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The Effect Of Nutritional Education On Adolescent Fruit Vegetable Eating Patterns, Based On Planned Behavior Theory

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ABSTRACT

Background: Consumption of fruit and vegetables in all countries is still below the recommended level, and the figure continues to decline (Vereecken et al., 2015) (Colapinto, Graham, and St-pierre, 2018). The population of Indonesia, especially teenagers, is also the same; most of the consumption of vegetables and fruit is still not enough. Nutrition education interventions to increase adolescent fruit vegetable consumption are rarely implemented, especially in Indonesia. Based on this, this study was conductedto examine the effect of nutrition education interventions with videos on fruit vegetable eating patterns, nutritional knowledge, and stages of behavior change based on the theory of planned behavior.

Methods: A total of 72 students from SMAN 2 Gorontalo Regency were selected as samples in this study. The form of quasi-experimental design used is the Time series design. This research design uses only one group and does not require a control group. Sample selection using a purposive sampling technique. The intervention was carried out for ten consecutive weeks by distributing videos of fruit vegetable consumption every week.

Results: At the end of ten weeks of intervention, 55 teenagers had followed the education stage, the remaining 11 dropped out. Age distribution of adolescents between 15-18 years. The results of the analysis of the paired sample t-test variables for eating vegetables and fruits (p=0.015), nutritional knowledge (p=0.00), attitudes (p=0.00), subjective norms (p=0.00), behavioral control (p=0.00). = 0.00), and intentions (p = 0.01) of fruit vegetable consumption behavior before and after the intervention there were differences with p <0.05. To see the effectiveness of watching frequency, an ANOVA test analysis was carried out on all variables, and

the results showed that there was a relationship between nutritional knowledge (p=0.024), attitude (p-0.032), subjective norm (p=0.034), and intention (p=0.41) after an intervention. Furthermore, the pattern of eating vegetables and fruit and behavioral control after the intervention was not related to the frequency of watching videos (p = 0.87 and p = 0.185).

Conclusion: Teenagers' nutrition education in videos is more effective and easy to understand to increase nutritional knowledge and change adolescent diets, especially fruit vegetables. However, teenage fruit vegetable consumption is still highly dependent on food availability, especially at the household level.

Keywords: Nutrition Education, Fruits and vegetables eating patterns, adolescents

INTRODUCTION

In many countries, fruit and vegetable consumption is still below the recommended level, and the figure continues to decline (Vereecken et al., 2015) (Colapinto, Graham, and St-pierre, 2018). The Indonesian population is also the same, most of the consumption of vegetables and fruit are still many who do not consume enough vegetables and fruits, namely 96.4% of the population, for adolescents aged 15-19 years consuming vegetables and fruits is still below the recommendation (Riskesdas, 2018). Adolescents consume inadequate amounts of protein, fruits and vegetables, and fast food, and excessive amounts of Na (Rachmi et al., 2020)

This unhealthy diet has a more significant impact on the risk of morbidity and mortality than unsafe sex, alcohol, drugs, and tobacco use (Willett et al., 2019). Consequently, strategies to increase fruit and vegetable consumption should significantly focus on population health.

Adequate intake of fruit and vegetables directly impacts dietary energy intake. It is critical in healthy weight-promoting eating habits because of its low caloric value and high supply of dietary fiber (Mytton et al., 2014). In addition, increasing fruit and vegetable intake has been shown to have beneficial effects on bone density, cardiovascular health and reduce the risk of non-communicable diseases such as diabetes, cancer, and metabolic syndrome (Wang et al., 2014) (Tian et al., 2017). A poor diet has an adverse impact on weight problems (Sekti and Fayasari, 2019) (Koca et al., 2017), and conversely, regular consumption of fruit and vegetables protects against coronary heart disease, hypertension, stroke, some cancers, and diabetes (Tian et al. al., 2017)

So it is necessary to increase the habit of consuming fruit vegetables. Interventions to change eating patterns have been shown to improve adolescent consumption behavior (Schmitt et al., 2019) (Begley et al., 2019) (Bauer et al., 2020). The interventions provided also take various forms, such as providing complimentary breakfast at school and nutritional promotion assistance, obtaining improved results in the types of food and beverages students consume in the morning (Bauer et al., 2020). However, consumption patterns only describe intake at one meal, namely in the morning, and this study did not measure the type and size of the portion consumed.

Research on nutrition education interventions and dietary counseling in adolescents in low- and middle-income countries focuses on complementary feeding for infants and young children or very few pregnant women in adolescents (Salam et al., 2016). Nutrition education and/or dietary counseling interventions for adolescents in Indonesia are also rarely carried out (Oddo, Roshita, and Rah, 2019). Another US-based study conducted a health clinic-based behavioral nutrition

intervention emphasizing a diet high in fruits, vegetables, and low-fat dairy products. This intervention significantly increased fruit, potassium, and magnesium intake and decreased total fat consumption (C. Couch, 2008).

Research on nutrition education that aims to change the behavior of adolescents' eating patterns is needed to create good habits so that adolescents can implement a fruit-vegetable diet. Intervention efforts to change the behavior of adolescent eating patterns that have been carried out gave varied results depending on the intervention method provided. Several studies show that knowledge through nutrition education can improve the practice of a balanced diet in adolescents (Aparicio-Ugarriza et al., 2019) (Egg et al., 2020). Nevertheless, knowledge alone is not always sufficient to achieve sustainable behavior change (Hewett et al., 2020). A literature review Programs and policies targeting adolescent nutrition are relatively new and have low coverage. To improve the nutritional status of this vulnerable, additional evaluation of the program and monitoring of data on adolescents is needed (Oddo, Roshita, and Rah, 2019)

Nutrition education interventions and/or dietary counseling in adolescents using technology-based platforms, such as social media, to deliver nutrition-based messages is a promising strategy in low- and middle-income countries given the widespread use of smartphones (Oddo, Roshita, and Rah, 2019). The results of a review of journals on mobile-based interventions for dietary behavior change and health outcomes identified the most common input mode as text-based input. However, using more sophisticated methods, such as photo recognition, can obtain more meaningful results (Kankanhalli, Shin, and Oh, 2019).

Based on the description above, this research aims to see the effect of nutrition education intervention with video on fruit and vegetable eating patterns, nutritional knowledge, and stages of behavior change based on the theory of planned behavior.

MATERIALS AND METHODS

This research design is a quasi-experimental that uses a Time series design approach. This research design uses only one group, so it does not require a control group (Sugiyono, 2016: 78).

The population of this study was all students of class XI SMAN 2, as many as 248 students. The sample was done using the purposive sampling technique.Seventy-two students with inclusion criteria had a fruit-vegetable diet in the rare category, had a cellphone, were active students at SMAN 2, Limboto Regency. All students who have been selected as respondents are then given informed consent as a form of willingness to participate in this research series.

This research was conducted for ten consecutive weeks from July 26 to October 3, 2021, and has been approved by the ethics committee of the Faculty of Public Health, Hasanuddin University, with letter no 549/UN4.14.1/TP.02.02/2021. Before the study, written informed consent from all participants and parents was obtained.

MEASUREMENT

Intervention

The intervention given in this study was screening an educational video about the consumption of vegetables and fruit. Educational videos were distributed to respondents by providing a video link

(link https://youtu.be/K-irkJXSI4k) for ten consecutive weeks every Tuesday twice a day at 11.00 18.00 local time.

Fruit Vegetable Diet

Diet is a food consumption habit carried out within the last one month using a food frequency (FFQ) questionnaire. Frequent category if the score 0.43 and rarely if the score 0.43 (Marks et al., 2006). Calculation of eating patterns is done by looking at the frequency of consumption of each food item on the FFQ questionnaire with values for the frequency of options: > 1 time per day = 2.5; 1 time per day = 1.3-6 times per week = 0.43, 1-2 times per week = 0.14; 1-3 times per month = 0.07; never = 0.

Nutritional Knowledge

The measurement of knowledge in this study used a questionnaire containing questions about balanced nutrition, including questions about the pillars of balanced nutrition and general messages of balanced nutrition. Category Enough if the respondent's correct answer is 50% and less if the respondent's correct answer is <50%.

Theory Planned Behavior

The theory of Planned Behavior states that a person's behavior is determined by their intentions, influenced by attitudes, subjective norms, and perceived behavioral control (AJZEN, 1991).

– Behavior: the act of eating vegetables and fruit.

– Intention: perception of the possibility of eating vegetables and fruit.

– Attitude: favorable or unfavorable judgments about eating vegetables and fruit. This assessment is determined by people's beliefs, experiences, and knowledge.

– Subjective norm: belief that most people important to children agree or disagree with them eating vegetables and fruit

– Perceived behavioral control: the perception of how much control they have over behavior (the act of eating vegetables and fruit).

The assessment consists of attitudes, subjective norms, behavioral control, and intention to consume vegetables and fruit, using a questionnaire prepared by researchers using a Likert scale.

ANALYSIS

Statistical analysis was performed using the SPSS version 22.0 application. The variable data of respondents' characteristics were analyzed descriptively to show the distribution of respondents.

To see the difference between vegetable and fruit-eating patterns before and after the intervention, attitudes, subjective norms, behavioral control before and after the intervention, and the level of nutritional knowledge before and after the intervention were analyzed using paired sample T-test.

It sees the effectiveness of the frequency of watching videos. It was analyzed using the ANOVA test.

RESULTS

Seventy-two respondents were selected at the beginning of the week, 11 respondents withdrew from the second week to the fourth week of the intervention.

At the end of the 10th week of the intervention,61 respondents remained. However, after seeing the activity of watching videos that were evaluated every week, six respondents did not regularly watch for three weeks in a row, so they were excluded from data analysis. In the end, 55 respondents deserve us to proceed to the data analysis stage

Based on Table 1, it can be seen that the dominant respondent's age was at the age of 16 years (72.7%), the dominant sex was female (72.7%), and based on the category of parental income, most were included in the less category (72.7%).

Table 1. Age, gender and income distribution of parents

VARIABLE	CATEGORY	TOTAL	PERCENTAGE
Age	15	8	14.5
	16	40	72.7
	17	5	9.1
	18	2	3.6
	Total	55	100.0
Sex	Male	15	27.3
	Female	40	72.7
	Total	55	100.0
Parents' Income	Deficient	40	72.7
	Medium	8	14.5
	High	7	12.7
	Total	55	100.0

Table 2 shows the analysis results of differences before and after the variable intervention. Results indicate that the paired-sample test that all variables ranging from eating patterns of vegetables and fruit (p = 0.015), nutritional Knowledge (p = 0.00), attitudes (p = 0.00), subjective norms (p = 0, 00), behavioral control (p = 0.00) and intention (p = 0.01) have a p-value <0.05 so it can be concluded that there are differences between vegetable and fruit-eating patterns, attitudes, subjective norms, behavioral control, nutritional intentions and Knowledge before and after the intervention.

Table 2. Paired Sample t-Test Between Variables Before and After Intervention Test Statistics b

Test Statistics[b]

	Fruit and vegetable diet after – before intervention	Nutrition knowledge_ after – before intervention	Attitude after – before intervention	Subjective Norms after – before intervention	Behavior Control after – before intervention	Intention after – before intervention
Z	-2.441[a]	-5.463[a]	-3.915[a]	-4.097[a]	-4.244[a]	-3.179[a]
Asymp. Sig. (2-tailed)	**.015**	**.000**	**.000**	**.000**	**.000**	**.001**

a. Based on opposing ranks.

b. Wilcoxon Signed Ranks Test

From Figure 1, it can be seen that the median diet before (0.253) increased after the intervention (0.264).

Figure 2 shows the median value of nutritional knowledge before the intervention was seven, then increased to 9 after the intervention.

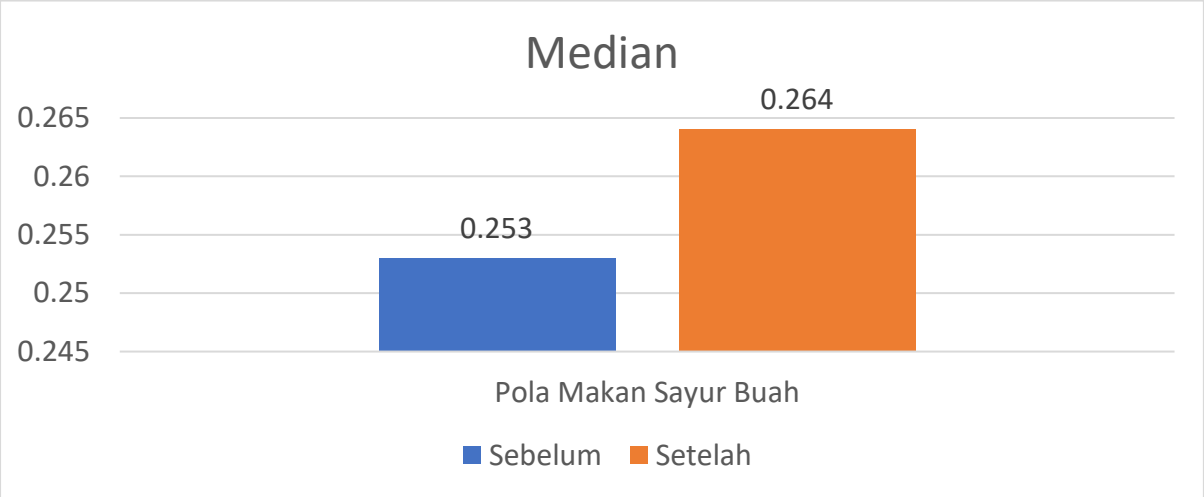

Figure 1 Median Diet before and after intervention

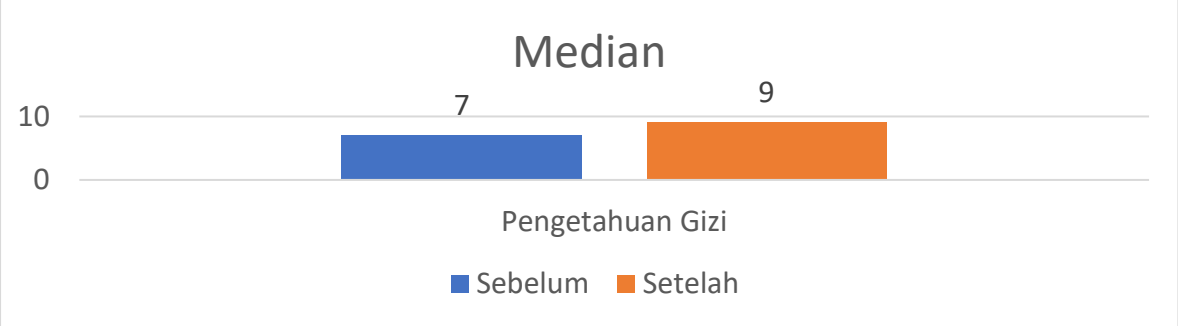

Figure 2. Median Knowledge of Nutrition Before and After Intervention

From Figure 3, it can be seen that the median attitude before the intervention was 123 and increased after the intervention to 138. The median subjective norm before the intervention was 90 and increased after the intervention to 104. The median behavioral control before the intervention was 85 increased to 94, and the median intention before the intervention was 48 increased to 56.

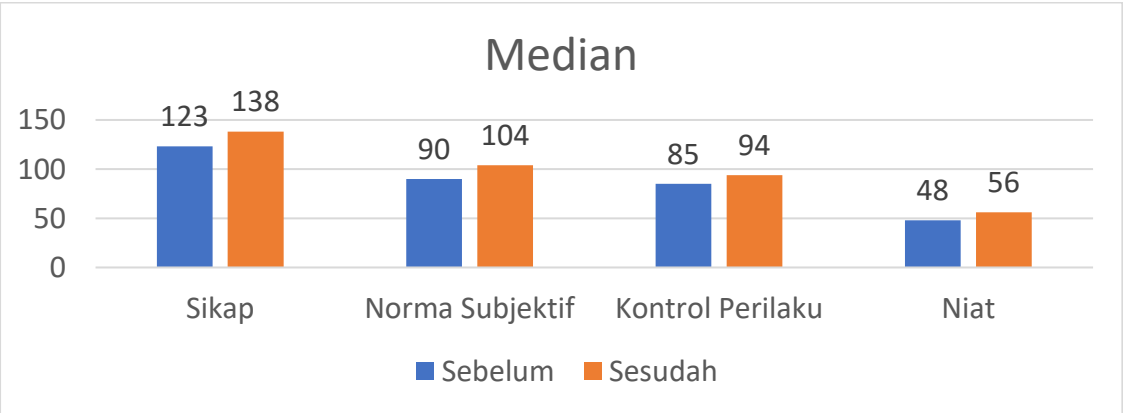

Figure 3 Median Attitudes, Subjective Norms, Behavior Control, and Intentions Before and After Intervention

Table 3 indicates the result of the ANOVA test analysis, and the results show a relationship between watching frequency with Attitude, Subjective Norm, Intention. After intervention with a p-value <0.05, while for the fruit vegetable diet and subjective control, there is no relationship with a p value> 0, 05.

Table 3. ANOVA. Test

	Fruit Vegetable Diet after intervention	**Nutritional knowledge after intervention**	**Attitude after intervention**	**Subjective Norms after intervention**	**Behavior Control after intervention**	**Intention after intervention**
Chi-square	4.891	7.496	6.911	6.772	3.376	6.385
df	2	2	2	2	2	2
Asymp. Sig.	.087	**.024**	**.032**	**.034**	.185	**.041**

a. Kruskal Wallis Test

b. Grouping Variable: Kategori Frekuensi Nonton Video

DISCUSSION

Based on the study results, it was found that there were differences between eating patterns of fruit and vegetables, nutritional knowledge, attitudes, subjective norms, behavioral control, and adolescent intentions before and after the intervention. Then found a significant relationship between the frequency of watching videos with nutritional knowledge, attitudes, subjective norms, and teenage intentions.

Fruit Vegetable Diet

Based on the analysis results, it is known that there are differences in adolescent fruit vegetable eating patterns before and after the intervention (p <0.05). Although there are differences, if we look at the median value of adolescents, fruit vegetable eating habits before the intervention is 0.253 and after the intervention is 0.264, this value illustrates that the category of teenage fruit vegetable eating patterns is still rare (<0.43). However, an increase in the median value was found. In the results of the ANOVA test between the eating pattern of fruit vegetables and the frequency of watching videos, it was found that p>0.05, which means that there is no relationship between the frequency of monitoring and eating vegetables.

The results of this study are in line with previous studies that adolescents in the intervention group showed significantly higher scores on the nutrition and health survey (=0.47, P=0.001) and showed a

greater preference for fruits and vegetables at post-natal care. test than the control group (=0 19 , P=0.003) (Schmitt et al., 2019).

Diet is the most important behavior that can affect nutritional status. The quantity and quality of food and drink consumed will affect nutritional intake and affect individual and community health. Optimal nutrition is essential for normal growth and physical development. Good nutrition makes a normal or healthy body weight, and the body is not susceptible to infectious diseases, increases work productivity, and is protected from chronic diseases and premature death.

Adolescent eating patterns will be strongly influenced by the availability of food in the school environment, as well as parents and peers (Madjdian et al., 2018)(Trübswasser et al., 2020)(Parks et al., 2018)(Chung, Ersig, and McCarthy, 2019). To improve the adolescent's fruit vegetable eating pattern, support from a multisector is needed because, from the teenager, there is an intention to change the behavior of eating fruit vegetables. The dependency of adolescents on the availability of food, athousehold and school levels, to carry out this behavior.

Nutritional Knowledge

Before and after the intervention, variable nutrition knowledge differed ($p<0.05$). Let us look further at the median value of nutritional knowledge before it rises from 7 to 9. Indications are that the median understanding of nutrition, before being included, in the knowledge category has not changed after the intervention became the excellent category. The ANOVA test obtained a p-value <0.05, which means a relationship between the frequency of watching videos and adolescent nutritional knowledge. So that the more teenagers watch eating videos, the better nutrition knowledge is.

The results of this study are similar to previous studies, namely the results of a literature review which aims to see the Relationship between knowledge and food intake, which found that there was a significant relationship, including consumption of fruit vegetables (Spronk et al., 2014).

The purpose of providing nutrition education is to encourage positive behavioral changes related to food and nutrition, but nutrition education alone is not adequate. Nutrition education by identifying and utilizing effective behavior change techniques for dietary interventions in young adults will assist the development of potentially more effective and replicable nutrition, policy, and interventions (Ashton et al., 2019).

Theory Planned Behavior

The analysis results showed differences before and after the intervention on Attitudes, Subjective Norms, Behavioral Control, and behavioral intentions of adolescent fruit vegetable consumption ($p<0.05$). The intention is the closest stage before adolescent fruit vegetable consumption behavior changes. In this study, it was found that there was an increase in choice at the end of the intervention, which in turn would support changes in adolescent fruit vegetable consumption behavior.

The results of this study are similar to previous studies, namely that the average level of perceived behavioral control (11,949 ± 2,876),subjective norms (16,515 ± 4,877), stages of change (6,355 ± 1,342), the process of change (8,614 ± 3,406), and self-efficacy (22.447±6.783) in the education

group,increased significantly (P-value <0.05); however, this change was not significant in the control group (P-value > 0.05). (Jalambadani et al., 2017)

The study findings indicate a change in eating vegetables and fruits in adolescents. Still, we have not seen it adequately in their nutritional literacy. Changes in fruit and vegetable diet as a mechanism for the Relationship between technology-based interventions (video) and health outcomes need to be investigated further.

CONCLUSION

Nutrition education in videos is moreeffective and easy for teenagers to understand to increase nutritional knowledge and change adolescent diets, especially fruit vegetables. However, teenage fruit vegetable consumption is still highly dependent on food availability, especially at the household level.

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