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The Frequency of Fast-Food Consumption and the Habit of Using Gadgets and Playing Games as Risk Factors for Childhood Obesity

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ABSTRACT

Introduction: Obesity is defined as the result of excessive fat accumulation caused by an energy imbalance, and it poses significant health risks. The contributing factors to be considered in this instance are the frequent consumption of fast food and reduced physical activity, which result from the increased use of gadgets and games. This study aimed to investigate the correlation between the aforementioned factors and the prevalence of obesity among elementary school children.

Methods: The heights and weights of 112 participants were measured to calculate their body mass index (BMI). The respondents were interviewed directly about their fast-food consumption habits over a one-week period and their daily use of gadgets and games. This study employed bivariate analysis to examine the relationships between variables in a sample, using the Chi-Square test with odds ratio determination, a 95% confidence interval, and a significance level of 0.05, as implemented in the International Business Machines Corporation (IBM) Statistical Package for the Social Sciences (SPSS) version 29.

Results: The chi-square test showed p>0.05, indicating no significant relationship between fast-food consumption or gadget use and obesity in elementary school children.

Conclusion: There was no association between the frequency of fast-food consumption and the habit of playing gadgets and games as a risk factor for obesity in elementary school children.

Highlights:

1. There was no relationship between the frequency of fast-food consumption and the risk of obesity in elementary school children. This result was based on interviews with students of Rangkah VII Elementary School during their daily life activities and their tendencies.
2. There was no relationship between the habit of playing gadgets and games as a risk factor for obesity in elementary school children. This result was based on interviews with students of Rangkah VII Elementary School during their daily life activities and their tendencies.

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Introduction

Obesity is the accumulation of excess fat in the body due to an imbalance between the energy intake and expenditure over an extended period, leading to potential health issues.[1] According to WHO, a child aged 5-19 is considered overweight if their BMI for age is +1 SD above the WHO growth reference and classified as obese if it's +2 SD.[1] Meanwhile, CDC (2000) defines childhood obesity when BMI is ≥95th percentile on the CDC BMI-for-age curve.

Childhood obesity remains a prevalent global issue. The prevalence of overweight and obesity in children aged 5-19 has sharply increased from 4% in 1975 to 18% in 2016. Nearly half of childhood obesity cases under 5 years old occurred in Asian countries in 2019 (WHO 2021). In Indonesia, obesity in children is on the rise, with a 3.6% prevalence under 5 years and 21.8% for those aged 18 and above. In East Java, 22.4% of the population suffered from obesity in 2018.[2] In Surabaya, 21.8% of residents aged ≥15 were affected by obesity in 2019.[3]

Obesity generally leads to cardiovascular diseases such as stroke, liver diseases, diabetes, musculoskeletal disorders, and an increased risk of certain cancers. Children with obesity are at a higher risk of developing obesity in adulthood, premature death, and various health issues in adulthood. Obese children may experience difficulty breathing, an elevated risk of bone fractures, hypertension, early signs of cardiovascular disease, insulin resistance, and psychological effects.[1]

According to the Ministry of Health Republic of Indonesia, one of the risk factors for childhood obesity is unhealthy eating habits, including the consumption of fast food, coupled with a decline in physical activity, such as frequent gaming, gadget use, and TV watching.[2] The increase in prosperity in Indonesia has led to lifestyle changes and altered eating habits. Eating habits, especially in urban areas, have shifted from traditional to a more Westernized diet, including fast food, resulting in an imbalanced nutritional intake and excess body fat leading to obesity.[4]

Apart from poor eating habits, physical activity plays a crucial role in obesity. Insufficient physical activity allows stored energy to turn into fat, leading to weight gain in individuals with sedentary habits and high-calorie diets.[5] The time children spend on gaming, replacing time that should be allocated for physical activities, tends to lead to unhealthy snacking.[6] Various studies on the frequency of fast food consumption have been conducted previously. Previous research in Europe categorizes frequent consumption of fast food by children as Ultra-Processed Food (UPF), stating that high consumption levels can lead to childhood obesity.[7] Another study in Brazil suggests that regularly consuming UPF can increase the risk of obesity. Fast food containing high levels of fat, salt, and sugar can contribute to childhood obesity.[8]

Studies on gadget and gaming habits have also been extensively conducted. Research in Malaysia suggests that elementary school children tend to spend more time at home playing gadgets and games than engaging in outdoor physical activities. Elementary school children with low physical activity levels have a threefold higher risk of obesity compared to those with regular physical activity. Other studies link obesity to low physical activity, prolonged sitting in school, insufficient sports activities, excessive use of electronic devices (gadgets), and a lack of outdoor play.[9-10]

In Indonesia, numerous studies have explored the risk factors for childhood obesity, particularly regarding the frequency of fast food consumption and gadget and gaming habits. In Surabaya, the last study on the risk factors of childhood obesity related to fast food was conducted in 2007, and no research has been done on gadget and gaming habits. This study aimed to evaluate the frequency of fast food consumption and the habit of using gadgets and playing games as risk factors for obesity in elementary school children to prevent an increase in obesity among elementary school children in Surabaya.

Methods

This research type was analytical observational research. The research design utilized is a case-control approach, comparing case and control groups to determine the proportion of occurrences based on exposure history.[9] The study sample consists of all students at SDN Rangkah VI Surabaya, totaling 112 children, including 56 obese children (cases) and 56 children with normal weight (controls). The inclusion criteria for the case group were children willing to be respondents, children attending school during sample collection, and children with obesity. The inclusion criteria for the control group were children willing to be respondents, children attending school during sample collection, and children with normal weight. The exclusion criteria were children with severe infectious diseases (Covid-19, Singapore flu, diphtheria, typhoid fever and children with conditions affecting the research (disabilities or special needs).

The dependent variable in this study is obesity in elementary school children. Independent variables include the frequency of fast food consumption (The frequency of fast food consumption by children in a week is categorized as follows: Often: ≥3 times per week, Rarely: 1–2 times per week, and Never: 0 times per week (Puput, 2019).), gaming, and gadget use (The frequency of children using gadgets and playing games is categorized based on daily duration as follows: Often: more than 2 hours per day, Rarely: 1–2 hours per day (American Academy of Pediatrics, 2001).) by children. For the dependent variable, weight and height will be measured using scales (The Onemed EB 9362 digital Scale has been certified with AKL 10901811217. The product has undergone a series of standard accuracy tests for manual scales and is approved for distribution and public sale) and a staturemeter (Onemed) to calculate BMI.

The independent variables will be assessed through interviews with all SDN Rangkah VI Surabaya students, documented on observation sheets. Data analysis will involve univariate and bivariate analyses. Univariate analysis produces frequency distribution and percentages for each variable, while bivariate analysis explores the correlation between fast food consumption, gaming habits, and obesity in elementary school children using the Chi-square Correlation Test. Informed consent is obtained before the research, providing consent forms to become respondents. However, this informed consent is given to the teachers as legal guardians at the school since the respondents are underage and require a guardian's approval. This study aims to explore the relationship between the frequency of fast food consumption and the habit of playing gadgets & games for obesity in elementary school children.

Data Analysis

Bivariate analysis was used to determine the relationship between 2 or more variables from a sample that has been taken. In this research, the statistical test used is the Chi-Square test with the determination of odds ratio (OR), confidence interval (CI) of 95%, and a significance level of 0.05 using the International Business Machines Corporation (IBM) Statistical Package for Social Sciences (SPSS) software version 29. The Chi-Square test aims to examine the relationship between one dependent variable and one independent variable, both measured on a nominal scale (Sujarweni, 2015). We used the chi-square analysis because it is only used to find the relationship between two variables. The sample size we used was limited to the number of samples collected at the time, so the data we used was not continuous.

Results

Based on Table 1, the gender distribution of the respondents/students consists of 48 boys (42.9%) and 64 girls (57.1%). In the case group (students with obesity), there are 34 boys (60.7%), which is higher than the 22 girls (39.3%). In the control group (non-obese/normal students), there are 42 girls (75%), outnumbering the 14 boys (25%). Regarding the ages of the respondents/students, the majority in both the case group (obese students) and the control group (normal students) are 9 years old, with a total of 72 children (64.3%). This includes 33 children (58.9%) in the case group and 39 children (69.6%) in the control group. Additionally, the number of third-grade students in both the case group (obese students) and the control group (normal students) is higher than that in other grades, with a total of 74 children (66.1%), divided into 33 children (58.9%) in the case group and 41 children (73.2%) in the control group. In this study, students from grades 2, 3, and 4 participated due to differences in entry times compared to grades 1, 5, 6, preventing the researcher from sampling other grades.

Table 1. Frequency distribution based on gender, age, and classes

	Case n (%)	Control n (%)	Total Children (%)
Gender			
Boys	34 (60.7)	12 (25)	48 (42.9)
Girls	22 (39.3)	42 (75)	64 (57.1)
Total	**56 (100)**	**56 (100)**	**112 (100)**
Age (Years Old)			
8	0 (0)	2 (3.6)	2 (1.8)
9	33 (58.9)	39 (69.6)	72 (64.3)
10	16 (28.6)	10 (17.9)	26 (23.3)
11	7 (12.5)	5 (8.9)	12 (10.7)
Total	**56 (100)**	**56 (100)**	**112 (100)**
Elementary Grade			
2	0 (0)	2 (3.6)	2 (3.6)
3	33 (58.9)	41 (73.2)	74 (66.1)
4	23 (41.1)	13 (23.3)	36 (30.3)
Total	**56 (100)**	**56 (100)**	**112 (100)**

Source: Research data, processed

According to Table 1, the majority of children dall into category of those who rarely consumed fast food. This allowed by the group who frequently consumed fast food, and the least presented group is that of children who never consumed fast food.

Table 2. Frequency distribution based on fast food consumption and most frequently consumed fast food and frequency distribution based on gadget and game playing habits and physical activity and others

Frequency of Fast-Food Consumption				
	Frequent n	**Rare n**	**Never n**	**Total**
Total Children	13 (11.6%)	88 (78.6%)	11 (9.8%)	112 (100%)
French fries	43	68	1	112
Frozen food	64	48	0 (0)	112
Snack	70	42	0 (0)	112
Pizza	29	81	2	112
Chocolate/ candy	66	45	1	112
Fried chicken	85	27	0	112
Instant noodle	59	51	2	112
Soft drink	53	56	3	112
Hamburger	29	79	4	112
Ice cream	69	43	0	112
Frequency of Gadget Playing Habits				
	Frequent n	**Rare n**		**Total**
Gadget-playing habits	66 (58.9%)	46 (41.1%)		112 (100)
Game-playing habits	23 (20.5%)	89 (79.5%)		112 (100)
Physical activity and others	16 (14.3%)	96 (85.7%)		112 (100)

Source: Research data, processed

Based on to the **Table 2**, it can be noted that the most frequently consumed types of fast food are fried chicken by 85 children, snacks by 70 children, and ice cream by 69 children. Conversely, a minor proportion of children reported never consuming certain fast foods, including frozen food, snacks, and ice cream. This finding suggests a general tendency among children towards frequent consumption of high-calorie fast foods, although the frequency of consumption varies according to the type of food consumed. According to the **Table 2,** it can be seen that a greater proportion of children have a high daily gadget playing habit, compared to those who have a low or infrequent gadget playing habit. Furthermore, the data indicates that a greater proportion of children do not engage in frequent gaming activities on a daily basis. Additionally, the data suggests that a larger number of children rarely engage in other physical activities, such as playing outside and only engage in physical exercise at school without additional activities.

Table 3. Relationship between fast food consumption frequency in obesity elementary school children

	Case (Obesity) n (%)	Control (Normal) n (%)	OR	95% CI	p-value
Frequency of Fast-Food Consumption					
Frequent	4 (7.1)	9 (16.1)	0.15	0.00 -0.68	0.298
Rare	47 (83.9)	41 (73.2)			
Never	5 (8.9)	6 (10.7)			
Total	**56 (100)**	**56 (100)**			

OR: odds ratio; 95% CI: 95% confidence interval
Source: Research data, processed

Based on Table 3, the percentage of students with infrequent fast food consumption is higher than the categories of frequent or never, and the difference between the case and control groups is not significant. The Chi-Square test with corrections yielded a p-value of 0.298 > 0.05, indicating no relationship between fast food consumption frequency as a risk factor for obesity in elementary school children.

Based on Table 4, the p-value for the three most consumed types of food by respondents is > 0.05, indicating no relationship with obesity in elementary school children. However, the test results for hamburgers show p < 0.05, indicating a significant relationship with childhood obesity. Nevertheless, hamburgers are a type of fast food that is rarely consumed by most children at SD Negeri Rangkah VII.

Table 4. Relationship between types of foods examined and obesity in elementary school children

Food Type	BMI	Frequent	Rare	Never	p-value
French fries	Normal	23	33	0	0.53
	Obesity	20	35	1	
Frozen food	Normal	35	21	0	0.34
	Obesity	29	27	0	
Snack	Normal	36	20	0	0.845
	Obesity	34	22	0	
Pizza	Normal	18	36	2	0.096
	Obesity	11	45	0	
Chocolate	Normal	35	20	1	0.407
	Obesity	31	25	0	
Fried chicken	Normal	44	12	0	0.659
	Obesity	41	15	0	
Instant noodle	Normal	30	25	1	0.982
	Obesity	29	26	1	
Soft drink	Normal	26	28	2	0.839
	Obesity	27	28	1	
Hamburger	Normal	21	33	2	0.019
	Obesity	8	46	2	
Ice cream	Normal	39	17	0	0.12
	Obesity	30	26	0	

BMI: body mass index
Source: Research data, processed

According to the table, the percentage of obese students with high gadget playing habits is 36 (64.3%), which is higher than normal students with high habits (53.6%). However, the Chi-Square test with corrections yielded a p-value of 0.337 > 0.05, suggesting no relationship between gadget playing habits as a risk factor for obesity in elementary school children.

Table 5. Relationship between gadget and games playing habits for obesity in elementary school children

	Case (Obesity) n (%)	Control (Normal) n (%)	OR	95%CI	p-value
Gadget-Playing Habits					
Frequent	36 (64.3)	30 (53.6)	1.56	0.73-3.33	0.337
Rare	20 (35.7)	26 (46.4)			
Total	56 (100)	56 (100)			
Game-Playing Habits					
Frequent	13 (23.2)	10 (17.9)	1.39	0.55-3.5	0.64
Rare	43 (76.8)	46 (82.1)			
Total	**56 (100)**	**56 (100)**			

OR: odds ratio; 95% CI: 95% confidence interval
Source: Research data, processed

Based on the table 6, the percentage of obese students with high gaming habits is 13 (23.2%), while normal students with high gaming habits are 10 (17.9%). Despite a subtle difference, the Chi-Square test with corrections yielded a p-value of 0.64 > 0.05, indicating no relationship

between gaming habits as a risk factor for obesity in elementary school children. In this case, the habit of using gadgets and playing games is distinguished because not all children use gadgets to play games. For example, some children may only watch TV or browse social media on their phones without playing games.

Discussion

Obesity is a condition caused by the imbalance between the intake of energy and the energy needed by the body to perform various biological functions such as growth, development, and physical activity.[11] Obesity can also lead to various health disorders in individuals, including cardiovascular diseases like stroke and liver disease, diabetes, musculoskeletal disorders, and certain cancers.[1,25,26] Children are at greater risk of obesity, as it may lead to obesity in adulthood, premature death, and diseases.[1] Obesity affects all age groups, and childhood obesity is a prevalent issue worldwide. The prevalence of obesity continues to rise globally, including in Asia and Indonesia. Surabaya, as one of the provincial capitals in East Java, Indonesia, has experienced an increase in childhood obesity cases. Lack of healthy food consumption is one of the risk factors for obesity in Indonesia.[27] Childhood obesity is influenced by various factors, including genetic factors, gender, dietary patterns, lifestyle, physical activity, and more.

Frequency of Fast Food Consumption

Based on bivariate analysis using the Chi-Square test to examine the relationship between the frequency of fast food consumption as a risk factor for obesity in elementary school children, a p-value of 0.298 > 0.05 was obtained. This indicates no significant relationship between the frequency of fast food consumption as a risk factor for obesity in elementary school children. This conclusion is supported by responses from respondents/students during interviews regarding the frequency of fast food consumption per week. Most respondents have infrequent fast food consumption, and the Chi-Square analysis demonstrates no significant relationship between the frequency of fast food consumption and the risk of obesity in children. Although most respondents rarely consume fast food, there are some students who eat instant noodles daily without intervals. Additionally, almost all respondents are regularly provided with fried chicken by their parents. In this study, fast food consumption is categorized as frequent, infrequent, and never.

Only a few students fall into the categories of never or frequent, while the majority are categorized as infrequent consumers of fast food. However, during interviews, nearly all respondents mentioned frequently consuming fast food or convenience food. This is evident from the three categories of food most frequently consumed, namely fried chicken, snacks, and ice cream. The Chi-Square test conducted on these three types of frequently consumed fast food showed no significant relationship with the risk factors for obesity in elementary school children. Changes in lifestyle and dietary patterns are factors influencing the high prevalence of obesity. In major cities, dietary patterns have shifted from traditional to westernized diets, particularly in the form of fast food. This shift towards high-calorie, high-fat, high-carbohydrate, high-cholesterol, and high-sodium diets but low in fiber, such as fast food, contributes to the imbalance of nutritional intake and becomes one of the risk factors for obesity in children.[4]

Several factors contribute to why many respondents/students consume fast food. One reason is that parents prefer things that are more practical and easier to pack for their children's school lunches.[12] Thus, without considering the child's nutritional intake, parents or fast food or convenience food for their children's meals. In addition to comfort, children who consume fast food too frequently every day may feel fuller, causing them to avoid eating staple foods or homemade meals. Instant noodles, sweet drinks, and snacks are types of fast food that are popular among children.[29] Many respondents or children participating in this study frequently consume snacks and ice cream. When asked why, the answer is that almost all children live near small shops that provide ice cream and snacks. With the advancement of time, there are now many shops that consistently sell ice cream because the distribution of ice cream refrigeration machines has become easier. Consequently, this becomes a habit for children to buy ice cream and snacks when at home.[13]

Fast food is the primary choice for busy parents and serves as the main food consumed when spending time together with the family in today's modern society. This is because fast food processing tends to be quick due to machine use, making it appear cleaner and more hygienic as it is processed by machines in restaurants. Fast food is also easily accessible, with service available at all times, and the ordering process is easy to understand due to current technological advancements.[12] Moreover, the availability of school canteens offering fast food such as fried foods, nuggets, sausages, candies, and soft drinks leads children to purchase these snacks during school hours. With the onset of the COVID-19 pandemic in 2019, children's eating habits have significantly changed. Lockdown measures, which prohibited activities outside the home, led to a less regulated eating pattern for children. Children are more inclined to consume fast food or convenience food at home. WHO suggests introducing local isolation measures and more health-focused epidemic measures. With restrictions on public activities, individuals are required to work from home (WFH) and engage in online learning. This shift to online learning has resulted in changes in children's habits at home, including daily eating habits and a decrease in physical activity.[14]

Most respondents in this study reported frequently consuming fast food, but when statistically analyzed, only a few respondents fell into the 'frequent' category of fast food consumption. The reason for this is that the study did not measure how much fast food was consumed daily. While categorized as frequent due to consuming fast food ≥3 times a week, the study did not inquire about the quantity consumed each time, affecting the categorization of respondents' fast food consumption frequency. This research aligns with previous studies which also found no

relationship between the frequency of fast food consumption and the risk of obesity in children.[9,15] However, it differs from another studies which state a connection between fast food consumption patterns and obesity in children.[16] The variation in study results is due to the use of different parameters in each study.

Gadget Playing Habits

Based on bivariate analysis using the Chi-Square test to examine the relationship between gadget playing habits as a risk factor for obesity in elementary school children, a p-value of 0.337 > 0.05 was obtained. This implies no significant relationship between gadget playing habits and the risk of obesity in elementary school children.

Generally, children, in addition to playing gadgets or games, also watch TV when gadgets/games are not being used. Only a few students are entirely allowed by their parents to use smartphones every day. For those restricted from using smartphones, they tend to watch TV for their daily activities. With the development of gadget technology such as television, computers, and smartphones, children may become inactive as most of their time is spent on passive activities like playing smartphones, video games, online games, internet use, and watching TV every day for up to 3 hours, contributing to the risk of obesity.[17-18] The longer use of gadgets is strongly associated with the COVID-2019 pandemic, where students were required to engage in online learning.[19] Although online learning is no longer in place, the habit of playing gadgets and games persists in children. Moreover, parents may feel that they have already facilitated their children, paying less attention to their children's routines. Some parents also believe that having a TV or smartphone keeps their children happy at home, reducing concerns about their children playing outside.

Furthermore, in addition to the high prevalence of gadget and game playing habits, children also tend to have insufficient physical activity. In interviews conducted by researchers, as many as 96 respondents/students (85.7%) stated that they only engage in sports at school and rarely play outdoors. Physical activity is the primary contributor to energy expenditure. Insufficient energy expenditure leads to an imbalance between energy intake and energy output, causing unused energy to be stored as fat and potentially resulting in obesity.[20] Addressing and eliminating high gadget use habits in children begins with the home environment. Parents can limit gadget usage for children and schedule beneficial activities to ensure that children are not solely focused on gadgets. Additionally, supporting their hobbies such as swimming, playing football, and more can reduce gadget usage in children. This research aligns with a study whose studies also concluded that there is no relationship between gadget and game playing habits and childhood obesity.[21] However, it differs from another research, which indicated a connection between gadget use and childhood obesity.[17]

Gaming Habits

Based on the Chi-Square test results to examine the relationship between gaming habits as a risk factor for obesity in elementary school children, a p-value of 0.64 > 0.05 was obtained, indicating no significant relationship between gaming habits and the risk of obesity in elementary school children. It is noted that 13 children with high gadget usage habits also have high gaming habits, with more than half being boys. Games or online gaming are activities that require an internet connection and have become a significant cultural phenomenon. The consumers of online games are not only adults but predominantly children and teenagers.[22] With technological advancements, children can play online games anywhere, using gaming consoles, computers, or even smartphones. With internet access via mobile data or WiFi, children can play online games without any obstacles.

Children with high gaming habits tend to be more addicted to playing games compared to those with high gadget usage habits. This is because games can be highly addictive when one becomes accustomed to them. Game addiction can be defined as excessive or obsessive game usage that disrupts various aspects of a person's daily life. Gaming addiction can have negative impacts on various life aspects for those who excessively play, including health, academic performance, psychological well-being, economic factors, and social interactions.[22] High habits of playing online games make children tend to stay in one place for extended periods, becoming lazy to engage in daily physical activities. Consequently, most of the energy and nutrients from consumed food will accumulate excessively in the body, leading to obesity. Lack of physical activity will cause stored energy to accumulate as fat in the body, resulting in a tendency to become overweight (obese).[23] To address the high habit of playing games, parents can start by encouraging children to be physically active. By engaging in and encouraging children to participate in sports, parents can guide them toward sports they enjoy. Children and teenagers should limit the time spent playing online games in a day, and it would be better if they only engage in online gaming during weekends or holidays.[24]

Strengths and Limitations

Strengths of this study include its comprehensive data collection, including measurements of height and weight, and direct interviews, enhancing the reliability of findings. A sample of 112 respondents strengthens the study's generalizability. The use of statistical analysis, particularly the Chi-Square test, adds validity, and the study maintains clear objectives focused on exploring the relationship between fast food consumption, gadget/game usage, and obesity in elementary. The limitation of this study is that it cannot generalize the habits of fast food consumption, gadget use, and playing games among all elementary school students in Surabaya. Time constraints confined sampling to grades 2, 3, and 4, while the study focused on two variables – fast food frequency and gadget/game habits – excluding other potential risk factors for obesity. Furthermore, the study did not assess the frequency of fast food consumption on a daily basis.

Conclusion

Based on the results, it can be concluded that there is no correlation between the frequency of fast food consumption and obesity risk in primary school children. Similarly, the study reveals no association between the habit of playing gadgets and games and the risk of obesity in this age group.

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Conflict of Interest

The authors declared there is no conflict of interest.

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Ethical Clearance

This study had received ethical clearance from the Ethics Committee for Health Research, Faculty of Medicine, Universitas Airlangga, Surabaya (no. 34/EC/KEPK/FKUA/2023) on 09-02-2023.

Authors' Contributions

All authors reviewed and approved the final version of the manuscript.

Data Availability

N/A.

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