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EVALUATING THE PLAQUE REMOVAL EFFICACY OF BASS AND COMBINATION BRUSHING TECHNIQUES IN 7TH GRADE STUDENTS AT SMPN 44 PALEMBANG, 2024

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ABSTRACT

Background: *Effective plaque control is vital for oral and general health. While the Bass technique is widely recommended, a Combination technique that blends circular, vertical, and vibratory strokes may enhance plaque removal. This study compared plaque-score reductions produced by the Bass and Combination techniques in seventh-grade students.*
Methods: *A pre-test–post-test control-group experiment was conducted with 32 randomly selected students at SMPN 44 Palembang. Participants were allocated to the Bass group (n = 16) or the Combination group (n = 16). Plaque levels were recorded with the Personal Hygiene Performance index before and after supervised brushing. Mean plaque-score reductions were compared using an independent-samples t-test (α = 0.05).*
Results:
The Bass group showed a mean plaque reduction of 1,1, whereas the Combination group achieved a 2,2- reduction. The difference was statistically significant (p value= 0.001).
Conclusion:
Among seventh-grade students, the Combination brushing technique removed significantly more plaque than the Bass technique. Incorporating the Combination method into school-based oral-health education may improve plaque control in this age group.

Keywords: *tooth-brushing technique; bass method; combination method; dental plaque; school children; oral-health education*

INTRODUCTION

Oral health is an essential part of overall health. According to Indonesian Law No. 17 of 2023, health encompasses physical, mental, and social well-being. The mouth, as the starting point of the digestive system, plays a critical role in nutritional intake and speech, especially in children whose physical and mental development depends heavily on good oral hygiene.

One key indicator of poor oral hygiene is plaque accumulation. Plaque, a sticky film of bacteria, can cause dental caries and periodontal disease if not adequately removed. While many Indonesians brush their teeth daily (82% according to the 2024 Indonesian Health Survey), only 6.2% do so at the correct times—after breakfast and before bed.

Several brushing techniques exist to aid plaque removal, with the Bass technique being recommended for its efficacy in cleaning along the gingival margin, and the Combination technique frequently used in school dental education programs. However, their comparative effectiveness in adolescents remains under-explored.

SMPN 44 Palembang, under the supervision of Puskesmas Empat Ulu, was chosen for this study after a preliminary health screening revealed that over 50% of its students had dental issues, likely due to improper brushing habits.

This study was conducted to determine whether there is a significant difference in

plaque score reduction between the Bass and Combination toothbrushing techniques among 7th-grade students at SMPN 44 Palembang in 2024.

METHODS

This study employed an experimental design using a pretest-posttest control group design to compare the effectiveness of the Bass and Combination toothbrushing techniques. A total of 32 students from 7th grade at SMPN 44 Palembang were selected through simple random sampling. They were randomly assigned into two equal groups: one group received training and brushing practice using the Bass technique, while the other group followed the Combination technique.

The population in this study included all 213 students enrolled in the 7th grade. The inclusion criteria were students from classes 7-1 to 7-7 who were present during data collection and willing to participate by signing an informed consent form. Students who were absent or refused to participate were excluded from the study. The sample size was determined using the Federer formula for experimental studies, resulting in a minimum of 16 participants per group.

The independent variable in this study was the toothbrushing technique (Bass or Combination), while the dependent variable was the plaque score, measured using the Patient Hygiene Performance (PHP) Index. Plaque assessment was conducted using a disclosing solution applied to six index teeth. Each tooth was evaluated on five surfaces (distal, gingival third, mesial, central, and incisal/occlusal). A score of 0 indicated no plaque, while a score of 1 indicated visible plaque. The final PHP score was calculated by summing all plaque-positive surfaces and dividing by the total number of surfaces examined.

Prior to the intervention, students were given health education and watched instructional videos on proper brushing using either the Bass or Combination technique. The data collection process was conducted over three days. On the first day, informed consent forms were collected and students were assigned to their respective groups. On the second day, the Combination group brushed their teeth under supervision after plaque disclosure and pre-brushing plaque assessment. The same steps were repeated on the third day for the Bass group. Three trained dental therapists assisted in applying the disclosing solution, conducting observations, and documenting plaque scores.

All data were collected through direct observation and recorded on standard forms. After collection, data were processed using editing, coding, scoring, and input into a statistical software. Shapiro-Wilk test was used to assess data normality. If data were normally distributed, paired t-tests were used to compare pre- and post-intervention scores within each group. If not, the Wilcoxon Signed-Rank test was applied. An independent t-test was used to compare the difference in plaque reduction between the two groups.

RESULTS AND DISCUSSION

This study aimed to compare the effectiveness of Bass and Combination toothbrushing techniques in reducing plaque scores among 7th-grade students at SMPN 44 Palembang. A total of 32 students were selected through random sampling, evenly divided into two groups. Female participants made up the majority (71.9%), which may suggest either a greater interest in participating in health studies among female students or simply reflect class demographics.

The results showed that both toothbrushing techniques led to statistically significant reductions in plaque scores. In the Bass group, the mean plaque score dropped from 2.7 before intervention to 1.6 after intervention, with a p-value of < 0.001,

indicating significant improvement. In the Combination group, the plaque score decreased from 3.09 to 0.80, also with a p-value of < 0.001, reflecting a more substantial reduction in plaque accumulation. The comparison between the two groups showed a statistically significant difference (p = 0.001), with the Combination technique yielding a greater average reduction in plaque scores (2.2 points) compared to the Bass technique (1.1 points).

Table 1. Distribution of Plaque Score Examination Results Before and After Brushing Teeth Using the Bass and CombinationTechnique

Group	Plaque score				*p value*	
Bass	Pre-test	16	2,7 (±0,790)	1,5-4,1	<0,001	0,001
	Post-test	16	1,6 (±0,824)	0,3-4,0		
Combination	Pre-test	16	3,09 (±0,817)	0-2	<0,001	
	Post-test	16	0,80 (±0,524)	2-4,5		

After the intervention using the Bass technique, the average score dropped to 1.6, indicating a reduction in plaque levels. This finding aligns with Yamani et al. (2020), who reported that after receiving education on the Bass brushing method, 74.5% of 10th-grade students at SMA Darul Hijrah Putra fell into the "good" category. The Bass group exhibited lower plaque scores than those using traditional brushing techniques. Similarly, Laut et al. (2021) found that average plaque scores dropped from 21% to 13% after students viewed a tutorial video on the modified Bass technique. Follow-up plaque controls showed further reductions to 3% and eventually 1%. The paired t-test results (t-calculated > t-table) indicated a significant difference in plaque scores before and after the intervention, particularly among fifth-grade students at SDN X Subang.

Worotijan, as cited in Laut et al. (2021), noted that the modified Bass technique is particularly effective, capable of cleaning up to 0.5 mm below the gumline (subgingival area), outperforming other common brushing methods. However, even after the intervention, four specific surfaces—distal, mesial gingival, and middle thirds—showed relatively low reductions in plaque scores. Kurniasari et al. (2015) suggested this could be due to difficulty in adopting the Bass technique, as many individuals are more accustomed to simpler brushing methods such as the Roll or Scrub technique.

Following the brushing intervention using the combination technique, average plaque scores on three tooth surfaces—distal, gingival, and middle thirds—remained relatively high, despite overall improvements. The average plaque score before brushing was 3.0, which dropped significantly to 0.8 after using the combination technique. This suggests that the combination technique is effective in reducing plaque. These findings support research by Prasetyowati et al. (2018), which concluded that brushing using a combination technique significantly reduces plaque index compared to non-combination (free) techniques. Similar results were reported by Silfia & Yenti (2022) in a study at SD 22/IV Kota Jambi, where the combination technique led to more substantial plaque score reductions than the horizontal technique.

The average plaque score before intervention was 2.7 for the Bass group and 3.0 for the combination group. After education and brushing interventions, scores dropped to 1.6 for the Bass group and 0.8 for the combination group. When examining tooth surfaces divided into five areas, the Bass group showed lower reductions compared to the combination group, indicating relatively higher remaining plaque levels. Wati et al. (2020) emphasized that although the Bass technique is effective in removing plaque, it requires skill, patience, and proper knowledge to achieve optimal results.

The comparison between the two techniques reveals that the combination method led to a greater average plaque score reduction

(2.2) than the Bass technique (1.1). Statistical analysis using an independent t-test yielded a p-value of 0.001, confirming a significant difference between the Bass and combination techniques among Grade 7 students at SMPN 44 Palembang.

This may be influenced by students' daily brushing habits, which often align more closely with the combination technique, even if not yet perfected. Interviews revealed that many students were already familiar with the combination method. According to Notoadmojo (in Silfia & Yenti, 2022), knowledge of proper brushing methods, such as the combination technique, significantly influences plaque control outcomes.

This finding is consistent with research by Suyatmi (2013, in W.G. Putri et al., 2024), which stated that the combination method is the most effective for reducing plaque. Experts agree that combining multiple brushing techniques, tailored to the anatomy of each tooth surface, yields the best results. The vertical motion is recommended for facial surfaces of anterior and posterior teeth, as well as palatal (upper) and lingual (lower) surfaces; horizontal motion is used for occlusal (chewing) surfaces of premolars and molars; and circular motion is used on facial surfaces from the back left, through the front, to the back right.

Significant plaque index improvement was observed following the use of the combination technique compared to individual or random methods. This is attributed to proper toothbrush selection and correct brushing movements, which help reduce plaque formation, strengthen teeth against caries, and maintain gum health. Several factors influence brushing effectiveness, including motor skills and brushing habits. Furthermore, plaque distribution in the mouth follows a pattern—certain areas accumulate more plaque, such as interproximal surfaces, lingual areas of the lower jaw, and buccal surfaces of molars. In contrast, anterior buccal surfaces of the upper jaw and palatal surfaces tend to have less plaque (Rismana et al., 2020).

CONCLUSION

This study found a significant reduction in plaque scores using both Bass and Combination brushing techniques. However, the Combination technique was more effective in reducing plaque among 7th-grade students of SMPN 44 Palembang. These findings suggest that dental health education programs in schools should prioritize practical and comprehensible methods like the Combination technique to ensure better oral hygiene among students.

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