Level Of Physical Activity, Body Mass Index, Sedentary Lifestyle Students In Mountain And Coastal Areas

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Abstract. This study aims to determine differences in body mass index, sedentary lifestyle, and physical activity of junior high school students in mountainous and coastal areas. This study used a cross-sectional design with 97 junior high school students as reasearch subjects who were living in coastal areas (CoA) and mountainous areas (MoA). Anthropometric measurements of subjects were performed to determine nutritional status based on BMI. The level of physical activity was measured using the IPAQ short form instrument and the Sedentary Lifestyle using the ASAQ instrument. Data were analyzed by descriptive test, percentage, and Mann Whitney test. The results showed a normal BMI category with a mean MoA (19.35±2.78) and CoA (20.25±4.00). For PA also showed a moderate results with a mean MoA (1970±2633.16) and CoA (1388.12±2290.20). While SL showed low mean results, namely MoA (187.85±217.62) and CoA (121.12±87.85). The results of the Mann Whitney test stated that the P value> 0.05 in BMI, PA, and SL. The conclusion is that there is no significant difference in nutritional status, physical activity, and sedentary lifestyle between students living in mountanious areas and coastal areas.

Keywords: Physical activity, sedentary, body mass index, students, geographic

1 Introduction

Physical activity is all efforts of body movement that is helped by the performance of the presence of muscles and also skeletons that contribute to each other and produce energy expenditure. The WHO (World Health Organization) Global Plan on Physical Activity 2018-2030: more active people for a healthier world (GAPPA or Global Action Plan on Physical Activity) (WHO, 2011). It means physical (the) activity can be said to be a series of businesses ranging from minimal to maximum, for example, eating, playing gadgets, using computers,

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walking to school to playing football (Handayani et al., 2021). Physical activity refers to a person's fitness level and condition (Yared et al., 2019). Where in physical activity especially for children to adolescents need to be considered in more detail. The measurement of physical activity is fundamental to health-related research, practice, and (Sattler et al., 2021).

If in young people to adults, the recommended physical activity is by exercising, but for small children sports activities need to be adjusted. Exercise itself according to (Wiersma, 2016), is a physical activity that is done in a measured and structured manner to improve and maintain physical condition. Physical activity is any bodily movement produced by skeletal muscles that require energy (Liu et al., 2012)(Bull et al., 2020). Physical activity is divided into three categories, the first in the category of light, medium to heavy category (Widiantini & Tafal, 2014). Light physical activity is a physical activity that is done with little exertion. For example are learning, eating, drinking, and brushing teeth. Then moderate physical activity is a physical activity that the body does by exerting more energy to produce sweat and make the heart rate and breathing frequency become faster, but still able to sing and talk. For example, cycling, jogging to jumping ropes. Then heavy physical activity is an activity that is done with high intensity and frequency so that the body experiences excessive energy drain and heart rate that beats very fast. An example is lifting heavy weights, participating in marathon races to playing football competitively.

Physical activity is a complex behavior; however, opportunities to be active exist in several domains in life: at work, household, or at school, for travel or during leisure time (Strain et al., 2020). It is necessary to know that a physical activity tailored to one's needs and abilities will affect both physical and spiritual conditions and circumstances. This is in line with that researched by (Budiati, 2013) that physical activity is essential for the health and condition of adolescents in carrying out their daily activities. In addition, adolescents who regularly perform physical activity also tend to have better protection against attacks of some diseases than adolescents who lack physical activity. That is, physical activity is very important especially for the growth and as antibodies of adolescents in each activity so that they do not get sick easily. Hopefully, the physical growth of a good child, it can affect how the child behaves for himself as well as the social and community of the surrounding environment.

In the information era as it is now, it is certainly a challenge to create an active and progressive environment. This is because more and more teenagers prefer to spend their time playing gadgets and online games. Physical inactivity became the number four killer in the world. Physical inactivity is a sufficient physical activity level to meet the present physical activity recommendations (Bull et al., 2020).

A lifestyle that is more often spent sitting, lying down, playing games, and watching television is a sedentary lifestyle (Rahma Pramudita et al., 2017). Sedentary lifestyle is very influential in the growth and future of children. This is evidenced by research conducted (Puspitasari, 2016), that sedentary lifestyle is very closely related to the level of physical activity of a person. If a child is used to this lifestyle, then it can be interpreted that the time will run out just to sitting, so that his physical activity becomes decreased. Lack of physical activity can result in the onset of some degenerative diseases. From hypertension, heart attack to obesity (Shin et al., 2014). According to (Puspitasari, 2016) also, children who spend more time playing games and watching television will have an impact on the child's low activity so that only a few calories in his body are wasted and most likely result in obesity. Obesity disease is one of the highest

degenerative diseases and affects many adolescent children. Basic Health Research Data from the Ministry of Health year 2013 mentioned, that obesity in adolescents 13 to 15 years in Indonesia amounted to 10.8% consisting of 8.3% overweight (obese) and 2.5% obesity (very obese).

Environmental conditions can affect a person's level of physical activity and nutritional status (Maddison et al., 2009). This is due to the differences in infrastructure in each different area so it affects their daily activity habits(Henderson et al., 2015). Bauman et al. (2002) also said that the level of education, income, and demographic conditions affect a person's level of physical activity. Starting from urban or urban areas to sub-urban areas both coastal and mountainous. These differences in characteristics and culture ultimately affect a person's lifestyle and physical activity. According to Andi (2020), factors that greatly affect the lifestyle and growth of children are ranging from genetics, socioeconomic conditions, health status, residential environment to sports or physical activity. In addition, the influence of the environment in urban areas will be greater to stimulate the growth of children than sub-urban. According to Passau (S & Andi, 2020) mention, this is because urban areas in facilities and facilities are more advanced than sub-urban areas. Starting from playgrounds, recreation places, science, and reading books that stimulate passion to facilities and health promotions that provide important education for physical activity. Not only that, the role of the environment and family here is also central to the impact on sedentary in children, from how to educate and direct their children to remain active even in today's modern era.

The coastal area or coastal zone is unique because, in the context of the landscape, the coastal area is the meeting place of land and sea (Asyiawati & Akliyah, 2011). Wherrett (2010) said that people living in coastal environments have a positive impact on individual welfare compared to communities outside the coastal environment. Most people describe the beach as a place that provides free space for relaxation, and the ability to explore so that it can affect humans and produce positive psychological effects such as calm and a feeling of peace (Peng & Yamashita, 2016). Hernández-Gallardo et al. (2020) in their research on students living in coastal areas of Ecuador concluded that people living on the coast have lifestyle habits that tend to be less mobile and avoid physical activity. The mountainous area has places conducive to health and wellness tourism as well as activities focused on contemplation and meditation (Schoner, 2010). Mountain areas also have recreational sports facilities such as swimming, diving, skiing, downhill biking, paragliding, snowboarding (Markovic & Petrovic, 2013).

This research will focus on the level of activity and sedentary of grade 7-9 children spread in various regions in East Java Province, of course with the background of each region has different habits and characteristics. By making parents the main factor related to how to provide education and parenting patterns carried out in the daily life of children, especially in their physical activities.

2 Materials and methods

2.1 Study participants

This study used a cross-sectional design with 97 junior high school students as research subjects. Research subjects were divided by cluster random sampling technique between groups of junior

high school students living in coastal areas (CoA) and groups of junior high school students living in mountainous areas (MoA). The number of samples in the CoA group was 46 students while the MoA group was 51 students.

2 2 Instruments and procedurs

Anthropometric measurements of subjects were performed to determine nutritional status based on BMI (Body Mass Index). Filling out the questionnaire regarding the physical activity carried out was obtained directly from the International Physical Activity Questionnaires (IPAQ) short form and Sedentary lifestyle instruments using the Adolescent Sedentary Activity Questionnaire (ASAQ) instrument. The IPAQ was used to calculate MET as an estimate of the energy expenditure of total weekly physical activity with weighted minutes reported per week in each activity category (Craig et al., 2003). While the ASAQ is done by calculating the average time per day used for a sedentary lifestyle. A sedentary lifestyle is said to be high if 5 hours of doing a sedentary lifestyle every day and said to be low if < 5 hours per day doing a sedentary lifestyle (Guo et al., 2012).

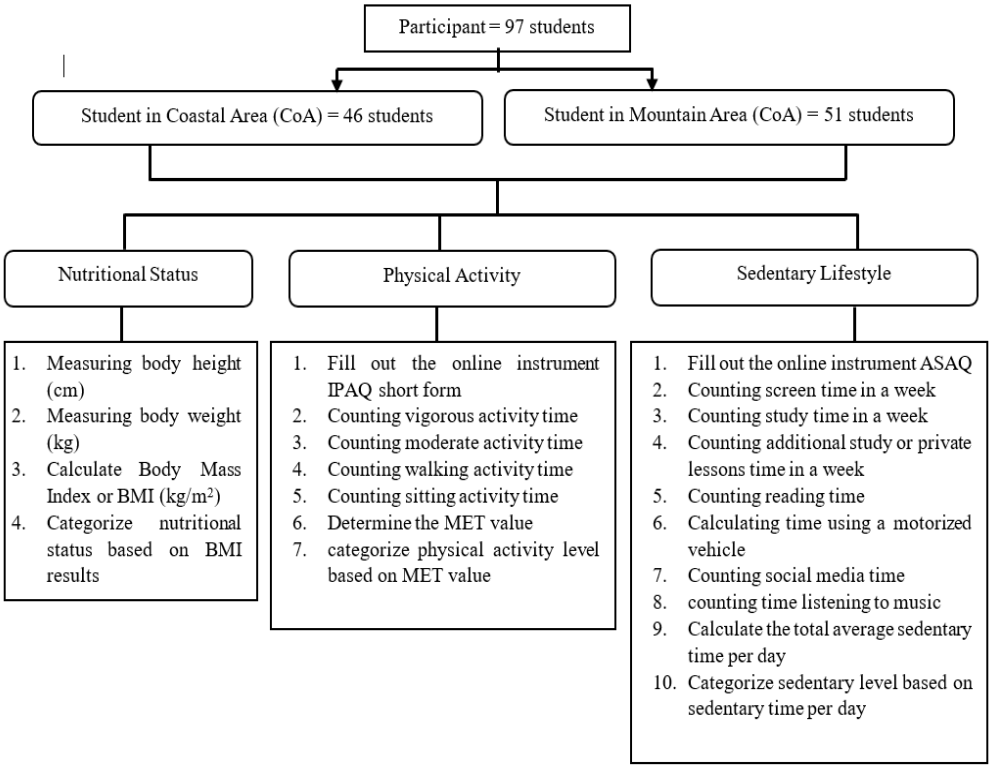

Fig. 1. Research procedures on measuring nutritional status, level of physical activity, and sedentary lifestyle of students in the CoA and MoA groups

2 3 Statistical analysis

The data collected were analyzed descriptively to determine the average nutritional status, physical activity, and sedentary lifestyle of each group. The percentage is also calculated based on the category of nutritional status, physical activity, and sedentary lifestyle to see the condition of the research subjects. Mann Whitney test was also carried out to determine the differences in variables between groups.

3 Results

A total of 97 junior high school students were used in this study consisting of 46 students in coastal areas and 51 students in mountainous areas. The average value and standard deviation of the characteristics of the research subjects in the two groups are presented in table 1.

Table 1. Characteristic of research subject in both groups

Variable	Mountain Areas (Mean±SD)			Coastal Areas (Mean±SD)		
	Boys (N=26)	Girls (N=25)	All Gender (N=51)	Boys (N=16)	Girls (N=30)	All Gender (N=46)
Age (year)	13.12±1.03	13.08±1.12	13.10±1.06	13.00±1.03	13.27±0.91	13.17±0.95
Height (cm)	151.58±11.30	150.48±7.84	151.04±9.67	152.19±10.84	151.40±5.97	151.67±7.89
Weight (kg)	45.73±8.48	42.64±7.12	44.22±7.92	46.25±13.38	46.87±8.55	46.65±10.34
BMI (kg/m^2)	19.87±2.80	18.81±2.71	19.35±2.78	19.82±4.55	20.48±3.74	20.25±4.00
PA level	2324.77 ± 2968.43	1601.60 ± 2233.48	1970 ± 2633.16	1251.18 ± 1210.08	1461.15 ± 2713.96	1388.12 ± 2290.20
SL level	124.41 ± 58.49	253.83 ± 293.60	187.85 ± 217.62	132.36 ± 79.23	115.13 ± 92.86	121.12 ± 87.85

Note: PA level = level of physical activity as measured by IPAQ; SL level = Level of Sedentary lifestyle as measured by ASAQ

This study uses BMI to measure the nutritional status of research subjects (Barao & Forones, 2012). The results of the percentage of BMI between the Mountain Areas Group (MoA) and the Coastal Areas group (CoA) are presented in more detail in table 2 below.

Table 2. Percentage of BMI level category in both groups

BMI level Category	MoA						CoA					
	Boys	%	Girls	%	All Gender	%	Boys	%	Girls	%	All Gender	%
High-grade underweight	2	7.69	6	24.00	8.00	15.69	5	31.25	6	20.00	11.00	23.91
Low-grade Underweight	9	34.62	7	28.00	16.00	31.37	1	6.25	4	13.33	5.00	10.87
Normal	14	53.85	12	48.00	26.00	50.98	7	43.75	15	50.00	22.00	47.83

Low-grade overweight	1	3.85	0	0.00	1.00	1.96	1	6.25	3	10.00	4.00	8.70
High-grade overweight	0	0.00	0	0.00	0.00	0.00	2	12.5	2	6.67	4.00	8.70

Note: MoA = Mountain Areas; CoA = Coastal Areas

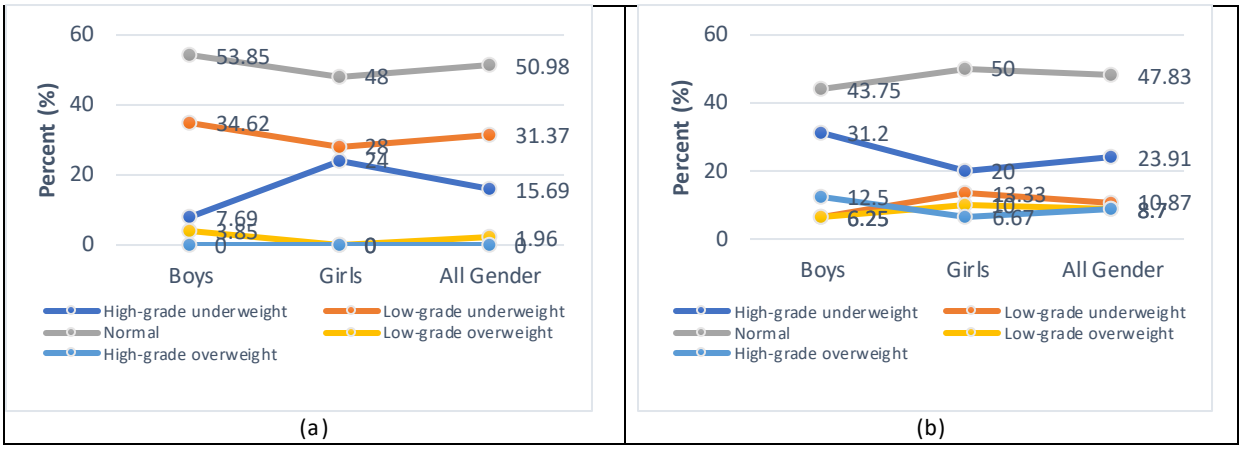

Fig. 2. (a) BMI level of the MoA group; (b) BMI level of the CoA group

Body Mass Index (BMI) level is categorized based on the Ministry of Health of the Republic of Indonesia with the criteria of High-grade underweight if the BMI value is <17, High-grade underweight if the BMI value is between 17.0 - 18.4, Normal if the BMI value is between 18.5 - 25.0, Low-grade overweight if the BMI value is around between 25.1 – 27.0 and High-grade overweight if the BMI value is > 27.0 (Harahap et al., 2014). Table 2 shows that the BMI level in the MoA group is mostly in the normal category with a percentage of 53% for men, 48% for women, and 50.98% for all genders. Meanwhile, the BMI level in the CoA group obtained similar results, namely most were included in the normal category with a percentage of 43.75% for men, 50% for women, and 47.83% for all genders. Thus it can be concluded that the average research subjects have a normal BMI.

Table 3. Percentage of PA level category in both groups

PA Level Category	MoA						CoA					
	Boys	%	Girls	%	All Gender	%	Boys	%	Girls	%	All Gender	%
Low	7	43.75	16	53.33	23.00	50.00	9	34.62	9.00	36.00	18.00	35.29
Moderate	6	37.5	8	26.67	14.00	30.43	8	30.77	10.00	40.00	18.00	35.29
High	3	18.75	6	20.00	9.00	19.57	9	34.62	6.00	24.00	15.00	29.41

Note : PA level = level of physical activity as measured by IPAQ; MoA = Mountain Areas; CoA = Coastal Areas

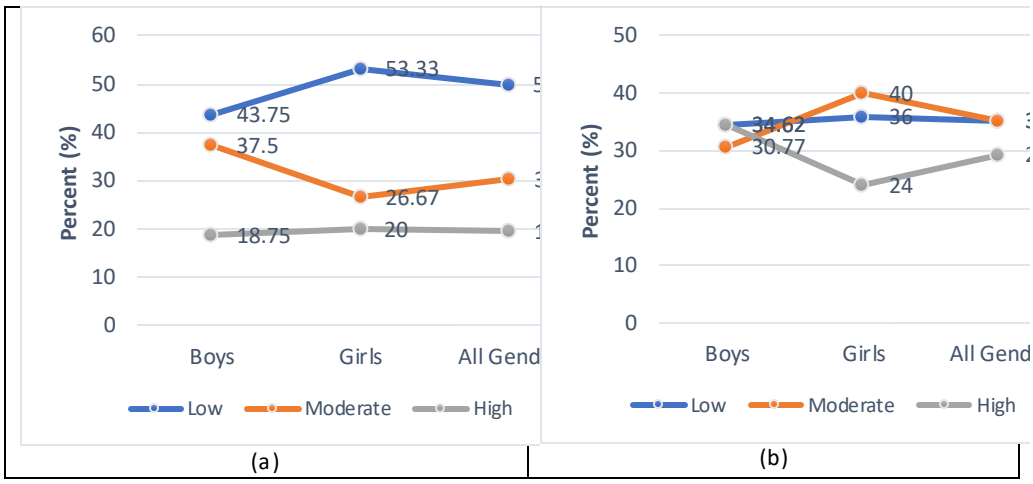

Fig. 3. (a) PA level of MoA group; (b) PA level of CoA group

PA level in this study was measured using the IPAQ Short form scoring instrument. The IPAQ was used to calculate MET as an estimate of the energy expenditure of total weekly physical activity by weighting the minutes reported per week in each activity category (Craig et al., 2003). Category low if the MET value is < 600 minutes/week, moderate if the MET value is 600 to < 3000 minutes/week, and high if the MET value is 3000 minutes/week (Ashok et al., 2017). In Table 3 above, the percentage of the Low MoA group category is the largest compared to other categories, both in boys (43.75%) and girls (53.33%). While the CoA group showed different results, the largest percentage in boys was in a low category (34.62%) and high category (34.62%), while for girls it was in the moderate category (40%).

Table 4. Percentage of SL level category in both groups

SL Level Category	MoA						CoA					
	Boys	%	Girls	%	All Gender	%	Boys	%	Girls	%	All Gender	%
Low	26	100	18	72	44	86.27	15	93.75	29	96.67	44	95.65
High	0	0	7	28	7	13.73	1	6.25	1	3.33	2	4.35

Note: SL level = Level of Sedentary lifestyle as measured by ASAQ; MoA = Mountain Areas; CoA = Coastal Areas

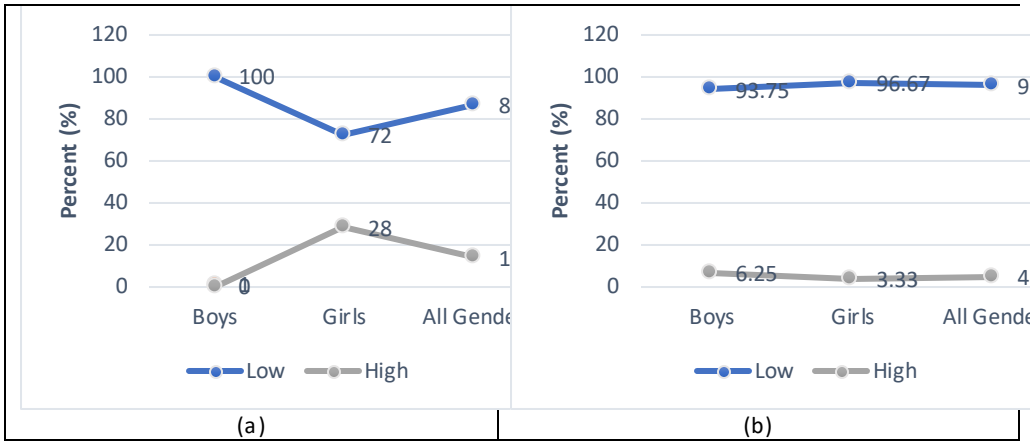

Fig. 4. (a) SL level of MoA group; (b) SL level of CoA group

SL level was measured using the ASAQ instrument (Hardy et al., 2007). The SL level is in the high category if the SL value is > 5 hours/day and the low category is if the SL value is 5 hours/day (Andriyani et al., 2020). Table 4 shows the value of 100% in the low category in the Boys MoA group and 72% in the Girls MoA group. While in the CoA group, the percentage with a large score is also in the low category, namely 93.75% for boys and 96.67% for girls. These results can be concluded that the average SL level category of the two groups is in the low category for both boys and girls.

To find differences in the BMI, PA level, and SL level variables in the MoA group and CoA group, the Mann Whitney test was carried out. The results of the Mann-Whitney test are presented in table 5 below.

Table 5. Differences in BMI PA and SL levels in The MoA group dan CoA group

Group	BMI (kg/m^2) Mean±SD	Sig.	PA (MET) Mean±SD	Sig.	SL Mean±SD	Sig.
MoA	19,35±2,78	0.454	1970 ± 2633.16	0.106	187.85 ± 217.62	0.059
CoA	20,25±4,00		1388.12 ± 2290.20		121.12 ± 87.85	

Note: *significant difference at α<0.05; MoA = Mountain Areas; CoA = Coastal Areas

Table 5 above shows that the value of sig. > 0.05 on all variables. So it can be concluded that there is no difference in the variables of BMI, PA, and SL in the MoA group and CoA group.

4 Discussion

The resuls of the the descriptive analysis of this study showed that the nutritional status as measured by BMI was normal in both the CoA and MoA groups. The Mann-Whitney test also showed no significant difference in nutritional status between the CoA and MoA groups (p=

0.454). Thus it can be concluded that students who live in coastal areas have no difference in nutritional status with students who live in mountainous areas. Nutritional status is influenced by 2 factors, namely total energy expenditure and dietary energy intake (Basain Valdés et al., 2017). Several mechanisms affect a person's weight, one of which is physical activity in response to the weather in the area (Tucker & Gilliland, 2007). Physical activity has an important role in weight loss because it involves a 20-50% increase in energy expenditure (Puspitasari, 2016). Some studies also reveal that a person will be more active in physical activity in hilly areas and pleasant scenery (Brownson et al., 2001). By the results of this study which states that the two areas have a normal average BMI because they are located in mountainous areas which are hilly areas and coastal areas that have beautiful scenery.

According to Westerterp et al. (2002), the environment can also affect physical activity because of the existing temperature (Westerterp-Plantenga et al., 2002). Exposure to cold temperatures causes behavioral changes to generate or conserve heat (Kingma et al., 2012). In the short term, cold temperatures can increase food intake and metabolic energy expenditure (Brobeck, 1997). In the mountainous area (MoA group) which in this study is in Malang Regency, it is an area with an average cool temperature between 18.25-31.45° C (Herlina & Prasetyorini, 2020). Thus the research subjects did physical activity well, this is evidenced by the results of the study which showed the average MET for students in mountainous areas was 1970 minutes/week which was included in the moderate category (see tables 1 and 5).

The coastal area (CoA group) which in this study is the Pacitan Regency area is a mountainous and coastal area. In this study, the research subjects were taken several students who went to school in the Ngadirojo sub-district which is a coastal area with an average temperature of 32.5 – 37 °C (Pacitan, 2020). The results showed that the average MET CoA group value was 1388 min/week which was included in the moderate category (see tables 1 and 5). This result is by Hernandez's research (2020) which reports that 52% of students in coastal areas have MET scores which are in the moderate category with an average MET score of 1076.93 min/week (Hernández-Gallardo et al., 2020).

The results of the sedentary lifestyle (SL) in both groups showed values that were included in the low category of 187.85 min/day for the MoA group and 121.12 min/day for the CoA group. From these results, it can be concluded that students who are in schools in mountainous and coastal areas have a low sedentary lifestyle which means they are active in physical activity. This is good because according to some studies, the mortality rate increases by 2% for every hour of sitting and can reach up to 8% per hour when spending time sitting more than 8 hours per day (Bailey et al., 2018).

Sedentary Lifestyle is sitting time or simply low-level physical activity or activities that refer to all kinds of activities carried out outside of bedtime, with very few calorie output characteristics such as lying down, sitting, watching television, using computers, and other forms of screen-based entertainment (Muflihah & Wardhani, 2021). Sedentary lifestyle results in energy that was previously not needed for activities which are then stored as fat deposits and eventually causes obesity (De Gouw et al., 2021).

Physical activity is related to the status of the city because substantially the progress of transportation and technology in urban areas , as well as the modernization and transfer of the function of work and agricultural aids in rural areas, is associated with a decrease in physical activity which increases obesity cases. The influence of advances in transportation and

technology such as television, the internet, games also has an impact on decreasing physical activity (Puspitasari, 2016). From this explanation, it can be concluded that mountainous and coastal areas have a low level of sedentary lifestyle due to undeveloped transportation facilities and technology such as in urban areas which result in daily activities being carried out manually by involving physically. Residents in coastal areas have a relatively low economic level. Resource economists view that the poverty of coastal communities, especially fishermen, is mostly due to socio-economic factors related to the characteristics of the resources and the technology used (Kristiyanti, 2016).

Based on the results of the Mann Whitney test in table 5, states that there is no significant difference between the MoA group and CoA group on the PA (P = 0.106) and SL (P = 0.059) variables. This is because the conditions of the people in the area are not much different. they generally still do not have the means of transportation and technology that is not yet advanced like urban areas, resulting in life there being done manually by involving physically.

5 Conclusions

Junior high school students in the mountains and coastal areas have a normal average nutritional status, moderate level of physical activity, and low sedentary lifestyle. It's good but needs to improve the level of physical activity because the percentage of the low category is still a lot. By statistical test, there was no meaning of differences in nutritional status value, level of physical activity, and sedentary lifestyle between students living in the mountains and coastal areas. This is due to the conditions of the two areas that are not much different in socio-economy. Suggestions for future research, apart from measuring the level of physical activity, nutritional status, and sedentary lifestyle, it also discusses socio-economic conditions, parental education levels, and the character and culture of the people of each region to identify factors that cause differences in levels of physical activity, nutritional status, and sedentary lifestyle.

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7 Conflict of interest

All researchers declare that there is no conflict of interest in this research

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