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THE EFFECT OF DIGITAL SPINNING WHEEL GAME ON DENTAL AND ORAL HEALTH KNOWLEDGE AMONG STUDENTS OF SMP NEGERI 8 BENGKULU CITY

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Abstract

Dental caries is one of the most common health problems among school-aged children, which can negatively affect comfort, learning concentration, and overall quality of life. This condition is generally caused by low knowledge and poor habits in maintaining oral and dental hygiene. Children often lack awareness of the importance of regular oral care, making it necessary to implement innovative, engaging, and interactive educational methods, such as digital game- based learning. This study employed an action research approach combined with a pre- experimental design using a one-group pretest–posttest method. The sample consisted of 34 randomly selected students, with data collected using a 20-item questionnaire that had been tested for validity and reliability. The intervention involved the use of a digital spin wheel game supported by a manual book as a learning guide. The results showed a significant improvement in students' knowledge after the intervention, with a Wilcoxon Signed-Rank Test result of $p = 0.000$ ($p < 0.05$). These findings indicate that the digital spin wheel game is an effective educational medium. It is expected to serve as an inspiring learning tool and is recommended for use in school-based health promotion programs.

Keywords: Digital Spinning Wheel Game, Oral Health, Knowledge, School Children, Health Education

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INTRODUCTION

Oral and dental health is an integral part of overall well-being and plays a vital role in children's growth and nutritional adequacy. Among school-aged children, dental caries remains one of the most prevalent oral health problems, which, if left untreated, can lead to pain, infection, and chewing difficulties. According to the World Health Organization (2022), approximately 3.5 billion people worldwide suffer from dental caries, including 514 million cases in primary teeth. In Indonesia, the prevalence of dental caries reaches 82.8%, and among children aged 10–14 years, it is 63.8%. In Bengkulu Province, oral and dental health problems affect 43.6% of school students, with dental caries being the most dominant issue.

The high prevalence of dental caries is closely associated with children's limited knowledge of oral hygiene. Friadi (2021) found that 82.2% of children had low levels of understanding regarding oral and dental health, while Fafiana (2023) reported 56%, and a study in Surabaya (2020) found 54%.

Insufficient knowledge contributes to poor oral health behaviors, such as frequent consumption of cariogenic foods, improper toothbrushing techniques, and brushing at inappropriate times. Hence, educational interventions that are engaging, interactive, and motivational are urgently needed to improve children's awareness and behavior toward oral health.

Game-based health promotion media, such as the spinning wheel, have been shown to enhance student engagement and make learning more enjoyable (Anggraini et al., 2021). Recent innovations have adapted such games into digital formats, making them more practical, accessible, and compatible with the lifestyle of children in the digital era (Mohamad et al., 2020). Supported by Edgar Dale's Cone of Experience Theory, interactive learning media can improve knowledge retention by up to 90% through direct experience. Previous research has also demonstrated the effectiveness of game-based media in increasing knowledge across health and educational contexts (Subakti, 2024; Nuzulia & Zain, 2020).

Therefore, this study aims to examine the effect of the digital spinning wheel game on students' knowledge of oral and dental health at SMP Negeri 8 Bengkulu City. The findings are expected to contribute to the development of effective and engaging digital game-based educational tools for school-based health promotion programs.

METHODS

This study employed a quantitative approach with a pre-experimental design, using a one-group pretest–posttest method. This design was applied to evaluate changes in students' knowledge before and after the intervention conducted through a digital spinning wheel game accompanied by a guidebook. The study was carried out at SMP Negeri 8 Bengkulu City, which is under the working area of Puskesmas Lingkar Barat, from May 27 to June 3, 2025.

The population of this study consisted of all seventh-grade students (n = 228). A sample of 34 students was selected using a simple random sampling technique, chosen from those who scored below 6 on the preliminary knowledge assessment. The inclusion criteria included students who were willing to participate, present during the study period, and capable of using devices to play the digital game. No specific exclusion criteria were applied.

The independent variable in this study was the digital spinning wheel game, while the dependent variable was students' knowledge of oral and dental health. The instrument used was a questionnaire consisting of 20 items, which had been tested for validity (correlation value > 0.514) and reliability (Cronbach's alpha = 0.922). The intervention was implemented by first distributing the guidebook, followed by having students scan a barcode to access the digital game. Each student spun the wheel 20 times within one hour, and each question that appeared was immediately discussed together.

Primary data were obtained through questionnaires, while secondary data were collected from the Bengkulu City Health Office. Data analysis was conducted using univariate analysis to describe the distribution of knowledge scores and bivariate analysis using the Wilcoxon Signed-Rank Test, since the Shapiro–Wilk normality test indicated that the data were not normally distributed.

This study received ethical approval from the Health Research Ethics Committee of Poltekkes Kemenkes Bengkulu, with approval number No. KEPK.BKL/114/02/2025.

RESULTS AND DISCUSSION

The results of this study revealed that the main factors contributing to dental caries among students at SMP Negeri 8 Bengkulu City were predominantly associated with improper toothbrushing time and incorrect brushing techniques. Based on the pre-test findings, as many as 88.2% of respondents reported brushing their teeth at inappropriate times—specifically, they did not brush after breakfast and before bedtime, which are the ideal times recommended by oral health authorities such as the World Health Organization (WHO) and the Indonesian Ministry of Health. This behavior suggests that although most students are familiar with the importance of brushing, they lack consistency in applying correct brushing schedules as part of their daily routine.

Further analysis indicated that the incorrect toothbrushing technique was another major cause, affecting 76% of the respondents who were found to apply ineffective brushing methods. Common errors included brushing too briefly (less than two minutes), failing to reach posterior teeth or the gumline, using horizontal scrubbing motions instead of gentle circular movements, and neglecting to replace toothbrushes regularly. These poor techniques prevent the complete removal of plaque, which leads to the accumulation of bacteria and ultimately increases the risk of caries formation. The data clearly demonstrate that students' knowledge and practical skills related to proper toothbrushing remain insufficient, making it a dominant behavioral risk factor for the high prevalence of dental caries in the school environment.

In addition to brushing behavior, the frequent consumption of cariogenic foods and beverages—including candies, chocolates, carbonated soft drinks, and other sugary snacks—was identified as the second most influential factor contributing to caries development. This dietary pattern is highly prevalent among adolescents, particularly in school settings where sweet snacks are easily accessible and often consumed during breaks. Unfortunately, these eating habits are rarely followed by adequate oral hygiene practices such as rinsing or brushing after eating. The continuous exposure of teeth to fermentable carbohydrates facilitates acid production by bacteria such as *Streptococcus mutans*, leading to enamel demineralization and cavity formation.

These findings are consistent with previous research, such as the study by Wahyu Fitriani (2023), which reported that nearly half of the respondents practiced improper brushing habits that contributed to increased caries rates. Similarly, Rustono et al. (2023) and Rivalina et al. (2022) found a significant correlation between incorrect brushing techniques and the incidence of dental caries among school-aged children. Furthermore, Risviany et al. (2021) emphasized that the consumption of cariogenic foods serves as a major etiological factor, aligning with the theoretical framework proposed by Tonglo & Maramis (2021), who noted that diets rich in sugar and poor oral hygiene collectively accelerate enamel demineralization and caries progression.

In addition, the present findings resonate with studies by Billa et al. (2023) and Kasih Putri Halawa (2023), which confirmed that low levels of oral health knowledge, coupled with inadequate brushing habits, significantly elevate the risk of dental caries among children and adolescents. Taken together, these results underscore the urgent need for comprehensive oral health education that not only informs students about proper brushing times and techniques but also promotes healthy dietary habits. Such interventions, particularly those utilizing interactive media such as digital spinning wheel games, have the potential to increase engagement, enhance learning outcomes, and ultimately reduce the prevalence of dental caries in the school environment.

Table 1. Risk Factors Contributing to Dental Caries among Students at SMP Negeri 8 Bengkulu City

Causes	**N**	**Frequency**
Foods and Sweet Drinks (Containing Cariogenic Substances)	34	18
Toothbrushing Time	34	30
Toothbrushing Technique	34	8

Figure 1. Pre-Design of the Digital Spinning Wheel Game

Figure 2. Pre-Design of the Manual Book Digital Spinning Wheel Game

In order to address these issues, this study developed a pre-design and design of an interactive digital spinning wheel game, accompanied by a manual book containing technical guidelines, educational materials, and instructions for effective use of the game. The pre-design phase included concept planning and initial sketches tailored to the characteristics of school-aged children, while the final design combined engaging visual elements and interactivity to enable students to learn about dental and oral health through enjoyable activities. The presence of the manual book allows teachers or facilitators to provide appropriate guidance during the use of the media.

The research instrument used in this study consisted of 20 questions covering topics such as dental caries, plaque, mouth ulcers, and proper toothbrushing techniques. According to Safitri (2023), knowledge is the result of a person's understanding after perceiving information through the senses, while Adam et al. (2022) emphasized that increasing knowledge can alter perceptions, habits, and shape behavior. Experience also plays an important role, as explained by Yulia Fifiana et al. (2023) and Wibowo et al. (2021), stating that interaction with the environment and participation in educational activities can broaden individual insight.

This is supported by Edgar Dale's Cone of Experience Theory, which suggests that learning based on concrete experiences tends to be more memorable. Kusumadani et al. (2022) further explained that habits at home also influence children's level of knowledge, particularly regarding dental care. In line with Anggraini et al. (2021), the spinning wheel media significantly improved students' knowledge scores because it encourages active participation and creates a fun learning atmosphere.

Statistical tests revealed a p-value = 0.000 ($p < 0.05$), indicating a significant effect of the digital spinning

wheel game on students' knowledge. These findings are consistent with Simanjuntak & Andayani (2022), who reported increased student knowledge after interventions using spinning wheel media, and with Kusumadani et al. (2022), who confirmed the essential role of learning media in successful health promotion.

The digital spinning wheel media used in this study was designed to resemble a circle divided into several segments, each containing specific educational content. When the wheel is spun and stops on a segment, students focus on that topic. This design is supported by Aulia et al. (2024) and Siregar et al. (2021), who stated that interactive media can optimally enhance students' interest, motivation, and understanding.

CONCLUSION

This study revealed that the main causes of dental caries among students at SMP Negeri 8 Bengkulu City were improper toothbrushing time and incorrect brushing techniques, exacerbated by high consumption of cariogenic foods. The low level of students' knowledge regarding dental and oral health care contributed significantly to the high incidence of caries in the school environment.

The development of a digital spinning wheel game accompanied by an interactive manual book proved effective in significantly increasing students' knowledge, with an average score improvement of 40.15 points after the intervention. These findings indicate that engaging and interactive learning media, tailored to students' characteristics, can serve as an effective educational strategy for promoting dental and oral health.

However, this study was limited by the absence of a control group, its focus on knowledge alone, and the use of a closed- ended questionnaire. Future research is recommended to employ an experimental design, consider behavioral variables, and use more exploratory instruments for deeper analysis.

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DECLARATION OF INTEREST STATEMENT

The authors declare that they have no conflict of interests.

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