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The Effect of Singing Method Counseling on How to Brush Teeth on Debris Index Values in Visually Impaired Children

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ABSTRACT Maintaining oral hygiene is a significant challenge for visually impaired children, who often rely on auditory and tactile cues to perform daily tasks, including toothbrushing. Traditional methods of dental health education are often less effective for this group due to limitations in visual perception, leading to a higher risk of plaque accumulation and oral diseases. This study aims to evaluate the effectiveness of a singing-based counseling method in improving toothbrushing techniques and reducing debris index scores among visually impaired children. This research employed a pre-experimental design with a one-group pretest-posttest approach, involving 30 visually impaired students from SLB-A Yayasan Pendidikan Anak-Anak Buta (YPAB) Surabaya. Participants were selected using total sampling. Data collection was conducted through debris index examinations before and after the intervention. The intervention involved oral hygiene counseling using a specially designed song that conveyed correct toothbrushing techniques, delivered over three sessions within one week. Debris index scores were recorded before and after the intervention using standard dental assessment procedures. Statistical analysis using the Wilcoxon Signed-Rank Test revealed a significant difference in debris index scores pre- and post-intervention ($p = 0.000$). The mean debris index score decreased from 1.83 to 0.90 after the counseling, indicating a substantial improvement in oral hygiene among participants. In conclusion, the use of singing as a method of oral health education is effective in enhancing toothbrushing skills and reducing plaque accumulation in visually impaired children. This approach offers a practical, engaging, and inclusive strategy to promote dental hygiene in special needs populations and is recommended for broader implementation in special education institutions.

INDEX TERMS Singing method, oral hygiene, visually impaired children, dental education, debris index

I. INTRODUCTION

Oral health plays a vital role in overall well-being, particularly in children, as it affects nutrition, communication, and quality of life. Among vulnerable populations, visually impaired children face unique challenges in maintaining oral hygiene due to limited access to visual instructional materials and difficulties in developing proper brushing techniques [1], [2]. Studies have shown that children with visual impairments are at a higher risk of dental plaque accumulation, gingival inflammation, and tooth decay due to inadequate hygiene practices [3]–[5]. These challenges are exacerbated by a lack of tailored oral health education approaches, leading to a critical need for alternative communication strategies that accommodate their sensory limitations [6].

Traditional dental education methods, which rely heavily on visual cues such as demonstrations, posters, and videos, are often ineffective for children with visual impairments [7], [8]. In recent years, innovative approaches such as the use of tactile models, audio instructions, and music have emerged to address this gap. Among these, singing methods have shown potential as engaging and effective tools to convey

health-related messages to children, especially in early learning environments [9], [10]. Educational songs can aid memory retention, reinforce routines, and increase motivation, which are essential for habit formation in oral hygiene practices [11].

Despite the growing interest in creative educational tools, research exploring the application of singing-based interventions for oral health in visually impaired children remains limited. Most existing studies focus on sighted populations or general special needs education, without emphasizing the distinct needs of visually impaired individuals [12], [13]. Moreover, few studies have assessed the clinical impact of such interventions using measurable outcomes like debris index scores, which evaluate the presence of dental plaque and are critical indicators of oral hygiene effectiveness [14].

This study aims to address this gap by examining the effectiveness of singing-based counseling as an educational tool for improving toothbrushing behavior and reducing debris index values among visually impaired children. Specifically, the study focuses on children enrolled at SLB-A Yayasan Pendidikan Anak-Anak Buta (YPAB) Surabaya,

an institution dedicated to the education of visually impaired students. The key contributions of this study are as follows:

1. It introduces a novel intervention method oral health education using a customized toothbrushing song targeted at visually impaired children.
2. It provides empirical evidence on the effectiveness of the intervention by measuring changes in debris index values before and after the counseling.
3. It contributes to the literature on inclusive health education, offering insights that may guide future curriculum development and public health policy for children with disabilities.

II. METHODS

This study employed a quantitative pre-experimental design using a one-group pretest-posttest approach, aimed at evaluating the effectiveness of singing-based counseling in improving toothbrushing behavior and reducing debris index scores among visually impaired children. This design is commonly used in early-phase intervention studies where a control group is not feasible but preliminary evidence is needed to determine intervention impact [15].

A. POPULATION AND SAMPLE

The target population consisted of students enrolled at SLB-A Yayasan Pendidikan Anak-Anak Buta (YPAB) in Surabaya, Indonesia. The school specializes in educating children with various degrees of visual impairment. A total sampling technique was applied, in which all eligible participants were included in the study. Inclusion criteria required participants to be aged between 7 and 13 years, diagnosed with visual impairment (total or partial), capable of communication, and without additional physical or cognitive disabilities that could interfere with participation in oral hygiene activities. A total of 30 students met these criteria and agreed to participate with parental consent.

B. ETHICAL CONSIDERATIONS

The research protocol was reviewed and approved by the institutional ethics committee. Written informed consent was obtained from parents or guardians, and assent was secured from participants. The study adhered to the ethical principles outlined in the Declaration of Helsinki and ensured anonymity and confidentiality throughout the data collection and analysis process.

C. INTERVENTION DESIGN: SINGING METHOD COUSELING

The intervention involved oral hygiene counseling using a custom-designed song that described proper toothbrushing techniques aligned with recommendations from the Indonesian Ministry of Health [16]. The song, created in a child-friendly and repetitive format, emphasized critical brushing steps, frequency, and duration, integrating rhythm and melody to support memory retention. Research supports the use of songs to facilitate learning in children with disabilities by reinforcing cognitive and motor routines [17], [18]. The counseling was conducted in three sessions over the span of one week, each lasting approximately 30–45 minutes. The sessions included:

1. An initial oral health introduction and pretest (debris index recording)
2. Singing and repetition of the toothbrushing song with tactile tooth models
3. A practical session with guided brushing while the song played
4. Final review and posttest (debris index recording)

All sessions were conducted in a familiar classroom setting to minimize discomfort or distraction. The same trained dental health educator facilitated all sessions, ensuring consistency in delivery.

D. DATA COLLECTION INSTRUMENT

The Debris Index (DI-S) component of the Simplified Oral Hygiene Index (OHI-S) was used as the primary outcome measure to assess oral hygiene status. This index evaluates the presence of soft debris on selected teeth surfaces and is widely used in dental public health research due to its simplicity, objectivity, and reproducibility [19]. Examinations were performed using a sterile mouth mirror and explorer under appropriate lighting. The same examiner conducted both the pretest and posttest evaluations to ensure intra-rater reliability. The debris index score ranges from 0 (no debris) to 3 (debris covering more than two-thirds of the tooth surface). Scores were recorded and averaged across subjects.

E. DATA ANALYSIS

Data were analyzed using IBM SPSS Statistics version 26. Descriptive statistics (mean, standard deviation) were used to summarize participant characteristics and debris index scores before and after the intervention. The Wilcoxon Signed-Rank Test was applied to evaluate differences between pretest and posttest scores, given the non-parametric distribution of the data [20]. A p-value of <0.05 was considered statistically significant.

F. STUDY STRENGTHS AND LIMITATIONS

The use of a singing method tailored to the sensory learning needs of visually impaired children represents a strength of this study. However, limitations include the absence of a control group and the short duration of follow-up. Future studies may benefit from incorporating control conditions, longer observation periods, and assessment of long-term behavioral retention.

III. RESULTS

A. CHARACTERISTICS OF RESPONDENTS

Based on the data presented in TABLE 1, it can be concluded that the majority of respondents in this study were male (65%), while only a small proportion were female (35%). In terms of age, the majority of respondents were aged 10-13 years (59%). TABLE 2 shows that the debris index value before being given the singing method counseling on how to brush teeth, the results show that the average child has a debris index value in the bad category 12 out of 34 respondents (35%). TABLE 3 shows that there is a decrease in the debris index value of respondents after receiving counseling, with 22 out of 34 respondents (65%) in the good category. Indicates that

counseling using the singing method can reduce the debris index value in visually impaired children.

TABLE 1
Characteristics of Respondent

Characteristics	Frequency	Percentage (%)
Sex	Male	22
	Female	12
Age	6-9 years old	14
	10-13 years old	20
Total	34	100

TABLE 2
Frequency Distribution of Debris Index Values Before Singing Method Counseling on How to Brush Teeth

Debris Index Value Category	Frequency	Percentage (%)
Good	1	3
Moderate	21	62
Poor	12	35
Total	34	100

TABLE 3
Frequency Distribution of Debris Index Values After Singing Method Counseling on How to Brush Teeth

Debris Index Value Category	Frequency	Percentage (%)
Good	22	65
Moderate	10	30
Poor	2	5
Total	34	100

TABLE 4
Result of Wilcoxon Test Before and After Singing Method Counseling on How to Brush Teeth

Variable	Categories			ρ Value
	Good	Moderate	Poor	
Before Counseling	1	21	12	0.000
After Counseling	22	10	2	

Based on **TABLE 4**, the p value is 0.000, thus it is known that there is a difference in the value of the debris index before and after counseling using the singing method on how to brush teeth. So that H_1 is accepted and H_0 is rejected, it can be concluded that there is an effect after being given counseling using the singing method on how to brush teeth on the value of the debris index in visually impaired children at SDLB-A YPAB Surabaya.

IV. DISCUSSION

A. INTERPRETATION OF RESULT

The findings of this study demonstrate that oral hygiene counseling utilizing the singing method significantly improved toothbrushing behavior and reduced debris index scores among visually impaired children. Prior to the intervention, many participants exhibited inadequate oral hygiene, as evidenced by elevated debris index values. Following the implementation of the song-based counseling program, a notable decrease in these scores was observed,

indicating an enhancement in oral hygiene practices. This suggests that auditory learning tools, particularly those incorporating rhythm and repetition, are effective in promoting behavioral change among children with visual impairments.

The mechanism through which singing improves oral hygiene behavior can be attributed to increased engagement, cognitive reinforcement, and ease of recall. Musical elements such as melody and rhythm act as memory cues that facilitate the retention of information over time [21]. Furthermore, the repetitive nature of songs reinforces correct techniques and establishes behavioral routines, aligning with behavioral theories of habit formation in pediatric health interventions [22].

These findings align with research by Noronha et al. [23], who demonstrated the effectiveness of music-based learning in improving hygiene behavior in early childhood. Similarly, Yusuf et al. [24] highlighted the role of educational songs in enhancing memory retention and motivation among children with learning difficulties. Our results extend these conclusions to the visually impaired population, emphasizing the value of sensory-adapted health education strategies.

B. COMPARISON WITH SIMILAR STUDIES

The results of this study are consistent with prior work that evaluated oral hygiene interventions for children with special needs. For instance, Park et al. [25] found that tactile and auditory instructional methods led to significant improvements in oral hygiene practices among children with visual impairments. Likewise, Singh et al. [26] reported improved plaque control in children who received audio-tactile instructions compared to those receiving traditional verbal education. However, this study's use of singing as an educational tool distinguishes it from other interventions. While tactile aids and verbal explanations are commonly employed, the use of music introduces an element of emotional engagement and enjoyment, which can be particularly effective for children. Tambunan et al. [27] found that visually impaired children who received musical instruction showed higher compliance and enthusiasm during brushing activities than those in non-musical groups. On the contrary, some studies have suggested that interventions relying solely on music without guided practice may be insufficient for long-term behavior change [28]. Therefore, it is critical that musical interventions be coupled with hands-on demonstrations and reinforcement sessions, as was implemented in this study. Additionally, cultural and linguistic adaptation of the song used in this intervention may have contributed to its success. Children were able to relate to the local language and context embedded in the song, thereby increasing their comprehension and internalization of the messages. This observation aligns with findings from Alzahrani et al. [29], who emphasized the importance of culturally sensitive educational tools in promoting health equity among marginalized groups.

C. LIMITATIONS, WEAKNESSES, AND IMPLICATIONS

Despite the promising results, this study is not without limitations. First, the pre-experimental design without a control group limits the generalizability of the findings. The

absence of a comparison group prevents the exclusion of external factors that might have influenced the outcome, such as natural maturation or external reinforcement from teachers or parents. Future research should consider employing randomized controlled trials to provide stronger evidence of causal relationships.

Second, the short duration of the intervention and follow-up may not fully capture the sustainability of behavior change. As highlighted by Ibrahim and Rahim [30], long-term oral hygiene maintenance requires ongoing education, reinforcement, and supervision. Incorporating periodic reinforcement sessions or integrating the singing method into the school curriculum may help sustain the behavioral gains observed in this study.

Third, the sample size was limited to a single institution, which may not reflect the broader population of visually impaired children across different regions or socioeconomic backgrounds. To enhance external validity, future studies should include a larger and more diverse sample drawn from multiple schools or regions.

Fourth, while the debris index provides a reliable quantitative measure of oral cleanliness, it does not account for other aspects such as gingival health, caries incidence, or qualitative improvements in brushing techniques. Including more comprehensive oral health indicators would offer a holistic assessment of the intervention's impact.

Nonetheless, the findings of this study carry significant implications for oral health promotion among special needs populations. First, they underscore the necessity of tailoring educational strategies to the sensory and cognitive profiles of target groups. For visually impaired children, auditory tools such as songs can serve as powerful mediums of instruction, compensating for their lack of visual access. Second, this study contributes to the growing body of literature advocating for inclusive health education. By demonstrating that creative and low-cost tools like singing can yield measurable improvements in health behavior, the findings support broader efforts to design equity-oriented public health interventions.

Third, the success of this intervention opens opportunities for interdisciplinary collaboration between health professionals, educators, and music therapists. Developing structured, evidence-based song curricula for various health topics could transform traditional approaches to health education in schools.

In conclusion, the implementation of a singing-based counseling method has proven effective in improving oral hygiene behavior among visually impaired children. The positive outcomes suggest that musical interventions, when thoughtfully designed and implemented, can serve as viable educational tools in special needs settings. However, further research with more rigorous designs, larger sample sizes, and long-term evaluations is needed to consolidate these findings and inform policy.

V. CONCLUSIONS

This study aimed to evaluate the effectiveness of a singing-based counseling method in improving toothbrushing behavior and reducing debris index scores among visually impaired children. The rationale stemmed from the need for more accessible and engaging oral health education

strategies for children with visual impairments, who often face greater challenges in maintaining oral hygiene due to their reliance on auditory and tactile cues. The findings revealed a significant improvement in oral hygiene practices following the intervention. Specifically, the average debris index score decreased markedly from 1.83 before the intervention to 0.90 afterward, indicating a substantial reduction in plaque accumulation. This statistically significant result ($p = 0.000$) confirms the effectiveness of the singing method as a viable educational tool. The integration of music into oral health education appears to enhance memory retention, engagement, and motivation among participants, factors critical to behavioral change, particularly in populations with special needs. These outcomes align with existing research that supports the use of music as a medium for improving health behaviors. However, several limitations must be acknowledged. The study utilized a one-group pretest-posttest design without a control group, which restricts the ability to attribute changes solely to the intervention. Additionally, the relatively short duration of the follow-up may not reflect the long-term sustainability of the observed improvements. Future research should consider employing a randomized controlled trial design with a larger and more diverse sample population to enhance the generalizability of results. It is also recommended that future studies incorporate longitudinal tracking to assess whether the behavioral improvements are maintained over time. Furthermore, exploring the use of culturally adapted and age-appropriate songs, coupled with periodic reinforcement, could optimize the educational impact. In conclusion, singing-based oral hygiene counseling offers a promising, low-cost, and inclusive strategy for promoting dental health among visually impaired children and merits broader implementation in special education and health promotion programs.

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DATA AVAILABILITY

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTIONS

Marselin Nainil Afifa was responsible for the conceptualization of the study, formulation of research objectives, and drafting of the manuscript. Sri Hidayati contributed to the design of the methodology and supervised data collection activities. Sunomo Hadi provided statistical

support, data validation, and assisted in the formal analysis of the results. Ratih Larasati played a key role in the literature review, critical revision of the content, and ensuring the accuracy of citations. All authors have read and approved the final version of the manuscript for submission.

DECLARATIONS

ETHICAL APPROVAL

This study was conducted in accordance with ethical standards and approved by the Health Research Ethics Committee of Poltekkes Kemenkes Surabaya. All procedures involving human participants were performed in compliance with institutional and national research ethics guidelines.

CONSENT FOR PUBLICATION PARTICIPANTS

All participants and their guardians provided consent for the anonymized publication of the results.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

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