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SCREEN TIME ON WEEKDAY AND WEEKEND AMONG HEALTH COLLEGE STUDENTS AND THE CORRELATION TO NUTRITIONAL STATUS

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ABSTRACT

Introduction: The prevalence of obesity in Indonesia reached 21.8% in 2018 and increased by 6.4% compared to 2013. Low physical activity is known as a risk factor of obesity. College students' activities are closely related to use of screen time. **Aims:** To identify the activities of screen time for assignments and non-assignments on weekdays and weekends among college student and analyze its relationship with body mass index (BMI). **Methods:** This study was conducted in 2018 with a cross sectional design among undergraduate students at the Faculty of Public Health, Universitas Airlangga, Indonesia, conducted in 2018. The screen time questionnaire was adapted from Sedentary Behavior Questionnaire. The correlation between screen time duration and BMI was analysed by Spearman test. **Results:** The female subjects were dominant (81.1%) and 28.4% of subjects as overweight-obese. The screen time duration in non-assignment activity on weekends has a positive correlation with the nutritional status of health college students (p 0.000, r 0.49), particularly duration of social networking sites and listening to music were more significant in obese than normal. The use of smartphones takes a high part, approximately 4 hours 20 minutes both on weekdays and on weekends**. Conclusion**: The screen time duration in non-assignment activity on weekend was associated to nutritional status of health college students. Health college students are encouraged to reduce screen time for non-assignment activities on weekends and to use wisely several smartphone applications or social networking sites to control body weight and achieve a balanced nutritional status.

Keywords: body mass index, college students, obesity, screen time, nutritional status

INTRODUCTION

Obesity has become a public health problem in almost all countries around the world since the e prevalence increases from year to year. In Southeast Asian region, the prevalence of obesity among adults increased from 20% in 2010 to 22% in 2014 and in Indonesia, there was an increase of obesity from 15.4% in 2013 to 21.8 % in 2018 (World Health Organization, 2016; Ministry of Health, 2018). Epidemiological studies describe the impact of obesity among young adults including loss of confidence in body shape (Atlantis and Baker, 2008; Luppino et al., 2010; Harriger and Thompson, 2012). Furthermore, obesity since adolescence and early adulthood has impact in later life and causes organ dysfunction such as cardiac dysfunction, diabetes, hypertension, stroke, cancer, and other metabolic diseases (Reilly and Kelly, 2011; Berenson and Bogalusa Heart Study Group, 2012; Kishi et al., 2014).

College students enter a transition period from late adolescence to early adulthood; the period of life when prevalence of obesity rises rapidly (Deforche et al., 2015). It has been hypothesized that unhealthy dietary habits and low physical activity are major determinants of obesity among university students (Deforche et al., 2015; Deliens et

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al., 2015; Breitenbach et al., 2016; Sogari et al., 2018). Among many sedentary behaviors, screen time remains the major activity related to both assignment and non-assignment done by college students.

Campus lifestyle, especially in urban areas, can change the lifestyle and behavior of students which can lead endemic of obesity (Deforche et al., 2015). Previous studies indicated the prevalence of obesity among health college students is high. A study of students at Taif University in Saudi Arabia showed a prevalence of obesity is 36.8% (Hamam et al., 2017). It is recorded that 30.1% and 25.9% of Malaysian and India medical students, respectively, were identified as overweight and obese (Boo et al., 2010; Gudegowda, Vengatesan and Sobagiah, 2018). Epidemiological studies of students from 22 universities from developing countries showed a prevalence of 22% (Peltzer et al., 2014). In Indonesia, a study of 307 Medical students at Sam Ratulangi University showed 32.2% with overweight and obese (Eka, Ticoalu and Wongkar, 2013). These data indicate the high prevalence of obesity in college students, especially in the health background. Since health college students seem knowing and understanding about risk factors of obesity, it is very interesting to identify the activities of screen time for assignments and non-assignments on weekdays and weekends among health college students and analyze its relationship with body mass index (BMI) according to several variables related to the characteristics of college students.

In recent decades, several scientific evidences show that the increase in the use of electronic media is in line with the increase in obesity in adolescents. The study also states that nowadays many people behave in front of electronic media so that they contribute to increasing the prevalence of obesity in adolescents (Komlos, Breitfelder and Sunder, 2009; Chinapaw et al., 2011; Ogden et al., 2012). There is a positive relationship between screen time and changes in BMI at the top of the BMI distribution (Mitchell et al., 2013). In addition, cumulative evidence suggests that increased screen time in young adults is associated with excess nutritional status as assessed by body mass index and fat mass (Boo et al., 2010; Breitenbach et al., 2016; Hamam et al., 2017).

Other studies show different results; there was no correlation found between screen time duration and nutritional status, which is mainly related to diet and knowledge level (Deforche et al., 2015). Therefore, this study aims to recognize the activities of screen time for assignments and non-assignments on weekdays and weekends among health college student and analyze its relationship with body mass index (BMI) according to several variables related to the characteristics of college students.

METHODS

Study design

We used a cross-sectional observational study in undergraduate (bachelor's degree) college students from two study programs at the Faculty of Public Health, Universitas Airlangga. Data collection was carried out between February and June 2018. This study was approved by the Ethics Committee of Faculty of Public Health, Universitas Airlangga with the letter number 904-KEPK FKP Universitas Airlangga in 2018 and written informed consent was obtained from all subjects.

Population and sampling

The population in this study were students at the Faculty of Public Health, Airlangga University, which consisted of two study programs, namely the nutrition study program and the public health study program. The sample in this study was selected by simple random sampling from the eligible population (1135 students) so that 74 students were selected. This

minimum sample size has taken into account the sample formula used by considering the P value of 28.4% and d of 10%. From 1135 students, 74 students were chosen randomly using a lottery system based on a certain identity, namely the Student Identification Number (NIM). If the selected students met the inclusion criteria, they were selected as samples. The inclusion criteria in this study were students aged 18-25 years, not fasting or following a certain diet, there was no change in physical activity since becoming a student, and willing to participate in the research process. Students who did not want to participate in this study were excluded.

Data measurement

Screen time was identified using the sedentary behavior questionnaire (SBQ). This questionnaire was adapted from a previous study at the University of California (Rosenberg et al., 2010). The questionnaire has been tested for validity and reliability with a Cronbach's alpha value of 0.705.

The SBQ was designed to assess the amount of time spent doing nine behaviors (watching television, playing computer/video games, sitting while listening to music, sitting and talking on the phone, doing paperwork or office work, sitting and reading, playing a musical instrument, doing arts and crafts, sitting and driving/riding in a car, bus, or train). The nine items were completed separately for weekdays and weekend days. Working for weekday reporting was, "on a typical weekday, how much time do you spend (from when you wake up until you go to bed) doing the following?" The use of screen devices was measured by minutes per day (minute/ day) spent in each device. Screen time duration was measured of the time used for college assignment and non-assignment activities. The screen time questionnaire covers all activities carried out on weekdays (Monday-Friday) and on weekends (Saturday-Sunday) during the last seven days. The non-assignment activities included leisure time activities. They are watching movies, listening to music, playing games, reading comics / electronic novels, and opening the social media (social networking sites). The activities related to the assignment are such as working on tasks that use computers or the internet. Interpretation of SBQ results includes high > 81.5 -> 102.75 hours / week; moderate > 60 - < 81.5 hours / week; low: < 38.5 - < 60 hours / week.

The physical activity levels (PAL) were taken using a questionnaire adapted from the sedentary behavior questionnaire and the International Physical Activity Questionnaire (IPAQ) (Yoo et al., 2008). The questions ask respondents about the time they spent being physically active in the last seven days.

This questionnaire consists of seven questions based on the physical activity carried out by the respondents during the last week. The interview results that have been obtained were then processed using the IPAQ scoring protocol guide so that physical activity data are obtained. The IPAQ uses MET (metabolic equivalents of task) as the unit. Physical activity categories consist of light activity (if doing physical activity < 600 METS-minutes/week), moderate activity (if doing physical activity 600-3000 METs-minutes/week), severe activity (if doing physical activity > 3000 METs-minute /week) (Yoo et al., 2008).

Nutritional status data were obtained from body weight measured using digital weight scales and body height measured using stadiometer by two trained investigators. Body mass index (BMI) was computed as the ratio of weight (kg) per square height (m^2) and nutritional status were categorized into underweight (<18.5 kg / m^2); normal (18.5 to 24.9 kg / m^2); overweight (25-29.9kg / m^2); and obese (≥30 kg / m^2). For the present study, BMI was divided into two categories: normal weight (< 24.9 kg / m^2) and over-obese (≥

25.0 kg / m^2). In this article, we write over-obese as obese subjects.

Statistical analysis

Descriptive analytics statistics were used to describe participant characteristics. Continuous variables were presented as mean and standard deviation, and categorical variables were summarized as numbers and percentages. Bivariate analysis to compare screen time duration between normal weight and over-obese was conducted by t-test or Wilcoxon test. Furthermore, to assess the correlation between duration of screen time activities and BMI Pearson correlation test was performed. All statistical calculations were conducted with Statistical Package for Social Sciences version 21 with p value<0.05 was significant.

RESULT

Demographic characteristic of study participants

Subjects' characteristics included gender, age, study program, type of residence, amount of monthly allowance, and physical activity level. Female was majority subjects in this study (81.1%). As many as 62.2% of subjects did not live with their parents, while the median of money allowance was IDR 665,000. Physical activity level showed 52.7% of subjects were categorized as moderate. Baseline characteristics are summarized in Table 1. Furthermore, Table 2 shows distribution of nutritional status based on gender. The mean of BMI was 23.14 kg / m^2, and as much as 28.4% classified as overweight and obese.

Activities and duration of screen time on weekdays and weekends based on nutritional status can be seen in Table 3. We divided screen time activities as college assignment and non-assignment activities. The college assignments were done more on weekdays with a screen time duration of 147.97 ± 106.16 min/day, while social networking sites was the dominant activity of non-assignments done both on weekdays and on weekends taking around 260 minutes every day. The activities that were significantly different on weekdays and weekend are doing assignment, and watching television or movie. This physical activity data used a questionnaire that was asked of respondents within the last seven days. However, this could be a weakness of the research because we do not know for sure how long the activity has been going on because we did not ask in detail. It's just that inclusion criteria regarding physical activity have not changed since becoming a student.

Stratified by nutritional status, it can be seen screen time duration of mean of non-assignment on weekend is longer in obese subjects ($p < 0.001$). The specific of non-assignment activities that have significant difference between normal weight and obese subjects are listening to music and networking on social sites as Facebook, Twitter, and Instagram. All these activities were performed at weekends. In addition, we also analyzed sitting time and physical activity level. The questions of physical activity questionnaire were about the duration of walking, working (moderate and severe categories), cycling, recreation and sports. A total of 52.7% was classified as moderate physical activity. In physical activity form, it was also asked how much time they spend in sitting on a working day and on holidays. The duration of sitting time on weekends was significantly longer than on weekdays ($p = 0.013$).

We associated body mass index based on some variables and the duration of screen time activities, both assignment and non-assignment, on weekday and weekend in Table 4. It clearly shows that almost all non–assignment activities on weekend were positively correlated significantly with BMI.

Those associations were proven in both genders, in both study programs, in all types of dwellings, as well as money allowances greater than the median. In

contrary, BMI of female, nutrition study program subjects, and living alone in boarding subjects were inversely correlated with screen time duration of assignment on weekends.

Table 1. Characteristic Distribution of Subjects

Characteristic	**(n=74)**	**%**
Gender		
Male	14	18,9
Female	60	81,1
Age		
18-20 years	34	46
21-22 years	40	54
Study Program		
Public health	36	51
Nutrition	38	49
Place of residence		
Not Living with parent	46	62,2
Living with parent	28	37,8
Physical activity level (MET min/week)		
Light (<600)	9	12.16
Moderate (600-3000)	39	52.70
Severe (>3000)	26	35.14
Money allowance/ month		
Median (Min-Max)	IDR 665,000 (450,000-5,000,000)	

Table 2. Nutritional Status Distribution based on BMI

Nutritional Status	**Total N=74 (%)**	**Male n = 14 (%)**	**Female N =60 (%)**
Body Mass Index			
Mean ± SD (kg/m^2)	23.14±4.57	24.99±5.28	22.71±4.32
Underweight	12 (16.2)	2 (14.2)	10 (16.7)
Normal	41 (55.4)	6 (42.9)	35(58.3)
Overweight	8 (10.8)	2 (14.3)	6(10)
Obese	13 (17.6)	4 (28.6)	9(15)

Table 3. Activities and Duration of Screen Time on Weekdays and Weekends

Activity	**Screen Time Duration (minute/day) (Mean ± SD)**			
	Total (n=74)	**Normal (n=53)**	**Obese (n=21)**	**p**
Assignment				
Mean of college assignment				
Weekdays	147.97±106.16	138.68±103.25	171.43±112.31	0.24
Weekends	88.18±97.9	94.53±103.07	72.14±84.01	0.38
p	<0.001*			
Non-Assignment				
Mean of all non-assignments				
Weekdays	107.64±46.04	103.38±48.42	118.38±38.37	0.21
Weekends	114.2±35,3	104.49±34.09	138.71±25.28	<0.001*
p	0.203			
Watching TV or movie				

Activity	**Screen Time Duration (minute/day) (Mean ± SD)**			
	Total (n=74)	**Normal (n=53)**	**Obese (n=21)**	**p**
Weekdays	86.76±88.56	88.59±91.3	82.14±83.19	0.78
Weekends	123.45±94.40	115.19±94.26	144.29±93.73	0.23
p	<0.001*			
Playing games				
Weekdays	48.04±62.37	47.55±58.81	49.29±72.12	0.92
Weekends	57.36±71.80	53.77±69.14	66.43±79.17	0.49
p	0.192			
Listening music				
Weekdays	88.45±93.31	84.72±83.93	62.26±61.1	0.59
Weekends	79.46±76.64	53.77±69.14	66.43±79.17	0.01*
p	0.337			
Social networking sites				
Weekdays	259.59±106.73	246.79±109.38	291.91±94.53	0.10
Weekends	260.68±86.71	246.23±85.94	297.14±79.32	0.02*
p	0.881			
Reading webtoon/comic				
Weekdays	55.74±73.97	50.94±74.32	67.86±73.43	0.38
Weekends	50.07±47.71	45±48.16	62.86±45.15	0.15
p	0.54			
Sitting time				
Weekdays	318,04±178.54	315±186.56	326.71±160.52	0.82
Weekends	368,92±223,425	376.7±250.61	349.29±135.43	0.55
p	0.013*			
Physical activity level		3056.75±2820.48	3750.07±2302.15	0.32

*significant, p<0.05, t-test

Table 4. The Correlation between Duration of Screen Time on Weekend and Weekday with Body Mass Index in Some Variables

Nutritional Status (BMI)	**Screen Time Activities P value (r)**			
	Assignment		**Non-Assignment**	
	Weekday	**Weekend**	**Weekday**	**Weekend**
Total	0.484	0.055	0.383	0.000 (0.49)*
Based on sex				
Male	0.699	0.334	0.219	0.027 (0.59)*
Female	0.720	0.048(-0,25)*	0.724	0.000 (0,46)*
Based on study program				
Nutrition	0.409	0.025 (-0,36)*	0.079	0.001 (0.51)*
Public Health	0.061	0.653	0.469	0.004 (0,47)*
Based on place of residence				
With parents/family	0.936	0.577	0.566	0.023 (0.43)*
Living alone/boarding	0.545	0.022 (-0.34)*	0.420	0.000 (0.57)*
Based on money allowance				
≤ median	0.025 (0.37)	0.491	0.721	0.093
>median	0.196	0.053	0.144	0.000 (0.65)*

*significant p< 0.05, Spearman test

DISCUSSION

The problem of obesity in young adults, especially in college students is still a global public health problems. The average BMI of the subjects in this study is 23.14 kg / m^2 and 28.4% identified as over-obese. The results of this study are slightly lower than those of other health college students. A study of medical students in Indonesia showed 32.2% with over nutritional status (Eka, Ticoalu and Wongkar, 2013). A study of students at the University of Taif in Saudi Arabia shows 36.8% prevalence of overweight and obesity (Hamam et al., 2017). However, the nutritional status in this study is higher than the data of 2018 Indonesian basic health research showing the age group of 19-24 years both for men and women with 15.5% and 24.7%, respectively, having overnutritional status (Ministry of Health, 2018). It is also higher than epidemiological studies on students from 22 universities from developing countries that show the prevalence of obesity was 22% (Peltzer et al., 2014). The average BMI in this study is similar to some studies in health students of Malaysia and India, as many as 25.9% and 30.1% are identified as overweight and obese (Boo et al., 2010; Gudegowda, Vengatesan and Sobagiah, 2018). Overweight and obesity among college students remains a public health problem that needs to identify several factors which might be associated with student activities, such as food intake and physical activity including screen time usage.

The screen time activities among college students is interested to be learned, both related to the assignment activity and non-assignment activities. Psychosocial factors are identified to be factors that influence the duration of students' screen time (Harriger and Thompson, 2012). Friendship environment, which is not supporting to do sports, can affect students' interest in doing physical activity (Deforche et al., 2015; Deliens et al., 2015). In this study, assignment tasks were done more on weekdays with a screen time duration of 147.97 ± 106.16 minutes / day. Social networking sites is a major non-assignment activity done both on weekdays and weekends, which takes about 4 hours 20 minutes every day, and watching TV is the main activity carried out on weekends rather than weekdays. The high duration of screen time is identified to reduce the level of physical activity in students. If this activity is followed by poor intake habit, it will cause unbalanced nutritional status or obesity (Ekelund et al., 2008). Our study showed there is no association between physical activity and nutritional status. However, this study indicated a significant relationship between the duration of the non-assignment screen time on weekends and nutritional status. Those specific activities are listening to music with duration 66 minutes and social networking sites which takes about 260 minutes every day. Listening to music by smartphone, television, or PC is usually done by college students when they spend more time on relaxing activities. This study show obese subjects spent more time in listening to music. It is similar to Stroebele and Castro's (2016) study in college students which found that the presence of music is connected with higher food consumption; fat intake was higher when music was on while eating in comparison to without listening to music (Stroebele and de Castro, 2006). Furthermore, Russo et al. (2017) revealed music exposure was able to stimulate the body weight gain by modulating the hypothalamic Ghre expression and its release (Russo et al., 2017).

Nowadays, social networking sites (SNS) are a popular form of communication and very familiar in every person, particularly in adolescence and undergraduate students. It not only offers users an opportunity to link with others but also allows individuals to compare themselves with other users. The long

duration of screen time usage on non-assignment activities undertaken by students can be seen in the use of smartphones for SNS. The use of smartphones takes a high part, approximately 4 hours 20 minutes both on weekdays and on weekends. Sampasa-Kanyinga et al. (2015) investigated the associations between time spent using SNS and unhealthy dietary behaviors and body weight in adolescents. The result is the use of SNS was associated unhealthy eating behaviors but no evidence was found of a significant association between use of SNS and BMI (Sampasa-Kanyinga, Chaput and Hamilton, 2015). It was supported by another study that maladaptive use (heavy use) of SNS has been associated with disordered eating behaviors (restrained eating), more specifically because of dissatisfaction with body weight (Murray, Maras and Goldfield, 2016). However, our study demonstrated that everyday college students have time spent using SNS more than four hours / day, and moreover time spent using SNS in weekends is significantly longer in obese than normal weight subjects with a time difference of almost one hour per day. Our results are similar to most studies that have shown the use of smartphones and other screen devices for social networking sites is associated with several risk factors for obesity. It might be obese subjects in our study use SNS on the weekend for searching more information about culinary food and delivery orders for those foods, since time spent using SNS correlated significantly with sitting time in weekend (data were not shown). It is similar to Alley et al. (2017) who found that social media use is associated with sitting time on non-workdays. However, the use of some smartphone applications such as weight monitors and diet monitors has a significant impact on weight loss (Chin et al., 2016). Therefore, it is needed to be wise while using a smartphone to get positive benefits.

Another important finding of our study is watching TV on weekends is significantly higher than on weekdays (123.45 ± 94.40 vs 86.76 ± 88.56 minutes / day) although is not a significant difference between obese and normal weight. Previous study showed watching TV ≥5 hours per day was associated with SSB consumption and obesity (Kenney and Gortmaker, 2017). It is estimated that the consumption of snacks is more on weekends along with non-assignment activities such as watching television. A systematic review of studies showed that watching television accompanied by eating was associated with low quality meals such as consumption of sweetened drinks, high-fat foods and high sugar, also less fruit and vegetable (Avery, Anderson and McCullough, 2017). Furthermore, long duration of television watching accompanied by poor eating habits is associated with an increased prevalence of obesity (Coon and Tucker, 2002; Avery, Anderson and McCullough, 2017; Ghobadi et al., 2018). Our study showed time spent watching TV on the weekend is around two hours/ day, so it appears this was not enough to associate with BMI. TV watching activities are generally carried out in a relaxed condition with a sitting position. Furthermore, in this study the results of the analysis of the duration in sitting time on weekends were significantly longer than on weekdays (368.92 ± 223.425 vs 318.04 ± 178.54, $p = 0.013$). This indicates that, on weekends, subjects performed more non-assignment activities by relaxing in a sitting position with the use of screen time such as watching TV. Epidemiological studies have proven that the sedentary behavior was associated with obesity problems in adults (Boo et al., 2010; Deliens et al., 2015; Hamam et al., 2017).

Overall, time spent for all non-assignment activities in weekends is higher significantly in obese than normal weight subjects (138.71 ± 25.28 vs 104.49 ± 34.09 minutes / day). It means obese subjects use

of SNS ≥2 h/day. A study by Sampasa-Kanyinga et al. (2016), found that adolescents are recommended to achieve max 2h/ day of screen time and subjects that use SNS ≥2 h/day had lower adherence to ST recommendation (Sampasa-Kanyinga, Chaput and Hamilton, 2015). Analysis based on several variables in this study showed a significant correlation between the duration of the non-assignment screen time on weekends and the nutritional status. Those variables are the type of study program, type of residence, and the amount of money allowance.

An interesting thing found in this study is an inverse correlation between the screen time duration of assignment activities and BMI on weekends. Those associations were proven in female subjects, nutrition study program and subjects not living together with their parents (Table 4). Generally, the assignment activities done during the weekend are urgent tasks related to the limited time so the subjects are more focused on doing the assignment and might not be followed by snacking/ eating snacks. Previous study showed snacking activities while studying was more seldom done than snacking while watching television. A study on college students in India demonstrated 31.9% of subjects were snacking with studying, meanwhile almost 73.6% of subjects were snacking with watching television (Mithra et al., 2018). This indicates that working on assignments on weekends is better done than doing non-assignment screen time activities associated with nutritional status, especially among obese subjects.

In this study, we described the details of the types and duration of screen time activities both on weekdays and on weekends. So, we can detect the specific screen time activities having risk to obese among college students. We controlled a confounding variable such As health knowledge. It is estimated our subjects have similar knowledge in understanding basic health and risk factors of obesity since it is studied since the first semester. Instead, the results of this study might only be generalized to health students majoring in nutrition and public health related to the burden of college assignments received only. The burden of lectures and different academic assignments in each department can give different results. Further research can be done with a wider population to describe the relationship in general.

The important thing that should be concerned related to weekend activities is habitual intake. Previous study showed the difference of food consumption between weekday and weekend; energy and macronutrient intakes were higher on weekend and have an impact on weight gain (Kandinasti and Farapti., 2019). Furthermore, eating out more often and over energy had greater risk of gaining weight on weekends (Puspikasari et al., 2024). Concerning sodium intake and taste preference is also important to identify obesity (Farapti et al., 2019; Furqonia et al., 2023)

In this study, however, we did not investigate food intake as risk factors of obesity. The small sample size also becomes a limitation of our study and the cross-sectional study design cannot describe a causal relationship. The strength of this study was that researchers considered variables outside campus activities, including non-assignment activities.

CONCLUSIONS

The present study supports the view that screen time duration in non-assignment activity on weekends has a positive correlation with the nutritional status of health college students. Listening to music and social networking sites, as well as the length of sitting time on weekends were identified as risk factors of obesity among students. The negative correlation between screen time of assignment activities on weekends and

nutritional status indicates that working on assignments on weekends might be better done than non-assignment screen time activities, especially in obese subjects. Health sciences students are encouraged to reduce screen time for non-assignment activities on weekends, and furthermore, it is needed to use wisely several smartphone applications or social networking sites to control body weight and achieve a balanced nutritional status. The weakness of this research is the use of a questionnaire that only explores physical activity during the last seven days. Therefore, improvements for further research need to be considered regarding method selection so that research has optimal results. For further studies, researchers can use other design studies to analyze causal relationship and large sample size. Additionally, researchers can include food intake as a variable.

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