



Effectiveness of the Spinning Wheel Game on Dental Caries Knowledge among Elementary School Students

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ARTICLE INFORMATION	ABSTRACT
<i>Article History:</i> <i>Received: April 20, 2026</i> <i>Revised: May 16, 2026</i> <i>Published: May 30, 2026</i> Keywords: Spinning Wheel Game Dental Caries Knowledge	Dental caries remains one of the most prevalent oral health problems among elementary school children. Limited knowledge regarding the causes and prevention of dental caries contributes to an increased risk of its occurrence, highlighting the need for educational media that are engaging, interactive, and appropriate for children's developmental characteristics. This study aimed to evaluate the effectiveness of the spinning wheel game in improving dental caries knowledge among fourth-grade students at SD Inpres Kaniti. A pre-experimental study employing a one-group pretest-posttest design was conducted. The study included 66 students selected through total sampling. Knowledge levels were assessed using a structured questionnaire administered before and after the educational intervention delivered through the spinning wheel game. Data were analyzed using the Wilcoxon Signed-Rank Test with a significance level of 5%. The results showed that the mean knowledge score increased from 47.26 at pretest to 78.92 at posttest, representing an improvement of 31.66 points. Furthermore, the proportion of students with a good level of knowledge increased to 85.0% following the intervention. The Wilcoxon Signed-Rank Test revealed a statistically significant difference between pretest and posttest knowledge scores ($Z = -6.936$, $p < 0.001$). In conclusion, the spinning wheel game was effective in improving dental caries knowledge among elementary school students. This educational medium has the potential to serve as an innovative, interactive, and enjoyable approach to oral health education, thereby supporting school-based oral health promotion programs.

INTRODUCTION

Oral health is an essential component of overall health and well-being, significantly influencing an individual's quality of life, particularly among school-aged children (Kassebaum et al., 2017; Garcia-Perez et al., 2022; Boodai et al., 2023; Alautry et al., 2024; Duan et al., 2025; Klarić Puđa et al., 2025). According to the World Health Organization, dental caries remains one of the most prevalent chronic diseases affecting children worldwide (World Health Organization, 2022). Untreated dental caries can lead to pain, infection, difficulty eating, sleep disturbances, and impaired concentration, ultimately affecting children's academic performance and overall development. These consequences highlight oral diseases as a persistent global public health concern and emphasize the importance of implementing preventive and promotive interventions from an early age (Hidayah, Hidayat, & Siswati, 2021; Husna et al., 2024).

In Indonesia, the prevalence of dental caries among school-aged children remains high. The National Basic Health Research reported that dental caries continues to be highly prevalent among school-age populations, while public awareness and utilization of dental care services remain inadequate (Badan Penelitian dan Pengembangan Kesehatan, 2019). Limited knowledge regarding the causes, prevention, and maintenance of oral health is one of the major factors contributing to the high incidence of dental caries in children. According to Notoatmodjo (2018), knowledge is a predisposing factor that plays a fundamental role in shaping individual health behaviors. Insufficient understanding of oral health often results in children failing to adopt proper toothbrushing habits, including brushing at the recommended times and using the correct technique. Therefore, oral health education should be introduced early as a key promotive and preventive strategy to reduce the burden of dental caries.

Previous studies have demonstrated that interactive learning media are more effective in improving health-related knowledge than conventional lecture-based approaches. Elementary school children are more likely to understand and retain information when learning activities incorporate elements of play, making the educational process more engaging, enjoyable, and meaningful (Rahmawati et al., 2023). One educational medium with considerable potential is the spinning wheel game, which integrates game-based activities, question-and-answer sessions, visual elements, and group discussions to encourage active student participation during the learning process (Aisyah & Latifa, 2023). Furthermore, educational games have been shown to enhance learning motivation, student engagement, and comprehension of health-related topics (Patil et al., 2024).

Despite these promising findings, evidence regarding the use of the spinning wheel game as an oral health education medium, particularly for improving knowledge of dental caries among elementary school students, remains limited. Most previous studies have focused on audiovisual media, animated videos, leaflets, booklets, or other educational games for oral health promotion. In contrast, the spinning wheel game has been more frequently applied in general health education, nutrition, and clean and healthy lifestyle promotion rather than oral health education. Consequently, empirical evidence supporting its effectiveness in improving dental caries knowledge among elementary school children is still insufficient. Furthermore, studies investigating this educational approach among elementary school students in Kupang Regency are scarce. This gap highlights the need for further research evaluating the effectiveness of the spinning wheel game as an innovative oral health education medium for school-aged children.

Preliminary observations conducted at SD Inpres Kaniti revealed that many fourth-grade students had limited knowledge regarding the causes of dental caries, foods that contribute to tooth decay, and the appropriate timing and technique for toothbrushing. In addition, oral health education activities at the school were infrequent and had not incorporated innovative learning media tailored to the developmental characteristics of elementary school children. These findings indicate the need for educational approaches that are engaging, interactive, and easy for children to understand, thereby facilitating more effective delivery of oral health messages. Addressing both the identified research gap and the local educational needs, this study introduces the spinning wheel game as an innovative educational medium that integrates play,

competition, and learning into an enjoyable classroom activity. The novelty of this study lies in its application of the spinning wheel game as an oral health education intervention to improve dental caries knowledge among elementary school students in Kupang Regency. Therefore, this study aimed to evaluate the effectiveness of the spinning wheel game in improving dental caries knowledge among fourth-grade students at SD Inpres Kaniti, Kupang Regency.

METHOD

This study employed a pre-experimental design using a one-group pretest–posttest approach. The study was conducted at SD Inpres Kaniti, Kupang Regency, Indonesia, in May 2025. The study population comprised all fourth-grade students enrolled at the school, totaling 66 participants. A total sampling technique was employed, whereby all students who met the inclusion criteria were recruited as study participants.

Data on dental caries knowledge were collected using a structured questionnaire consisting of 10 multiple-choice questions. Prior to data collection, the questionnaire was tested for validity and reliability among respondents with characteristics comparable to those of the study population and was confirmed to be valid and reliable.

Before the study commenced, written informed consent was obtained from the parents or legal guardians of all participants. Baseline knowledge of dental caries was assessed using a pretest administered before the intervention. The educational intervention consisted of an oral health education session delivered through a spinning wheel game and lasted approximately 30 minutes. Immediately after the intervention, participants completed the same questionnaire as a posttest to assess changes in their knowledge.

Descriptive statistics were used to summarize participants' characteristics and knowledge scores. Inferential analysis was performed using the Wilcoxon Signed-Rank Test to compare pretest and posttest knowledge scores. Statistical significance was set at $p < 0.05$ with a 95% confidence level.

This study received ethical approval from the Health Research Ethics Committee of Poltekkes Kemenkes Kupang (Komite Etik Penelitian Kesehatan, KEPK) under Ethical Approval No. LB.02.03/1/0012/2024.

RESULTS AND DISCUSSION

Table 1. Characteristics of Respondents by Gender (n = 66).

Gender	n	%
Female	41	62.1
Male	25	37.9
Total	66	100

Table 1 shows that the majority of respondents were female, accounting for 41 students (62.1%), while male respondents numbered 25 (37.9%).

Table 2. Distribution of Dental Caries Knowledge Levels Before and After the Spinning Wheel Game Intervention (n = 66).

Knowledge Level	Score	Before Intervention n (%)	After Intervention n (%)
Good	68–100	20 (30.5)	56 (85.0)
Moderate	34–67	20 (30.5)	10 (15.0)
Poor	0–33	26 (39.0)	0 (0.0)
Total		66 (100)	66 (100)

Table 2 shows an improvement in students' dental caries knowledge following the educational intervention using the spinning wheel game. Before the intervention, the largest proportion of students had a poor level of knowledge (26 students, 39.0%), while only 20 students (30.5%) demonstrated a good level of knowledge. Following the intervention, the distribution of knowledge levels improved considerably. The proportion of students with good knowledge increased to 56 (85.0%), whereas the number of students with moderate knowledge decreased to 10 (15.0%), and no students remained in the poor knowledge category. These

findings indicate that the spinning wheel game effectively improved dental caries knowledge among elementary school students.

Table 3. Wilcoxon Signed-Rank Test Results for Dental Caries Knowledge Before and After the Spinning Wheel Game Intervention.

Variable	n	Mean Rank	Sum of Ranks	Z	p-value
Negative Ranks	1	6.50	6.50		
Positive Ranks	63	32.91	2073.50	-6.936	<0.001
Ties	2	–	–		
Total	66				

Table 3. The Wilcoxon Signed-Rank Test revealed that 63 students experienced an increase in their knowledge scores following the intervention, while only one student showed a decrease and two students had no change in their scores. The test yielded a Z value of -6.936 with $p < 0.001$, indicating a statistically significant difference between pre-intervention and post-intervention knowledge scores. These findings demonstrate that the spinning wheel game was effective in significantly improving dental caries knowledge among elementary school students.

This study investigated the effectiveness of the spinning wheel game in improving dental caries knowledge among fourth-grade students at SD Inpres Kaniti, Kupang Regency. The findings demonstrated that the spinning wheel game was effective in increasing students' knowledge of dental caries. As presented in Table 2, the study population consisted predominantly of female students (62.1%), whereas male students accounted for 37.9% of the participants. Theoretically, gender differences may influence responses to health education, as previous studies have suggested that female students tend to show greater concern for health-related issues and are generally more receptive to educational interventions (Damopolii et al., 2025). Nevertheless, knowledge improved consistently across participants in the present study, suggesting that the effectiveness of the spinning wheel game was not substantially influenced by gender.

The baseline findings presented in Table 1 indicate that, prior to the intervention, most students had a poor level of knowledge regarding dental caries (39.0%). This result suggests that students' initial understanding of the causes and prevention of dental caries was inadequate. Similar findings have been reported in previous studies, which identified limited oral health knowledge among elementary school children as an important contributing factor to the high prevalence of dental caries (Patil et al., 2024). Low baseline knowledge may be attributed to the limited use of engaging educational approaches and the lack of interactive learning media appropriate for the developmental characteristics of elementary school children (Amran et al., 2026). Other studies have likewise demonstrated that game-based educational media are more effective than conventional teaching methods in improving children's oral health knowledge (Afifah et al., 2026).

The statistical analysis revealed that the spinning wheel game produced a significant improvement in students' knowledge of dental caries. The Wilcoxon Signed-Rank Test showed a statistically significant difference between pre-intervention and post-intervention knowledge scores ($p < 0.05$). A total of 63 students demonstrated improved knowledge scores, as reflected by the predominance of positive ranks, whereas only one student experienced a decrease in score and two students showed no change. These findings indicate that the spinning wheel game is an effective educational medium for improving dental caries knowledge among elementary school students. This result is consistent with recent evidence showing that game-based learning enhances student engagement and learning outcomes, particularly in health education settings (Chen et al., 2025).

From the perspective of learning theory, the observed improvement in knowledge can be explained through the principles of active learning and constructivism, whereby students actively construct knowledge through direct learning experiences (Freeman et al., 2014). Rather than merely delivering information, the spinning wheel game encourages interaction, problem-solving, immediate feedback, and healthy competition, thereby stimulating students'

cognitive engagement throughout the learning process. Such active participation promotes deeper information processing and enhances knowledge retention. These findings are supported by Alotaibi (2024), who reported that interactive game-based educational media improve children's understanding by simultaneously engaging cognitive, affective, and psychomotor domains.

Although the intervention resulted in a significant improvement in knowledge, these findings should be interpreted within a broader behavioral context. Increased knowledge alone does not necessarily lead to sustained improvements in oral health behaviors unless reinforced by supportive environmental factors, consistent practice, and continuous educational support. Therefore, educational interventions such as the spinning wheel game should not be implemented as one-time activities but rather integrated into routine school health education programs with active involvement from teachers and parents. This interpretation is consistent with the findings of Ompusunggu and Achdiani (2025), who emphasized that continuous health education programs are essential for achieving long-term behavioral change.

The findings of this study have important practical implications for the development of school-based oral health promotion strategies. The spinning wheel game may serve as an innovative educational medium within the School Dental Health Program (*Usaha Kesehatan Gigi Sekolah* [UKGS]). Beyond improving students' knowledge, this interactive learning medium has the potential to increase learning motivation, sustain students' attention, and promote active participation during classroom activities. These findings are consistent with those reported by Sukini et al. (2022), who concluded that game-based educational media are more effective than conventional teaching methods because they create an enjoyable, engaging, and interactive learning environment.

The findings suggest that game-based learning media such as the spinning wheel game represent a promising approach for strengthening oral health education among elementary school children. This educational medium provides an engaging and interactive learning experience that facilitates students' understanding of dental caries while remaining relatively simple and cost-effective to implement. Consequently, it has considerable potential for adoption in school settings, including those with limited educational resources, to support sustainable oral health promotion initiatives.

CONCLUSION

This study demonstrated that the spinning wheel game was effective in improving dental caries knowledge among fourth-grade students at SD Inpres Kaniti, Kupang Regency. The findings suggest that this game-based educational medium can serve as an engaging, interactive, and effective tool for delivering oral health education in elementary schools, particularly within the School Dental Health Program (*Usaha Kesehatan Gigi Sekolah* [UKGS]). Incorporating the spinning wheel game into routine school-based oral health promotion activities may enhance students' participation and facilitate knowledge acquisition in an enjoyable learning environment.

Schools and healthcare professionals are encouraged to integrate the spinning wheel game into oral health education and promotion programs to improve children's awareness of dental caries prevention. Future research should evaluate the long-term effects of this intervention on oral health behaviors and clinical outcomes, as well as compare its effectiveness with other educational media using more rigorous study designs, such as randomized controlled trials, to strengthen the evidence for game-based oral health education among elementary school children.

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