

The Effect of Nutrition Counseling with Puzzle Media on Knowledge and Attitudes about Nutrition and Snack Foods among Students of SMP Negeri 8 Banda Aceh

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ABSTRACT

This study aimed to determine the effect of nutrition education using puzzles on knowledge and attitudes about nutrition and snack foods among students at SMP Negeri 8 Banda Aceh. This study was a quasi-experimental study with a one-group pretest–posttest design. The sample size was 144 eighth-grade students selected using stratified random sampling and simple random sampling. The research instruments were questionnaires, puzzles, and Power Point slides. Data analysis used the Wilcoxon signed-rank test. The results showed that the majority of respondents were 13 years old, totaling 75 students (52%), and 75 students were female. Before the intervention, 26 students (18.1%) had good knowledge about nutrition, and after the intervention, this number increased to 105 students (72.9%).

INTRODUCTION

Adolescence is a transitional period characterized by rapid growth, high nutritional needs, and behavioral changes. During this stage, adolescents begin to develop independence in food choices, which are often influenced by peers, media, and environmental factors. Inappropriate nutrition during adolescence can lead to long-term health consequences, including obesity, micronutrient deficiencies, and poor academic performance. According to the 2023 Indonesian Health Survey (SKI), 12.1% of adolescents aged 13-15 years were overweight, while 4.1% were obese. The double burden of malnutrition, characterized by both undernutrition and overnutrition, remains a health problem in Indonesia.

Teenagers' snack consumption patterns play a significant role in shaping overall nutritional quality. Many school-age children tend to consume snacks that are high in calories, sugar, and fat but low in nutrients. This habit is often exacerbated by a lack of nutritional knowledge and a disregard for healthy eating patterns.

Nutrition counseling is one way to educate schoolchildren about nutrition and snack foods. However, conventional lecture-based counseling often fails to effectively engage adolescents. Therefore, the integration of interactive and participatory learning media, such as puzzles, is increasingly being promoted as a strategy to improve student understanding and learning outcomes. Puzzle-based learning combines entertainment and education (edutainment), allowing students to actively construct knowledge through play. Valentine's research shows that puzzle media has an impact on student learning outcomes. Puzzle media can encourage curiosity and critical thinking in students.

LITERATUR REVIEW

Nutrition Counseling in School-Based Health Promotion

Nutrition counseling is a structured educational effort aimed at improving students' understanding, attitudes, and practices regarding healthy eating. School environments are considered strategic settings for nutrition intervention because adolescents spend most of their daily time in school and are highly influenced by peer interaction and school food environments. Research from 2020–2024 consistently emphasizes that effective nutrition education in schools can significantly improve knowledge and encourage healthier food choices among adolescents. Several studies (e.g., Rahmawati & Yuliana, 2021; Hidayat et al., 2023) showed that nutrition counseling integrated into school programs has a positive effect on students' dietary behavior, especially regarding snack selection and consumption patterns.

Puzzle Media as an Interactive Learning Tool

Puzzle media is categorized as a form of interactive and game-based learning that supports cognitive engagement and improves retention. Educational gamification strategies have been increasingly utilized in health education due to their effectiveness in motivating learners and transforming abstract concepts into concrete, visual, and enjoyable experiences (Putri et al., 2020; Sari & Widodo, 2022). Studies in nutrition education indicate that interactive media such as puzzles enhance students' concentration, stimulate problem-solving abilities, and strengthen memory retention. This method is particularly effective for younger learners (ages 10–15), who respond positively to tactile and visual learning activities.

Knowledge about Nutrition and Snack Food Choices

Adolescent nutrition knowledge plays a critical role in shaping healthier eating habits. However, numerous studies in Indonesia and Southeast Asia report that adolescents have relatively low knowledge regarding balanced nutrition, food labeling, and the health risks of consuming unhealthy snacks (Fitriani, 2021; Mahesa et al., 2024). Common issues include the popularity of cheap, tasty, and widely available processed snacks containing excess sugar, sodium, artificial colorants, and preservatives. Improving knowledge through engaging educational methods such as puzzles has been shown to increase students' awareness of food quality and nutritional value.

Attitudes Toward Healthy Snacks Among Adolescents

Attitude is a key determinant of food choice behavior. Although knowledge influences attitude, various factors such as peer influence, marketing exposure, taste preference, and family habits also shape adolescents' attitudes toward snack foods (Nurdin & Harahap, 2022). Recent research (2020–2024) indicates that interventions combining cognitive and affective approaches such as interactive games, group discussion, and counselling are more effective in improving attitudes than lecture-based methods alone. Using puzzle media allows students to reflect on their choices, engage in hands-on learning, and develop positive attitudes toward nutritious snack options.

Effectiveness of Puzzle-Based Nutrition Counseling

Empirical studies demonstrate that puzzle-based learning significantly impacts nutrition-related outcomes among school-aged children. For example, a 2021 quasi-experimental study reported that puzzle media increased nutrition knowledge scores by up to 40% post-intervention. Similar findings from 2022 and 2023 show improvements in attitudes toward healthy snacks and reduced interest in consuming high-calorie, low-nutrient foods after exposure to interactive educational tools. These outcomes suggest that puzzle media strengthens both cognitive domains (knowledge acquisition) and affective domains (attitude formation), supporting its use in school nutrition counseling programs.

METHODOLOGY

The type of research is a quasi-experimental study with a one-group pretest-posttest design to determine the effect of nutrition counseling using puzzle media on knowledge and attitudes about nutrition and snack foods among students of SMP Negeri 8 Banda Aceh. The study was conducted at SMP Negeri 8 Banda Aceh. Data collection was from August 6 to 12, 2025, after obtaining ethical approval 064/EA/FK/2025 from the Faculty of Medicine, Syiah Kuala University.

The study population was all 223 eighth-grade students of SMP Negeri 8 Banda Aceh. The minimum sample size required was 144 students, calculated using the Slovin formula with a 5% error tolerance. The sampling techniques used were stratified random sampling and simple random sampling. Inclusion criteria were students attending SMP Negeri 8 Banda Aceh, in the eighth grade, and willing to be respondents. Exclusion criteria were students who were absent during the study and did not participate in the complete research activities.

The intervention consisted of nutrition counseling delivered through a combination of Power Point slides and puzzles. Students completed the nutrition puzzles individually, guided by researchers and trained enumerators who had received prior briefings. Questionnaires were used to collect data. The knowledge questionnaire contained multiple-choice questions related to nutrition and snack food, covering topics such as balanced diets, nutrition, and examples of healthy snack food. The attitude questionnaire consisted of statements rated on a Likert scale (agree-disagree) to measure students' perceptions and attitudes toward healthy food choices. Both instruments were tested for validity and reliability prior to data collection. Cronbach's Alpha values were 0.973 for nutrition knowledge, 1.000 for nutrition attitudes, 0.912 for snack food knowledge, and 0.947 for snack food attitudes, indicating excellent reliability.

Before the intervention, participants completed a pretest questionnaire to measure their knowledge and attitudes before the intervention. A posttest questionnaire was administered 3 days after the intervention, using puzzles. Data were analyzed univariately and bivariately. The Wilcoxon signed-rank test was used to identify significant differences before and after the intervention. A difference was determined if the P-value was ≤ 0.05 .

RESEARCH RESULT

In this section, you must describe each step taken to complete your research. In this section, each statistical test you perform should be thoroughly explained. This section is very important to describe the research methodology used. Any statistical findings should be summarized and presented in a table or graph; not just copy-paste from your statistical tools.

Table 1. Respondent Characteristics

Characteristics	Frequency (n = 144)	Percentage (%)
Age		
12 years	6	4,2
13 years	75	52
14 years	56	38,9
15 years	7	4,9
Gender		
Male	69	48
Female	75	52
Class		
VIII-1	21	14,6
VIII-2	20	13,8
VIII-3	20	13,8
VIII-4	21	14,6
VIII-5	21	14,6
VIII-6	20	13,8
VIII-7	21	14,6

Table 1 shows that the majority of respondents were 13 years old, amounting to 75 students (52%) and 75 students were female (52%).

Table 2. Knowledge of Nutrition and Snack Foods among Students of SMP Negeri 8 Banda Aceh

Variables	Before Intervention						After Intervention					
	Good		Enough		Bad		Good		Enough		Bad	
	n	%	n	%	n	%	n	%	n	%	n	%
Nutritional Knowledge	26	18,1	33	22,9	85	59	105	72,9	33	22,9	6	4,2
Snack Food Knowledge	94	65,2	32	22,3	18	12,5	124	86	19	13,3	1	0,7

Table 2 shows that students' knowledge about nutrition and snack foods increased after the intervention. Before the intervention, 26 students (18.1%) had good knowledge of nutrition. After the intervention, this number increased to 105 students (72.9%). Before the intervention, 94 students (65.2%) had good knowledge about snack foods. After the intervention, this number increased to 124 students (86%).

Table 3. Attitudes towards Nutrition and Snack Food Among Students of SMP Negeri 8 Banda Aceh

Variables	Before Intervention				After Intervention			
	Positive		Negative		Positive		Negative	
	n	%	n	%	n	%	n	%
Attitudes Toward Nutrition	77	53,5	67	46,5	118	81,9	26	18,1
Attitudes Toward Snack Food	69	47,9	75	52,1	103	71,5	41	28,5

Table 3 shows changes in student attitudes toward nutrition and snack food. Before the intervention, 77 students (53.5%) had a positive attitude toward nutrition. After the intervention, this number increased to 118 students (81.9%). Before the intervention, 69 students (47.9%) had a positive attitude toward snack food. After the intervention, this number increased to 103 students (71.5%).

Table 4. Results of the Wilcoxon Signed Rank Test

Variables	Negative Rank	Positive Rank	Ties	P-value
Nutritional Knowledge	3	130	11	0,000
Snack Food Knowledge	0	91	53	0,000
Attitudes Toward Nutrition	0	142	2	0,000
Attitudes Toward Snack Food	0	129	15	0,000

Based on Table 4, the P-value = 0.000 (≤ 0.05) was obtained, indicating a significant difference between before and after the intervention for all variables. Nutrition counseling using puzzle media increased knowledge and changed attitudes to be more positive towards nutrition and snack foods in students of SMP Negeri 8 Banda Aceh.

DISCUSSION

Respondent Characteristics

The majority of respondents in this study were 13 years old (75 students) and 75 students (52%) were female. Adolescents are considered a nutritionally vulnerable group due to rapid physical growth and increased nutrient needs. Knowledge and attitudes toward food are key factors influencing snack choices during adolescence. Individuals aged 12 and above are capable of abstract thinking, logical reasoning, and understanding more complex cause and effect relationships. This aligns with the respondents in this study, who were at an appropriate cognitive developmental stage to receive counseling interventions.

The results of this study are consistent with previous findings by Ton Nu et al. in France, who found that age and gender influence adolescents' eating habits, with girls tending to be more health conscious than boys. Rahmawati et al. in South Kalimantan reported that differences in eating behavior between male and female adolescents were influenced by parenting patterns and increasing age. However, Gonzalez et al. in Jakarta found that environmental factors and visual information on packaging had a stronger influence on snack food selection than demographic characteristics, such as age and gender.

The Effect of Nutrition Counseling with Puzzle Media on Knowledge about Nutrition and Snack Foods

The results of this study indicate an increase in students' knowledge about nutrition and snack foods after the counseling. The Wilcoxon signed rank test showed a P-value of 0.000 (≤ 0.05), indicating that the counseling was effective in improving students' knowledge. These results align with constructivist learning theory, which states that knowledge is more effectively internalized when students actively participate in constructing their own understanding. The puzzle media used in this study provided an interactive and experiential form of learning, where students were directly involved in arranging, identifying, and connecting images related to food groups and nutritional messages. This hands-on activity encouraged cognitive engagement, attention, and memory retention, all of which contributed to improved learning outcomes.

The use of puzzle media also integrates visual, kinesthetic, and cooperative learning styles, which is particularly effective for adolescents. According to Mokhtari et al., interactive instructional media that combines visual and tactile components can improve the understanding and motivation of students aged 12-15 years. Similarly, Rahman et al. found that students exposed to participatory nutrition learning demonstrated higher retention rates of dietary knowledge compared to those who received lecture-based instruction.

The increase in knowledge in this study is in line with the research of Indriani et al. who reported that puzzle-based nutrition counseling among elementary school students significantly improved their ability to identify food groups and balanced meal portions. This shows that puzzles are not only engaging but can also be adapted to different levels of education, including adolescents. The increased knowledge about snack food in this study suggests that puzzle media can help clarify the characteristics of healthy versus unhealthy snack food, which is crucial for encouraging better food choices among students. Before the intervention, 94 students (65.2%) had good knowledge about snack food. After the intervention, this number increased to 124 students (86%). These results indicate that the counseling was effective in increasing student knowledge.

These results support the view of interactive media as an alternative to traditional teaching, where learning occurs through exploration, rather than passive listening. Incorporating fun and game-like elements can reduce student boredom and create a positive learning environment, ultimately improving their academic and health outcomes.

The Effect of Nutrition Counseling with Puzzle Media on Students' Attitudes about Nutrition and Snack Food

Attitude change is an important behavioral component that accompanies knowledge acquisition. The results showed an improvement in students' attitudes toward nutrition and snack foods after the intervention, with a P-value of 0.000 (≤ 0.05). The number of students with positive attitudes toward nutrition increased from 77 (53.5%) to 118 (81.9%). Students with positive attitudes toward snack foods also increased from 69 (47.9%) to 103 (71.5%).

These results indicate that puzzle-based learning not only improves students' knowledge but also influences their affective and behavioral dimensions. When learning is fun and participatory, students are more likely to internalize the message and adopt positive attitudes. According to Ajzen's Theory of Planned Behavior (TPB), attitudes are a strong predictor of behavioral intentions; therefore, improved attitudes may ultimately lead to healthier food choices among adolescents.

Similar results were reported by Prameswari et al. that educational games improved knowledge and attitudes towards balanced nutrition among junior high school students. Sundari et al. noted that interactive learning strategies were effective in shaping adolescents' self-awareness and responsibility for their own dietary behavior.

The increase in positive attitudes toward snack food, in particular, reflects a shift in students' perceptions of what constitutes healthy snack food. Many students initially associated snack food with taste and convenience rather than nutritional value. Through puzzle-based learning experiences, students became more aware of the importance of food safety, hygiene, and nutritional content. Puzzle media serves as an effective behavior change communication tool that can be integrated into school health programs. Compared to traditional lectures, this approach not only encourages knowledge acquisition but also emotional engagement, which is essential for sustainable attitude change. Locally developed, low-cost outreach media can be a tool in improving health literacy among adolescents.

CONCLUSIONS AND RECOMMENDATIONS.

- 1) Nutrition education using puzzles effectively improved students' knowledge and attitudes toward nutrition and snack foods (P-value = 0,000).
- 2) Interactive puzzle activities increased engagement, motivation, and understanding, resulting in higher posttest scores.
- 3) Students' knowledge improved from bad to good, and attitudes toward nutrition and snack foods became more positive.
- 4) Schools should integrate interactive educational media such as puzzles into routine learning activities.
- 5) Teachers are encouraged to use game-based learning to increase student interest in health education.
- 6) Schools and public health institutions should collaborate to organize regular nutrition education programs.
- 7) Parents should guide their children in choosing healthy snacks and provide nutritious food options at home.

ADVANCED RESEARCH

Still conducting further research to learn more about The Effect of Nutrition Counseling with Puzzle Media on Knowledge and Attitudes about Nutrition and Snack Foods among Students of SMP Negeri 8 Banda Aceh.

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