

## Time Spent in Physical Activity and Abdominal Muscle Endurance Level between Cadets and Civilian Students of National Defense University of Malaysia

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### Abstract

**Background and Aim:** The purpose of this study was to investigate the differences and relationships between the amount of time spent in physical activity and abdominal muscle endurance among the cadets and civilian students.

**Methods:** In this study, a total of 191 male participants (19.7±0.9 years; 63.1±7.5 kg; 169.3±4.8 cm) from the National Defense University of Malaysia (NDUM) volunteered to participate including cadets (n=106) and civilian students (n=85) in 2019. Time spent in physical activity was measured by total minutes and total days of engagement in physical activities. A one-minute sit up was used to measure abdominal muscle endurance. The cross-sectional study and open-ended questions were administered for data collection.

**Results:** The research findings showed that cadets spent more time in physical activity compared to civilian students in days (cadet, 5.47±.81 days; civilian, 3.25±1.41 days) and minutes (cadet, 76.93±21.73 min; civilian, 58.65±22.48 min). The levels of the cadets of abdominal muscle endurance were significantly greater than that of civilian students (cadet, 45.82±5.95 reps; civilian, 34.5±5.94 reps). Based on the t-test cadets showed a statistically significantly greater in total days of doing physical activity [t(189)=13.73, p(.00)<.05], total minutes [t(189)=5.67, p(.00)<.05] and abdominal muscle endurance [t(189)=13.07, p(.00)<.05] compared to civilians. There was also a positive relationship between performing physical activity in days per week (r=.44) and minutes (r=.34) with abdominal muscle endurance in both groups.

**Conclusion:** In conclusion, the amount of time spent in physical activity had a significant influence on abdominal muscle endurance. The greater time spent in physical activity led to greater physical fitness level.

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**Keywords:** Physical Activity, Time Spent, Cadet Students, Civilian Students, Physical Fitness.

## زمان سپری شده در فعالیت بدنی و سطح استقامت عضلات شکمی بین دانشجویان افسری و غیرنظامی دانشگاه دفاع ملی مالزی

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### چکیده

**زمینه و هدف:** هدف از این مطالعه بررسی تفاوت و ارتباط بین مقدار زمان صرف شده در فعالیت بدنی و استقامت عضلات شکمی در دانشجویان افسری و غیرنظامی بود.

**روش‌ها:** در مجموع ۱۹۱ مرد (۱۹/۷±۰/۹ سال؛ ۶۳/۱±۷/۵ کیلوگرم؛ ۱۶۹/۳±۴/۸ سانتی متر) شامل دانشجویان افسری (۱۰۶ نفر) و غیرنظامی (۸۵ نفر) در سال ۲۰۱۹ از دانشگاه دفاع ملی مالزی داوطلب شرکت در این مطالعه شدند. زمان صرف شده در فعالیت بدنی با دقایق کل و کل روزهای شرکت در فعالیت‌های بدنی اندازه‌گیری شد. برای اندازه‌گیری استقامت عضلانی شکمی از آزمون یک دقیقه درازو نشست بهره گرفته شد. مطالعه مقطعی و پرسش‌های بازپاسخ برای جمع‌آوری داده‌ها استفاده شد.

**یافته‌ها:** دانشجویان افسری در مقایسه با دانشجویان غیرنظامی فعالیت روزانه بیشتر (دانشجوی افسری، ۵/۴۷±۵/۸۱ روز؛ غیرنظامی، ۳/۲۵±۱/۴۱ روز) و دقایق انجام فعالیت بدنی زیادتری (دانشجوی افسری، ۷۶/۹۳±۲۱/۷۳ دقیقه؛ غیرنظامی، ۵۸/۶۵±۲۲/۴۸ دقیقه) داشتند. همچنین دانشجویان افسری از سطح بهتر استقامت عضلانی شکمی در مقایسه با دانشجویان غیرنظامی (دانشجوی افسری، ۴۵/۸۲±۵/۹۵ تکرار؛ غیرنظامی، ۳۴/۵±۵/۹۴ تکرار) برخوردار بودند. بر اساس آزمون تی دانشجویان افسری در کل روزهای انجام فعالیت بدنی دقایق کل و استقامت عضلات شکم در مقایسه با دانشجویان غیرنظامی رکورد معنی‌دار بهتری کسب کردند. همچنین در هر دو گروه بین انجام فعالیت بدنی در روزهای هفته ( $T=۰/۴۴$ ) و دقیقه ( $T=۰/۳۴$ ) با استقامت عضلانی شکمی همبستگی مثبتی وجود داشت.

**نتیجه‌گیری:** در مجموع، مقدار زمانی که در فعالیت بدنی سپری می‌شود، تاثیر معنی‌داری بر استقامت عضلات شکمی دارد. همچنین هرچه زمان بیشتری در فعالیت بدنی صرف شود، سطح آمادگی جسمانی را افزایش می‌دهد.

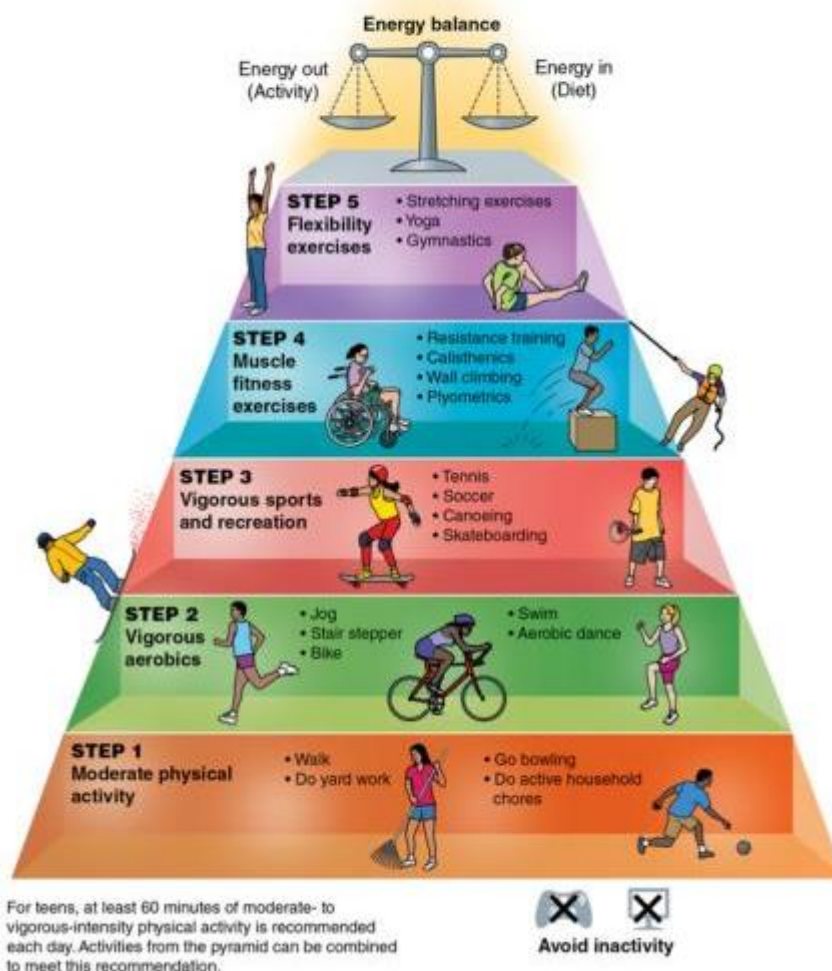
**کلیدواژه‌ها:** فعالیت بدنی، زمان صرف شده، دانشجویان افسری، دانشجویان غیرنظامی، آمادگی جسمانی.

## Introduction

Physical activity is very imperative actions and needs to be applied in everyday life (1,2). The ability and success of the nation are depending on the generation that is equipped with an adequate level of physical fitness and should not only focus on knowledge and skills. Regular involvement in physical activity is beneficial and promotes physical the health and fitness (3,4), mental health (5), social satisfaction (6), and psychological health (7). Whereas, physical inactivity prevents overweight and obesity (8) various disorders and diseases such as type 2 diabetes, cardiovascular diseases (e.g. heart attack, myocardial infarction, stroke, and heart failure) and certain cancers (9,10).

Physical activity can be defined as any bodily movement produced by the contraction of skeletal muscle that increases energy

expenditure above a basal level (1,11). Regular and adequate levels of physical activity in adults play key role in energy expenditure, and are essential for energy balance and weight control (8). The World Health Organization (WHO) suggested that all age groups should be physically active daily as part of play, games, sports, transportation, recreation, physical education, or planned exercise (1). For adults aged 18-64 years old, they should perform at least 150 to 300 minutes per week or three days a week of any type of physical activity. For health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activity (1). Figure-1 shows the types and intensity of physical activity for guideline purposes (12).



**Figure-1.** The Physical Activity Pyramid including types and intensity of activities (12)

The primary benefit of regular physical activity is attributed to the increased level of physical fitness. Physical fitness is defined as the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and respond to emergencies (11). Physical fitness consists of several components that includes cardiorespiratory endurance, musculoskeletal strength and endurance, muscular power, flexibility, balance, and speed. Previous studies stated that regular physical training improves physical fitness, such as flexibility, muscular strength, cardiorespiratory, and muscular endurance (3,4,13). Meanwhile, physical inactivity results in loss of physical ability such as deteriorates in muscle strength (3), cardiorespiratory fitness (14) and muscle endurance (15).

So far, few studies have been conducted to investigate the status of university students, especially in the National Defense University of Malaysia (NDUM) regarding the amount of time spent in physical activity and the relationship with physical fitness level. At NDUM, the students can be categorized into two; cadets and civilian students. Cadet is a student enrolled in military training and academic study simultaneously, whereas civilian students who are not members of a military and only engaged in the academic studies (16). However, in order to produce intellectual leaders of character required by NDUM, NDUM's students were urged to participate in any kind of activities to attain these attributes for them to graduate. These consist of graduate officers, commissioned officers, sportsmen/women, masters of unarmed combat, Imams/Khatibs; and officers and gentlemen/ladies (16).

In terms of academic hours, cadets and civilian students have accumulated to study at similar times from 8.00 a.m. to 5.00 p.m., and from 5.00 to 6.30 p.m., it was accommodated slots for both groups of students to perform the physical activity. Cadets have compulsory military physical training at this hour.

Meanwhile, civilian students were free to choose any kind of activities either individual or team sports. A further advantage for cadets are general military training on every Saturday and unarmed combat training on every Friday evening (from 3.00 to 6.30 p.m.). During semester breaks, cadets undergo advanced training to improve military skills and military leadership (16). Generally, cadets spent more hours of training compared to civilian students. Given the differences between days and time spent in physical training, this study aimed to investigate the differences and relationships of the amount of time spent in physical activity with the abdominal muscle endurance between cadets and civilian students in NDUM.

## Methods

### Participants

The data was collected from 191 male participants (with an average age of  $19.7 \pm 0.91$  years, an average weight of  $63.18 \pm 7.50$  kg and an average height of  $169.34 \pm 4.82$  cm) in NDUM who volunteered to participate in this study. The sample size of the study was determined according to the formula used by Krejcie and Morgan (17) as shown in Figure 2. In this study, in order to determine the participants and to increase the efficiency of the study, purposive sampling technique was used (18). This sampling technique is a strategy in which individual settings are intentionally selected to provide valuable information that cannot be obtained from other choices. For this study, the samples are purposive based on cadets and civilian students. The participants were selected based on some inclusion and exclusion criteria. The inclusion criteria included the samples are injury-free, involved actively in physical activity and willingness to participate in this study voluntarily. Whereas, the exclusion criteria included passive students or students who were not willing to participate in physical activity and injured samples.

$$s = \frac{X^2 NP (1-P)}{d^2 (N-1) + X^2 P (1-P)}$$

$$s = \frac{3.84 * 140 * 0.5 * (1-0.5)}{0.0025 * (140-1) + 3.84 * 0.5 * (1-0.5)}$$

$$s = 134.4 \div 1.3075$$

$$s = 102$$

s = required sample size.  
 $X^2$  = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).  
 N = the population size.  
 P = the population proportion (assumed to be .50 since this would provide the maximum sample size).  
 d = the degree of accuracy expressed as a proportion (.05).

**Figure-2.** The sample size formula used in this study

### Study Design

In this study, a survey and a cross-sectional design were performed. The collection of data was started in January until February 2019. The survey applied open-ended questions in order to get broad information among participants. Two questions included, 1) How many days have you done physical activity in a week? and 2) How long (minutes) do you do physical activity in a day? Both of these questions are very important to understand the pattern of physical activity and the level of being active among participants. Meanwhile, the cross-sectional design was performed to record and measure the abdominal muscle endurance level among participants without any interference or intervention applied.

### Abdominal Muscle Endurance Test

The one-minute sit-up test was conducted to measure the abdominal muscle endurance

among participants. Prior to the test, participants performed a 15 minute standardized warm-up for physical and mental readiness. All participants were fully briefed and familiarized with the test protocol. Participants lay on their back with their knees bent at approximately right angles ( $90^\circ$ ) while both feet were positioned flat on the ground. They held their hands against and crossed their chest during the test (Figure 3). An assistant held the subjects' feet placed on the ground. Participants sat up until they touched their knees to both elbows; then, they returned to the floor (19). The movement was repeated as many times as possible for 1 minute. The assistant kept the participant informed of the time remaining. The assistant counted and recorded the number of completed correct sit-ups. The test was measured only once due to fatigue influence.



**Figure-3.** Illustration of one-minute of sit-up test

### Statistical Analysis

Results are presented as means $\pm$ SD. Independent sample t-test was used to measure differences between cadets and civilian students in days and minutes of time spent in physical activity with abdominal muscle endurance. Pearson correlation was used to examine the relationship between times spent in physical activity with abdominal muscle endurance. All statistical analyses were performed using Statistical Package for Social Science (SPSS) version 25.0 with the significance level of  $P \leq 0.05$ .

### Ethical Consideration

This research was endorsed by the Centre for Research and Innovation Management, UPNM, Kuala Lumpur, Malaysia (Research's Code: 07/2019, Memo No.: UPNM (PPPI)

01.05/24(40). The participants were informed about the study's objectives and written consent was obtained prior to data collection of fitness tests. The participants were also informed that the data would be used for publication. Moreover, the participants were ensured that participation is voluntary and their information will be kept strictly confidential.

### Results

Table 1 presents the demographic information of the participants. Based on age, the ages of the most of the participants were in order of 19 years old (56.6%), 20 years old (27.7%) and 21 years old (9.4%). The majority of the participants were from Malays ethnic (78.53%) and cadets (55.5%).

**Table-1.** Demographic information of participants

Variables	No. of Participants (n)	Percentage (%)
<b>Sex</b>		
Male	191	100
<b>Age</b>		
19	108	56.5
20	53	27.7
21	18	9.4
22	11	5.8
23	1	.5
<b>Race</b>		
Malay	150	78.53
Indian	25	13.09
Chinese	16	8.38
<b>Categories of students</b>		
Cadet	106	55.5
Civilian	85	44.5

Table 2 represents the physical characteristics of the participants. As observed here, the cadets had 62.77 kg of body mass and 169.29 cm of height, which were lower than

civilian students with 63.72 kg of body mass and 169.41 cm of height. In terms of body mass index (BMI), all participants showed a normal range of BMI.

**Table-2.** Physical characteristics of participants

Participants	Age (years)	Weight (kg)	Height (cm)	BMI
Cadet (n=106)	19.30±.71	62.77±6.67	169.29±4.85	21.9±4.32
Civilian (n=85)	20.11±.94	63.72±8.43	169.41±4.79	22.2±5.12
Overall (N=191)	19.66±.91	63.18±7.50	169.34±4.82	22.1±4.19

Based on the analysis of independent sample t-test in Table 3, it was found that total days of engagement of physical activity in a week was [t(189)=13.73, p(0.00)<0.05], total minutes of doing physical activity in a day was [t(189)=5.67, p(0.00)<0.05] and abdominal muscle endurance level was [t(189)=13.07,

p(0.00)<0.05]. Thus, this analysis showed that there was a significant difference in time spent in physical activity (total of days and minutes) and abdominal muscle endurance level between cadets and civilian participants. Hence, the cadets showed greater domination in all variables compared to civilian participants.

**Table-3.** Time spent in physical activity and abdominal muscle endurance level

Variables	Participants	Mean	SD	t	df	p
<b>Total days of doing physical activity in a week</b>	Cadet (n=106)	5.47	.81	13.73	189	.00*
	Civilian (n=85)	3.25	1.41			
<b>Total minutes of doing physical activity in a day</b>	Cadet (n=106)	76.93	21.73	5.69	189	.00*
	Civilian (n=85)	58.65	22.48			
<b>Abdominal muscle endurance level</b>	Cadet (n=106)	45.82	5.95	13.07	189	.00*
	Civilian (n=85)	34.51	5.94			

\*level of significant at p<.05

**Table-4.** Correlations of time spent in physical activity and abdominal muscle endurance

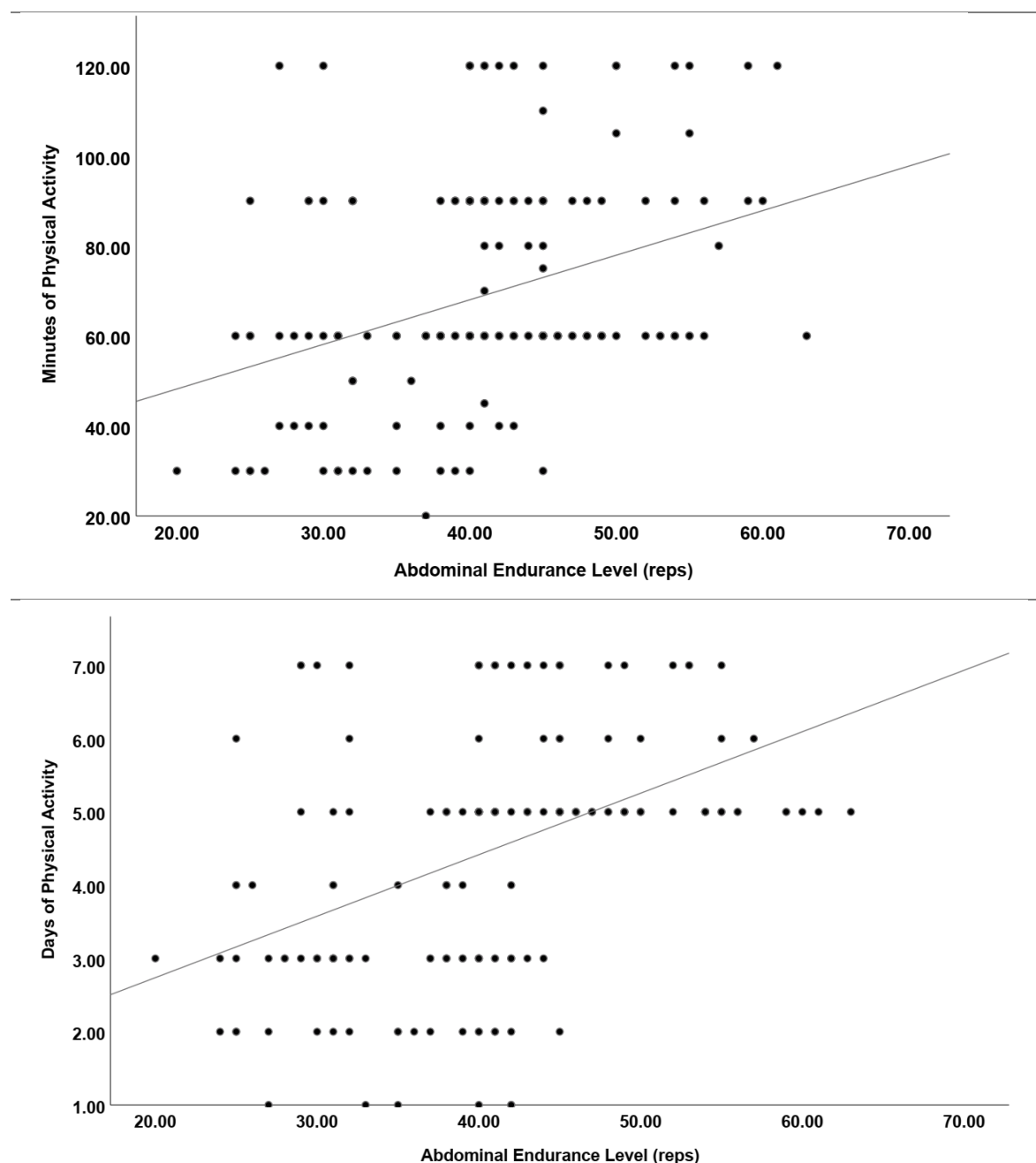
Variable	Physical activity days per week	Physical activity minutes per week	Abdominal muscle endurance
<b>Physical activity days per week</b>	-	r = .29**	r = .44**
<b>Physical activity minutes per week</b>	r = .29**	-	r = .34**
<b>Abdominal muscle endurance</b>	r = .44**	r = .34**	-

\*\* Correlation is significant at the 0.01 level (2-tailed)



A Pearson's correlation analysis was performed and the results are presented in Table 4. As observed, there was a low correlation between doing physical activity per week and abdominal muscle endurance level ( $r=0.44$ ,  $p<0.00$ ) and doing physical activity minutes per

day and abdominal muscle endurance level ( $r=0.34$ ,  $p<0.00$ ). Figure 4 shows the distribution of variables. Thus, the time spent in physical activity positively associated and influenced the level of abdominal muscle endurance.



**Figure-4.** Scatter plot of time spent (days and minutes) in physical activity and abdominal muscle endurance.

### Discussion

The main objective of this study was to investigate the differences and relationship amount of time spent in physical activity with the abdominal muscle endurance between cadets and civilian students. The main finding of this study revealed that there was a significant difference between cadets and civilian students.

Cadets showed greater mean value in terms of time spent in physical activity and abdominal muscle endurance level compared to the civilian students. This study also found that there was a low and positive correlation between time spent in physical activity and abdominal muscle endurance.

The mean of time spent in physical activity in

cadets was 384.65 minutes per week. As compared with the recommendation time of doing physical activity by (1), cadets fulfilled the recommendation time and considered physically active. Consistent with this finding, a study by Bhamani et al., (20) 377.3 minutes per week were spent by the adult and elderly population for performing physical activity. Meanwhile, Ekelund et al., (21) found that children and youth aged 4 – 18 years only managed to participate 245 minutes per week in physical activity. It was expected that cadets performed better than civilian as they were involved in systematically and structured training organization and monitored by Akademi Latihan Ketenteraan (ALK). Based on the study by Juhary (16), from Monday to Saturday cadets not only engaged in the academic studies but also performed their military training programs simultaneously. Although, it is mandatory to participate in physical activity and military training programs, it is believed that some of the cadets have their own motive to participate in the physical activity. As reported by Lim et al., (22) some familiar motives for participation in sport and physical activity included improving physical fitness, improving health, reducing stresses, leisure time purpose, and adopting an active lifestyle. While, (mention the name and year of the paper as mentioned already) (23) reported that another motive for participation in sport and physical activity were positive health, muscular strength and endurance, competition, social recognition and challenge.

In contrast, civilian students spent less time in physical activity (175.95 minutes per week), but still considered to be physically active and fulfilled the recommendation time by WHO (1). This is consistent with the finding of Lian et al study (24), which stated that the physical activity level of Malaysian adolescents (civilian) was low, and only 40% of 770 participants performed physical activity from 1 to 3 times per week. Globally, more than 80% of adolescents aged 11–17 years did not meet current recommendations for daily physical activity (25). Ekelund et al., (21) found that some children and youth aged 4–18 years showed approximately 126 minutes per week for performing physical activity. Lim et al., (22) found that there are five common reasons for those who do not participate in sport and physical activity, including lack of enough time, not interested, weather condition, health reasons, and lack of facilities. Another limitations factors participating in sport and physical activity are fatigue, laziness, body image, physical-social

anxiety and lack of time (23). This is in line with our findings on NDUM civilian students who were mostly less interested in any sports or exercise as there is no enforcement to join (26) compared to cadets who are restricted by military rules and regulation.

The findings of the current study showed that the cadets had better abdominal muscle endurance level compared to civilian students. In line with this finding, Pławińska L, Umbrasko (27) stated that the cadets of National Defense Academy displayed a high level of fitness in cardiorespiratory level, muscular strength and endurance. According to Aandstad et al., study (28), the Home Guard soldiers produced more minutes of moderate physical activity during Home Guard military training compared to civilian life. As stated by Juhary (16), cadets enrolled and participated in military training programs and he sports activity. Moreover, soldiers performed systematic and organized training such as aerobic-related physical demands (28). Hence, the physical fitness of cadets or individuals involved in the military were higher than civilian students.

In terms of the correlation between the variables, the findings of the current study showed that there was a positive correlation between time spent (days and minutes) in physical activity and abdominal muscle endurance level. In line with our finding, Reyes et al., (29) stated that greater time spent in vigorous physical activity with intensity was significantly associated with physical fitness components in boys. In addition, a study by Evaristo et al., (15) on 567 Portuguese adolescents aged 12 – 18 years, it was found that cardiorespiratory fitness and high muscular fitness was positively associated with a better health-related quality life. In addition, active lifestyle may reduce mortality and prevent many chronic diseases such as hypertension, diabetes, stroke, cancer and also promotes healthy cognitive and psycho-social functions (6,10,30).

In this study, the contributing factor to the high level of fitness among cadets was regular participation in military training and physical activity. Hence, it can be confirmed that the greater time spent (days and minutes) on physical activity has significant influences on the level of physical fitness. The limitation of the current study was that the data only showed the time spent in physical activity not the types of activity. Moreover, the numbers of participants between the cadets and civilian students were not equal that can indirectly affect the results.



## Conclusion

In conclusion, there were six leaders of character for being a holistic student at NDUM namely commissioned officers, sportsmen/women, masters of unarmed combat, Imams/Khatibs, and officers and gentlemen/ladies. Therefore, NDUM's students were urged to regularly participate in physical activity to acquire the six leaders of character. The present study revealed that cadets spent more days and minutes in physical activity and also showed greater abdominal muscle endurance level compared to civilian students. Moreover, there was a positive correlation between time spent in physical activity and abdominal muscle endurance. The physical activity not only leads to attain the leaders of character's certificate for NDUM's students but also improves the mental and physical health, social satisfaction, quality of life and more confidence. Therefore, there is a need for a study to investigate the motives and barriers of cadets and civilian students participated in physical activity. Moreover, it is necessary to determine the types of their activity to examine the pattern and intensity of each activity.

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### Clinical Point applicable for Military

- This study could be a guidance for Military Agency to understand the greater time spent in physical activity and improve physical fitness.
- The results of the study also could be a norm standard of core muscle endurance among military personnel.
- The Military Agency could use this One-minute sit up a test to measure the core muscle endurance fitness among military.

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## Authorship

All authors are accepting and responsible for the data presented, completing the fitness test, analysis and interpretation of data. The authors also accept and approved the final version of this article including the data and the content.

## Conflict of Interest

The present study has no financial support from any agency. Therefore, there is no conflict of interest and no benefits in the current study.

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