

## RELATIONSHIP AMONG OBESITY, PHYSICAL ACTIVITY LEVEL, PHYSICAL FITNESS AND ACADEMIC PERFORMANCE IN FEMALE SECONDARY SCHOOL STUDENTS IN SHAH ALAM

Nurul Amira Mohd Samsudin\*, Sarina Md. Yusof, and Suhana Aiman

Faculty of Sports Science & Recreation, Universiti Teknologi MARA Shah Alam, Malaysia

\*Email: nurulamiramohdsamsudin@gmail.com

(Received 29 December 2017; accepted 6 November 2018; published online 17 January 2019)

**To cite this article:** Mohd Samsudin, N. A., Md. Yusof, S., & Aiman, S. (2019). Relationship among obesity, physical activity level, physical fitness and academic performance in female secondary school students in Shah Alam. *Malaysian Journal of Movement, Health & Exercise*, 8(1), 83-91.

<https://doi.org/10.15282/mohe.v8i1.227>

**Link to this article:** <https://doi.org/10.15282/mohe.v8i1.227>

### Abstract

The aim of this study was to determine the relationship among obesity, physical activity level, physical fitness and academic performance among female secondary school students in Shah Alam. Two hundred and fourteen participants (age: 16 years, body height:  $156.76 \pm 5.65$  cm, body mass  $59.92 \pm 13.35$  kg, BMI:  $24.41 \pm 5.00$  kg/m<sup>2</sup>) participated in this study. Students with a body mass index above 25 kg/m<sup>2</sup> were classified as obese. Physical activity level was evaluated by using International Physical Activity Questionnaire (IPAQ), while physical fitness was evaluated by the total score of four fitness components (cardiovascular endurance, muscular endurance, muscular strength, flexibility) measured by SEGAK used in Malaysia secondary schools. Academic performance was assessed by the Average School Grade (ASG) from the Form Three Assessment (PT3) results of the previous year. There was a negative significant relationship between obesity and physical activity level ( $r = -0.20$ ,  $p < 0.05$ ), obesity and physical fitness ( $r = -0.42$ ,  $p < 0.05$ ), obesity and academic performance ( $r = 0.49$ ,  $p < 0.05$ ), physical activity level and physical fitness ( $r = 0.54$ ,  $p < 0.05$ ), physical activity level and academic performance ( $r = -0.14$ ,  $p < 0.05$ ). and physical fitness and academic performance ( $r = -0.26$ ,  $p < 0.05$ ). These results suggested that obesity status, physical activity level and physical fitness could not only affect health status but also academic performance in secondary school students.

**Keywords:** Obesity; physical activity level; physical fitness; academic performance; secondary school students

## **Introduction**

Obesity is a condition in which a person has accumulated so much body fat that they experience negative consequences on their health. According to Sobol-Goldberg and Rabinowitz (2016), by 2030, obesity is expected to increase by 50% worldwide. Students, whether male or female, whose their fitness level has declined by 20% will have a decrease in academic performance compared to other students whose have did not change their fitness level (Bezold, Konty, Day, Berger, Harr, Larkin, Napier, Nonas, Saha, Harris, & Stark, 2014). According to Serra-Paya, Ensenyat, Serra-Paya, and Blanco-Nespereira (2015), to have a lower prevalence of obesity or overweight and higher fitness level, children must be involved in at least three hours of physical activity per week. Children who are obese will also have poor fitness levels and have been described to suffer negative impacts on mental function and academic performance (Morita, Nakajima, Okita, Ishihara, Sagawa, & Yamatsu, 2016). In addition, females have been reported to have a higher prevalence of obesity than men (NHMS, 2015).

Previous articles have stated that there are relationships among physical activity level, physical fitness and academic performance (Bezold et al., 2014; Howie & Pate, 2012; Lambourne, Hansen, Szabo, Lee, Herrmann, & Donnelly, 2013). Obesity will occur when a person has a low physical activity level. It is stated that low physical activity level leads to low physical fitness (Serra-Paya et al., 2015), which is followed by low academic performance (Howie & Pate, 2012). Obese students are more likely to have poorer grades compared to the non-obese. A few articles have described a negative relationship between obesity and academic performance of the students. Hence, there has been no conclusive relationship between obesity and academic performance among Malaysian secondary school students.

School children in Malaysia are known to have sedentary lifestyle, as the Malaysian school system is very exam oriented (Berita Harian, 2017). Much time is also spent by watching television, playing video games and using mobile phones, which reflects a sedentary lifestyle (Morita et al., 2016). In response to the identified problem; therefore, the purpose of the study is to determine the relationship among obesity, physical activity level, physical fitness and academic performance in female secondary school students in Shah Alam, Selangor, Malaysia.

## **Methods**

### *Research Design*

This study uses a causal-comparative and correlational research design. The causal comparative design is to differentiate the physical activity level, physical fitness and academic performance between obese and non-obese female secondary school students in Shah Alam. The correlational research design has been selected because to determine if a relationship exists among obesity, physical activity level, physical fitness and academic performance in female secondary school students in Shah Alam.

### *Participants*

The participants of the study were 351 female students age 16 from secondary schools in Shah Alam. They were analysed based on obesity status, physical activity level, physical fitness and academic performance. In this study, the stratified random sampling was used. A 4000-pupil population was first divided into the specified group. 16-years-old students were selected because PT3 results were used for data analysis. Then, the participants have randomly selected from this group based on the following inclusion criteria:

- i. Females aged 16 years old.
- ii. Sat for *Pentaksiran Tingkatan 3* (PT3) examination in the previous year.
- iii. Obtained consent from parents.

### *Instrumentation*

The questionnaire used was the short version of the International Physical Activity Questionnaire (IPAQ). The questionnaire consists of IPAQ variables (vigorous physical activity, moderate physical activity, walking and sitting). It provides information on time spent walking, and in vigorous, moderate, and sedentary activity. The answers refer to all domain of physical activity and were used to assess physical activity level among participants.

The score sheet form includes demographic information (race, height, weight, BMI) and physical fitness score was used to assess the physical fitness of the participants. BMI was calculated using bodyweight in kilograms divided by height in meters squared to measure the obesity level of the participants.

Physical fitness test comprised of step test, push-up, partial curl-up and sit and reach test. A combination of health-related fitness components including cardiorespiratory endurance, muscular strength, muscular endurance and flexibility was used to compare physical fitness between obese and non-obese. The physical fitness was assessed by adding the tests scores achieved by the student.

Academic performance represents performance outcomes achieved by students and assessed by examination results. In this study, academic performance was assessed by PT3 result comprised of nine or ten subjects. The Ministry of Education (MOE) describes the PT3 examination as a Malaysian public examination that is taken by all form three student at the age of 15. The Average School Grade was calculated by the total of grade value achieved by the student divided the total of subjects that are taken by the students. A lower value of the Average School Grade shows higher academic performance.

### *Procedures*

Prior to the study, ethical approval was obtained. Approval from Ministry of Education (MOE) was also obtained. During first visit to the schools, participants were informed about the study and given an information sheet consent form to be signed by their parents. The next visit, participants answered IPAQ to determine the physical activity level. Then, the height and weight of the participants were collected to calculate the BMI and measure the

level of obesity. They underwent physical fitness tests which were step test, push up test, partial curl-up test and sit and reach test to assess the physical fitness of the participants. The test was conducted during physical education classes for each school. Lastly, the PT3 results of the students were obtained from their school.

### Statistical analysis

The statistical techniques proposed in this study is Pearson's correlation coefficient. Pearson's correlation coefficient was used to measure the association among obesity, physical activity level, physical fitness and academic performance in female secondary school students in Shah Alam.

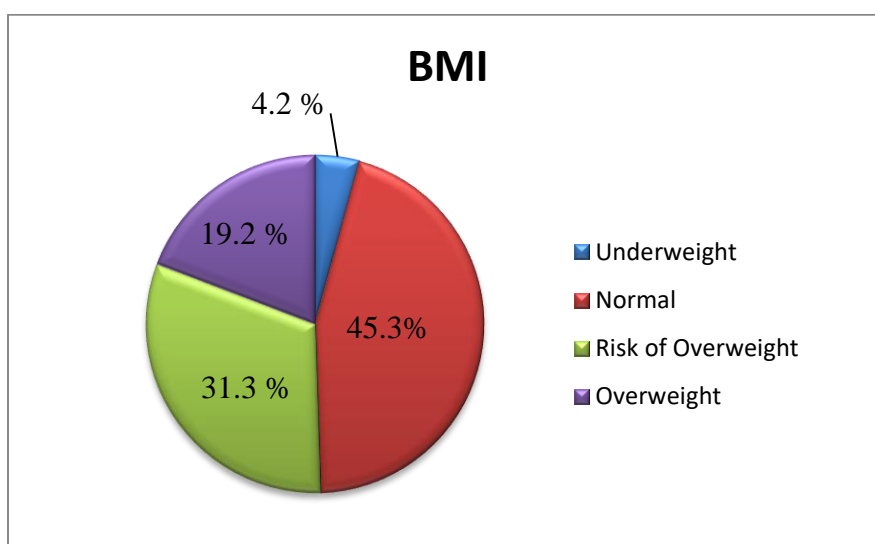
## Results

137 IPAQ questionnaires returned were found to be faulty and incomplete. The reported results below are inclusive of the remaining 214 respondents. Mean and standard deviation are represented as (M ± SD)

### Demographic

**Table 1:** Mean and standard deviation

Measure	Mean ± SD
Height	156.76 ± 5.65 cm
Mass	59.92 ± 12.35 kg
Body Mass Index (BMI)	24.41 ± 5.00 kg/m <sup>2</sup>



**Figure 1:** Percentage of participants based on BMI (kg/m<sup>2</sup>)

*Relationship among obesity, physical activity level, physical fitness and academic performance*

**Table 1:** Correlations between Obesity, Physical Activity Level, Physical Fitness and Academic Performance.

		Physical Activity Level (METs)	Physical Fitness (Score)	Academic Performance (Average Grade Score)
Obesity (kg/m <sup>2</sup> )	<i>r</i>	-0.20**	-0.42**	0.49**
	<i>p</i>	0.003	0.00	0.00
Physical Activity Level (METs)	<i>r</i>		0.54**	-0.14*
	<i>p</i>		0.00	0.047
Physical Fitness (Score)	<i>r</i>			-0.26**
	<i>p</i>			0.00

\*. Correlation is significant at the 0.05 level (2-tailed)

We found a negative correlation between obesity and physical activity level ( $r = -0.20$ ). This means that an increase of physical activity level would likely to be associated to lower obesity level. After that, the correlation between obesity and physical fitness ( $r = -0.42$ ) shows that high obesity level associated with low physical fitness. The correlation between physical activity level and academic performance ( $r = -0.14$ ) also shows that high physical activity levels are associated with high academic performance. Additionally, the correlation between physical fitness and academic performance ( $r = -0.26$ ) shows that high physical fitness is associated with high academic performance.

In addition, we found a positive correlation between obesity and academic performance ( $r = 0.49$ ) that means high obesity level is associated with low academic performance. We also found a large correlation between physical activity level and physical fitness ( $r = 0.54$ ). This means that an increase of physical activity level is associated with an increase of physical fitness. All correlations were found to be significant ( $p < 0.05$ ).

## Discussion

The main objective of this study was to determine the relationship among obesity, physical activity level, physical fitness and academic performance. There was a significant relationship between obesity and physical activity level. It is shown that high obesity level is associated with low physical activity level. This finding was in agreement with the previous finding that indicated physical activity was crucial in attempt to reduce obesity among children (O'Malley, Johnston, Delva, & Terry-McElrath, 2009). Students with low physical activity levels will experience obesity, while a high physical activity level will increase the rate of metabolism of the body (Powers & Howley, 2014). A high rate of metabolism will decrease the prevalence of obesity among students. In Malaysia, the prevalence of obesity among students has increased, as schools have been focusing in high academic achievement over co-curricular activities. Mostly, students with important examinations in that year such as PT3 and SPM will spend more time studying and less on physical activity; even physical education classes will be replaced by the tough subjects such as Mathematics, Science, History and English. Hence, based on the findings of this study,

we speculate that obese female students in secondary schools have lower physical activity level than non-obese students.

There was also a significant relationship between obesity level and physical fitness among female secondary school students in Shah Alam. It was shown that those with high obesity levels were associated with low physical fitness. This finding supports previous finding by Powers and Howley (2014), suggesting that a person with high body fat composition was associated with low physical fitness. It seems logical that students who were obese had low physical activity level which lead to low physical fitness. Similar to physical activity level, physical fitness was crucial to adolescents, as students with high physical fitness showed less fatigue and high endurance (Powers & Howley, 2014). A superior level of fitness may lead to an array of positive cognition and mental health such as improved mood, self-esteem work behaviour (Folkins & Sime, 1981). Thus, based on the outcome of our study, we speculate that students with better physical fitness displayed better classroom behaviour during classes, thus enabling them to perform better academically compared to the students with lower physical fitness. However, it should be noted that this speculation is bound to a limitation of this study. Our study only included 16-year-old female, as academic performance was measured based on their PT3 results from the previous year. We did not include males in this study to minimize gender-related biases such as menstruation and puberty that may have caused discrepancies in our analyses.

Furthermore, there was a significant relationship between obesity and academic performance. It was shown that those with high obesity level are more likely to have low academic performance. In contrast, some of previous study did not support this finding which they concluded that academic performance was not largely affected by obesity status, but other factors such as the racial, cognitive function, socioeconomic, physiological and behavioural characteristics of each individual (Baxter, Guinn, Tebbs, & Royer, 2013). However, much is still not understood on how mental functions and academic achievements may vary as a function of obesity and further research endeavours are warranted. Most findings have shown significant relationship between these variables. In this study, it was clearly shown that obese students had poorer academic performance compared to non-obese students. These results support previous findings, supporting the existence of a relationship between obesity and academic performance and suggesting that obesity level among student will affect their academic performance (Morita et al., 2016). In addition, García-Hermoso and Marina (2015) found a stronger relationship between obesity and academic performance achieved by the students in their study.

Then, there was also a significant relationship between physical activity level and physical fitness. It was shown that high physical activity levels will lead to high physical fitness. This finding associated with the past finding that indicates person who has higher physical activity levels will have also higher fitness levels (Torrijos-Niño, Martínez-Vizcaíno, Pardo-Guijarro, García-Prieto, Arias-Palencia, & Sánchez-López, 2014). From previous findings, a few studies have shown the physical fitness of the participants was assessed by the test on cardiorespiratory endurance only (Church, Earnest, Skinner, & Blair, 2007; Pronk, Martinson, Kessler, Beck, Simon, & Wang, 2004; Redón, Grassi, Redon, Álvarez-Pitti, & Lurbe, 2017). The participants were tested by the tests that focussed only on cardiorespiratory fitness. In contrast, the participants in this study were tested by combining all of the fitness components such as cardiorespiratory endurance, muscle strength, muscle

endurance and flexibility. They performed a step test, push-up, partial curl-up and sit and reach test. The sum of the test scores then was total up to represent their physical fitness. The finding was interesting as the participants' fitness level should be assessed by all these components compared to only using one component, which was cardiorespiratory endurance.

A significant relationship between physical activity level and academic performance was also demonstrated in this study. This was in line with the relationship of physical fitness and academic performance. Students with better physical activity and physical fitness levels were found to perform better academically. This finding was strongly supported by previous findings claiming that academic performance of the students could be increased when their physical fitness are improved by 20% and above (Bezold et al., 2014). Additionally, many studies have shown the positive effects of physical activity as related to academic performance (Ahamed, MacDonald, Reed, Naylor, Liu-Ambrose, & McKay, 2007; Dwyer, Sallis, Blizzard, Lazarus, & Dean, 2001; Howie & Pate, 2012; Rasberry, Lee, Robin, Laris, Russell, Coyle, & Nihiser, 2011; Taras, 2005; Trudeau & Shephard, 2008). It can be concluded that the students with high physical activity level and physical fitness will have high aerobic capacity which can increase their brain activity and cognitive functions. Further, with high aerobic capacity, students are able to pay better attention during classes as they are less limited by fatigue and are more energetic compared to students with low physical fitness. This may briefly explain how students with better physical fitness may show better academic performance compared to others.

## **Conclusion**

In conclusion, this study has demonstrated a significant relationship among obesity, physical activity level, physical fitness and academic performance in female secondary school students in Shah Alam. Clearly, academic performance among secondary school students is affected by obesity status, physical activity level and physical fitness. In order to achieve better academic performance among students, it is suggested that school systems in Malaysia emphasize not only in curricular activities but also co-curricular activities.

## **References**

- Ahamed, Y., MacDonald, H., Reed, K., Naylor, P.-J., Liu-Ambrose, T., & McKay, H. (2007). School-based physical activity does not compromise children's academic performance. *Medicine and science in sports and exercise*, 39(2), 371-376.
- Baxter, S. D., Guinn, C. H., Tebbs, J. M., & Royer, J. A. (2013). No relationship between academic achievement and body mass index among fourth-grade, predominantly african-american children. *Journal of the Academy of Nutrition and Dietetics*, 113(4), 551-557.
- Bezold, C. P., Konty, K. J., Day, S. E., Berger, M., Harr, L., Larkin, M., . . . Stark, J. H. (2014). The effects of changes in physical fitness on academic performance among new york city youth. *Journal of Adolescent Health*, 55(6), 774-781.

- Church, T. S., Earnest, C. P., Skinner, J. S., & Blair, S. N. (2007). Effects of different doses of physical activity on cardiorespiratory fitness among sedentary, overweight or obese postmenopausal women with elevated blood pressure: A randomized controlled trial. *Jama*, 297(19), 2081-2091.
- Dwyer, T., Sallis, J. F., Blizzard, L., Lazarus, R., & Dean, K. (2001). Relation of academic performance to physical activity and fitness in children. *Pediatric Exercise Science*, 13(3), 225-237.
- Folkins, C. H., & Sime, W. E. (1981). Physical fitness training and mental health. *Am Psychol*, 36(4), 373-389.
- García-Hermoso, A., & Marina, R. (2015). Relationship of weight status, physical activity and screen time with academic achievement in adolescents. *Obesity Research & Clinical Practice*.
- Howie, E. K., & Pate, R. R. (2012). Physical activity and academic achievement in children: A historical perspective. *Journal of Sport and Health Science*, 1(3), 160-169.
- Lambourne, K., Hansen, D. M., Szabo, A. N., Lee, J., Herrmann, S. D., & Donnelly, J. E. (2013). Indirect and direct relations between aerobic fitness, physical activity, and academic achievement in elementary school students. *Mental Health and Physical Activity*, 6(3), 165-171.
- Morita, N., Nakajima, T., Okita, K., Ishihara, T., Sagawa, M., & Yamatsu, K. (2016). Relationships among fitness, obesity, screen time and academic achievement in Japanese adolescents. *Physiology & Behavior*, 163, 161-166.
- O'Malley, P. M., Johnston, L. D., Delva, J., & Terry-McElrath, Y. M. (2009). School physical activity environment related to student obesity and activity: A national study of schools and students. *Journal of Adolescent Health*, 45(3, Supplement), S71-S81.
- Powers, S. K., & Howley, E. T. (2014). *Exercise physiology: Theory and application to fitness and performance*: McGraw-Hill Humanities/Social Sciences/Languages.
- Pronk, N. P., Martinson, B., Kessler, R. C., Beck, A. L., Simon, G. E., & Wang, P. (2004). The association between work performance and physical activity, cardiorespiratory fitness, and obesity. *Journal of Occupational and Environmental Medicine*, 46(1), 19-25.
- Rasberry, C. N., Lee, S. M., Robin, L., Laris, B., Russell, L. A., Coyle, K. K., & Nihiser, A. J. (2011). The association between school-based physical activity, including physical education, and academic performance: A systematic review of the literature. *Preventive medicine*, 52, S10-S20.
- Redón, P., Grassi, G., Redon, J., Álvarez-Pitti, J., & Lurbe, E. (2017). Sympathetic neural activity, metabolic parameters and cardiorespiratory fitness in obese youths. *Journal of Hypertension*, 35(3), 571-577.



- Serra-Paya, N., Ensenyat, A., Serra-Paya, P., & Blanco-Nespereira, A. (2015). Physical activity behavior, aerobic fitness and quality of life in school-age children. *Procedia - Social and Behavioral Sciences*, 191, 1758-1762.
- Sobol-Goldberg, S., & Rabinowitz, J. (2016). Association of childhood and teen school performance and obesity in young adulthood in the us national longitudinal survey of youth. *Preventive Medicine*, 89, 57-63.
- Taras, H. (2005). Physical activity and student performance at school. *Journal of school health*, 75(6), 214-218.
- Torrijos-Niño, C., Martínez-Vizcaíno, V., Pardo-Guijarro, M. J., García-Prieto, J. C., Arias-Palencia, N. M., & Sánchez-López, M. (2014). Physical fitness, obesity, and academic achievement in schoolchildren. *The Journal of Pediatrics*, 165(1), 104-109.
- Trudeau, F., & Shephard, R. J. (2008). Physical education, school physical activity, school sports and academic performance. *International Journal of Behavioral Nutrition and Physical Activity*, 5(1), 10.