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Association between Food and Beverage Social Media Exposure with Nutritional Intake of Female Adolescents at SMA Negeri 1 Kota Cirebon, Indonesia

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ABSTRACT

Background: Previous studies have indicated that exposure to social media can impact adolescents' nutritional intake. Given that 87.5% of Indonesian adolescents use the internet to access social media.
Aims: This study aims to analyze how exposure to social media content about food and beverage affect their nutritional intake.
Method: The research method used in this study was analytical observational with a cross-sectional approach, involving 114 respondents. Data was collected through a questionnaire of food and beverage social media exposure, anthropometric measurements, and direct interviews using a 24-hour food recall format. Data was analyzed using the Spearman correlation test.
Results: Based on the analysis results, it can be concluded that there is a negative relationship between exposure to social media related to food and beverage and adolescent nutritional intake. This means that as exposure to social media content about food and beverage increases, adolescents tend to have lower nutritional intake. The Spearman correlation coefficient of -0.23 supports this finding, indicating a weak but statistically significant negative association.
Conclusion: This negative correlation suggests that social media may influence adolescents in ways that may be detrimental to their overall nutritional health. For example, social media platforms often promote foods and beverages that are high in sugar, fat, and calories, which can lead adolescents to make less healthy food choices. In addition, constant exposure to food-related content may create unrealistic expectations about diet and body image, potentially influencing their eating habits. Recommendations for future research focus on the types of food-related content that adolescents encounter, distinguishing between promotional and educational messages, a more diverse sample of adolescents from different schools and socioeconomic backgrounds, and examining confounding variables such as physical activity levels and peer influence.

Keywords: *Social media exposure, Nutritional intake, Female adolescent.*
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1. Introduction

Previous research has focused primarily on the dietary intake and issues faced by female adolescent, examining how factors such as peer influence, food availability, socioeconomic status, and exposure to social media affect their food choices. Research highlights issues such as undernutrition, chronic energy deficiency and anemia, with data showing an increased prevalence of these issues among adolescent girls. An important aspect of this research is the influence of social media, which can lead to unhealthy diets due to exposure to promotional content and influencers' lifestyles. Given the unique nutritional needs and body image-related social pressures that adolescent girls face, understanding these dynamics is critical to developing targeted interventions to improve their nutritional health.

According to the Nutrition Global Report (2018), there were 16.2 million (5.7%) adolescents suffering from undernutrition worldwide in 2016. Meanwhile, in Indonesia itself, there is a double nutritional burden due to nutritional transitions affecting adolescent groups. The prevalence of undernourishment status in West Java, based on Riskesdas data in 2018, is known to be 9.1% (1.4% very thin and 7.7% thin) among adolescents aged 16-18 years. The prevalence of the underweight category with low values was 3.3% in Tasikmalaya, while the highest was 18.7% in Cirebon.(Nuraini & Lestari, 2021; Rahman et al., 2021; Wulandari et al., 2019)

Previous research suggests that adolescents' nutritional intake may be influenced by various factors, including peer influence, food availability, food choices, body image, socioeconomics, nutrition knowledge, physical activity, and also exposure to social media related to food and beverages. Adolescents' nutritional intakes are often less varied and do not meet the Recommended Dietary Allowance (RDA). Given that the high usage of social media among adolescents; according to the Indonesian Internet Service Providers Association, 87.5% of adolescents use the internet to access social media.(Adiba et al., 2020; Insani, 2019)

In this study, the selection of female adolescent as the research sample is based on several reasons, including a high interest in visual content, adolescent females tend to be more attracted to content such as attractive food photos and videos on social media platforms which may influence their food choices. The influence of influencers and celebrities is also one of the reasons, as many young women follow influencers and celebrities who often promote certain foods and beverages, and exposure to the lifestyle and food choices shown by these influencers can also influence their eating preferences and habits.(Adiba et al., 2020)

The increasing incidence of chronic energy deficiency (CHD) and anemia in female adolescent is also one of the reasons for conducting this study. According to Riskesdas data, in 2018, there was an increase in cases of anemia in adolescent girls, which was around 37.1% in 2013 and increased to 48.9% in 2018. Meanwhile, the prevalence of CHD in female adolescent (aged 16-19 years), according to data from the Ministry of Health in 2021, also tends to increase, where in 2018 the prevalence of CHD was 33.5%, while in 2020 it was 36.3%.(Djogo et al., 2021; Ridwan & Fibrila, 2022)

To differentiate from previous studies, this study examines three aspects of exposure to social media related to food and beverages, namely, duration of exposure, frequency of exposure, and patterns of food selection based on exposure, and we found that exposure to social media related to food and beverages cannot be assessed from only one aspect, but must be assessed from many aspects. Even the three aspects that we studied were not strong enough to describe exposure to social media related to food and beverages in groups of female adolescents, with the discovery of several confounding variables, namely the length of study time and variety of food menus in female adolescents, as well as socio-economic factors, physical activity and body image of female adolescents, which turned out to have a greater influence on food selection patterns.

Social media exposure can harm adolescents' nutritional intake by promoting unhealthy foods high in sugar, fat, and calories through widespread advertising and endorsement by influencers. This continued exposure can lead to the development of preferences for unhealthy choices, as adolescents are highly susceptible to peer influence and may imitate the eating habits of popular figures. In addition, social media often instills unrealistic body image standards, putting pressure on adolescents to engage in unhealthy eating behaviors such as crash dieting or overeating. In addition, many teens lack the critical ability to evaluate the nutritional quality of the content they encounter, so they rely on misleading information and unhealthy food

trends. Combined with a lifestyle that includes more time spent in front of screens, these factors contribute to poor food choices and negatively impact adolescent nutritional health.

The research gap in this study relates to specific social media patterns and their influence on adolescent dietary behaviors. While the existing literature has examined the general impact of social media on food choices, there is a lack of comprehensive analyses that focus on the nuances of how different types of social media content - such as promotional posts, peer interactions, and educational messages - affect food choices and nutrient intake. In addition, previous studies have often overlooked the differential effects of social media exposure based on demographic factors such as age, socioeconomic status, and cultural background, which can significantly influence adolescents' eating behaviors. By addressing these gaps, this study aims to provide a more detailed understanding of the complex relationship between social media patterns and dietary behaviors, ultimately contributing to more effective interventions to promote healthier eating habits among adolescents.

Therefore, this research aimed to analyze the association between social media exposure to food and beverages and nutritional intake in adolescents, with a focus on adolescent female adolescents, and explore the factors that impact food choices and nutritional intake specifically in this group, which often has different dynamics than adolescent males. This study identified gaps in the existing literature regarding the influence of social media exposure on nutritional intake. In addition, this study focused on measuring exposure through duration, frequency and food selection patterns based on social media to provide a comprehensive analysis of the impact of social media on adolescents' nutritional intake.(Adiba et al., 2020)

2. Methods

Study design/ Research procedures

The research method used in this study was analytical observational with a cross-sectional approach, the sample was taken based on the affordable population, namely 11th grade female students of SMA Negeri 1 Kota Cirebon, who were considered to have environmental characteristics in accordance with the research needs. The sample selected must meet the inclusion criteria, namely female students of class XI SMA Negeri 1 Kota Cirebon and female students who are willing to take part in the study and are willing to become research samples, and also meet the exclusion criteria, including female students who are on a strict diet due to suffering from certain diseases and female students who are professional athletes who are undergoing special training, there are no samples that drop out in this study. The sample size was determined using a cluster sampling technique calculated using the Slovin formula, where from a known population of 160 female students, 114 samples were obtained, from 12 classes in grade 11, samples were taken from 6 classes with a proportion of the sample size of 19 female students from each class.

Grade XI students were chosen as the focus of the study because this age group is a critical stage of development during which they experience significant physical, emotional and social changes. In addition, students typically gain more autonomy in making food choices, influenced by peer interactions and social media, which can lead to both positive and negative eating habits. Adolescent girls are particularly vulnerable to social pressures related to body image, which can significantly influence their food choices and nutrient intake. In addition, Grade XI students are often preparing for important transitions, such as higher education, which can further influence their lifestyle and eating habits. Health issues specific to this population, such as iron deficiency anemia and disordered eating, highlight the need for targeted research. In addition, few studies have examined the dietary habits and influence of social media on female students in this age group.

The cluster sampling technique in this study has the potential to cause bias in sample selection, where the selected sample is only from the same school and has similar characteristics, namely coming from an urban environment, so it cannot represent samples with environmental characteristics in rural areas. It also results in a less diverse cluster variation, which causes the results of the study not to reflect the wider population.

Measurements

The independent variable in this study is food and beverage social media exposures, while the dependent variable in this study was nutritional intake in adolescent girls. Data was collected through a questionnaire of food and beverage social media exposure, anthropometric measurements, and direct interviews using a 24-hour food recall format.

Some confounding variables that may affect the results of this study are related to socioeconomic factors, which can significantly affect access to healthy foods and dietary choices, with students from lower socioeconomic backgrounds often relying on cheaper and less nutritious foods. In addition, physical activity levels also play a role, as more active adolescents may require higher caloric intake and tend to choose healthier foods to meet their energy needs. Body image and self-perception also influence eating behaviors, with those with a negative body image more likely to engage in crash dieting or unhealthy eating patterns. Peer influence is another important factor, as adolescents are often influenced by their friends' eating habits, which may not have been accounted for in this study. Cultural background can shape food preferences and dietary practices, leading to differences in food choices among participants. In addition, educational background influences nutrition knowledge and interpretation of food-related social media content. Finally, overall screen time and media consumption may vary among participants, affecting their dietary behaviors and the effectiveness of social media in promoting healthy eating.

The social media exposure questionnaire consisted of three parts, including aspects of exposure duration, aspects of exposure frequency, and aspects of food selection patterns. The exposure duration aspect consisted of 3 questions with a score weight of 3-12 points, the exposure frequency aspect consisted of 26 questions with a score weight of 0-78 points, and the food selection pattern aspect consisted of 16 questions with a score weight of 0-16 points. The total food and beverage social media exposure questionnaire consisted of 45 questions with a score weight ranging from 29 points at the lowest to 132 points at the highest, which were then divided into three categories based on the score obtained by each respondent: low exposure, moderate exposure and high exposure.

Nutritional intake was measured using a 24-hour food recall form, where an interview was conducted and the kind and quantity of food consumed during the 24 previous hours were recorded, starting with the morning meal and ending with the evening meal. Nutrient intake data will be obtained by analyzing food consumption using the Food Composition List tool. The results of the food recall in terms of household size (URT) were converted into gram units, which were analyzed using the Nutria survey application to obtain the amount of nutrient consumption. The amount of nutrient consumption was then calculated manually to obtain the level of energy and nutrient adequacy. Food and beverage social media exposure questionnaire data, anthropometric measurements and interviews with 24-hour food recall format were collected directly by the researchers.

Statistical techniques

The statistical techniques used was univariate analysis to assess the frequency distribution of the nutritional intake and food and beverage social media exposures, including aspects of exposure duration, frequency of exposure, and food selection patterns. Bivariate analysis used to test the association between food and beverage social media exposure with nutritional intake using the Spearman correlation test.

Ethical Clearance

This study received ethical approval from the Health Research Ethics Committee of the UGJ Faculty of Medicine, with ethical approval number 76/EC/FKUGJ/V/2024. The researcher has also provided a consent form to potential respondents prior to data collection.

3. Results

The respondents included in this study were 114 respondents that match the inclusion and exclusion criteria, with data on respondent characteristics presented in this study only in the form of age. The data obtained in this study are primary data collected directly by the researchers through questionnaires and interview results. The questionnaire used in this study has been tested for validity and reliability, with the results obtained valid for all question items and also reliable with an alpha coefficient value 0.891.

Table 1. Frequency Distribution of Respondent's Age

Age	f	%
14	1	9%
15	23	20.2%
16	76	66.7%
17	14	12.3%
Total	**114**	**100%**

Index: n = number, % = percentage

This study was conducted on 114 students of SMA Negeri 1 Kota Cirebon from grade 11 with the age of respondents ranging from 14 to 17 years. Data on Table 1, it shows that the frequency distribution of 1 student aged 14 years, 23 students aged 15 years, 76 students aged 16 years and 14 students aged 17 years.

Table 2. The Average Frequency of Food and beverage social media exposure

Food and beverage social media exposure	f	%
Mild exposure	4	3.5%
Moderate exposure	102	89.5%
Severe exposure	8	7%
Total	**114**	**100%**

Index: f = frequency, % = percentage

From the Table it can be seen the univariate data analysis test, the distribution of social media exposure data related to food and beverages, which includes aspects of exposure duration, aspects of exposure frequency and aspects of food selection patterns, the results showed that 4 students experienced mild exposure (3.5%), 102 students experienced moderate exposure (89.5%) and 8 students experienced severe exposure (7%).

Table 3. The Average Frequency of Aspects from Food and beverage social media exposure

Variable	Category	f	%
Duration of exposure			
	Short exposure duration	81	71.1%
	Medium exposure duration	33	28.9%
	Long exposure duration	0	0%
Exposure frequency			
	Rare exposure frequency	0	0%
	Sufficient exposure frequency	79	69.3%
	Frequent exposure frequency	35	30.7%
Food choice patterens			
	Not exposed	22	19.3%
	Exposed	92	80.7%

Index: f = frequency, % = percentage

In terms of exposure duration, Table 3 showed that 81 students had short exposure duration (71.1%), 33 students had medium exposure duration (28.9%) and there were no students with long exposure duration. In terms of frequency of exposure, the results showed that there were no students with rare exposure frequency, 79 students had sufficient exposure frequency (69.3%) and 35 students had frequent exposure frequency (30.7%). The food choice pattern aspect, showed that 22 students were not exposed to social media when choosing food and beverage (19.3%) and 92 students were exposed to social media when choosing food and beverage (80.7%).

Table 4. Frequency Distribution of Nutritional Intake.

Nutritional intake	f	%
Severe deficit	68	59.6%
Moderate deficit	9	7.9%
Mild deficit	8	7%
Normal	17	14.9%
Excessive	12	10.5%
Total	**114**	**100%**

Index: f = frequency, % = percentage

The Table 4 it can be seen the distribution of data for the nutritional intake of the respondents showed that 68 students had a severe energy deficit level (59.6%), 9 students had a moderate energy deficit level (7.9%), 8 students had a mild energy deficit level (7%), 17 students had a normal energy adequacy level (14.9%) and 12 students had an excess energy adequacy level (10.5%).

Table 5. Cross-tabulation between Food and beverage social media exposure with Nutritional Intake

Food and beverage social media exposure	Nutritional Intake (Energy Adequacy Level)					Correlation coefficient	*p-Value*
	Severe deficit	Moderate deficit	Mild deficit	Normal	Excenssive		
Mild exposure	1	0	2	1	0	-0.23	0.014
	0.9%	0%	1.8%	0.9%	0%		
Moderate exposure	59	9	6	16	12		
	51.8%	7.9%	5.3%	14%	10.5%		
Severe exposure	8	0	0	0	0		
	7%	0%	0%	0%	0%		
Total	**68**	**9**	**8**	**17**	**12**		
	59.6%	**7.9%**	**7%**	**14.9%**	**10.5%**		

From the Table, it shows that the association between food and beverage social media exposures with the nutritional intake of female adolescent at SMA Negeri 1 Kota Cirebon obtained a p-value of 0.014 or $p < 0.05$, which indicates that there is a significant association between food and beverage social media exposures with the nutritional intake of female adolescent. As for the correlation coefficient value, the result is -0.23, which shows that there is a negative correlation with a low level of relationship. The data in the table shows that the higher the exposure to food and beverage social media experienced by the respondents, the lower the nutritional intake, with the majority of respondents having moderate exposure with a level of severe nutritional deficit as many as 59 students (51.8%).

4. Discussion

The data from this study it can be seen that the majority of female students had a moderate level of exposure with a severe nutritional intake deficit based on the level of energy adequacy, namely 59 students (51.8%). From the results of statistical tests with Spearman correlation, p-value obtained was 0.014 or p-<0.05, retrieved a significant association between exposure to food and beverage social media and nutritional intake. While the correlation coefficient value obtained is -0.23, which means that there is a negative correlation with a low level of relationship. This shows that the relationship between the two variables is inversely proportional, where the higher the social media exposure experienced by the students, the lower the nutritional intake they get. This relationship may be due to several other factors that influence both variables, one of which is the respondents' environmental and daily factors.

Based on the analysis of the characteristics of the respondents in the field, there are several factors that can influence the results of the study, namely related to the respondents' very long study time, namely from 6:45 am to 5:00 pm in the afternoon, as well as the curriculum implemented by SMA Negeri 1 Kota Cirebon, namely the independent curriculum, which requires grade 11 students to start preparing for the next level of education. These things allow the respondents to have longer study time, which can reduce the level of social media exposure among adolescents and actually have a positive impact on various aspects of adolescent development and growth.

The negative correlations found between social media exposure and adolescent girls' dietary intake can be theoretically explained by considering the impact of long study time and its effects on social media engagement and food choices. First, the long study time experienced by the respondents, from 6:45 am to 5:00 pm, limited their opportunities for social media interaction. Reduced exposure to social media content, especially food marketing through influencers, may lead to a decrease in the influence of unhealthy food choices that are often promoted online. When adolescents spend more time focusing on their studies, they are less likely to be exposed to persuasive marketing messages that encourage the consumption of high-calorie, low-nutrient foods. In addition, the self-contained curriculum implemented at SMA Negeri 1 Kota Cirebon emphasizes academic preparation, which may encourage a more structured and disciplined approach to daily routines. This structured environment may encourage healthier eating habits, as students can prioritize meal planning and preparation over impulsive food choices influenced by social media. A focus on academic achievement may also shift teens' priorities away from the appeal of social media trends, including food-related content.

In addition, the cognitive engagement required for prolonged learning may improve critical thinking skills, allowing teens to better evaluate the information they encounter on social media. As they become more sophisticated media consumers, they may be less susceptible to marketing tactics used by influencers, allowing them to make more informed and healthier food choices. Long study hours and a structured curriculum may lead to less exposure to social media, which in turn reduces the impact of influencer food marketing on girls. These dynamics suggest that prioritizing academic engagement may have a protective effect on adolescents' dietary intake, promote healthier eating behaviors, and reduce the negative influence of social media.

Longer study time can reduce adolescents' social media exposure in a number of ways, including increasing engagement in positive activities, which can help develop new skills and interests. Establishing healthy routines, improving the quality of social interactions and reducing social media addiction, can have a negative impact on their mental and emotional health. Thus, extended study time is not only beneficial for academic achievement, but can also help reduce excessive social media exposure among adolescents. (Tesa Yolanika Sitompul et al., 2024)

In addition, long study hours led to limited meal times, where adolescents who spend a lot of time studying have limited time to prepare and consume food. This can also lead them to choose foods that are quick and easy to prepare, such as ready meals or unhealthy snacks, which are often low in nutrients. The lack of variety in school meals can also lead to a lack of nutritional intake. (Al-Haifi et al., 2023)

According to research carried out by Qutteina et al., 2022 there is a significant association between exposure to food and beverage social media and adolescents' nutritional intake, with different patterns depending on the type of food consumed and the type of food and beverage content that provides higher exposure. (Qutteina et al., 2022)

Social media exposure may influence adolescents' nutritional intake through several interrelated mechanisms. Some of these mechanisms include the influence of food messages, where social media is often used to disseminate food messages, both promotional and informational. Adolescents who are exposed to more messages about unhealthy foods tend to develop preferences and increase their intake of these foods. Conversely, exposure to messages about healthy foods can encourage consumption of healthy foods. Social media can also shape descriptive norms, which are beliefs about what is considered common practice by others. (Qutteina et al., 2022)

Exposure to educational messages about healthy foods can also improve adolescents' food literacy, where higher food literacy is associated with the ability to plan, select and consume healthy foods. When adolescents are exposed to good information about healthy food on social media, they are more likely to adopt healthier diets. Interaction with social media content can also reinforce the influence of the messages they receive, both positive and negative, and influence their food choices. In addition, many food advertisements on social media are specifically targeted at adolescents, based on their interests and behaviors. (Qutteina et al., 2022)

However, there were also variables of physical activity and socioeconomics that were examined in previous studies but not in this study. In the Adiba et al., 2020 study, it was stated that adolescents who are less physically active tend to have a more sedentary lifestyle, which can lead to increased consumption of high-calorie, low-nutrient foods, such as fast foods like hamburgers and chips, processed snacks like crisps and sweet snacks, and sweet foods like chocolate, pastries and ice cream. This may lead to a shift in nutritional adequacy standards and a negative association in this study. (Adiba et al., 2020)

Physical activity may influence girls' food and beverage social media exposure and nutrient intake through several mechanisms, namely, higher physical activity may influence girls' food choices, where those who are physically active are likely to be more aware of the importance of nutrition and prefer healthy foods to support their physical performance. Physical activity may influence calorie and nutrient requirements; physically active adolescent girls may require more calories and protein, which may influence the types of foods they choose. In addition, physical activity may contribute to female adolescents' self-perception and body image; if they feel better about themselves as a result of exercise, they are likely to make healthy food choices and vice versa.

In addition, the socioeconomic variables described in the study by Lauren Davine et al in 2023 may also influence the negative association found in this study. Individuals with low socioeconomic status often have limited access to healthy foods and tend to choose foods with low prices and large portions that are unhealthy or low in nutrients. People in this situation also tend to have limited time, so they often choose fast or ready-to-eat foods. (Devine et al., 2023)

Socioeconomics may mediate the relationship between social media exposure and adolescent dietary intake through several mechanisms, including access to technology and social media, where adolescents with higher socioeconomic status may have greater access to technological devices and the Internet, allowing them to be exposed to more content about food or nutrition. The quality of content received, where adolescents from families with higher levels of education may be better able to evaluate and select quality social media content, including information about healthy eating. Furthermore, the availability of healthy food, where adolescents from lower socioeconomic backgrounds may live in an environment where healthy food is difficult to access, even though they are exposed to social media content promoting healthy food, this may prevent them from applying what they see on social media in their daily lives.

This study has several limitations that may affect the results of the study that can be used as evaluation material for designing future research, some of these include limitations during the food recall interview process where respondents cannot specifically remember the amount and type of food and beverage they have consumed in the previous 2 times 24 hours. This results in the results obtained from the 24-hour food recall interview not being able to describe the daily nutritional intake of the respondents, but only the nutritional

intake at that time; limitations of the research sample, where this study only involved respondents from one place or school, which was only conducted at SMA Negeri 1 Kota Cirebon. This may mean that the results of this study may not be generalizable to female adolescent in other schools with different environmental characteristics; limitations of intermediate variables with the discovery of several intermediate variables that were not specifically examined and discussed in this study that could affect nutritional intake such as study time, body perception, socioeconomics, food menu variations, types of exposure received and physical activity of research respondents. The following can lead to bias in research data because data is collected and self-reported, and self-reported data is often less accurate due to self-awareness, limited memory, or perhaps a desire to give a "good" answer.

Based on the findings of a negative correlation between social media exposure and adolescent girls' dietary intake, concrete recommendations for interventions should focus on promoting digital literacy and healthy eating habits. Schools and community organizations can implement educational programs that teach adolescents how to critically evaluate food marketing messages on social media and help them distinguish between healthy and unhealthy food options. Workshops can include hands-on activities that encourage students to analyze the nutritional content of popular foods promoted by influencers and understand the health implications of these choices. In addition, integrating nutrition education into the curriculum can empower students to make informed food choices by emphasizing the importance of a balanced diet over the appeal of trendy foods. Working with parents to reinforce these lessons at home can further support healthy eating behaviors. By promoting digital literacy and nutrition awareness, interventions can equip adolescent girls with the skills they need to effectively navigate social media influences, ultimately promoting healthier diets and improving their overall nutritional health.

5. Conclusion

This negative relationship suggests that social media may influence adolescents in ways that could detract from their overall nutritional health. For instance, social media platforms often promote foods and beverages that are high in sugar, fat, and calories, which might lead adolescents to make less healthy food choices. Additionally, the constant exposure to food-related content might create unrealistic expectations about diet and body image, potentially affecting their eating habits.

In this study we found that exposure to food and beverage social media cannot be assessed from only one aspect, but must be assessed from many aspects, even the three aspects we examined were not strong enough to describe food and beverage social media exposure in groups of female adolescent, with the discovery of several confounding variables, namely the factor of length of study time and the variety of food menus in female adolescent, as well as socio-economic factors, physical activity and body image of female adolescent, which turned out to be more influential in food selection patterns, especially in female adolescent.

Thus, suggestions for future research are to further develop aspects of social media exposure related to food and beverages, such as the type of content and what types of food messages were ultimately received from the content viewed by respondents, distinguishing between promotional messages and educational messages, a more diverse sample of adolescents from various schools and socioeconomic backgrounds, and examining confounding variables such as physical activity levels and peer influence.

Conflict of Interest

The authors declare there is no conflict of interest for the result.

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