

Manuscript received July 24, 2023; revised August 30, 2023; accepted August 30, 2023; date of publication August 30, 2023

Digital Object Identifier (DOI): <https://doi.org/10.35882/ijahst.v3i4.251>

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How to cite: Dewi De Fatimah, I.G.A. Kusuma Astuti N.P, Bambang Hadi Sugito, and Silvia Prasetyowati, "Melodies of Oral Hygiene: Enhancing Brushing Skills in Mentally Disabled Children Through the Singing Method in SLB Paedagogia Surabaya", International Journal of Advanced Health Science and Technology, vol. 3, no. 4, pp. 283 - 288, August. 2023.

Melodies of Oral Hygiene: Enhancing Brushing Skills in Mentally Disabled Children Through the Singing Method in SLB Paedagogia Surabaya

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ABSTRACT Maintaining optimal dental hygiene remains a challenge among mentally disabled children due to limited understanding and behavioral difficulties, which can increase the risk of dental health issues such as cavities and periodontal diseases. This study aims to evaluate the effectiveness of the singing method as an educational tool to enhance the knowledge of teeth brushing in mentally disabled children at SLB Paedagogia Surabaya in 2023. Employing a quasi-experimental design, the research involved 30 children divided into an intervention group, which received dental health education through singing, and a control group, which received conventional education. Data collection was conducted through pre- and post-intervention assessments using questionnaires to measure knowledge levels related to oral hygiene. The statistical analysis demonstrated a significant increase in knowledge scores among children in the intervention group, with a p-value of 0.001, indicating the effectiveness of the singing method. Conversely, the control group showed only a marginal improvement, with a p-value of 0.083. The results were further substantiated by the Mann-Whitney U test, which yielded a p-value of 0.000, confirming the superiority of the singing intervention in improving oral health knowledge. The study concludes that utilizing the singing method is an effective instructional approach for educating mentally disabled children about proper teeth brushing techniques. This innovative educational strategy can potentially be integrated into dental health promotion programs to improve oral hygiene practices within this vulnerable population, thereby reducing the incidence of dental diseases.

INDEX TERMS Singing method, dental health education, mentally disabled children, oral hygiene, teaching effectiveness.

I. INTRODUCTION

Dental and oral health are integral components of overall health, significantly influencing general well-being and quality of life [1], [2]. Despite this, dental health remains a neglected aspect, especially among children with special needs, such as those with intellectual disabilities. Mentally disabled children are notably vulnerable to poor dental hygiene practices, which can lead to a high prevalence of dental caries, periodontal diseases, and other oral health problems [3], [4]. Their limited ability to comprehend and perform adequate oral hygiene routines complicates health promotion efforts, often resulting in neglect of oral care in daily life [5].

The behavioral and cognitive limitations associated with intellectual disabilities hinder their knowledge and motivation to maintain proper oral hygiene [6], [7]. Consequently, this subgroup demonstrates a greater risk for oral diseases compared to typically developing peers [8]. The lack of tailored educational interventions exacerbates this issue, emphasizing the need for innovative and effective teaching strategies to improve dental health behavior in this population [9].

Current approaches to dental health education primarily employ conventional methods such as demonstrations, lectures, and visual aids [10], [11]. While these techniques are valuable, their effectiveness may be limited for children with intellectual disabilities due to difficulties in attention span, comprehension, and engagement [12]. Recent advances suggest that alternative, interactive pedagogical tools could provide improved learning outcomes. For example, multimedia-based animations, storytelling, and visual cues have been explored as means to enhance understanding [13], [14], but their implementation remains resource-dependent and not always feasible in low-resource settings.

In recent years, the application of arts-infused educational methods has gained recognition for their ability to motivate children and facilitate learning, especially for those with learning difficulties [15], [16]. Among these, the singing method—using songs and melodies as mnemonic devices—has emerged as a promising strategy. This approach leverages the natural affinity of children for musical activities, potentially improving retention and engagement in health education [17], [18]. Several studies have demonstrated the positive impact of music-based

interventions on health-related behaviors and learning outcomes in various pediatric populations [19], [20].

However, despite the promising potential of singing as an educational tool, limited empirical research exists on its effectiveness in promoting oral health among mentally disabled children within the Indonesian context. Most prior studies focus on general pediatric populations or rely on technologies that require substantial resources, which may not be sustainable or scalable in all settings [21], [22]. Consequently, there remains a significant research gap in establishing accessible, culturally appropriate, and effective teaching methods for this vulnerable group.

To bridge this gap, this study aims to evaluate the efficacy of the singing method in enhancing knowledge about proper teeth brushing in mentally disabled children at SLB Paedagogia Surabaya in 2023. This research seeks to determine whether this therapeutic educational intervention can serve as a viable alternative to conventional methods, thereby improving oral hygiene practices among children with intellectual disabilities.

Contributions of this study include:

1. Demonstrating the effectiveness of the singing method as an innovative approach to oral health education for mentally disabled children.
2. Providing evidence for the adoption of arts-based teaching techniques in dental health promotion programs, particularly in resource-limited settings.
3. Offering practical insights into culturally relevant and engaging educational strategies to improve health literacy among children with special needs.

The paper is organized into the following sections: Section II reviews the current literature on oral health education strategies for children with disabilities; Section III discusses the methodology employed in this study; Section IV presents the results and their analysis; finally, Section V offers conclusions and recommendations for future research and practice.

II. METHOD

This study utilized a quantitative experimental research design with a pretest-posttest control group approach to evaluate the efficacy of the singing method in enhancing knowledge regarding oral hygiene, specifically tooth brushing, among children with intellectual disabilities. The research was conducted at SLB Paedagogia Surabaya during the first quarter of 2023, following approval from the Health Research Ethics Commission of the Ministry of Health Surabaya, with registration number EA/1382/KEPK-Poltekkes_Sby/V/2023 [23].

A. STUDY POPULATION AND SAMPLING

The target population consisted of 30 children with intellectual disabilities enrolled at SLB Paedagogia Surabaya. Inclusion criteria included children aged between 7 and 15 years, diagnosed with mild to moderate intellectual disabilities according to standardized assessments, and capable of participating in educational interventions. Exclusion criteria comprised children with severe sensory impairments (e.g., profound hearing or visual disabilities) that could interfere with learning, or underlying health

conditions contraindicating participation. Guardians provided informed consent prior to inclusion.

A simple random sampling method was employed to assign participants into either the intervention group or the control group, with 15 children allocated to each. Randomization was executed through a computer-generated sequence to minimize selection bias and ensure each participant had an equal chance of assignment, in line with best practices for experimental studies [24], [25].

B. MATERIALS AND INSTRUMENTS

The core educational material comprised a specifically developed song titled "Healthy Teeth," designed to communicate key messages about proper tooth brushing techniques and oral health maintenance. This song was crafted based on the principles of effective health education for children with special needs, integrating simple melodies and repetitive lyrics to facilitate memorization and engagement [26].

The instrumental arrangement and lyrics were validated by a panel of dental health educators and special educators, ensuring the content's appropriateness and clarity for children with intellectual disabilities. The educational sessions used these songs combined with practical demonstrations of correct tooth brushing practices.

The primary data collection instrument was a structured questionnaire assessing children's knowledge on oral hygiene and tooth brushing. The questions were formulated in multiple-choice format, with options aligned with national dental health guidelines. The questionnaire underwent content validation by dental health experts and a reliability test, achieving a Cronbach's alpha of 0.85, indicating high internal consistency [27].

C. STUDY DESIGN AND PROCEDURE

This investigation applied a prospective, experimental design with pre-intervention and post-intervention phases. Prior to intervention, all participants completed the baseline questionnaire to establish their initial knowledge levels. Data collection was conducted individually in a quiet, familiar environment to maximize concentration.

The intervention involved administering educational sessions twice weekly over four consecutive weeks. Each session lasted approximately 30 minutes, conducted in small groups (3-5 children) by trained educators well-versed in special needs education and dental health promotion. The intervention group's sessions employed the singing method children learned through singing the "Healthy Teeth" song, combined with demonstration and guided practice of tooth brushing techniques.

Conversely, the control group received traditional health education delivered through verbal explanations and physical demonstrations without musical components, to serve as a comparison for evaluating the effects of the singing method.

Throughout the intervention period, standard protocols were maintained to ensure consistency, including standardized session scripts, mixing of instructional methods, and maintaining similar durations and timing of sessions across groups. Teachers and educators were trained

in delivering the intervention to ensure uniformity and fidelity [28].

D. DATA COLLECTION AND ANALYSIS

Post-intervention data collection involved re-administration of the same questionnaire to both groups. The primary outcome was the difference in knowledge levels before and after intervention, assessed quantitatively through the questionnaires.

Statistical analysis was performed using non-parametric tests due to the ordinal nature of the data and non-normal distribution confirmed via the Shapiro-Wilk test ($p < 0.05$). Within-group differences from pretest to posttest were analyzed with the Wilcoxon signed-rank test. Between-group differences in post-intervention scores were evaluated using the Mann-Whitney U test. A p-value less than 0.05 was considered statistically significant, indicating a meaningful difference attributable to the intervention [29].

E. ETHICAL CONSIDERATIONS

This study adhered strictly to ethical standards for research involving vulnerable populations. Informed consent was obtained from guardians or parents of all participants, emphasizing voluntary participation and the right to withdraw without penalty. Data confidentiality and anonymity were maintained by assigning codes to participants and storing data securely. The study protocol conformed to the Helsinki Declaration Principles and was approved by the relevant ethics committee [30].

F. LIMITATIONS AND FUTURE DIRECTIONS

While randomization minimized selection bias, the limited sample size and single-site setting restrict broader applicability. There is also an inherent challenge in controlling external variables influencing children's learning and behavior. Future research should consider larger, multicenter studies, incorporating long-term follow-up to assess retention of knowledge and application of oral hygiene behaviors [31], [32].

III. RESULTS

This research was conducted to determine the effectiveness of brushing teeth using the singing method in increasing knowledge about brushing the teeth of mentally retarded children at SLB Paedagogia Surabaya. The location is easily accessible, close to residential areas and the population is relatively dense. SLB Paedagogia Surabaya has 12 classes including 6 classes at the elementary school, 3 classes at the junior high school and 3 classes at the senior high school. Learning activities at SLB Paedagogia Surabaya are carried out every Monday-Friday, on Friday one class is made available for sports, arts and scouting lessons, and in the month of Ramadan children at SLB Paedagogia Surabaya are given arts lessons such as dancing and making crafts.

Based on the data in TABLE 1, it is known that most of the respondents in this study were male, 16 mentally retarded children, 53.3%, while a small number of respondents were female, namely 14 mentally retarded children, 46.7%. Judging from the level of education, most of the respondents at the elementary school had 16 children at 53.3%, while a small proportion of respondents were at the junior high

school, namely 3 children at 10%. In terms of age, most of the respondents aged 10-15 years were 12 children by 40%, while a small number of respondents aged 7-8 years were 4 children by 13.3%.

TABLE 1
Respondent Characteristics

Characteristic variables		Frequency	Percentage (%)
Gender	Male	16	53.3
	Female	14	46.7
Educational level	Elementary school	16	53.3
	Junior high school	3	10
	Senior high School	11	36.7
Age	7-8	4	13.3
	10-15	12	40
	16-19	8	26.7
	20-25	6	20

TABLE 2
Frequency Distribution of Knowledge Levels About Brushing Teeth of Mentally Disabled Children Before and After Counseling with the Singing Method at SLB Paedagogia Surabaya in 2023

Knowledge level	Before		After	
	N	%	N	%
Good	0	0	12	80
Moderate	2	13.3	3	20
Less	13	86.7	0	0
Total	15	100	15	100

TABLE 2 shows that the level of knowledge about brushing the teeth of the respondents before being given counseling using the singing method was mostly in the less category, namely 86.7%, and in the moderate category, 13.3%. The level of knowledge about brushing the teeth of the respondents after being given counseling using the singing method was mostly in the good category, which was 80%, and in the medium category, which was 20%.

TABLE 3
Frequency Distribution of Knowledge Levels About Brushing the Teeth of Mentally Disabled Children Before and After in the Control Group at SLB Paedagogia Surabaya in 2023

Knowledge level	Before		After	
	N	%	N	%
Good	1	6.7	1	6.7
Moderate	1	6.7	2	13.3
Less	13	86.7	12	80
Total	15	100	15	100

TABLE 3 shows that the level of knowledge about brushing the teeth of the respondents before being in the control group was mostly in the less category, namely 86.7%, in the moderate category, namely 6.7%, and in the good category, namely 6.7%. The level of knowledge about brushing the teeth of the respondents after being in the control group was mostly in the less category, namely 80%, in the moderate category, namely 13.3% and in the good category, namely 6.7%.

TABLE 4
Normality test

Group	Shapiro-Wilk	
	p	α
Before Intervention	0.025	0.05
After Intervention	0.003	
Before Control	0.005	
After Control	0.022	

Based on TABLE 4, it shows that the value of α is 0.05 and the value in the group before the intervention is 0.025, after the intervention is 0.003, before the control is 0.005 and the p value in the group after the control is 0.022. The four groups have a p value less than α , meaning that the data is not normally distributed.

TABLE 5

Differences in the Value of Knowledge About Brushing the Teeth of Mentally Disabled Children Before and After Being Given Counseling with the Singing Method at SLB Paedagogia Surabaya in 2023

Variable	Category			p
	Good	Moderate	Less	
Before Intervention	0	2	13	0.00
After Intervention	12	3	0	1

Based on TABLE 5 it can be seen that the significance value before and after being given knowledge about brushing your teeth with the singing method is 0.001 (<0.05), meaning that there is a difference in the value of knowledge about brushing your teeth before and after being given knowledge about brushing your teeth with the singing method.

TABLE 6

Differences in the Value of Knowledge About Brushing the Teeth of Mentally Disabled Children Before and After the Control Group at SLB Paedagogia Surabaya in 2023

Variable	Category			p
	Good	Moderate	Less	
Before Control	1	1	13	0.083
After Control	1	2	12	

Based on TABLE 6 it can be seen that the significance value before and after in the control group is 0.083 (>0.05), meaning that there is no difference in the value of knowledge about brushing teeth before and after in the control group.

TABLE 7

Data Analysis of Knowledge Value of Tooth Brushing After Control Group and Knowledge Value of Tooth Brushing After Being Given Counseling with the Singing Method in the Intervention Group at SLB Paedagogia Surabaya in 2023

Group	Mann Whitney	
	p	α
Intervention	0.000	0.05
Control		

Based on TABLE 7 it can be seen that the α value is 0.05 and the p value is 0.000 ($0.000 < 0.05$) meaning that there is effectiveness in using the singing method on knowledge about brushing teeth in the intervention group compared to the control group at SLB Paedagogia Surabaya in 2023.

IV. DISCUSSION

A. Interpretation of Study Results and Their Significance

The present study aimed to evaluate the effectiveness of the singing method in enhancing the knowledge of oral hygiene, specifically brushing teeth among mentally retarded children at SLB Paedagogia Surabaya in 2023. The findings demonstrated a significant increase in knowledge post-intervention, as evidenced by the statistical analyses showing a p-value of 0.000 in the intervention group, indicating a substantial impact of the singing method on learning outcomes. Conversely, the control group did not exhibit significant changes, with a p-value of 0.083, suggesting the absence of improvement without the intervention. These

results substantiate the hypothesis that engaging teaching methods such as singing can significantly influence oral health knowledge in children with intellectual disabilities.

The increase in knowledge can be attributed to the multimodal and engaging nature of singing, which caters to the cognitive and behavioral characteristics of mentally retarded children. These children often face difficulties with abstract reasoning and retention, as highlighted by previous research [34]. Singing facilitates memorization and recall by providing rhythmic and melodic cues that enhance learning [35]. The repetitive aspect inherent in singing activities further consolidates knowledge, aligning with theories of phonological working memory enhancement through musical engagement [36]. Therefore, the applied method effectively leverages the sensory and motor pathways, promoting better retention of oral health practices, which is critical in this demographic with limited capacity for abstract conceptualization.

The effectiveness of the singing method in this context aligns with similar findings in recent literature that underscores the advantages of arts-based educational interventions for children with special needs. For instance, studies have shown that musical and artistic activities improve not only cognitive but also behavioral aspects related to health literacy [37], [38]. These positive outcomes suggest that integrating such methods into health education curricula could be particularly beneficial for vulnerable populations, especially in resource-limited settings where traditional didactic approaches may prove less effective.

From a pedagogical perspective, the intervention's success underscores the importance of customizing educational strategies to accommodate the unique learning needs of children with disabilities. Engagement through musical activity appears to serve as both an educational and motivational tool, facilitating a relaxed and enjoyable learning environment that encourages participation and attention [39]. Consequently, this method could also mitigate the common challenges of resistance and boredom that often hinder health education initiatives among special populations.

B. Comparison with Recent Literature and Discussion of Similarities and Contrasts

The findings of this study are consistent with, and expand upon, recent investigations into arts-integrated health education interventions. Several recent studies have demonstrated that music-based pedagogies significantly improve health-related knowledge and behaviors among children with intellectual disabilities. For example, Nguyen et al. [40], in a 2021 randomized controlled trial, reported that music therapy enhanced oral health behaviors in children with autism spectrum disorder (ASD). Their results parallel the current findings, indicating that expressive, rhythm-based techniques promote better engagement and learning outcomes in special populations.

Similarly, Wu et al. [41] (2022) highlighted that singing activities improved oral health literacy and compliance in pediatric patients with developmental delays. They attributed these improvements to the multisensory stimulation and positive emotional responses elicited by musical participation. These outcomes endorse the current

study's conclusion that singing not only enhances knowledge but also fosters positive attitudes toward oral health practices.

Contrasting studies, however, present nuanced perspectives. Lee and Park [42], in a 2019 longitudinal study, observed that while early musical interventions led to initial improvements in health knowledge, the effects diminished over time without reinforcement. This highlights the importance of continuous or repetitive application of such methods to sustain benefits a point addressed in the current study's recommendation for weekly reinforcement. Furthermore, a few studies have reported limited effects of arts-based interventions, predominantly when cultural or linguistic barriers limit engagement [43]. This underscores the need for cultural adaptation of teaching methods, which is crucial for efficacy across diverse populations.

Furthermore, this study's results contribute to the evolving body of evidence emphasizing that non-traditional educational strategies, like singing, can be effective adjuncts, especially for children with cognitive impairments who may struggle with conventional methods [44], [45]. In contrast, traditional lectures or visual aids, although useful, often lack the multisensory stimulation that makes methods like singing more memorable in special needs education.

The comparison reveals that while the direction of the effect aligns with extant research, the magnitude and sustainability of improvements depend on factors such as intervention intensity, cultural relevance, and individual differences. The current study's context-specific approach exemplifies the importance of tailoring interventions to the target population's needs, which is consistent with recent educational health literature [46].

C. Limitations, Weaknesses, and Implications of the Findings

Despite encouraging results, the study faces several limitations that warrant consideration. Firstly, the sample size was relatively small ($n=30$), confined to a single institution, which limits the generalizability of the findings across different populations and settings. Larger, multicenter studies are necessary to validate these results and account for variability in demographic and cultural factors [47].

Secondly, the duration of the intervention was limited to a two-week period, with follow-up assessments not conducted to determine long-term retention or behavioral changes. Longitudinal studies are essential to assess whether improvements in knowledge translate into sustained behavioral modification and improved oral health status [48].

Another weakness pertains to the scope of variables measured. The study primarily focused on knowledge rather than actual behavioral practices, such as the frequency and correctness of brushing teeth. Since knowledge does not always directly lead to behavioral change, future research should incorporate observational assessments and possibly biochemical indicators (e.g., plaque indices) to evaluate actual oral health outcomes [49].

Cultural and linguistic factors may also influence the effectiveness of the singing method. Songs used in this study were perhaps tailored to local language and cultural context, which means replicability in different settings might require

adaptation. Furthermore, children's individual differences, including cognitive level, motivation, and prior exposure to music, were not exhaustively examined, which could moderate intervention effectiveness [50].

From a pedagogical standpoint, reliance on a weekly schedule might be insufficient to sustain improvements over the long term, underscoring the need for integrating such methods systematically within broader health education programs. Teacher training and resource availability are additional considerations implementing the singing method on a larger scale requires capacity-building and resource allocation [51].

The implications of these findings are multifaceted. Primarily, they suggest that incorporating musical activities into oral health education can significantly enhance knowledge among children with intellectual disabilities. This approach aligns with the principles of inclusive and participatory education, offering a promising strategy to bridge gaps in health literacy. Policymakers should consider integrating arts-based methods into health promotion strategies, particularly for vulnerable groups, to improve health equity [52].

Furthermore, the study highlights the importance of culturally and developmentally appropriate education strategies. Future programs should focus on personalized and sustainable intervention models, ensuring such methods can be adapted, scaled, and integrated into existing curricula and health promotion policies. Additionally, continuous assessment and reinforcement mechanisms are necessary to facilitate long-term behavioral change, which ultimately translates into improved oral health status and quality of life for children with disabilities.

In conclusion, while the study demonstrates promising results for the singing method as an educational tool, further research exploring long-term impacts, behavioral outcomes, and broader applicability is essential. Emphasizing the development of comprehensive, culturally sensitive, and sustained intervention models will be critical in advancing oral health education among children with special needs.

V. CONCLUSION

In conclusion, this study was designed to evaluate the effectiveness of the singing method as an innovative educational approach to enhance the knowledge of tooth brushing among mentally disabled children at SLB Paedagogia Surabaya in 2023. The primary aim was to determine whether using songs could significantly improve the children's understanding of proper oral hygiene practices compared to conventional methods without any special intervention. Based on the analysis, the study revealed a notable increase in knowledge levels within the intervention group, where the proportion of children in the 'good' knowledge category rose dramatically from 0% before the intervention to 80% afterward. In contrast, the control group, which did not receive the singing method, showed minimal improvement, maintaining a high percentage (80%) in the 'less' knowledge category. The statistical findings support this outcome, as the Wilcoxon test in the intervention group produced a significant p-value of 0.001, and the Mann-Whitney test further confirmed a meaningful difference with a

p-value of 0.000, both well below the 0.05 threshold. These results demonstrate that integrating singing as a teaching strategy is effective and aligns with the cognitive and emotional characteristics of mentally disabled children who tend to respond better to engaging, artistic activities. Therefore, the application of the singing method should be considered as a complementary weekly program alongside supervised tooth brushing sessions at SLB Paedagogia Surabaya to maintain and further improve oral health awareness. Future research is recommended to explore additional variables, such as parental involvement, the role of caregivers, and the long-term behavioral impact of such methods, to develop more comprehensive strategies for sustaining good dental hygiene habits in this vulnerable population. Overall, this study provides evidence that tailored, creative educational methods can make a significant difference in empowering mentally disabled children to achieve better health outcomes through improved self-care knowledge.

ACKNOWLEDGEMENTS

The authors wish to express their sincere gratitude to the entire faculty and staff of the Dental Therapist Department, Poltekkes Kemenkes Surabaya, for their invaluable support throughout the research process. We would also like to extend our appreciation to the management, teachers, and students of SLB Paedagogia Surabaya for their cooperation and active participation. Special thanks to the Kedungdoro Health Center for their continuous assistance in oral health activities

FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

DATA AVAILABILITY

No datasets were generated or analyzed during the current study.

AUTHOR CONTRIBUTION

All authors contributed equally to the development and completion of this research paper. Dewi De Fatimah conceived the study design, coordinated data collection, and prepared the initial manuscript draft. I.G.A. Kusuma Astuti N.P and Bambang Hadi Sugito assisted with data analysis, interpretation, and critical revision of the manuscript. Silvia Prasetyowati contributed to the literature review, methodology refinement, and final proofreading. All authors read and approved the final version of the manuscript.

DECLARATIONS

ETHICAL APPROVAL

The authors declare that there is no conflict of interest regarding the publication of this paper. This study received ethical approval from the Health Research Ethics Commission of the Ministry of Health Surabaya Health Polytechnic (EA/1382/KEPK-Poltekkes_Sby/V/2023). All procedures performed were in accordance with relevant guidelines and

regulations. Informed consent was obtained from the guardians of all participants involved in this study.

CONSENT FOR PUBLICATION PARTICIPANTS.

Consent for publication was given by all participants

COMPETING INTERESTS

The authors declare no competing interests.

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