaching the stickers was identical to the frequency of brushing teeth (Figure 1: K, L, M)

RESULTS

Figure 2 shows the increase in the means of dental health knowledge test scores for the control group (64.4) and the treatment group (92.5). The results of the independent T-test show that the means of the knowledge test scores between the control and treatment groups are significant ($P=0.000$).

Figure 3 indicates that there was a decrease in the mean of OHI-S scores for the control group (1.68) and

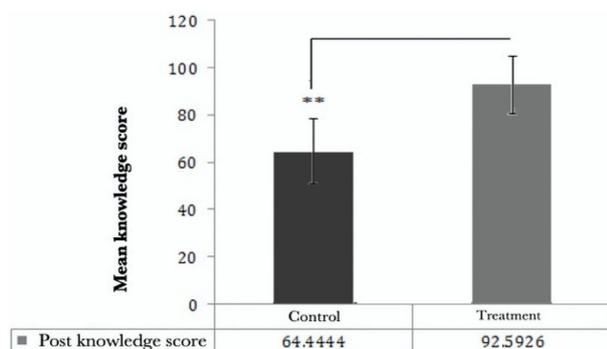


Figure 2. Mean of knowledge post-test; **) $P<0.01$.

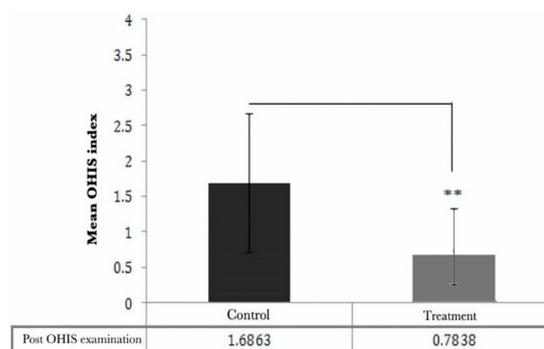


Figure 3. Mean of post OHI-S examination after 30 days; **) $P<0.01$.

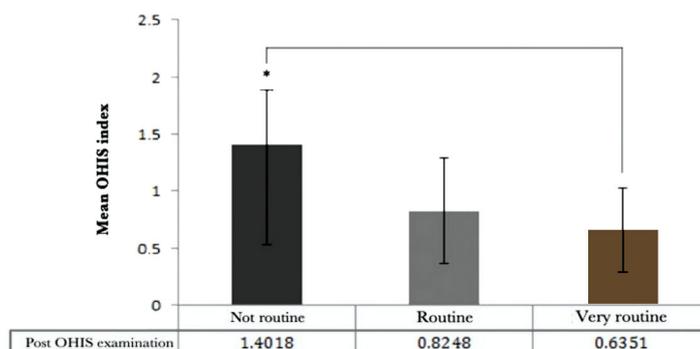


Figure 4. Mean of OHI-S based on the frequency of using reminder stickers for 30 days; *) $P<0.05$.

Table 2. Correlation between the frequency of sticking the stickers and OHI-S

Variable correlation	R	P	Note
Frequency of attaching the stickers – OHI-S	-0.387	0.046	Significant

the treatment group (0.78). The results of the independent T-test reveal that the means of OHI-S between the control and treatment groups are significant ($P=.000$).

The results of the ANOVA test (Figure 4) that measured the means of OHI-S scores and the frequency of attaching the stickers show that there is no significant difference between the not routine and routine categories ($P=.089$) or between the routine and very routine ($P=.070$). However, the differences between the not routine and very routine categories are significant ($P=.047$). Because these ANOVA test results were significant, the study continued with a Pearson's correlation between the frequency of attaching the stickers and OHI-S scores. This calculation produced a significant relationship and negative correlation coefficient in the moderate range (Table 2).

Statistical results reveal that games can significantly increase children's knowledge about dental health. The game used in this study was a reminder sticker book with educational stories (Figure 1: E, J).

DISCUSSION

Reminders in the form of stickers can be widely used in the health field. One of the reasons for the success the reminder stickers is that they can increase mindfulness (Figure 2), which is the process of bringing one's attention and awareness to the present time.¹⁶ Games, which are the best strategy for improving children's oral health behaviours,¹⁸ are valuable learning tools that make learning more interesting and have been widely used in all fields of education by both students and teachers. Game-based oral health interventions reinforce messages about oral health knowledge through crosswords and quizzes.¹⁹ Educational media are necessary to increase the success of achievement goals in learning communication.²⁰ This communication and dental health education (DHE) in schools can significantly increase knowledge of oral health and oral hygiene.²¹ Games can also reduce OHI-S scores. Statistical test results indicated that OHI-S scores significantly decreased after students were given the reminder stickers (Figure 3) and had a significant relationship with the negative correlation coefficient between the frequency of attaching the stickers in the morning and in the afternoon (Table 2).

The negative correlation indicates that the mere routine of attaching the stickers can reduce OHI-S scores. These scores decreased significantly in the very routine group compared to the not routine group (Figure 4). The frequency of attaching the stickers in the morning and in the afternoon is an indicator of how routinely to brush the teeth (Figure 1:

K, M, L). A toothbrushing habit that is not routine can cause food debris and calculus. Several studies show a decrease in OHI-S scores can correlate with the knowledge gained from health education methods such as games, that include health and hygiene messages. These games are an effective way to teach basic health concepts and significantly reduce index plaque scores.^{19,22} The increased knowledge and decreased OHI-S scores in this study were also influenced by the sample groups: children who still enjoy interactive activities like games and simple quizzes and who have basic dental health knowledge.²³ Although there are many levels of toothbrushing frequency, we suggest that brushing twice per day, once in the morning and once at night, is sufficient.²⁴ The reminder sticker book in this study included sun and moon stickers that mirror toothbrushing times. Though twice-daily toothbrushing is effective at reducing bacterial load in oral cavities, supplementing brushing with routine tongue cleaning would result in dramatic and significant improvements in dental health and hygiene.²⁵

Reminder sticker books are a tool for developing children's interest in brushing their teeth more effectively and efficiently by playing games. The means of the knowledge posttest increased after they were given the reminder stickers, which were easy and fun to play with. This was significantly different from the control group; the OHI-S index differed significantly between the treatment group and the control group. The reminder sticker books can increase dental and oral health in seven- to eight-year-old children.

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