

## Effect of Tooth Brushing, Using Song and Dental Model, on Plaque Index of Children with Visually Impairment

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### Abstract

Dental health education should be introduced to children, including those with physical disabilities. Children with visual impairment have poor oral hygiene and a high plaque index. Educational methods for children with visual impairment have been developed, such as the audio tactile performance method where verbal information is given, followed by the children's emulation of the model while brushing their teeth. In this study, we aimed to analyze the effect of tooth-brushing intervention, using an audio song and dental model, on the plaque index of children with visual impairment. Methods: This study involved 30 children with visual impairment, aged 7-12 years old, who are free from other form handicapping conditions and who were able to read with Braille. The teachers instructed and guided the children in brushing their teeth, following the audio song and dental model every day for one week. We assessed their dental plaque index before and after the one-week. Results: Tooth-brushing intervention with the audio song and dental model decreased the participants' plaque index. The mean of the plaque index before the intervention was  $1.23 \pm 0.39$ , dropping to  $0.69 \pm 0.28$  after the intervention, with a statistically significant difference ( $p < 0.05$ ) was compared using the paired t-test. Conclusion: Children with visual impairment could maintain an adequate of oral hygiene with a decrease their plaque index score after brush theirteeth using an audio song and dental model.

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### Introduction

Oral and dental health play important roles in determining individual wellbeing and quality of life and influencing work performance and self-confidence. Dental health education (DHE) for children with physical limitations is more challenging and involves a higher level of difficulty than that for children without disabilities. The prevalence of blindness and deafness among children is quite significant and generally results in this group's rejection by society.<sup>1</sup> Oral hygiene maintenance is one of the most overlooked activities of children with visual impairment.<sup>2</sup>

Such children are individuals with

disturbance or interference in their sense of vision. Similar to any other group of people, they experience oral health problems and should be given the same opportunity as normal children have to maintain oral and dental hygiene.<sup>2</sup> Their limited ability to self-examine their oral condition causes their lack of awareness in maintaining their oral health and detecting dental diseases. A study reports that children with visual impairment commonly have worse oral hygiene, judging from their higher level of plaque index.<sup>3</sup>

Generally, DHE uses a visual approach, but this cannot be used for children with visual impairment.<sup>1,4</sup> Children with visual impairment are more dependent on sounds, conversations, and touch to adapt to situations. Some researchers developed a method called audio tactile performance (ATP) to educate children with visual impairment. This method provides verbal information on the importance of the teeth, the proper tooth-brushing method, and the

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manner of feeling how to brush the teeth using a large-scale model. A study indicates that children with visual impairment can maintain an acceptable level of oral hygiene when taught with this method.<sup>5</sup> A review of the relevant literature shows that creative activities with music, dance, songs, drama, and visual arts have positive effects on children and youth's self-confidence, self-esteem, relationship building, and sense of belonging.<sup>6</sup>

Therefore, we hypothesized that singing a song and using the tactile sense as the media would result in better oral health, measured by assessing the plaque index score after tooth-brushing among children with visual impairment.

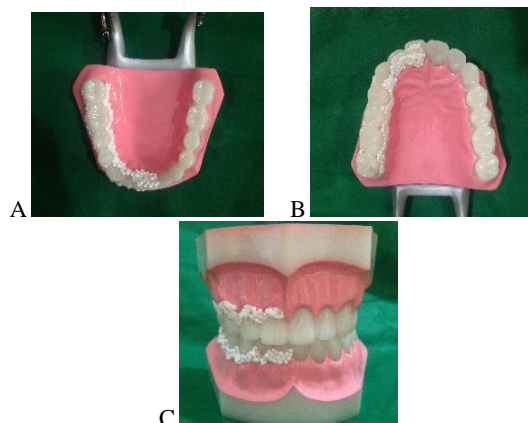
In this study, we investigated whether singing a tooth-brushing instruction song and using the tactile sense on a modified typodont might decrease the plaque index score after tooth-brushing among children with visual impairment. The purpose of this study was to develop a new method that might help this group maintain good oral health.

## Methods

We used a clinical experimental study to analyze the difference in the plaque index scores of children with visual impairment before and after receiving tooth-brushing instruction with a song and dental model. The subjects were 30 children with visual impairment (both those with low vision and blindness), who are free from other form handicapping conditions and who were able to read with Braille, ranging from 7 to 12 years old and studying in the National Special Needs School Type A in Jakarta, Indonesia.

Prior to the intervention, we trained the supervising teachers on how to do Fones' tooth-brushing method<sup>7</sup> with an audio and typodont aid and then explained the research process to them. During our first visit after the children brushed their teeth at home, we examined their plaque index and gave them brief information about dental plaque. With the aid of the typodont that had roughened surfaces imitating plaque (Figure 1), we asked the children to feel the typodont with their fingers and then compare the sensation with the plaque in their mouths, as felt by their tongues. Afterward, we taught them how to perform Fones' tooth-brushing method<sup>7</sup> using the typodont and a toothbrush by making them listen to a song about eliminating plaque with a

toothbrush and doing the proper tooth-brushing motions (Figure 2). The children repeated this procedure daily for a week in school, assisted by the teachers.



**Figure 1.** Typodont dental model; A. Mandibular arch occlusal view; B. Maxillary arch occlusal view; C. Typodont frontal view with rough surface imitating plaque on the right side of the maxilla and the mandible.

### *Mari kawan sikat gigi bersama*

Hey, come on; together let's get our teeth brushed

### *Siapkan pasta juga sikatnya*

Prepare your toothpaste, also your toothbrush

### *Sikat cermat serta perlahan*

Brush your teeth slowly and carefully

### *Bagian depan atas dan bawah*

Your upper and lower front teeth

### *Sikat yang samping kiri dan kanan*

Brush the left and the right sides

### *Bagian dalam atas dan bawah*

Then the upper and lower teeth on the inner side

### *Lalu berkumur sekali saja*

Swish, swish, swish, rinse your mouth just one time

### *Sikat semua segar rasanya.*

We brushed everything, and our teeth feel so clean.

**Figure 2.** Tooth-brushing intervention song lyrics.

We made our second visit one week after the first visit. After the children brushed their teeth at home, we examined their plaque index to observe their latest oral health status and to evaluate the tooth-brushing instruction given.

We evaluated the plaque index with Silness and Loe's method that measures the plaque thickness on the tooth cervical margin,

and the score can be interpreted as the individual's oral health status. We evaluated six teeth (16, 21, 26, 36, 41, and 46) per subject by drying the tooth surfaces and visually examining them with adequate lighting aid, a mouth mirror, and a disclosing solution. The surfaces examined were mesiobuccal, buccal, distobuccal, and palatal or lingual, with the following scores: 0 = absence of plaque, 1 = presence of plaque on the gingival margin and the areas adjacent to the tooth surface, 2 = moderate presence of plaque in the gingival pocket or margin and the areas adjacent to the tooth surface, and 3 = major amount of plaque in the gingival pocket and/or margin and the areas adjacent to the tooth surface. We then added the scores and divided them by the number of surfaces examined; the final number would be the plaque index.<sup>8</sup>

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## Results

Two calibrated operators conducted the plaque index examination in this study. We used the Kappa statistical test to determine the scoring consistency between the operators and obtained a 0.865 value. The Shapiro-Wilk test showed that the data was normally distributed ( $p > 0.05$ ). We performed a paired t-test to analyze the significance of the study subjects' plaque index differences before and after one week of tooth-brushing intervention through the audio (song) and tactile (typodont) media.

The children's plaque index was lower after than before the intervention. The data analysis with the paired t-test obtained the value of  $p = 0.001$  ( $p < 0.05$ ), indicating significant differences before and after one week of intervention. Table 1 shows the analysis results.

## Discussion

The tooth-brushing instruction media in this study used the ATP method by combining three components: listening to a song, using the sense of touch, and brushing the teeth. During our first visit, we gave the children a brief

explanation of dental plaque. We then asked them to feel with their fingers the roughened typodont that simulated plaque and to compare it with the sensation of dental plaque in their mouths, as felt by their tongues. We used the typodont to give the children with visual impairment an illustration of the shape and the arrangement of teeth. The fingertips and the tongue are among the most accurate, tactile-sensing body parts.<sup>9</sup> Two earlier research studies on children with visual impairment made them sense their own tooth surfaces with their tongues, and they felt that the soft deposits of plaque were rough.<sup>5,10</sup>

Afterward, the teachers taught the children how to brush their teeth with Fones' method<sup>7</sup> using the typodont and a toothbrush. The teachers asked the children to brush their teeth together while listening to a song about eliminating dental plaque using a toothbrush, along with a description of the proper tooth-brushing motions. The song had been publicized, and its lyrics used simple sentences that would be easily understood even by children with visual impairment.<sup>11</sup>

The occipital lobe activities of children with visual impairment spike when they are listening, outperforming normal children's listening abilities. Children with visual impairment have the ability to detect peculiar notes compared to the notes that they usually hear.<sup>12</sup> The children learned to brush their own teeth with the help of trained teachers. We trained the teachers in tooth-brushing with the aid of a song and the typodont. Hence, they could give positive feedback to the children about the importance and the correct way of brushing their teeth. Training that develops a positive attitude to complement the tooth-brushing skill plays a role in the success of DHE. Several studies suggested that motivation or positive feedback improved oral health.<sup>5,10,13</sup>

Our research has proven that the tooth-brushing instruction with the song and typodont aid is effective in reducing the dental plaque index count, especially since the combination of the appropriate method and repetition makes tooth-brushing an oral hygiene habit or routine in accordance with this study's goal. We modified the DHE method by adjusting it to the needs of children with visual impairment. Thus, our approach positively motivated the children and

developed their tooth-brushing skill with the aid of their teachers, leading to the DHE's success.

## Conclusion

This study showed that children with visual impairment could maintain an adequate of oral hygiene with a decrease their plaque index score after brush their teeth using the audio song and typodont aid.

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