EFFECTS OF COVID-19 PANDEMIC ON PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR AMONG MALAYSIA UNDERGRADUATE UNIVERSITY STUDENTS

AHMAD YASRI BIN AHMAD YASRANI

UNIVERSITI SAINS MALAYSIA

2021

EFFECTS OF COVID-19 PANDEMIC ON PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR AMONG MALAYSIA UNDERGRADUATE UNIVERSITY STUDENTS

by

AHMAD YASRI BIN AHMAD YASRANI

**Dissertation submitted in partial fulfilment of the requirements
for the degree of
Bachelor of Health Science (Honours) (Exercise and Sports Science)**

July 2021

CERTIFICATE

This is to certify that the dissertation entitled "Effects of COVID-19 Pandemic on Physical Activity and Sedentary Behaviour among Malaysia Undergraduate University Students" is the bona fide record of research work done by Ahmad Yasri bin Ahmad Yasrani during the period from October 2020 to July 2021 under my supervision. I have read this dissertation and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation to be submitted in partial fulfilment for the degree of Bachelor of Health Sciences (Honours) (Exercise and Sports Science).

Main Supervisor,

Dr. Adam Abdul Malik

Lecturer,

Exercise and Sports Science Programme,

School of Health Sciences,

Health Campus, Universiti Sains Malaysia,

16150 Kota Bharu, Kelantan, Malaysia.

Date:

DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated and duly acknowledged. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at Universiti Sains Malaysia or other institutions. I grant Universiti Sains Malaysia the right to use the dissertation for teaching, research, and promotional purposes.

AHMAD YASRI BIN AHMAD YASRANI

Date: 11 July 2021

ACKNOWLEDGEMENT

In the name of Allah, the most Gracious and the most Merciful.

I would like to express my gratitude to Allah SWT for giving me opportunity and assist me endlessly in completing this thesis. I would also like to take this opportunity to express my deepest gratitude appreciation towards my supervisor, Dr. Adam Abdul Malik for his constant guidance, motivation, knowledge, and patience throughout the process of completing this thesis.

Special thanks also go to my Course Coordinator of Research Project, Dr. Nur Syamsina Ahmad for her understanding, support and assistance that helped me to finish up this thesis. Besides, I would like to thank all the lecturers of Exercise and Sports Science Programme for their generous sharing of knowledges given along this course journey.

Not forgetting, I want to express my heartiest gratitude to my parents, family and friends for their continuous support and encouragement throughout my years of study and throughout the process of my research. Thanks for those memories and friendship through our times in Universiti Sains Malaysia.

Finally, I sincerely would like to show my special thanks towards Universiti Sains Malaysia for providing me the opportunity to experience this remarkable research project. This accomplishment would not have been possible without them. Thank you.

AHMAD YASRI BIN AHMAD YASRANI.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Page

LIST OF SYMBOLS

%	Percentage
>	Greater than
<	Less than
=	Equal

LIST OF ABBREVIATIONS

ANOVA	Analysis of variance
BMI	Body mass index
COVID-19	Coronavirus disease 2019
G-LTEQ	Godin leisure-time exercise questionnaire
IPAQ-SF	International physical activity questionnaire
MCO	Movement control order
MET	Metabolic equivalent
PA	Physical activity
SB	Sedentary behaviour
SD	Standard deviation
SPSS	Statistical package for the social sciences
WHO	World health organization

LIST OF APPENDICES

KESAN PANDEMIK COVID-19 TERHADAP AKTIVITI FIZIKAL DAN TINGKAH LAKU SEDENTARI DALAM KALANGAN PELAJAR PRA-SISWAZAH UNIVERSITI MALAYSIA

ABSTRAK

Bilangan kajian yang terhad dijalankan di Malaysia untuk meneliti kesan pandemik COVID-19 ini secara langsung ke atas populasi pra-siswazah universiti Malaysia. Oleh itu, kajian ini bertujuan untuk menyiasat perubahan aktiviti fizikal, tingkah laku sedentari dan berat badan di kalangan pelajar universiti prasiswazah Malaysia sebelum, semasa dan selepas Perintah Kawalan Pergerakan (PKP) 1.0. Kajian keratan rentas ini melibatkan seramai 136 pelajar prasiswazah Malaysia. Soal Selidik Senaman Masa Lapang Godin (G-LTEQ) digunakan untuk menilai aktiviti fizikal dan Borang Soal Selidik Aktiviti Fizikal Antarabangsa (IPAQ-SF) digunakan untuk menilai tingkah laku sedentari responden. Berat badan sebelum, semasa dan selepas PKP 1.0 dilaporkan sendiri oleh responden. Pecahan tertile dilakukan pada jumlah skor aktiviti fizikal pra-PKP 1.0 dan kumpulan berikut ditubuhkan: kumpulan aktiviti fizikal yang rendah, sederhana, dan tinggi sebelum PKP 1.0. Diasingkan tiga kumpulan aktiviti fizikal pra-PKP 1.0 (rendah, sederhana, tinggi) mengikut masa ANOVAs dijalankan untuk jumlah aktiviti fizikal, tingkah laku sedentari, dan berat badan. Keputusan menunjukkan bahawa terdapat perbezaan yang ketara dalam aktiviti fizikal dan berat badan tetapi tidak ada perbezaan yang ketara dalam tingkah laku sedentari. Berdasarkan dapatan yang diperoleh, ia boleh disimpulkan bahawa pandemik COVID-19 ini membawa kesan negatif terhadap aktiviti fizikal, tingkah laku sedentari dan berat badan.

EFFECTS OF COVID-19 PANDEMIC ON PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR AMONG MALAYSIA UNDERGRADUATE UNIVERSITY STUDENTS

ABSTRACT

Limited studies have been conducted in Malaysia to examine the effect of the COVID-19 pandemic directly on the undergraduate university population of Malaysia. Therefore, this study aimed to investigate the changes of physical activity, sedentary behaviour, and body weight among Malaysia undergraduate university students before, during and after Movement Control Order (MCO) 1.0. This cross-sectional study involved 136 Malaysian undergraduate students. The Godin Leisure-Time Exercise Questionnaire (G-LTEQ) was used to assess the physical activity and the International Physical Activity Questionnaire-Short Form (IPAQ-SF) was used to assess sedentary behaviour of the respondents. Body weight before, during and after the MCO 1.0 was self-reported by the respondents. Tertile splits were performed on the pre-MCO 1.0 total physical activity score and the following groups were established: low, moderate, and high pre-MCO 1.0 physical activity group. Separated the three pre-MCO 1.0 physical activity group (low, moderate, high) by time ANOVAs were conducted for total physical activity, sedentary behaviour, and bodyweight. The results revealed that there was a significant difference in physical activity and body weight but there was no significant difference in sedentary behaviour. Based on the findings obtained, it can be concluded that this COVID-19 pandemic brings negative effect on physical activity, sedentary behaviour, and bodyweight.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

The World Health Organization (WHO) announced the cause of this epidemic outbreak was a novel coronavirus discovered in 2019 (2019- nCoV) or SARS-CoV-2 and named the disease coronavirus disease 2019 (COVID-19) (*Coronavirus Disease (COVID-19) Situation Reports*, 2020). Consequently, the Movement Control Order (MCO) was enforced nationwide on the 18th March 2020 until the 28th April 2020 to control the spread of COVID-19 in Malaysia (Elengoe, 2020). The government imposed a few restrictions some of which include people prohibited from attending mass gatherings such as religious, sports, social, and cultural events. All education institutions were also affected with the closing of pre-school, primary and secondary schools, and universities (public and private), enforcing the implementations of online based learning and teaching activities. This strategy was imposed to slow COVID-19 transmission by limiting contact between people. Moreover, physical distancing and stay at home recommendations during the COVID-19 pandemic may have altered social interactions, which lead to the closure of essential services and public premises such as sports event, fitness centres, and outdoor parks and limited leisure time activity options. As a result, people spend much of their time at home, which is likely to influence most aspects of their routine lifestyle, including physical activity and sedentary behaviour. Therefore, it is likely that restrictions imposed in the MCO due to COVID-19 pandemic may reduce physical activity (PA), increase sedentary behaviour (SB), and significantly increase body weight.

Despite that MCO has been effective in containing the transmission of diseases (Tang, 2020), this may have potential effects on other aspects of health. This is mainly because a sufficient amount of PA is required to maintain regular health status in preventing chronic diseases (Warburton, Nicol & Bredin, 2006). Furthermore, obesity and a lack of exercise also serve as risk factors for the development of more severe symptoms and complications if they were to become infected with COVID-19 (Carter, Baranauskas & Fly, 2020). Although the benefits of PA and problems associated with prolonged sedentary behaviour are well known (Warburton, Nicol & Bredin, 2006), it may be necessary to remain active during this COVID-19 pandemic. As such, researchers stress the importance that individuals attempt to sustain the WHO recommendation of PA of 150 minutes per week of moderate-intensity physical activity or 75 minutes per week of vigorous-intensity physical activity, considering the barriers caused by the pandemic (Mattioli *et al.*, 2020). While outdoor activities are usually more open, varied, and have more facilities and infrastructure to conduct any PA, there are still many possibilities to exercise at home during lockdown. However, some people may have limitations, such as a lack of equipment and room to exercise at home (Barkley *et al.*, 2020).

Although an emerging body of literature explores the potential impact of COVID-19 on the levels of PA and SB, Sallis *et al.*, (2020) argued that this type of research is required not only to inform the recommendations for improved intervention during the COVID-19 pandemic, but also to strengthen responses to similar events in the future. Therefore, the purpose of this study was to assess PA, SB, and bodyweight in a sample of undergraduate university students before, during, and after MCO due to the COVID-19 pandemic particularly in Malaysia.

1.2   PROBLEM STATEMENT

Initially, limited studies have been conducted in Malaysia to examine the effect of the pandemic directly on the undergraduate university population of Malaysia. Secondly, there was a defined date of 18 March 2020 in which the first phase of the MCO came into effect until the fourth phase 12 May 2020 (Tang, 2020). Due to the MCO, higher education institutions, educational colleges, and schools had to close (Shah *et al.*, 2020). All face-to-face lectures were cancelled, and daily university activity stopped. The sudden closure undoubtedly changed the daily lives of most university students taking classes. Hence, changes in PA, SB, and bodyweight before, during, and after MCO will be analysed in this study. The findings of this study could enhance the current understanding of the impact of COVID-19 pandemic on lifestyle, specifically PA and SB of university students.

1.3   OBJECTIVES OF THE STUDY

1.3.1   General Objectives

To determine the effect of COVID-19 pandemic on physical activity and sedentary behaviour among Malaysia undergraduate university students.

1.3.2   Specific Objectives

1. To compare the changes in physical activity level of undergraduate students before, during and after MCO 1.0.

2. To compare the changes in sedentary behaviour of undergraduate students before, during and after MCO 1.0.

3. To compare the changes in body weight of undergraduate students before, during and after MCO 1.0.

1.4   RESEARCH QUESTIONS

1. Is there any significant different in physical activity level before, during and after MCO 1.0 among university students?

2. Is there any significant different in sedentary behaviour before, during and after MCO 1.0 among university students?

3. Is there any significant different in body weight before, during and after MCO 1.0 among university students?

1.5   HYPOTHESES OF THE STUDY

H_{o1}: There is no significant difference in physical activity levels before, during and after MCO 1.0 among Malaysia undergraduate university students.

H_{a1}: There is significant difference in physical activity levels before, during and after MCO 1.0 among Malaysia undergraduate university students.

H_{o2}: There is no significant difference in sedentary behaviour levels before, during and after MCO 1.0 among Malaysia undergraduate university students.

H_{a2}: There is significant difference in sedentary behaviour levels before, during and after MCO 1.0 among Malaysia undergraduate university students.

Ho3: There is no significant difference in body weight before, during and after MCO 1.0 among Malaysia undergraduate university students.

Ha3: There is significant difference in body weight before, during and after MCO 1.0 among Malaysia undergraduate university students.

1.6   SIGNIFICANCE OF THE STUDY

This study will analyse a sample of Malaysia undergraduate university students because this population will serve as a viable source for assessing the effects of the pandemic upon the variables of interest especially in PA and SB. Thus, this study hopes to expand the existing literature by assessing the effects of the COVID-19 pandemic on the PA level and SB among Malaysian university students. We hope that the findings of this study will enable Malaysian higher education institutions, colleges, and universities to form a framework for identifying evidence-based PA and SB intervention practices to assist students in the future in times of similar pandemics.

CHAPTER 2

REVIEW OF LITERATURE

2.1   PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR AMONG UNIVERSITY STUDENTS

According to Clemente *et al.*, (2016), average both young men and women university students complies the PA recommendations during weekdays with more than 10,000 steps and 30-minutes of moderate-to-vigorous PA per day. Although, different results were found during weekend whereby students did not achieve the PA recommendations (Clemente *et al.*, 2016). Study from Fagaras, Radu & Vanvu, (2015) reported that for physical activity, male students are more active compare with female students and also women perform less vigorous activity than men. Physical activity and sedentary activities have a huge effect on the weight and overall health of students (Keating *et al.*, 2005). These findings showed reasonable basis for health and active lifestyle among students.

As stated by Tremblay *et al.*, (2017) sedentary behaviour is any waking behaviour characterized by an energy expenditure lower than 1.5 metabolic equivalents (METs) while in a sitting, reclining, or lying position. In general, this means that any time an individual is sitting or lying down, they are engaging in sedentary behaviour. Watching TV, video game playing, computer use or screen time, driving cars, and reading are typical sedentary behaviours. Castro *et al.*, (2020) assessed self-reported and accelerometer measured PA levels. Their data indicate that university students spend 7.29 hour per day being sedentary, but the levels of total sedentary behaviour

were significantly higher when measured using accelerometers (9.82 hour per day). The findings of the study show that a large proportion of university students participated in higher sedentary time levels relative to the general population of young adults and accumulate sedentary time levels associated with an increased risk of adverse health outcomes (Castro *et al.*, 2020).

2.2 PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR IN COVID-19 PANDEMIC

There are articles which attempt to quantify the impact of COVID-19 pandemic on physical activity (Ammar *et al.*, 2020; López-Bueno *et al.*, 2020; Stanton *et al.*, 2020; Tison *et al.*, 2020). These papers used a variety of methods such various survey instruments assessing physical activity and a pedometer application and analysed on different populations. Overall, they agree that the pandemic may decrease physical activity. They all reported significant pandemic-related decreases in physical activity however, article by (Meyer, Mcdowell & Meyer, 2020) suggests that this change may be moderated by pre-pandemic physical activity. In that analysis, 32% decrement in physical activity during the pandemic were recorded by participants that were active pre-pandemic whereas participants who were inactive pre-pandemic had relatively largely unchanged physical activity. This indicated that the physical activity of active and inactive individuals could be differentially influenced by pandemic-related restrictions.

There were also survey-based studies showing that sedentary behaviour may be increased by the pandemic, and pre-pandemic physical activity behaviour may moderate this effect (Meyer, Mcdowell & Meyer, 2020; Ammar *et al.*, 2020). These studies showed increases in daily sitting during the pandemic of 26–60%, with the highest increases seen in individuals who were physically active before the pandemic. Taken together, these decrement in physical activity and increment in sedentary behaviour could contribute in decreased daily caloric expenditure that could cause weight gain related to the pandemic. This pandemic could drive greater caloric

consumption and worsen this issue (Carter, Baranauskas & Fly, 2020). Despite this potential for pandemic-related weight gain, to the best of our knowledge changes in bodyweight has not been assessed. In the context of MCO measures, this indicate that there is a need to increase awareness of PA and SB during the COVID-19 pandemic.

2.3   MEASURING PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR DURING THE COVID-19 PANDEMIC

According to Sallis *et al.*, (2020) no specific studies at this stage are proposed because widely used methods to measure PA and SB should be used if possible. Currently, there are many validated measures and questionnaire, available for all ages and tailored for many population subgroups. (Craig *et al.*, 2003; Prince *et al.*, 2008; Prince *et al.*, 2019). Although device-based measures may be recommended due to their better accuracy compared to self-reports. Due to cost constraints, the use of device-based measures could be difficult in large studies. Sallis *et al.*, (2020) also recommend that researchers attempting to conduct studies related to other phases of the behavioural epidemiology framework are encouraged to consider the choice of measurement tool and any necessary adaptations for collecting PA and SB data during the pandemic such as adapting on existing instruments for online administration.

CHAPTER 3

METHODOLOGY

3.1   STUDY DESIGN

This present study utilised a cross sectional questionnaire-based study. This study proposal has been approved (Appendix A) by Human Research Ethics Committee (HREC), Health Campus of Universiti Sains Malaysia (USM/JEPeM/21010023). This study had no conflict.

3.2   STUDY LOCATION

The data collection was conducted online in Malaysia.

3.3   STUDY POPULATION

Malaysian undergraduate students in public and private universities.

3.4   SUBJECT CRITERIA

The inclusion criteria for participation in this study include male and female undergraduate students in public and private higher education institution in Malaysia.

The exclusion criteria were both Malaysian students studying outside of Malaysia and international undergraduate students studying inside and outside of Malaysia.

3.5   SAMPLE SIZE CALCULATION

The sample size was calculated using G*Power software (version 3.1.9.4) based on similar previous study findings on PA and SB. Power analysis was carried out using the findings from Barkley *et al.*, (2020). They used a survey-based method and studied pre- and post-cancellation on PA and SB on a sample of $N = 398$ for their research. With the effect sizes set at p = 0.25 (medium) and an $\alpha \leq 0.05$, $N = 54$ participants would be needed to achieve a power ≥ 0.95 for difference in PA and SB, respectively. Based upon the analysis, our current sample of N = 136 was acceptable.

3.6   SUBJECT RECRUITMENT

A convenience sampling strategy was utilised in this study, whereby students' living either in the university campus or at home during the COVID-19 pandemic was recruited. To ensure a well-spread pool of respondents, the participants was sampled randomly from both private and public universities from all states in Malaysia. Any participants of different years of study ranging from year 1 to year 5 was recruited. A Google form link to the survey was published and advertised from 16 May 2021 to 22 June 2021. Questionnaire data was downloaded and collected on 23 June 2021. Any respondent with exclusion criteria or missing data for one or more of the items of interest (i.e., physical activity, sedentary behaviour, bodyweight) at either period (before, during and after) in the survey was subsequently omitted from the data set collection.

3.7   DATA COLLECTION METHOD

This study attempts to assess the impact of COVID-19 on PA and SB changes via online survey (Google forms). It took around 5 minutes for the participants to complete the online survey. The online survey involved with the measurement of PA, SB, and self-reported bodyweight before, during and after MCO 1.0. The first page of the survey contained an informed consent statement explaining the study. That consent statement will be highlighted with the consent statement and voluntarily agreement to participate in this study. The second page contained self-administered demographics questionnaire (Appendix D) that require all the participants providing their socio-demographic information to be segregated into inclusion and exclusion criteria such as gender, age, education level university (foundation, bachelor's degree, master's degree, PhD), nationality (Malaysian, non-Malaysian), academic year, place of study during academic year (Malaysia, overseas), and bodyweight. Participants were asked to specifically report their bodyweight before, during and after the MCO1.0. Using self-reporting is a valid method of assessing bodyweight in adults (Kee *et al.*, 2017). The third and fourth page of the survey will contain both Godin Leisure-Time Exercise Questionnaire (G-LTEQ) (Appendix E) and International Physical Activity Questionnaire-Short Form (IPAQ-SF) (Appendix F). These questionnaires will be used to obtain the total minutes and score of physical activity per week and sitting time per day. These questionnaires (G-LTEQ and IPAQ) have been validated and can be accessed via following links (https://forms.gle/KQUS6hmWYbAkjXndA)

3.8   STUDY PROTOCOLS

Physical activity were assessed using the Godin Leisure-Time Exercise Questionnaire (G-LTEQ; Godin & Shephard, 1985) that requires respondents to indicate the number of times per week they participate in 15 minutes of strenuous, moderate, and mild physical activity. G-LTEQ was featured in the prior conducted study by Barkley *et al.*, (2020). The survey defines strenuous/vigorous physical activity as activities in which the participant's "heart beats rapidly" and lists several examples of these types of activities (e.g., running, jogging, football). Moderate activity is defined as physical activities that are "not exhausting" and provides examples (e.g., fast walking, tennis, leisure bicycling). Finally, low/mild activities are defined as those that require "minimal effort" and, again, examples are provided (e.g., slow walking, yoga, fishing). A score for each intensity is calculate using the following equations: times per week participating in strenuous x 9, moderate x 5, mild x 3. Each of these individual scores was then summed for a total physical activity score.

Participants were asked to report their typical activity prior to MCO 1.0 using the following language: "During a typical 7-day (one week) period before MCO 1.0, how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time?" Participants then reported their during MCO 1.0 physical activity using the following language: "During a typical 7-day (one week) period during MCO 1.0 how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time? Lastly, participants reported their current physical activity using the following language: "During a typical 7-day

(one week) period after MCO 1.0, how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time?"

Sedentary behaviour were assessed using the validated International Physical Activity Questionnaire-Short Form (IPAQ-SF) and language that is similar to the PA assessments (Craig *et al.*, 2003; van der Ploeg *et al.*, 2010). IPAQ-SF was also featured in the prior conducted study by Barkley *et al.*, (2020). Specifically, participants will be asked "During a typical week before MCO 1.0, how much time did you usually spend sitting on a weekday?" The same language will be used for assessing sedentary behaviour during and after MCO by slightly modifying the questions to "During a typical week during MCO 1.0, how much time you usually spent sitting on a weekday?" and "During a typical week after MCO 1.0, how much time you usually spent sitting on a weekday?"
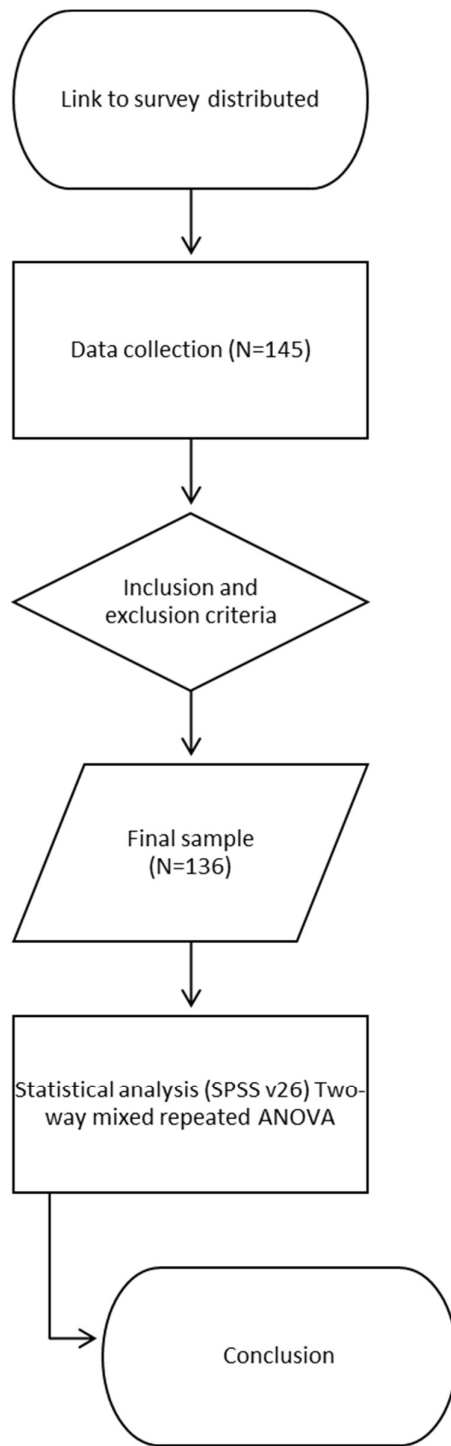
.

Figure 3.1: Flow chart of the study procedures

3.9   STATISTICAL ANALYSIS

All statistical analyses were conducted using SPSS (SPSS 26.0; IBM Corporation, Armonk, NY, USA). Two-way mixed with repeated measures analysis of variance (ANOVA) was performed to examine changes in low, moderate, vigorous, and total physical activity, sedentary behaviour, and body weight. Only main effects (changes in PA, SB, and bodyweight) and interactions related to changes in time (before, during, and after MCO) were reported for these ANOVAs.

Tertile splits was performed on pre-MCO 1.0 total PA score and the following groups were established: low, moderate, and high pre-MCO 1.0 physical activity. Separate the three pre-MCO1.0 physical activity group (low, moderate, high) by time ANOVAs were conducted for low, moderate, vigorous, and total physical activity, sedentary behaviour, and bodyweight. The significant level was set at ($\alpha \leq 0.05$). Results were reported as mean $\pm$ standard deviation (SD).

CHAPTER 4

RESULTS

4.1 DEMOGRAPHIC OF RESPONDENTS

The demographic characteristics (Table 4.1) shows, gender, age and academic year of the respondents. There were 136 university students enrolled in this study, comprising 54 males and 82 females, aged 20–25 years old. The majority were age 21 (49.3%) and in the second year of academic (54.4%). Mean variables of the respondents are shown in the Table 4.1. The data were analysed by descriptive statistics and expressed in means ± standard deviations (SD).

Table 4.1: Demographic of undergraduate respondents

Variables	Total (N=136)	Mean ± SD
Gender		
Male	54	
Female	82	
Age		21.64 ± 0.99
20	6	
21	67	
22	45	
23	9	
24	6	
25	3	
Academic year		2.43 ± 0.70
1	6	
2	74	
3	50	
4	4	
5	2	

4.2   PHYSICAL ACTIVITY

The physical activity score mean is presented in the Table 4.2. The two-way mixed ANOVA with repeated measures showed that there was a significant effect main effect of time by group activity (F = 15.086; df = 3.625; p < 0.001), However, there was no significant difference of physical activity level before, during and after in both low and moderate group.

Table 4.2: Mean ± SD of Godin physical activity scores for before, during and high for the three separate pre-MCO physical activity groups.

Activity group	Godin score before	Godin score during	Godin score after
Low	4.45 ± 4.26	9.23 ± 7.90	15.50 ± 23.06
Moderate	23.41 ± 15.13	19.86 ± 21.75	21.91 ± 17.60
High	48.52 ± 18.69	21.12 ± 19.02	30.29 ± 20.76
Overall	37.33 ± 23.81	18.99 ± 18.60	26.54 ± 21.32

4.3   SEDENTARY BEHAVIOUR

The sedentary behaviour mean is presented in the Table 4.3. The two-way mixed ANOVA with repeated measures showed that there was no significant main effect of time on sedentary behaviour (F = 0.467; df 3.827; p = 0.751).

Table 4.3: Mean ± SD of sedentary behaviour (hour/day) before, during and after for the three separate pre-MCO physical activity group.

Activity group	Sedentary before	Sedentary during	Sedentary after
Low	7.73 ± 2.60	11.55 ± 3.33	10.68 ± 4.36
Moderate	6.33 ± 2.47	10.45 ± 2.54	8.68 ± 2.32
High	6.13 ± 2.47	10.61 ± 4.21	9.06 ± 3.97
Overall	6.42 ± 2.54	10.73 ± 3.85	9.26 ± 3.85

4.4   BODY WEIGHT

The body weight mean is presented in the Table 4.4. The two-way mixed ANOVA with repeated measures showed that there was a significant main effect of time on body weight (F = 3.522; df = 2.613; p = 0.021). However, there was no significant difference of body weight before, during and after in both low and moderate group.

Table 4.4: Mean ± SD of bodyweight (kg) before, during and after for the three separate pre-MCO physical activity group.

Activity group	Bodyweight before	Bodyweight during	Bodyweight after
Low	60.32 ± 15.71	59.14 ± 12.86	59.27 ± 13.93
Moderate	61.64 ± 16.61	62.77 ± 18.01	63.70 ± 18.93
High	58.65 ± 10.69	60.27 ± 12.45	61.16 ± 13.09
Overall	59.40 ± 12.64	60.49 ± 13.48	61.27 ± 14.25

CHAPTER 5

DISCUSSION

5.1   PHYSICAL ACTIVITY

The objective of this study was to analyse the effects of COVID-19 pandemic on physical activity and sedentary behaviour among Malaysia university students. Several studies found that regardless of the subgroup or methodology used, PA decreased while SB increased during the COVID-19 pandemic lockdown (Stockwell *et al.*, 2021). In this study, there was a significant decrease of 28.9% in overall PA group score from before to after MCO 1.0 (Table 4.2). Although there were no significant changes of PA in both low and moderate activity group. Similar to our results, previous studies have reported significant changes in PA level activity group by time interactions for total physical activity from pre- to post cancellation of class (Barkley *et al.*, 2020). They also had no significant changes in light physical activity for the low activity group nor in light or vigorous physical activity for the moderate activity group.

In addition to the reduction in high PA group, there was a 37.6% reduction in total physical activity from before to after MCO 1.0 in participants who were most physically active before the pandemic. Conversely, overall activity group (low, moderate, and high) increased their total PA score after the MCO 1.0 by 39.8%. Interestingly, emerging findings demonstrated that university students had a better engagement in physical activity, even with a substantial increase in sedentary behaviour during confinement.

In this present study, we did not report main effects of PA on time by gender nor academic year as these effects are not part of the research questions. However, since majority of our sample size (60.3%) is female, the results might suggest that studies from Ss & Marathamuthu, (2021), which reveal women say that exercise helps them manage their physical and mental health during the Covid-19 epidemic and physical activity is enjoyable for women, and they believe it is vital to engage in it frequently in comparison to men. Their study also discovered that during the MCO period, females demonstrated more positive behaviour towards physical activity and exercise as compared to males.

Overall, undergraduate students significantly decreased in PA and students from the high activity group decrease the most in total PA score. These findings could imply that while the MCO 1.0 may have restricted some student's ability to engage in physical activity, other components of the MCO during this COVID-19 pandemic may have stimulated PA in others.