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Ocena czynników wpływających na skuteczność terapii integracji sensorycznej u dzieci w wieku przedszkolnym i wczesnoszkolnym

Assessment of factors influencing the effectiveness of sensory integration therapy in preschool and early school-aged children

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Physical activity, eating behaviour, and sleep quality as predictors of Body Mass Index in adolescents? A correlational study on high school students in East Kalimantan

Aktywność fizyczna, zachowania żywieniowe i jakość snu jako predyktory wskaźnika masy ciała u nastolatków? Badanie korelacyjne na uczniach szkół średnich we Wschodnim Kalimantanie

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Abstract

Background and Study Aim. Obesity is a metabolic disease characterised by excessive fat accumulation. Indonesia ranks second after Singapore with the largest number of obese adolescents. The study aimed to assess the impact of physical activity, eating behavior, and sleep quality on Body Mass Index (BMI) in adolescents.

Materials and Methods. This study was quantitative, with an ex post facto design. The study included 231 students (136 males, 95 females) aged 16-19 years, each with a Body Mass Index (BMI) ≥ 25.1. Participants were healthy and consented to the study by completing a screening questionnaire. The analysis was performed using regression techniques in the Statistical Package for Social Sciences (SPSS) version 21 software.

Results. The selected regression model is feasible and demonstrates that physical activity, diet, and sleep quality collectively influence students' BMI (p-value < 0.001). Furthermore, the analysis shows that physical activity (p-value < 0.001), diet (p-value = 0.019), and sleep quality (p-value < 0.001) independently affect students' BMI.

Conclusions. We suggest that schools need to hold counseling programs in collaboration with relevant health workers to conduct counseling with the prevention of malnutrition, especially obesity. Provide additional tasks in the form of physical activity that students must do at home with parental supervision and the results will be reported to the teacher as an additional task value. Parents should also provide supervision of eating behavior and sleep patterns. For future researchers to be able to reveal other variables that can affect student BMI, because our report found only 49.90%.

Keywords

physical activity, dietary behaviour, sleep quality, Body Mass Index

Streszczenie

Wprowadzenie i cel badania. Otyłość jest chorobą metaboliczną charakteryzującą się nadmiernym nagromadzeniem tłuszczu. Indonezja zajmuje drugie miejsce po Singapurze pod względem liczby otyłych nastolatków. Celem badania było ocenienie wpływu aktywności fizycznej, zachowań żywieniowych i jakości snu na wskaźnik masy ciała (BMI) u nastolatków.

Materiały i metody. Badanie miało charakter ilościowy, z zastosowaniem projektu ex post facto. W badaniu uczestniczyło 231 uczniów (136 chłopców, 95 dziewcząt) w wieku 16-19 lat, każdy z wskaźnikiem masy ciała (BMI) ≥ 25,1. Uczestnicy byli zdrowi i wyrazili zgodę na udział w badaniu, wypełniając kwestionariusz przesiewowy. Analiza została przeprowadzona za pomocą technik regresji w oprogramowaniu Statistical Package for Social Sciences (SPSS) wersja 21.

Wyniki. Wybrany model regresji jest wykonalny i pokazuje, że aktywność fizyczna, dieta i jakość snu wspólnie wpływają na BMI uczniów (p < 0,001). Ponadto analiza pokazuje, że aktywność fizyczna (p < 0,001), dieta (p = 0,019) i jakość snu (p < 0,001) niezależnie wpływają na BMI uczniów.

Wnioski. Sugerujemy, aby szkoły prowadziły programy doradcze we współpracy z odpowiednimi pracownikami służby zdrowia w celu przeprowadzenia poradnictwa związanego z zapobieganiem niedożywieniu, zwłaszcza otyłości. Należy dostarczać dodatkowe zadania w formie aktywności fizycznej, które uczniowie muszą wykonywać w domu pod nadzorem rodziców, a wyniki będą zgłaszane nauczycielowi jako dodatkowa wartość zadania. Rodzice powinni również nadzorować zachowania żywieniowe i wzorce snu. Przyszli badacze powinni być w stanie ujawnić inne zmienne mogące wpływać na BMI uczniów, ponieważ nasz raport znalazł tylko 49,90%.

Słowa kluczowe

aktywność fizyczna, zachowania żywieniowe, jakość snu, wskaźnik masy ciała

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Introduction

Today, technology has advanced at a rapid pace. Virtual technology is a current trend in the world of business, health education, entertainment, military training, medical, engineering design, robotics, and telerobotics, manufacturing, education, and so on. The rapid development of technology in addition to having a positive impact, also causes a negative impact on children's health and tends to use brain activity more than physical activity [1]. Giving children access to internet-connected electronic devices and introducing them at an early age can result in reduced movement or physical activity [2]. The convenience of transport, computers, films, television, games, and fast food encourages sedentary and lazy living habits, leading to an increased risk of obesity. This change in lifestyle has resulted in a change in diet that refers to a diet high in calories, fat and cholesterol but low in fibre, especially fast food, which has the effect of increasing obesity [3].

The convenience of transport, computers, films, television, games, and fast food encourages sedentary and lazy living habits, leading to an increased risk of obesity. This change in lifestyle has resulted in a change in diet that refers to a diet high in calories, fat and cholesterol but low in fibre, especially fast food, which has the effect of increasing obesity [4]. Weight gain can be monitored by calculating the Body Mass Index (BMI). BMI is a widely used measurement to check the average weight status of the population as it is an accessible and cost-effective tool, requiring only height and weight measurements to identify individuals as underweight, normal weight, overweight, obese, and very obese [5].

The incidence of overweight and obesity in adolescents is directly associated with depression and poor body image, whereas it is indirectly associated with negative self-appraisal, eating disorders, and poorer quality of life [6]. Obese children will tend to have a sedentary lifestyle, where most of the time is spent sitting around without any physical activity. Recently published research shows that most children and adolescents (80%) worldwide do not meet the recommended level of 60 minutes of physical activity per day [7]. Children and adolescents who do not adhere to WHO recommendations are considered to be suffering from 'exercise deficit disorder' including all its negative health consequences.

Physical activity is an essential prerequisite of human health. This applies to all age categories, including pubertal children, it is generally assumed that the more active people are, the fitter the human body condition. Physical activity in adolescents may be associated with increased self-confidence, self-concept, lower anxiety and stress [8]. Furthermore, a lack of movement activity will result in delays in social, emotional, and cognitive development [9]. Good physical activity will improve learning achievement [10], improving cognition and reducing depression risk in adolescents [11]. In addition, research has consistently identified a range of specific benefits such as improved physical and physiological health and positive health outcomes in the areas of mental health and well-being [12].

In addition to physical activity, lifestyle changes occur today, one of which is consumption patterns. People's consumption patterns have changed in their choices, namely, people prefer instant food or fast food. Changes in lifestyle that are increasingly modern and sedentary lifestyles are often found in big cities in Indonesia. This change in lifestyle has resulted in a change in diet that refers to a diet high in calories, fat, and cholesterol but low in fibre, especially fast food which has an impact on increasing obesity [13]. Unhealthy eating behaviour can lead to health problems. Short-term problems include poor concentration on learning and decreased physical fitness, while long-term problems include Chronic Energy Deficiency (CHD), anaemia, tooth decay and obesity. Poor eating behaviours can affect nutrient imbalances in the body and lead to nutritional problems in adolescents such as overweight and underweight [14].

Another factor that can influence obesity is sleep quality. Sleep quality is generally defined in terms of total sleep time, sleep onset latency, sleep efficiency, degree of fragmentation, or sometimes sleep-disrupting events. Lack of sleep or poor sleep quality will have negative impacts on health, including mental health such as depression, worry, anxiety, impaired physiological functions such as motor impairment, cognitive impairment, emotions, sports performance and potentially increased risk of injury, drug use, poor diet, obesity, poor academic performance, and drug use [15]. It is recognised that sleep is essential for the body's overall health [16]. Poor sleep quality has important impacts on adolescent health. For example, sleep quality is associated with physical and emotional growth [17], learning and academic performance, as well as cognitive function [18]. Middle school and high school require more complex academic tasks, yet adolescents with chronic sleep deprivation and short sleep duration may experience poor daytime functioning and academic performance [19].

Previous studies have shown that reduced activity and exercise accompanied by a poor lifestyle over a long period of time will result in an increase in Body Mass Index leading to obesity. Lack of movement will lead to delays in social, emotional, and cognitive development [9]. Dietary management is one of the recommended ways to control weight [20]. Appropriate physical activity can prevent inactivity and weight gain in adolescents [21]. Physical activity is believed to control body shape to remain ideal. This is relevant to the results of other studies which state that there is a relationship between physical activity and Body Mass Index [22].

Some previous studies can be used as a basis for us to conduct further research with the aim of knowing whether physical activity, eating behaviour, and sleep quality can be predictors of Body Mass Index in adolescents. The results of this study can be used as additional evidence and reference for teachers, parents, and adolescents the importance of maintaining physical activity, eating behaviour, and sleep quality to prevent obesity.

Materials and methods

Participants

This sentence can be omitted as the information is already provided earlier . The sampling technique was carried out through purposive sampling, with the criteria of having a Body Mass Index ≥ 25.1 (overweigth and obesity category for BMI in Indonesia), the subject is not in a state of illness, and is willing to be a sample by filling out a screening questionnaire to find out if it has a medical condition that might affect the study. The study subjects totalled 231 students (male 136, female 95).

Research design

This research is quantitative, with an ex post facto design. This means that the study aims to determine whether there is an influ-

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ence between variables, namely physical activity, eating behaviour, and sleep quality on Body Mass Index. The instrument used to determine physical activity is The Physical Activity Questionnaire for Adolescent (PAQ-A). The PAQ-A assesses physical activity levels for adolescents in grades 9 to 12 or in a school setting. Scores range from 1-5, the final score is the mean value of 8 statements [23]. The eating pattern instrument is the Dutch Eating Behaviour Questionnaire (DEBQ). The DEBQ has 33 questions, consisting of three subscales that evaluate emotional eating behaviour, external eating behaviour, and restricted eating behaviour. Scores range from 1-5, where the higher the score, the more negative the eating behaviour [24]. The sleep quality instrument is the Pittsburgh Sleep Quality Index (PSQI). The PSQI consists of 19 questions distributed into the following seven components: sleep quality, sleep onset latency, sleep duration, sleep efficiency, sleep disturbance, sleep medication use, and daytime dysfunction. Each item is scored from 0-3, and the total score ranges from 0 to 21. A global PSQI score above 5 indicates poor sleep quality [25]. The instrument to measure Body Mass Index requires measuring height and weight [5].

Statistical analysis

The statistical analysis technique used the Statistical Package for Social Science (SPSS) version 21 software. The level of statistical significance was set at p-value < 0.05.

Results

The results of descriptive statistics of physical activity variables, eating behaviour, sleep quality, and Body Mass Index of students can be seen in Table 1.

Based on Table 1, obtained data on physical activity (2.49 ± 0.57), eating behaviour (94.44 ± 13.45), sleep quality (8.62 ± 2.66), BMI (26.84 ± 1.17).

Table 1. Descriptive statistics of physical activity, eating behaviour, sleep quality, and BMI

Variable	Mean ± SD
Physical activity	2.49 ± 0.57
Eating behaviour	94.44 ± 13.45
Sleep quality	8.62 ± 2.66
BMI	26.84 ± 1.17

Normality test

The normality test uses the Kolmogorov-Smirnov Test, namely by looking at the significance value of the residual variable if the p-value > 0.05, it can be said that the data is normally distributed. The results are presented in Table 2.

Table 2. Normality test results

Variable	p-value	Description
Physical activity	0.108	Normal
Eating behaviour	0.208	Normal
Sleep quality	0.244	Normal
BMI	0.126	Normal

The normality test results in Table 2 above, shows that data physical activity (p-value 0.108 > 0.05), eating behaviour (p-value 0.208 > 0.05), sleep quality (p-value 0.244 > 0.05), BMI (p-value 0.124 > 0.05), data obtained from the results of the data normality test p-value ≥ 0.05, which means that the data is normally distributed.

Linearity test

The linearity test is used to determine whether the independent variable and the dependent variable in this study have a linear relationship if the increase in the independent variable score is followed by an increase in the dependent variable score. The results of the Linearity test of this study can be seen in Table 3.

Table 3. Linearity test results

Variable	p-value	Description
Physical activity	0.159	Linear
Eating behaviour	0.130	Linear
Sleep quality	0.936	Linear
BMI	0.126	Linear

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The homogeneity test results in Table 3 above, shows that the data physical activity (p-value 0.159 > 0.05), eating behaviour (p-value 0.130 > 0.05), sleep quality (p-value 0.936 > 0.05), BMI (p-value 0.126 > 0.05), data obtained from the results of the data linear p-value ≥ 0.05.

Hypothesis test results

To determine the influence between the influence between variables, namely physical activity, eating behaviour, and sleep quality on Body Mass Index is done with t test analysis (partial) and F test (simultaneous), the results are as follows:

Table 4. Partial test results (t-test)

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	25.545	0.991		25.769	0.000
Physical activity	−0.868	0.177	−0.425	−4.918	0.000
Eating behaviour	0.017	0.007	0.198	2.380	0.019
Sleep quality	0.212	0.040	0.483	5.241	0.000

Based on the analysis results in Table 4, it can be explained as follows:
The physical activity variable obtained a t value of -4.918 and a p-value of 0.000 <0.05, meaning that there is a significant influence between physical activity and student BMI. The value is negative, meaning that if the physical activity score is getting better, the BMI score will decrease.
The diet variable obtained a t value of 2.380 and a p-value of 0.019 <0.05, meaning that there is a significant influence between diet and student BMI. The value is positive, meaning that if the diet score is higher, the BMI score will also be higher.
The sleep quality variable obtained a t value of 5,241 and a p-value of 0.000 <0.05, meaning that there is a significant influence between sleep quality and student BMI. The value is positive, meaning that if the sleep quality score is higher, the BMI score will also be higher.
The F test is needed to determine the effect of the independent variables on the dependent variable simultaneously and to determine the accuracy of the regression model used. The model accuracy test aims to determine whether the formulation of the model is appropriate or fit, the results are in Table 5.

Table 5. ANOVA test results

ANOVA[a]					
Model	Sum of squares	df	Mean square	F	Sig.
Regression	3.554	2	1.777	29.189	0.000[b]
Residual	3.775	62	0.061		
Total	7.329	64			

a: Dependent Variable: BMI
b: Predictors: (Constant), physical activity, eating behaviour, sleep quality

Based on Table 5, the calculated F value is 44,242 and the p-value is 0.000 <0.05. It can be concluded that the regression model chosen is feasible to test the data and the regression model can be used to predict that physical activity, diet, and sleep quality together affect students' BMI. The results revealed an Adjusted R Square value of 0.499, indicating that 49.90% of the variation in student BMI can be explained by physical activity, diet, and sleep quality, with the remaining 50.10% attributed to other factors.

Discussion

It can be concluded that the selected regression model is feasible to test the data and the regression model can be used to predict that physical activity, diet, and sleep quality together affect students' BMI. Overweight and obesity have been associated with various factors, including physical activity, unhealthy eating habits, alcohol consumption, socioeconomic conditions and genetic factors. Changes in individual lifestyle behaviours, such as lack of physical activity and increased sedentary behaviour associated with rapid urbanisation, may lead to an increase in the prevalence of overweight and obesity [26]. Lack of physical activity and obesity, together are major risk factors for many chronic diseases [27].
Based on the results of the study, it shows that physical activity affects students' BMI. Someone with good physical activity, the possibility of obesity will be smaller. Less physical activity can increase BMI because energy intake from food consumed is stored in the body, resulting in an increase in BMI and vice versa. Less physical activity causes a lot of energy to be stored as fat, so people who do less physical activity tend to become obese. The results of previous studies show that someone who is more active or with high physical activity, has a lower body fat percentage [28-29]. Consistently revealed that increasing physical activity is recommended as a strategy for preventing adolescent obesity [30]. Exercise habits are very important, which are based on children's daily physical activities such as walking and cycling. Those who do not regularly engage in physical activity are more at risk of obesity than those who

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frequently engage in physical activity. In addition, adolescents who regularly engage in physical activity tend to have a healthy body and ideal weight. The incidence of overweight and obesity in adolescents is directly related to depression and poor body image while indirectly related to negative self-assessment, eating disorders and poorer quality of life [6].

Based on the results of the study, it shows that diet affects students' BMI. Obese and overweight adolescents scored significantly higher than normal weight adolescents on three subscales [24]. The study concluded that there is a relationship between BMI and eating behaviour, where adolescents often consume fast food and are at low levels of physical activity [31]. In children, making better food choices is highly recommended for people who are overweight and obese [32]. Obesity is caused by overconsumption of energy, which is influenced by environmental factors. Obese people are usually more responsive than normal weight people to external hunger cues such as the taste and smell of food or the timing of meals. They tend to eat when they feel like eating, rather than when they are hungry. This excessive eating behaviour makes it difficult to get out of obesity if you do not have self-control and strong motivation to reduce weight.

Based on the results of the study, it shows that sleep quality affects students' BMI. People with obesity have a higher frequency of sleep disturbances than healthy groups of people. This causes obesity to trigger shorter sleep duration and higher PSQI scores. With a higher PSQI score than the non-obese group, obesity has a significant influence on poor sleep quality [33]. Sleep disturbances, rather than sleep duration, predicted to contribute to overweight [34]. An imbalance between activity and sleep patterns such as sleeping late at night and not doing enough activities during the day makes the metabolic process not smooth and fat accumulation occurs in the body, which can cause obesity [35].

Conclusions

Finally, we conclude that the selected regression model is feasible and can be used to predict that physical activity, diet, and sleep quality together affect students' BMI (p-value 0.000 < 0.05). Partially, it is also convincing that physical activity (p-value 0.000 < 0.05), diet (0.019 < 0.05), and sleep quality (p-value 0.000 < 0.05) affect students' BMI. We suggest that the school needs to hold an extension programme in collaboration with relevant health workers to conduct counseling with the prevention of malnutrition, especially obesity. Provide additional tasks in the form of physical activity that students must do at home with parental supervision and the results will be reported to the teacher as an additional assignment value. Parents should also provide supervision of eating behaviour and sleep patterns. For future researchers to be able to reveal other variables that can affect student BMI, because our report found only 49.90%.

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