

The Use of Puzzle Media on the Knowledge of Toothbrushing Techniques in Children with Intellectual Disabilities

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ARTICLE INFORMATION	ABSTRACT
<i>Article History:</i> <i>Received: May 1, 2025</i> <i>Revised: May 29, 2025</i> <i>Published: May 31, 2025</i> Keywords: Knowledge Puzzle Media Toothbrushing Techniques Children with Intellectual Disabilities	Children with intellectual disabilities often experience limitations in cognitive and motor functions, behavioral and muscular disorders, gag reflexes, and uncontrolled body movements. These conditions hinder their ability to perform optimal toothbrushing, which negatively affects their oral and dental health. Oral health education, particularly regarding proper toothbrushing practices, can serve as a solution to address these challenges. This study aimed to determine the effect of puzzle media on the knowledge of toothbrushing techniques among children with intellectual disabilities at SLB B-C Optimal Surabaya. A true experimental design with a pretest-posttest control group approach was employed, involving 34 students divided into intervention and control groups. Data were collected using a structured questionnaire. The data were analyzed using the Wilcoxon signed-rank test and the Mann–Whitney U test. The results showed a statistically significant difference with an Asymp. Sig. (2-tailed) value of 0.001, indicating a significance level below α (0.05). The findings suggest that the use of puzzle media has a significant effect on improving the knowledge of toothbrushing techniques among children with intellectual disabilities at SLB B-C Optimal Surabaya.

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INTRODUCTION

Oral and dental health is closely related to overall bodily health. Proper dental and oral care is a crucial component in maintaining general health balance. The oral cavity not only plays a role in the initial stages of digestion but also serves as an early indicator of an individual's overall health status. Therefore, healthy teeth and a mouth are often considered indicators of one's general physical hygiene and well-being (Sutomo et al., 2020).

Nevertheless, oral and dental health problems remain a persistent challenge in Indonesia. Data from the Ministry of Health of the Republic of Indonesia (2018) indicate that 57.6% of the population experienced some form of oral or dental health issue (Badan Penelitian dan Pengembangan Kesehatan, 2019). Although 94.7% of Indonesians report brushing their teeth daily, only 2.8% brush correctly twice a day—after breakfast and before bedtime (Badan

Penelitian dan Pengembangan Kesehatan, 2019). This low percentage of proper brushing behavior contributes significantly to the high prevalence of oral and dental problems.

Children with intellectual disabilities represent a group with special needs characterized by significant limitations in intellectual and adaptive functioning from early developmental stages, typically before the age of 22. These limitations hinder their ability to adapt to their environment and to carry out personal care activities, including maintaining oral hygiene. Cognitive and motor impairments, as well as uncontrolled behavior, make it difficult for them to brush their teeth properly and independently, thereby increasing their risk of developing oral health issues (Istanto, Widyagdo, & Fratiwi, 2023; Dewi, Sugito, & Putri, 2022). A study by Novani, Hadi, and Mahirawatie (2023) found that 48.5% of children with mild intellectual disabilities at SLB B-C Optimal Surabaya had poor toothbrushing habits.

In the context of oral health education for children, the use of appropriate learning media significantly affects the success of information delivery. Educational tools that are engaging—such as puzzles—can help enhance attention, motivation, and fine motor skills among children with intellectual disabilities (Ke, & Abras, 2013; Dandashi et al., 2015). Puzzles not only make the learning process enjoyable but also improve the focus and engagement of children during learning activities (Itryah & Arinda, 2023; Sandat & Wedayanthi, 2024). This medium has been used in various health education programs to reinforce and clarify messages, including those related to oral hygiene (Pay et al., 2023).

The novelty of this study lies in the utilization of puzzle media as an interactive and enjoyable educational tool to improve toothbrushing knowledge among children with intellectual disabilities—an approach that has not been widely implemented systematically in special education settings. The objective of this study is to determine the effectiveness of puzzle media in improving knowledge of proper toothbrushing techniques among children with intellectual disabilities at SLB B-C Optimal Surabaya.

METHOD

This study employed a true experimental design with a pretest-posttest with control group approach. This study was conducted at SLB B-C Optimal, located at Jl. Wardoyo No. 12, behind the TNI AL Kenjeran Complex, Sukolilo Subdistrict, Bulak District, Surabaya City. The research was carried out from January to July 2024. The population consisted of all children with mild intellectual disabilities at SLB B-C Optimal Surabaya, totaling 34 participants.

Data collection was performed through pretests and posttests using a structured questionnaire as the primary research instrument. The data on toothbrushing knowledge were obtained from both the intervention and control groups before and after the treatment. The Wilcoxon signed-rank test was used to analyze differences in knowledge within each group, while the Mann–Whitney U test was used to compare the posttest results between the intervention and control groups. This study was conducted in accordance with ethical principles and ethical approval obtained from the Health Research Ethics Committee of the Surabaya Ministry of Health Polytechnic No. EA/3041/KEPK-Poltekkes_Sby/V/2024.

RESULTS AND DISCUSSION

Table 1. Distribution of Respondents According to Characteristics of Children with Intellectual Disabilities at SLB B-C Optimal Surabaya.

Characteristics	n	%
Gender		
Male	22	64.7
Female	12	35.3
Age		
7-15 years old	28	82.4
16-20 years old	4	11.8
21-33 years old	2	5.8
Education		
Kindergarten (TK)	1	2.9

Characteristics	n	%
Elementary school (SD)	17	50.0
Junior high school (SMP)	10	29.4
Senior high school (SMA)	6	17.6

Based on Table 1, it is shown that the majority of children with intellectual disabilities were male, accounting for 64.7%. In terms of age characteristics, most participants were between 7 and 15 years old (82.4%), while the smallest age group was 21 to 33 years old (5.8%). Regarding educational level, the majority were at the elementary school level (50%), while the smallest proportion was at the kindergarten level (2.9%).

Table 2. Frequency Distribution of Toothbrushing Knowledge Levels Among Children with Intellectual Disabilities in the Control Group at SLB B-C Optimal Surabaya.

Level of Knowledge	Before		After	
	n	%	n	%
Good	0	0	0	0
Fair	1	5.9	2	11.8
Poor	16	94.1	15	88.2
Total	17	100	17	100

Based on Table 2, the level of toothbrushing knowledge among respondents in the control group before the intervention was mostly in the "poor" category, accounting for 94.1%. The "fair" category accounted for 5.9%, while none of the respondents (0%) were in the "good" category.

Table 3. Frequency Distribution of Toothbrushing Knowledge Levels Among Children with Intellectual Disabilities in the Intervention Group at SLB B-C Optimal Surabaya.

Level of Knowledge	Before		After	
	n	%	n	%
Good	0	0	15	88.2
Fair	3	17.7	1	5.9
Poor	14	82.3	1	5.9
Total	17	100	17	100

Based on Table 3, the level of toothbrushing knowledge among respondents in the intervention group before the intervention was mostly in the "poor" category (82.3%), followed by the "fair" category (17.7%), and none were in the "good" category (0%). After the intervention, most respondents in the intervention group were in the "good" category (88.2%), while 5.9% were in the "fair" category and 5.9% remained in the "poor" category.

Table 4. Wilcoxon Test Results Before and After in the Control Group.

Variable	Category			p-value
	Good	Fair	Poor	
Before	0	1	16	0.317
After	0	2	15	

Based on Table 4, the Asymp. Sig. (2-tailed) the value was 0.317, which is greater than 0.05. Therefore, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected, indicating that there was no significant difference in toothbrushing knowledge before and after the intervention in the control group.

Table 5. Wilcoxon Test Results Before and After in the Intervention Group.

Variable	Category			p-value
	Good	Fair	Poor	
Before	0	3	14	0.001
After	15	1	1	

Based on Table 5, the Asymp. Sig. (2-tailed) The value was 0.001, which is less than 0.05. Therefore, the alternative hypothesis (H_1) is accepted and the null hypothesis (H_0) is rejected, indicating a significant difference in toothbrushing knowledge before and after the intervention using puzzle media as an educational tool.

Table 6. Mann–Whitney Test Results After the Intervention in the Control and Intervention Groups.

Group	Mann Whitney	
	p	α
Intervention	0,001	0.05
Control		

Based on Table 6, it is evident that the significance level (α) is 0.05 and the p-value is 0.001 ($0.001 < 0.05$), indicating that the use of puzzle media had a significant effect on the knowledge of toothbrushing techniques in the intervention group compared to the control group at SLB B-C Optimal Surabaya.

DISCUSSION

Based on data analysis from the control group, it was found that there was no significant increase in toothbrushing knowledge between the pre-test and post-test. This is attributed to the fact that the control group did not receive any form of intervention, such as educational counseling or learning media. Most children with intellectual disabilities in this group demonstrated low levels of knowledge both before and after the intervention. These findings are consistent with a study by De Fatimah et al. (2023), which reported that children with intellectual disabilities exhibited low knowledge levels prior to receiving dental health education. Similarly, Pudentiana (2021) found no significant improvement in toothbrushing knowledge between the pre-test and post-test in the control group.

Conversely, in the intervention group that received education on proper toothbrushing techniques using puzzle media, a significant improvement in knowledge was observed. Statistical analysis showed a meaningful difference in knowledge scores before and after the intervention. This indicates that the use of puzzle media as an educational tool can enhance children's understanding of proper toothbrushing techniques. These results align with research by Sihombing, Rosma, and Realita (2020), which demonstrated increased knowledge after implementing health education using puzzle media. Similarly, Herawati et al. (2022) reported that educational games such as puzzles effectively improve children's health knowledge.

The greater improvement in the intervention group compared to the control group highlights the effectiveness of puzzle media in delivering health information to children with intellectual disabilities. Puzzle games are considered engaging and able to foster active participation while preventing boredom during the learning process. This is supported by Hidayah (2023), who stated that puzzle-based media facilitate learning through visual and kinesthetic involvement, thus enhancing knowledge retention. Dental health education using puzzle media significantly impacted the knowledge and behavior of elementary school students (Nurizza et al., 2022; Ulliana et al., 2025).

Health education plays a critical role in increasing public awareness and understanding of healthy lifestyle behaviors. According to Erika and Fitri (2021), health education aims to empower individuals by improving their knowledge and skills to make informed health decisions. In the context of children with intellectual disabilities, the appropriate choice of media—such as puzzles—is essential, as these children tend to learn more effectively through concrete objects and direct experiences (Daniati, Apriliani, & Anang, 2022). Puzzle media aid in visualizing abstract concepts, enhancing fine motor coordination (Risnawati, Wibowo, & Bahar, 2019), and creating an enjoyable and interactive learning environment (Marzuki, et al., 2023).

This study has several limitations. First, the limited number of respondents ($n=34$) may restrict the generalizability of the findings to the broader population of children with intellectual disabilities. Second, the relatively short duration of the intervention may not be sufficient to

assess long-term retention of knowledge. Third, knowledge was assessed using closed-ended questionnaires only, without direct observation of actual toothbrushing practices, which may not fully reflect behavioral changes. Future studies are recommended to adopt a longitudinal design, include a larger sample size, and incorporate observational methods to assess actual behavioral outcomes.

CONCLUSION

It can be concluded that this study demonstrates the influence of using puzzle media on the knowledge of toothbrushing among children with intellectual disabilities at SLB B-C Optimal Surabaya. Therefore, puzzle media can be utilized as a learning tool in subjects at special education schools (SLB) to encourage students to learn through play. Further research is recommended to compare puzzle media with other forms of educational media (such as animated videos, interactive posters, or digital games) to determine the most effective learning method for children with special needs.

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