

Adolescents' Knowledge and Attitudes after Animated Video Education With and Without Counseling

(Pengetahuan dan Sikap Remaja setelah Edukasi melalui Video Animasi dengan dan tanpa Konseling)

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ABSTRACT

This quasi-experimental study compared animated video alone with counseling combined with animated video for improving adolescents' knowledge and attitudes toward fruit and vegetable consumption in Pangkalpinang City. Eighty students aged 12–15 years were selected by simple random sampling and assigned to a control group (video only, n = 40) or intervention group (counseling + video, n = 40). Knowledge and attitudes were assessed before and after intervention and analyzed using Wilcoxon signed-rank and Mann-Whitney U tests. Knowledge increased significantly within both groups ($p < 0.001$), but the between-group difference in knowledge gain was not significant ($Z = -1.744$; $p = 0.081$). Attitude improved significantly in the intervention group ($Z = -3.21$; $p = 0.003$), but not in the control group ($p = 0.250$), and the between-group difference favored counseling + video ($Z = -2.784$; $p = 0.005$). Combined counseling and animated video was therefore more effective for improving attitudes, while knowledge gains were comparable.

Keywords:

Adolescents; animated video; attitude; counseling; fruit and vegetable consumption; knowledge

ABSTRAK

Penelitian kuasi-eksperimen ini membandingkan video animasi saja dengan penyuluhan yang dikombinasikan dengan video animasi untuk meningkatkan pengetahuan dan sikap remaja terkait konsumsi sayur dan buah di Kota Pangkalpinang. Sebanyak 80 siswa usia 12–15 tahun dipilih secara simple random sampling dan dibagi menjadi kelompok kontrol (video saja, n = 40) dan kelompok intervensi (penyuluhan + video, n = 40). Pengetahuan dan sikap diukur sebelum dan sesudah intervensi serta dianalisis dengan uji Wilcoxon dan Mann-Whitney U. Pengetahuan meningkat signifikan pada kedua kelompok ($p < 0,001$), tetapi perbedaan peningkatan antarkelompok tidak signifikan ($Z = -1,744$; $p = 0,081$). Sikap meningkat signifikan pada kelompok intervensi ($Z = -3,21$; $p = 0,003$), tidak pada kontrol ($p = 0,250$), dan perbedaan antarkelompok signifikan memihak penyuluhan + video ($Z = -2,784$; $p = 0,005$). Kombinasi penyuluhan dan video animasi lebih efektif meningkatkan sikap, sedangkan peningkatan pengetahuan relatif sebanding.

Kata kunci:

Animasi; pengetahuan; penyuluhan; remaja; sayur dan buah; sikap

Introduction

National health surveillance in Indonesia consistently documents insufficient fruit and vegetable consumption. The 2013 Basic Health Research (Riskesdas) survey reported that 93.5% of individuals aged over 10 years consumed inadequate amounts of fruit and vegetables, a figure that rose to 95.5% in 2018 (Badan Penelitian dan Pengembangan Kesehatan, 2013, 2019). In Bangka Belitung Province, this proportion reached 97.5%. The World Health Organization (WHO) recommends a minimum daily intake of 400 grams of fruit and vegetables for individuals aged 10 years and above, aligning with Indonesian Balanced Nutrition Guidelines (Kementerian Kesehatan Republik Indonesia, 2014; World Health Organization, 2026).

Adolescence represents a critical developmental period characterized by rapid physical, cognitive, and psychosocial transitions that shape long-term health behavior and dietary habits (World Health Organization, n.d.). In Indonesia, adolescent eating patterns frequently include low intake of nutrient-dense foods, including fruit and vegetables (Rachmi et al., 2021). Fruit and vegetable consumption during childhood and adolescence is



shaped by multiple determinants, including home availability, parental modeling, family support, preferences, peer influence, and the broader food environment (Pearson et al., 2009; Rasmussen et al., 2006).

Health and nutrition education is an important strategy for promoting healthier dietary choices. However, educational messages do not automatically translate into sustained behavior change because outcomes depend on intervention content, delivery, intensity, context, and the behavioral mechanisms addressed. Systematic reviews indicate that school-based interventions can produce improvements in fruit and vegetable intake, although effect sizes and consistency vary across settings (Evans et al., 2012; Knai et al., 2006; Medeiros et al., 2022; O'Brien et al., 2021). Interventions that strengthen self-efficacy and implementation intentions may also support dietary change (Guillaumie et al., 2012).

Schools provide a strategic setting for nutrition education because adolescents can be reached repeatedly through structured learning activities. Evidence from school-based programs shows that nutrition education may improve knowledge, attitudes, and selected dietary behaviors, but results are heterogeneous and often depend on whether education is combined with environmental, digital, or experiential components (Champion et al., 2019; Silveira et al., 2011; Wang et al., 2015). Experiential approaches, such as school gardening, have also been associated with improved fruit and vegetable knowledge, attitudes, preferences, or intake (Chan et al., 2022; McAleese & Rankin, 2007).

Animated video is one educational medium that combines narration, written information, images, and motion. Indonesian studies have reported that animation or audiovisual nutrition education can improve knowledge and attitudes in schoolchildren, adolescents, and caregivers, although the magnitude and statistical significance of the effects differ between outcomes and study designs (Febriani et al., 2019; Haris, 2018; Putri et al., 2023; Siswati et al., 2022). These findings support further evaluation of animated media for adolescent fruit and vegetable education.

Based on this background, the research question was as follows: Does counseling supported by animated video improve adolescents' knowledge and positive attitudes toward fruit and vegetable consumption in Pangkalpinang City?

This study has implications for health-promotion efforts intended to increase fruit and vegetable consumption among adolescents. Animated video may assist counseling by presenting verbal and visual information in an integrated format. Multimedia-learning research indicates that well-designed combinations of words and images can support attention, organization, and integration of information, whereas unnecessary or poorly coordinated elements may increase cognitive load (Yue et al., 2013). Reviews of video-based education similarly show that video can improve knowledge and selected psychosocial outcomes, but effectiveness depends on design quality, population, outcome measurement, and the presence of complementary instruction (Dahodwala et al., 2018; Deshpande et al., 2023).

Methods

Study Design and Setting

The study used a quasi-experimental design with a two-group pretest-posttest approach. It was conducted at SMPN 3 Pangkalpinang City from October to November 2022.

Population and Sampling

The population consisted of 415 junior high school adolescents. A sample of 80 participants was calculated using the Slovin formula with a desired precision of 10%. Participants aged 12–15 years were selected through simple random sampling and divided into two equal groups ($n = 40$ per group):

Control Group: Received nutrition education through an animated video presentation alone.

Intervention Group: Received direct face-to-face counseling combined with the animated video presentation.

Instruments and Data Collection

Data were collected through knowledge and attitude questionnaires administered before and after the intervention:

Knowledge Instrument: Consisted of structured items scored 1 for a correct answer and 0 for an incorrect answer (total score scaled to 0–100).

Attitude Instrument: Assessed respondents' perception and readiness regarding fruit and vegetable consumption using a 4-point Likert scale (1 to 4).

Data Analysis

Statistical analyses were performed using SPSS software. Intra-group differences (pretest vs. posttest) were evaluated using the non-parametric Wilcoxon signed-rank test. Inter-group differences in knowledge and attitude changes (mean change scores) were evaluated using the Mann-Whitney U test. Statistical significance was set at $p < 0.05$.

Results

Respondent Characteristics

The characteristics of the respondents, including age and sex distribution, are presented in [Table 1](#).

Table 1. Distribution of Respondents by Age and Sex (N = 80)

Adolescent Characteristics	Frequency (n)	Percentage (%)
Age		
12 years	4	5.0
13 years	56	70.0
14 years	18	22.5
15 years	2	2.5
Sex		
Male	37	46.3
Female	43	53.8

[Table 1](#) shows that among the 80 respondents, 70.0% (56 participants) were 13 years old and 53.8% (43 participants) were female. The respondents were divided into two groups of 40 participants each.

Intra-Group Knowledge and Attitude Changes

Descriptive and statistical analyses of respondents' knowledge and attitudes before and after the intervention in both groups are presented in [Tables 2, 3, 4, and 5](#).

Table 2. Knowledge and Attitudes Before and After Animated Video Intervention in the Control Group (n = 40)

Study Variable	n	Min ± Max	Mean	SD
Knowledge				
Before intervention	40	30 ± 70	47	10.67
After intervention	40	20 ± 90	62	18.84
Change	40	-20 ± 50	15	16.79
Attitude				
Before intervention	40	2.5 ± 3.7	3.17	0.28
After intervention	40	2.4 ± 3.6	3.10	0.29
Change	40	-0.8 ± 0.6	-0.07	0.30

[Table 2](#) presents respondents' knowledge and attitudes before and after the fruit and vegetable animated video intervention. The mean increase in knowledge was 15 points, with a standard deviation of 16.79, a minimum value of -20, and a maximum value of 50. The mean change in attitude was -0.07, with a standard deviation of 0.30, a minimum value of -0.8, and a maximum value of 0.6.

Table 3. Knowledge and Attitudes Before and After Counseling Combined with Animated Video in the Intervention Group (n = 40)

Variable	n	Min ± Max	Mean	SD
Knowledge				
Before intervention	40	20 ± 70	43.75	10.79
After intervention	40	20 ± 90	65.50	16.63
Change	40	-20 ± 50	21.75	18.20
Attitude				
Before intervention	40	2.7 ± 3.6	3.14	0.23
After intervention	40	2.3 ± 4.0	3.28	0.31
Change	40	-0.7 ± 0.5	0.14	0.28

[Table 3](#) presents respondents' knowledge and attitudes before and after counseling combined with the fruit and vegetable animated video. The mean increase in knowledge was 21.75, with a standard deviation of 18.20, a minimum value of -20, and a maximum value of 50. The mean increase in attitude was 0.14, with a standard deviation of 0.28, a minimum value of -0.7, and a maximum value of 0.5.

The pretest-posttest patterns in mean knowledge and attitude scores are illustrated in [Figures 1 and 2](#).

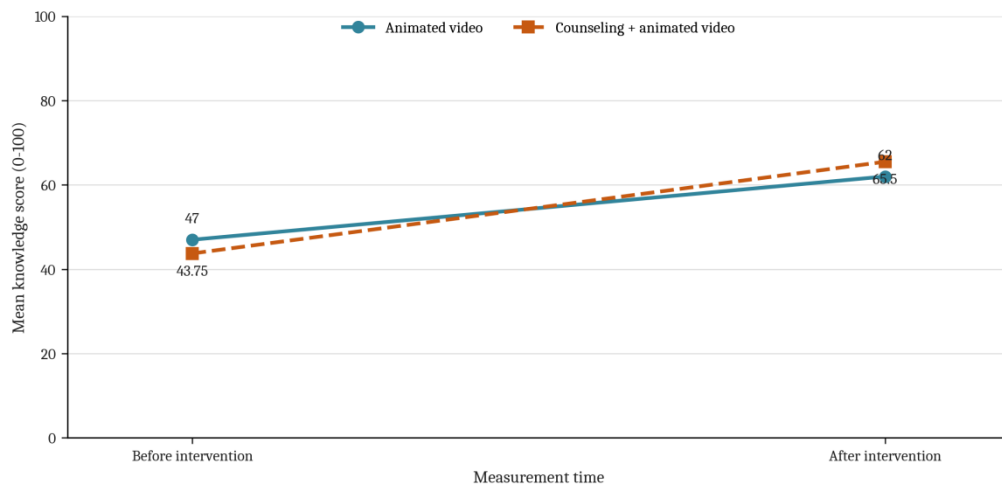


Figure 1. Changes in Mean Knowledge Scores Before and After the Intervention

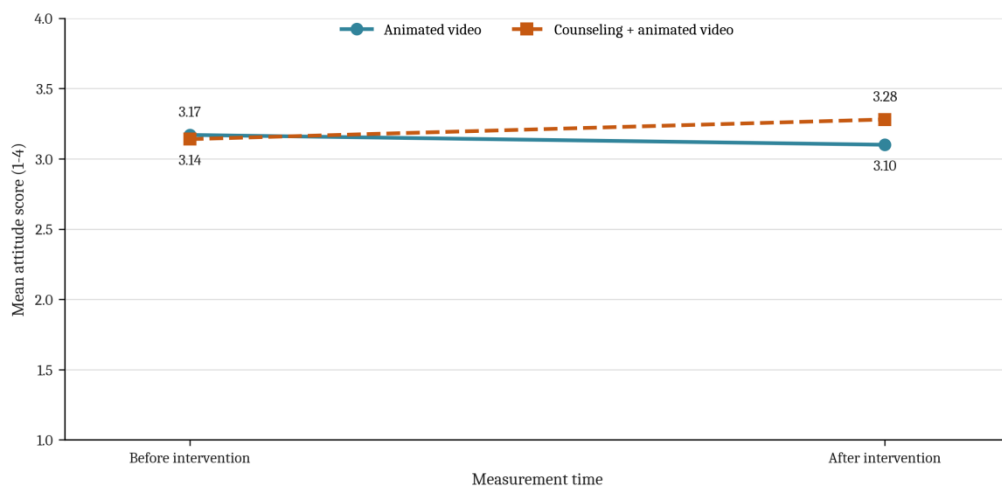


Figure 2. Changes in Mean Attitude Scores Before and After the Intervention

Table 4. Intra-Group Comparison of Knowledge and Attitudes Before and After Interventions (Wilcoxon Signed-Rank Test)

Group	Variable	Pretest Mean	Posttest Mean	Z Statistic	p-value	Conclusion
Control (Animated Video)	Knowledge	47.00	62.00	-4.33	< 0.001	Significant
Control (Animated Video)	Attitude	3.17	3.10	-1.15	0.250	Not significant
Intervention (Counseling + Video)	Knowledge	43.75	65.50	-4.81	< 0.001	Significant
Intervention (Counseling + Video)	Attitude	3.14	3.28	-3.21	0.003	Significant

Table 4 presents the intra-group statistical analysis. Both groups demonstrated significant improvements in knowledge ($p < 0.001$). For attitude, the control group showed no statistically significant change ($Z = -1.15$, $p = 0.250$), whereas the intervention group demonstrated a statistically significant improvement in attitude ($Z = -3.21$, $p = 0.003$).

The between-group mean changes in knowledge and attitude scores are visualized in Figures 3 and 4.

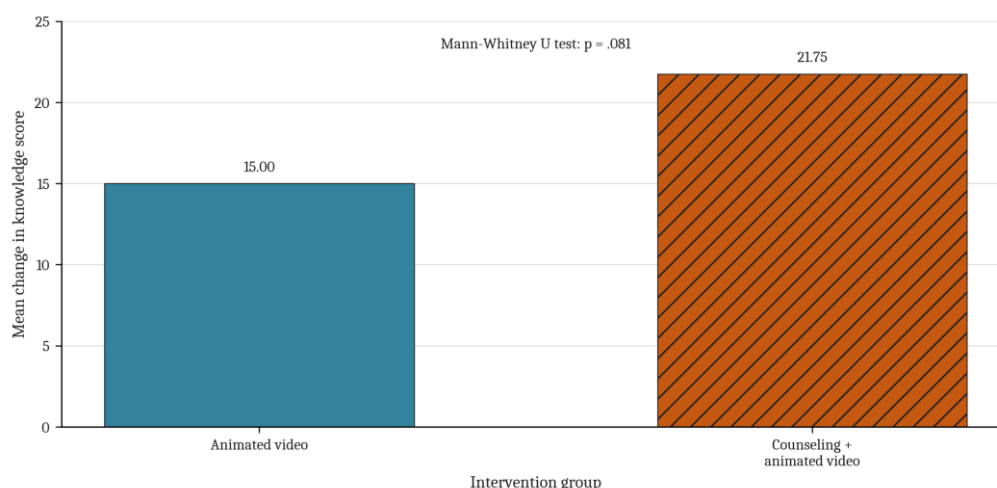


Figure 3. Comparison of Mean Knowledge Score Changes Between Intervention Groups

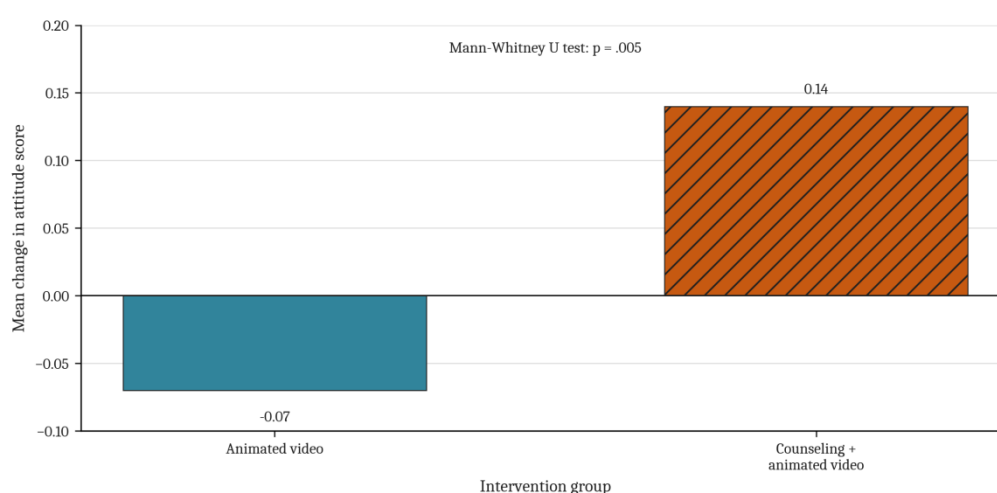


Figure 4. Comparison of Mean Attitude Score Changes Between Intervention Groups

Between-Group Differences in Knowledge and Attitudes

To compare the effectiveness between the two interventions, mean change scores were analyzed using the Mann-Whitney U test.

Table 5. Between-Group Comparison of Knowledge and Attitude Score Changes (Mann-Whitney U Test)

Variable	Intervention Group	Mean Change	Z Statistic	p-value	Conclusion
Knowledge	Animated video (Control)	15.00	-1.744	0.081	Not significant
Knowledge	Counseling + animated video (Intervention)	21.75			
Attitude	Animated video (Control)	-0.07	-2.784	0.005	Significant
Attitude	Counseling + animated video (Intervention)	0.14			

Table 5 presents the between-group comparison. The mean increase in knowledge was 15.00 in the control group and 21.75 in the intervention group. The Mann-Whitney U test yielded $Z = -1.744$ and $p = 0.081$ (> 0.05), indicating no statistically significant difference in knowledge gain between the two groups. For attitude, the mean change was -0.07 in the control group and 0.14 in the intervention group. The analysis yielded $Z = -2.784$ and $p = 0.005$ (< 0.05), demonstrating a statistically significant difference in attitude improvement favoring the intervention group receiving combined counseling and animated video.

Discussion

The respondents were predominantly early adolescents aged 13 years. This age group undergoes rapid physical, cognitive, and psychosocial development that can affect how health information is interpreted and translated into food choices (World Health Organization, n.d.). The finding is highly relevant in the Indonesian context, where adolescent dietary patterns commonly include inadequate consumption of nutrient-dense foods and are influenced by individual, family, social, and environmental factors (Rachmi et al., 2021; Rasmussen et al., 2006).

This study examined nutrition education delivered through an animated video alone versus direct counseling combined with an animated video. Knowledge increased within both groups significantly, whereas the between-group difference in knowledge gain was not statistically significant ($p = 0.081$). However, attitude change differed significantly between groups ($p = 0.005$), suggesting that the addition of direct counseling strengthened the persuasive and reflective components of the intervention. This interpretation aligns with evidence that adolescent fruit and vegetable behavior is shaped not only by information but also by interpersonal communication, social support, modeling, and perceived behavioral control (Pearson et al., 2009; Rasmussen et al., 2006).

The non-significant between-group difference in knowledge gain should not be interpreted as animated video being ineffective. Both groups were exposed to the animated video, and both showed significant posttest knowledge gains, which likely reduced the statistical contrast attributable to direct counseling. Reviews of school-based nutrition interventions indicate favorable but heterogeneous effects on knowledge, with stronger results observed when interventions are intensive, multi-component, and tailored to the target audience (Champion et al., 2019; Medeiros et al., 2022; O'Brien et al., 2021; Silveira et al., 2011). Similarly, Wang et al. (2015) showed that school-based nutrition education improves nutrition knowledge and attitudes, though behavioral changes require additional reinforcement.

The significant superiority of the combined intervention in improving attitudes can be explained by the complementary functions of interactive counseling and visual media. Animation simplifies abstract nutrition concepts, while face-to-face counseling provides emphasis, clarification, and two-way interaction. According to the Cognitive Theory of Multimedia Learning, instructional value depends on integrating verbal and visual representations without overloading working memory (Yue et al., 2013). Reviews of video-based education similarly emphasize that video is most impactful when embedded within structured, interactive educational processes rather than delivered as isolated exposure (Dahodwala et al., 2018; Deshpande et al., 2023).

These findings correspond with Indonesian studies reporting positive outcomes from animated or audiovisual nutrition education (Febriani et al., 2019; Haris, 2018; Putri et al., 2023; Siswati et al., 2022). Nevertheless, the present study highlights that educational interventions may impact knowledge and attitude outcomes differently. This variability is consistent with systematic review evidence showing that educational interventions are context-dependent and require repeated exposure, interpersonal reinforcement, and supportive environments to shift dietary behaviors (Evans et al., 2012; Knai et al., 2006).

Conclusion

Nutrition education about fruit and vegetable consumption delivered to adolescents in Pangkalpinang City using animated videos combined with direct counseling significantly improves positive attitudes toward fruit and vegetable intake compared to animated videos alone. However, both educational delivery approaches yield comparable gains in adolescent nutrition knowledge.

Recommendations

School health initiatives (UKS) and community health centers (Puskesmas) can combine engaging audiovisual media with interactive face-to-face counseling in adolescent nutrition promotion.

Further studies can use randomized designs with follow-up periods and include dietary intake measures to assess longer-term knowledge, attitudes, and actual fruit and vegetable consumption.

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Declaration

Use of Generative Artificial Intelligence

Generative Artificial Intelligence (AI) tools were used during the preparation of this manuscript for language refinement, grammar checking, and improving the clarity of academic writing. The authors remained fully responsible for the research design, data collection, data analysis, interpretation of findings, and final content of the manuscript. Generative AI was not used to generate research data, perform statistical analyses, or replace the authors' intellectual contributions.

Author Contributions

All authors contributed to the development of this study. The first author was responsible for conceptualizing the research, developing the methodology, conducting data collection, and drafting the initial manuscript. The second author contributed to data analysis, interpretation of results, and critical revision of the manuscript. All authors reviewed and approved the final version of the manuscript and agreed to be accountable for all aspects of the research.

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Conflict of Interest

The authors declare that they have no conflicts of interest that could have influenced the conduct or reporting of this study.

Ethics Approval and Informed Consent

This study was conducted in accordance with ethical principles for research involving human participants. For adolescent participants, informed consent was obtained from their parents or legal guardians, while assent was obtained from the participants themselves prior to data collection. Participants were informed about the purpose of the study, data confidentiality procedures, the voluntary nature of their participation, and their right to withdraw from the study at any stage without any consequences.

Data Availability

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request. Any data sharing will comply with ethical requirements and protect the confidentiality and privacy of the participants.

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