Bicycling and Walking to and from School: Does It Affect Students' Body Mass Index and Aerobic Capacity?

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Abstract

This study investigates the differences between students who regularly cycle or walk when going to and from school and students who do not cycle or walk on body mass index and aerobic capacity. This comparative research involved 20 male students who were obtained using quota sampling techniques and divided into two groups. The first group consists of 10 students who have the habit of going to and from school by bicycle or walking (BW group). In comparison, the second group consists of ten students who do not have the habit of going to and from school by bicycle or walking (including being dropped off/picked up by their parents) (Non-BW group). The research instruments used were weight scales, height measuring instruments, and a 20-meter pacer test. The data analysis technique used is the independent sample t-test. Results of differences between the BW group vs. Non-BW group revealed that there was a significant difference in mean values in the aerobic capacity variable ($29.1 \pm 2,883$ vs. $26.39 \pm 2,822$ ml/kg/min, $p<0.005$), while in the body mass index variable there was no significant difference ($21,089 \pm 3.702$ vs. 22.216 ± 4.968 kg/m2, $p>0.005$). This research concludes that students in the BW group show better aerobic capacity than Non-BW group students. However, the body mass index showed no significant differences between the two groups.

Keywords: *Students' Active Lifestyle; Bicycling; Walking; Body Mass Index; Aerobic Capacity*

Introduction

The last few decades have shown that there has been an increase in children's dependence on motorized vehicles (Rothman et al., 2018). On the other hand, there has been a significant decline in the percentage of children walking to school (Khodanazari et al., 2022). Research conducted by Irawan & Sumi (2012) states that teenage students in developing countries, such as Indonesia, tend to be more accustomed to using motorbikes than active transportation modes such as cycling. This is reinforced by previous research in 2011 in Yogyakarta, which found that 62.76% of students went to school using motorized vehicles, and only 7.97% of students cycled to school (Irawan & Sumi, 2011). This situation will affect the physical activity level of children and teenagers.

Children and adolescents worldwide are reported to have low physical activity levels (Bastam et al., 2022; Guthold et al., 2020). In fact, 6% of deaths worldwide are caused by lack of physical activity (WHO, 2010). The Sports Development Index report in Indonesia also shows that the physical fitness index of Indonesian people continues to decline, and 60% of people's physical fitness is in the "very poor" category (Mutohir et al., 2022).

Students who have the habit of using an active mode when traveling to school by cycling or walking are highly recommended (Institute of Medicine (IOM), 2013) because it has a positive correlation with the amount of daily physical activity (Kek et al., 2019; Roth et al., 2012). In addition, students who cycle or walk to school have a positive relationship with body composition (Lubans et al., 2011). It will increase cardiovascular fitness or aerobic capacity, especially for students who are used to cycling to school (Larouche et al., 2014).

Therefore, research is needed to reveal the differences between students who have the habit of cycling or walking when going to and from school (BW group) and students who do not have this habit (Non-BW group) in terms of aerobic capacity and body mass index. This needs to be done because, until now, there are still minimal research results or references that reveal significant differences between the two groups mentioned above (BW group vs. Non-BW group).

Methodology

This research is classified as quantitative research. This research type is comparative research (Sugiyono, 2017), which aims to compare two groups on the variables of body mass index and aerobic capacity. The participants or subjects of this research are students of State Junior High School (JHS) 7 Nganjuk, East Java, Indonesia. The quota sampling technique is used in this research because this technique determines samples that have specific characteristics or characteristics up to the desired quota amount (Sugiyono, 2022). The total participants were 20 male students. All participants will be divided into two groups, namely the group of students who have the habit of cycling or walking when going to and from school (BW group) and the group of students who do not have the habit of cycling or walking when going to and from school (Non-BW groups). Both groups had the same number of participants; the BW group had ten students and the Non-BW group had ten students.

The variables that will be compared in this study are aerobic capacity and body mass index. In measuring aerobic capacity, the instrument used is a 20-meter pacer test with the final result vo2max, which has units of ml/kg/min (Burns et al., 2014; Mahar et al., 2018). Body mass index (BMI) requires data on height and weight with final units of kg/m^2 (Elazeem et al., 2021; Nuttall, 2015). The instrument used to measure height is a height meter and body weight using a weight scale. If height and weight data have been obtained, BMI can be determined using the formula (Visaria & Setoguchi, 2023; Zierle-Ghosh & Jan, 2023):

$$BMI = \frac{kg}{m^2}$$

Description: BMI = Body mass index; kg = (kilogram); m = (meters).

Data analysis used descriptive statistical tests and independent sample t-tests. Descriptive statistical tests were used to analyze participant characteristics and the main variables in the study (aerobic capacity and body mass index), which were presented with mean values and standard deviation (SD). The independent sample t-test determines differences between groups, and the results can be declared significant if the p-value ≤ 0.05 (Maksum, 2018). Data analysis used Microsoft Excel and SPSS version 25 software.

Results and Discussion

Results

The results in this study present the results of the data analysis that has been carried out. To determine the characteristics of students as research subjects, use the mean and standard deviation (SD) values for the variables age, height, and weight presented in table 1 below.

Table 1. Characteristics of students as research subjects

Variable	Mean ± SD	
	BW Group (N=10)	**Non-BW Group (N=10)**
Age (years)	14.8 ± 0.422	14.5 ± 0.527
Heigth (cm)	163.4 ± 4.248	160.8 ± 4.211
Weight (kg)	56.6 ± 11.635	57.2 ± 11.631

To see the differences between the BW group and the non-BW group in the variables of aerobic capacity and body mass index, they are presented in Figure 1 below.
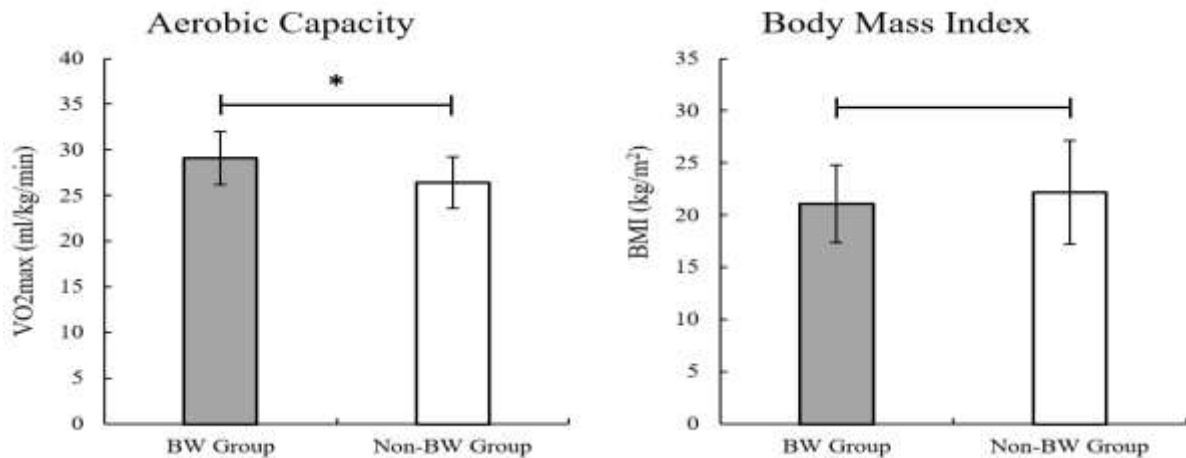

Figure 1. Differences in aerobic capacity and body mass index variables between the BW group and the non-BW group (Data shown are the mean value ± SD and the results of the independent sample t-test. *: there is a significant difference between the two groups (p<0.05)).

The graphic image above shows two different charts. The first graph shows a significant difference in the aerobic capacity variable between BW group vs. Non-BW group (29.1 ± 2,883 vs. 26.39 ± 2,822 ml/kg/min, p<0.05), and the second graph shows an insignificant difference in the index variable body mass between BW group vs. Non-BW group (21,089 ± 3,702 vs. 22,216 ± 4,968 kg/m2, p>0.05).

Discussion

This study aimed to compare groups of students who had the habit of cycling and walking when going to and from school (BW group) and students who did not have the habit of cycling and walking when going to and from school (Non-BW group) in aerobic capacity and BMI. The research results have shown a significant difference between the BW group and the Non-BW group (p<0.005), and the BW group has better capacity. However, the two groups showed no significant differences in body mass index (p>0.05).

Walking to and from school can contribute significantly to meeting children's Moderate-Vigorous Physical Activity (MVPA) needs (Martin et al., 2016). Total physical activity and MVPA are related to aerobic capacity (VO2max) (Tangen et al., 2022). If daily physical activity and MVPA are met, there is a possibility that aerobic capacity will also increase. In addition, students who have the habit of cycling to school will contribute to increasing cardiovascular fitness or aerobic capacity (Larouche et al., 2014). In fact, research has shown that cycling and walking have the same health benefits (Kelly et al., 2014).

The results of research on body mass index in this study, where there was no difference between the BW group and the non-BW group, turned out to be similar to the results of previous research. Longitudinal studies have found no relationship between students' active habits when traveling to school and body mass index (Aires et al., 2010; Heelan et al., 2005; Rosenberg et al., 2006). In addition, other studies show similar results, namely that there is no significant difference in body composition or body mass index between students who use active modes of transportation and students who are passive on their way to school (Meron et al., 2011; Micklesfield et al., 2021).

There is a great need for proposals to create policies to increase youth or students' use of bicycles for school trips (Irawan, 2022). Apart from cycling, students can also walk to go to school. This is necessary because currently, it is estimated that 57% of children in Indonesia lack physical activity (Ministry of Health of the Republic of Indonesia, 2018). Research conducted on students in Yogyakarta, Indonesia shows that students who are still active in school are not accustomed to using active modes of transportation (bicycling, etc) and prefer to use motorbikes for mobilization, including to school (Irawan & Sumi, 2012). This high level of physical inactivity among Indonesian children can cause concern because the long-term effects of low physical activity are pretty serious (Hanifah et al., 2023).

Conclusion

The conclusion is that students who have the habit of cycling and walking when going to and from school (BW group) have significantly better aerobic capacity than students who do not have the habit of cycling and walking when going to and from school (Non-BW group). However, this is not the same as the body mass index variable because there is no significant difference between the BW and non-BW groups on this variable.

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