UNIVERSITI PUTRA MALAYSIA

PREVALENCE OF PHYSICAL INACTIVITY AND ITS ASSOCIATED FACTORS AMONG UNDERGRADUATE STUDENTS IN FACULTY OF MEDICINE AND HEALTH SCIENCES, UNIVERSITY PUTRA MALAYSIA DURING COVID-19 PANDEMIC LOCKDOWN

GROUP 19

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ABSTRACT

Introduction: Physical inactivity is the main cause of noncommunicable diseases and mortality. It also became a concern among university students due to COVID-19 pandemic. Movement Control Order (MCO) was implemented during this pandemic which restricted outdoor activities. This may be a huge factor that increases the prevalence of physical inactivity among Malaysians. Therefore, the general objective of this study is to determine the prevalence of physical inactivity and its associated factors among undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia during COVID-19 pandemic lockdown.

Objectives: This study aims to determine the prevalence of physical inactivity and its associated factors characteristics such as age, gender, ethnicity, programme, part time work, academic activities, perceived benefits and barriers towards physical activity, body image, and internet addiction among undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia during COVID-19 pandemic lockdown.

Methodology: A cross sectional study conducted using convenience sampling method. There were a few instruments used in the questionnaire such as self-administered questionnaires for sociodemographic factors and academic activities, Internal Physical Activity Questionnaire (IPAQ) for the physical activity intensities, Internet Addiction Test (IAT) to assess the severity of the internet dependency, Exercise Benefits/Barriers Scale to assess perceived benefits and

barriers to physical activity and Dresden Body Image Questionnaire for the perception of the body image assessment. All the data collected was analysed using IBM Statistical Package for Social Sciences (SPSS) version 26.0. The data analysis involved descriptive analysis and Mann-Whitney Test was used for continuous data while Chi-square test used for categorical data. The significance of the independent factors on physical inactivity was assessed using multiple logistic regression.

Results: A total of 670 students were recruited for the study. The findings revealed that the prevalence of physical activity among respondents was 29.4% whose physical activity levels were below 600 MET-minutes/week. The prevalence of physical inactivity was higher in females (31.5%) than in males (22.1%). Using multiple logistic regression, physical inactivity was higher among health sciences students than in medical students (OR = 1.577, 95% CI = 1.109, 2.243, $p<0.05$). The odds of being physically inactive is higher among those with lower perceived benefits score (OR = 0.872, 95% CI = 0.823, 0.923, $p<0.001$). Therefore, programme and perceived benefits scale were significantly associated with physical inactivity among respondents in this study.

Conclusion: Conclusively, there is significant decrease in physical inactivity among university students when compared with previous studies in this population. 29.4% of the total respondents is a huge number of students who are physically inactive. Therefore, it is recommended that counselling on physical activity awareness among new university students should be encouraged. The findings of this study might be used to better understand how various factors influence students' physical inactivity. Hence, the findings suggest that regular physical activity should be promoted during the COVID-19 pandemic among university students to enhance their health.

TAHAP KETIDAKAKTIFAN FIZIKAL DAN FAKTOR-FAKTOR YANG BERKAITAN DALAM KALANGAN PELAJAR SARJANA DI FAKULTI PERUBATAN DAN SAINS KESIHATAN, UNIVERSITI PUTRA MALAYSIA SEMASA PANDEMIK COVID-19

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ABSTRAK

Pengenalan: Ketidakaktifan fizikal merupakan punca utama penyakit tidak berjangkit dan kematian. Ia menjadi perhatian dalam kalangan pelajar universiti disebabkan wabak COVID-19. Perintah Kawalan Pergerakan (PKP) dilaksanakan selama wabak ini yang mengehadkan aktiviti luar. Ini mungkin merupakan faktor besar yang meningkatkan berlakunya ketidakaktifan fizikal dalam kalangan rakyat Malaysia. Oleh itu, objektif umum kajian ini adalah untuk menentukan tahap ketidakaktifan fizikal dan faktor-faktor yang berkaitan dalam kalangan pelajar sarjana di Fakulti Perubatan dan Sains Kesihatan, Universiti Putra Malaysia semasa pandemik COVID-19.

Objektif: Kajian ini bertujuan untuk mengkaji tahap ketidakaktifan fizikal dan faktor-faktor yang berkaitan seperti umur, jantina, etnik, program, kerja sambilan, aktiviti akademik, kepercayaan kesihatan, imej badan, dan ketagihan internet dalam kalangan pelajar sarjana di Fakulti Perubatan dan Sains Kesihatan, Universiti Putra Malaysia semasa pandemik COVID-19.

Metodologi: Kajian keratan rentas yang dilakukan menggunakan kaedah persampelan secara kebetulan. Terdapat beberapa instrumen yang digunakan dalam soal selidik seperti soal selidik yang dikendalikan sendiri untuk faktor sosiodemografi dan aktiviti akademik, Soal Selidik Aktiviti Fizikal (IPAQ) untuk tahap aktiviti fizikal, Ujian Ketagihan Internet (IAT) untuk menilai tahap ketagihan internet, Skala Tanggapan Manfaat / Halangan Latihan untuk menilai faedah yang dirasakan dan halangan terhadap aktiviti fizikal dan Soal Selidik Imej Tubuh Dresden untuk persepsi penilaian imej badan. Semua data yang dikumpulkan dianalisis menggunakan IBM

Statistical Package for Social Sciences (SPSS) versi 26.0. Analisis data melibatkan analisis deskriptif dan Mann-Whitney Test digunakan untuk data berterusan manakala ujian Chi-square digunakan untuk data kategori. Faktor-faktor yang ketara terhadap ketidakaktifan fizikal dinilai menggunakan regresi logistik berganda.

Keputusan: Seramai 670 pelajar menyertai untuk kajian ini. Hasil kajian menunjukkan bahawa ketidakaktifan fizikal dalam kalangan responden adalah 29.4%. Wanita mempunyai ketidakaktifan fizikal yang tinggi (31.5%) berbanding lelaki (22.1%). Dengan menggunakan regresi logistik berganda, ketidakaktifan fizikal lebih tinggi dalam kalangan pelajar sains kesihatan berbanding pelajar perubatan (OR = 1.577, 95% CI = 1.109, 2.243, $p < 0.05$). Ketidakaktifan fizikal juga lebih tinggi di antara mereka yang mempunyai skor tanggapan manfaat yang lebih rendah (OR = 0.872, 95% CI = 0.823, 0.923, $p < 0.001$). Oleh itu, program dan skor tanggapan manfaat dikaitkan dengan ketidakaktifan fizikal di kalangan responden dalam kajian ini.

Kesimpulan: Konklusinya, ada penurunan yang ketara dalam ketidakaktifan fizikal dalam kalangan pelajar universiti jika dibandingkan dengan kajian sebelumnya dalam populasi ini. 29.4% daripada jumlah responden adalah jumlah yang besar pelajar yang tidak aktif secara fizikal. Oleh itu, disarankan agar kaunseling mengenai kesedaran aktiviti fizikal dalam kalangan pelajar universiti baru harus digalakkan. Dapatan kajian ini dapat digunakan untuk lebih memahami bagaimana pelbagai faktor mempengaruhi ketidakaktifan fizikal pelajar. Oleh itu, hasil kajian menunjukkan bahawa aktiviti fizikal harus digalakkan semasa wabak COVID-19 dalam kalangan pelajar universiti untuk meningkatkan tahap kesihatan.

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LIST OF ABBREVIATIONS

COVID-19	:	Coronavirus Disease of 2019
DBIQ	:	Dresden Body Image Questionnaire
EBBS	:	Exercise Benefits/Barriers Scale
HBM	:	Health Belief Model
IAT	:	Internet Addiction Test
IPAQ	:	International Physical Activity Questionnaire
JKEUPM	:	Ethics Committee for Research Involving Human Subject
MCO	:	Movement Control Order
MET	:	Metabolic Equivalent Test
NCD	:	Noncommunicable Disease
PA	:	Physical Activity
SAQ	:	Self Administered Questionnaires
SD	:	Standard Deviation
SPSS	:	Statistical Package for the Social Sciences
WHO	:	World Health Organisation

CHAPTER 1

INTRODUCTION

1.1 Background

Physical activity is defined by the World Health Organisation, WHO (2020), as "any movement produced by skeletal muscles that involve energy expenditure". Regular physical activity has been shown to improve physical and mental wellbeing and avoid non-communicable diseases. The World Health Organisation (WHO) (2020) estimates that the main cause of noncommunicable diseases (NCDs) and mortality worldwide is physical inactivity. This will induce an economic burden by increasing the cost of medical treatment and lack of efficiency. Therefore, several organizations have begun to provide the public with guidelines and recommended activities. In general, these guidelines centered on cardiorespiratory endurance and prescribed periods of intense physical exercise affecting large muscle groups, lasting 3 days or more a week for at least 20 minutes. These exercises are aimed at improving body weight, avoiding premature death, reducing the risk of non-communicable diseases, alleviating depression and anxiety, raising mood, and maximizing the ability to carry out daily activities of existence. (U.S. Health and Human Services Agency, 2006).

According to Guthold et. al (2018), Global age-standardised prevalence of insufficient physical activity was 27.5% (95% CI: 25.0%, 32.2%) in 2016, with a difference between gender of more than 8 percentage points (95% CI: 23.4%, 21.1–30.7, in men vs 31.7%, 28.6–39.0, in women). The highest levels in 2016, were in women in Latin America and the Caribbean was 43.7% (95% CI: 42.9%, 46.5%), South Asia was 43.0% (95% CI: 29.6%, 74.9%), and high-income Western countries was 42.3% (95% CI: 39.1%, 45.4%), whereas the lowest levels

were in men from Oceania was 12.3% (95% CI: 11.2%, 17.7%). Prevalence in 2016 was more than twice as high in high-income countries 36.8% (95% CI: 35.0%, 38.0%) as in low-income countries 16.2% (95% CI: 14·2%, 17·9%), and insufficient activity has increased in high-income countries over time 31.6% (95% CI: 27.1%, 37.2%) in 2001.

Based on a survey conducted on Malaysian adults aged 16 years and above to identify the prevalence of physical inactivity using the International Physical Activity Questionnaire (IPAQ) instrument. It was noted that 33.5% of adults were reported as physically inactive (National Health and Morbidity Survey, 2015). The Global Health Observatory (2018) reported that among adults aged 18 years old and above in Malaysia, the prevalence of physical inactivity for a male is 36.6% (95% CI: 26.6%, 43.6%) and female is 42.8% (95% CI: 32.68%, 53.54%) and age-standardized estimate for both sexes was 38.8% (95% CI: 29.7%, 48.6%). According to Lian et al. (2016), Malaysia has also been described as one of the least physically active countries in the world with more than 60% of adults being largely sedentary.

University environment or college is a period of great change for young adults. Coming with a new freedom lifestyle encourages high school students to make choices and decisions that they have not previously made, including how the student should integrate physical activity. Goje et al. (2014) stated that previous research has found that the rate of physical activity among undergraduate students is declining compared to the time they were already in high school. It is because of the university's evolving climate that allows them to become free and leads them to a chosen sedentary lifestyle. According to Bray et al. (2004), among 145 Canadian university undergraduates, a cohort analysis exploring vigorous physical activity during the transition from

high school to university found that 66.2% of students were active during the last two months of high school, but this drops to 44% in their first two months at university.

There are a few factors that contribute to physical inactivity. Age is one of the factors identified to have an association with physical activity. The study carried out by Teh et al. (2013) among young adults aged 16 years old and above in Malaysia showed that more than half of the respondents were physically active (95% CI: 63.1%, 65.5%) but physical inactivity levels increased with advancing age. The next factor is gender. Rajappan et al. (2015) claimed the rate of physical inactivity is higher in females than males as female students are more likely to focus on other weight management methods. This is proved by the research data that shows 30% of female participants involved in low physical activity whereas only 14 % of male participants in the low physical activity group.

Race also has an association with physical activity. Based on research by Crespo et al. (2000), they find the highest rate of physical inactivity among Mexican-Americans, followed by Blacks and then Whites. The highest rates of physical inactivity were found among Hispanic men and women (Marshall et al., 2007). Lian et al. (2016) stated that based on their research, Tukey post hoc tests revealed that Chinese engaged significantly less light exercises compared to Malay and Indian, whereas other races engaged more in vigorous activity compared to Malay, Chinese and Indian. For the part-time work factors, Pruitt and Springer (2010) claimed that students who were working more than 10 or 20 hours per week were involved in less physical activity ($p<0.05$). According to this survey, higher levels of work intensity are associated with physical inactivity.

Based on the Health Belief Model, multiple sclerosis patients felt that their degree of disability hindered their desire to exercise. As self-efficacy and perceived exercise benefits are essential determinants of physical activity, these modifiable factors should be targeted in attempts to improve health. Also after adjusting for the significant effects of disability level on physical activity, self-efficacy and perceived benefits remained good exercise predictors (Kesser & Kosma, 2012). Wan Omar et. Al (2013) believed that students should consider personal constraints that contribute to physical inactivity, such as lack of time, sunburn due to walking outdoors, non-supportive environment, traffic risk, violence, etc. These other contexts of physical activity may also be highly evaluative and understandable compared to body image (Sabiston et al., 2014).

Research by Towne et al. (2017) indicated that students are more likely to meet the physical activity guidelines although there was an increase in daily usage of technology. Sahin and Lok (2018) stated that The findings showed that as the internet addiction level increases, the physical inactivity among adults also increases based on their research association between physical activity levels and internet addiction of adults. In a study El Ansari (2011) also suggested that, when the students who are doing well with the academic activities were pleased with their weight/body image, they were more prone to be inactive, but more probable to be physically active when they viewed themselves as overweight. Based on the other research conducted by Añez et al. (2018), which studies the association between body image dissatisfaction, physical activity and screen-time in Spanish adolescents, it was found that high level of body image dissatisfaction is one of the barriers to practising physical activity.

In 2020, all countries around the world affected by COVID-19 pandemic. Most countries have applied social isolation measures to prevent and curb the spread of the infection. Data from Fitbit claimed that there is a decrease in regular physical activity among users from the United States of America, Spain, Italy, and Brazil (Fitbit Staff, 2020). As for Malaysia, the Movement Control Order that has been implemented prohibits the operation of sports facilities to avoid gatherings and all Malaysians are required to stay at home (News Straits Times, 2020). Meyer et. al (2020) also claimed that weekly physical activity was reduced among the previously active participants due to self-isolation and other restrictive methods, based on their research conducted on 3052 United States of America adults.

As the COVID-19 pandemic has affected the total world population, the Malaysian government decided to implement a nationwide Movement Control Order (MCO) effective from 18 March 2020 to reduce the spread of infection. Implementation of MCO may be a huge factor that increases the prevalence of physical inactivity among Malaysians as social interactions were prohibited. Therefore, we aim to determine the prevalence of physical inactivity among undergraduate students of University Putra Malaysia (UPM) during COVID-19 pandemic and its associated factors.

1.2 Problem Statement

Movement Control Order (MCO) is an effective measure to curb COVID-19 transmission (Tang, 2020). The research done during the early phase of the COVID-19 outbreak in China showed that the physical activity of people was greatly affected due to the restrictive measures (Zhang et al., 2020). More recent studies focus on the effects of the pandemic on physical activity and the sedentary behavior of the general population in the United States and China (Meyer et al., 2020; Zheng et al., 2020) instead of the impact on university students specifically. Goje et al. (2014) studied the prevalence of physical inactivity among university students and revealed that the prevalence of physical inactivity among university students was 41.4%. This research in Malaysia also studied the associated factors for physical inactivity among university students and found out that there is an association between physical inactivity and gender, family income, and self-efficacy. According to this research, physical inactivity was higher among females (95% CI: 2.4, 5.8), low family income (95% CI: 3.3, 6.2), and low self-efficacy for physical activity (95% CI: 1.4, 2.6).

Several studies have shown that COVID-19 pandemic causes psychological impact among university students in Malaysia due to strict social isolation (Sundarasen et al., 2020). However, the local research about physical inactivity among university students during the COVID-19 pandemic is scarce. According to WHO (2020) physical activity plays a vital role in maintaining blood pressure, managing weight, and reducing the risk of diseases that are susceptible to COVID-19 such as cardiovascular diseases, stroke, type 2 diabetes mellitus, and cancers. Despite the health benefits, a meta-analysis highlighted that about 40% to 50% of college students are physically inactive (Keating et al., 2010). Kwan et al. (2012) stated that

physical activity levels decline as adolescents make the transition into adulthood particularly the transition into colleges or universities.

Lack of time is the most common excuse given by the students for being physically inactive which greatly increases the risk of obesity (Al-Isa et al., 2011). Besides, students develop poor health as they spend an average of 12.1 hours on weekdays and 10.1 hours on weekends for sedentary pursuits (Murphy et al., 2018). Furthermore, physical inactivity reduces the positive emotions (Hogan et al., 2014) and leads to depression and anxiety as the sitting time is prolonged (Rebar et al., 2014). Moreover, attending online classes continuously and the prohibition on outdoor social activities during the COVID-19 pandemic reduce social engagement among university students (Romero-Blanco et al., 2020). Therefore, it is crucial and important to understand the prevalence of physical inactivity and its associated factors among university students during the COVID-19 outbreak to reduce the effects of this pandemic on physical inactivity by making better-informed decisions.

1.3 Significance of study

This study is focusing on physical inactivity as it becomes a concern among university students due to the COVID-19 pandemic lockdown. This study will also determine the prevalence of physical inactivity among undergraduate students as well as the factors associated with it during the COVID-19 pandemic. So far there are limited studies carried out regarding the physical inactivity among university students in Malaysia. To our knowledge, there is a lack of evidence for the association between physical inactivity among university students during the COVID-19 pandemic lockdown.

Therefore, this study would add to the body of knowledge on the effects of the COVID-19 outbreak on physical inactivity. Moreover, the results of this study will be beneficial for the university authorities to reinforce knowledge and create suitable programs in facilitating students during the unique circumstances involving pandemics. The results will also assist in better physical activity recommendations during the COVID-19 pandemic which will prevent the occurrence of physical inactivity and its serious consequences among university students.

1.4 Research questions

The research question of this study will be:

I. What is the prevalence of physical inactivity among undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia during COVID-19 pandemic lockdown?

II. Is there any association between socio demographic characteristics, perceived benefits and barriers towards physical activity, body image, and internet addiction and physical inactivity among undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia?

1.5 Study Objectives

1.5.1 General Objective

The general objective of this study is to determine the prevalence of physical inactivity and its associated factors among undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia during COVID-19 pandemic lockdown**.**

1.5.2 Specific Objectives

I. To describe the socio demographic characteristics (age, gender, ethnicity, programme, part time work), academic activities, perceived benefits and barriers towards physical activity, body image, and internet addiction among respondents.

II. To determine the prevalence of physical inactivity among respondents.

III. To determine the association of physical inactivity with socio demographic characteristics, perceived benefits and barriers towards physical activity, body image, academic activities and internet addiction among respondents.

IV. To determine the factors of physical inactivity.

1.6 Research hypothesis

The research hypothesis of this study will be:

H_1: There is a significant association between socio demographic characteristics and physical inactivity.

H_2: There is a significant association between perceived benefits and barriers towards physical activity and physical inactivity.

H_3: There is a significant association between body image and physical inactivity.

H_4: There is a significant association between internet addiction and physical inactivity.

H_5: There is a significant association between academic activities and physical inactivity.

CHAPTER 2

LITERATURE REVIEW

2.1 Definition of physical inactivity

The World Health Organisation, WHO (2020) describes physical activity as any body movement performed by skeletal muscles that need energy consumption including during leisure time, for transportation to and from any destinations, or as part of work. Regular physical activity has been proven to prevent non-communicable diseases such as heart failure, stroke, diabetes, and multiple cancers. Physical activity improves blood pressure, body weight and mental wellbeing.

The World Health Organisation, WHO (2020) reports that physical inactivity is one of the major risk factors for noncommunicable diseases and premature mortality worldwide. It raises the risk of cancer, heart disease, stroke, and diabetes by 20–30%. If the global population were more active, it is expected that four to five million deaths could be avoided every year. It also puts a strain on society due to the hidden and rising costs of medical treatment, as well as inefficiency. Physical inactivity is estimated to cost the health-care system US$54 billion in 2016 and resulting in US$14 billion in economic losses.

U.S. Department of Health and Human Services (2006) indicated that the American College of Sports Medicine (ACSM), the American Heart Association (AHA), and other national organizations began recommending physical activities to the public as adequate research was conducted to prove the benefits of intense exercise on cardiorespiratory fitness. In general, these

recommendations stressed on cardiorespiratory endurance and specified periods of intense physical activity involving large muscle groups, which is minimum 3 days per week for at least 20 minutes per session. These activities aim to improve body weight, lower the risk of coronary heart disease, hypertension, colon cancer, and diabetes mellitus, and avoid premature death. Physical activity on a daily basis has been shown to reduce stress and anxiety, improve mood, and strengthen the ability to execute routine tasks.

2.2 Complications of physical inactivity

Lee et al. (2012) found that 6% of coronary heart disease burden, 7% of type 2 diabetes and 10% of colon and breast cancer caused by physical inactivity globally. In 2008, almost 5.3 million premature deaths occurred due to physical inactivity. 533,000 and 1.3 million deaths could be avoided if the rate of physical inactivity decreased by 10% or 25% respectively. This study estimated that increasing physical activity would improve the world's population's lifetime by 0.68 years.

Ding et. al (2016) stated that physical inactivity is linked to a range of chronic illnesses and premature death. In addition to morbidity and premature death, physical inactivity has a large economic cost. Physical inactivity cost health-care systems globally $53.8 billion in 2013, according to conservative estimates, with the public sector paying $31.2 billion, the commercial sector $12.9 billion, and households $9.7 billion. Furthermore, deaths caused by physical inactivity cost $13.7 billion in productivity, and 13.4 million DALYs were lost globally due to physical inactivity. High-income countries bear a larger amount of financial burden (80.8% of health-care expenditures and 60.4% of indirect costs), while low-income and middle-income countries bear a greater percentage of the illness burden (75.0 % of DALYs).

Slentz et al. (2017) claimed that physical inactivity led to a gain of abdominal and visceral fat. Admiraal et al. (2011) also stated that physical inactivity, regardless of age, sex, race, or BMI, has been associated with an increased risk of type 2 diabetes. Evidence shows that the prevalence of diabetes is higher in obese, overweight, and physically inactive individuals and physical inactivity is independently associated to a higher risk of each of these diseases. Lippi et al. (2020) described physical inactivity is linked with a slew of negative metabolic consequences that can dramatically increase the risk of a variety of serious and harmful diseases, including diabetes, cancer, osteoporosis, and cardiovascular disease. In general, physical inactivity was linked to a 24% increased risk of coronary heart disease, a 16% increased risk of stroke, and a 42% increased risk of diabetes.

2.3 Physical inactivity during COVID-19 pandemic

As the COVID-19 has been declared as a pandemic, most countries have implemented Movement Control Orders to prevent the spreading of coronavirus. However, isolation might lead to an increase in sedentary behaviour, which can be bad to one's health. An abrupt decline in activity levels, as will probably happen with social isolation, is of particular concern in older adults, who are typically more inactive than their younger peers and prone to frailty, sarcopenia, and chronic diseases (Roschel et al., 2020). Although the precise effects of the COVID-19 outbreak on physical inactivity is unknown, wearable trackers such as Fitbit can provide estimations of the influence on regular step counts during this movement control order. Data from 30 million users worldwide predicts a drop in phase count of about 12% in the United States (from the week of March 22, 2019 to the week of March 22, 2020), and even more in

other countries; 38 percent, 25%, and 15% in Spain, Italy, and Brazil, respectively (Fitbit Staff, 2020).

According to a report published in the News Straits Times on March 16, 2020, all Malaysians were instructed to stay home following the implementation of the MCO. The restriction of public meetings, medical examinations, and quarantine for Malaysian citizens returning from overseas, the restriction of foreigners entering the country, and the closure of all recreational facilities. Only primary and essential services, such as health care, sanitation, power, telecommunications, and food distribution, are permitted (News Straits Times, 2020).

Meyer et al. (2020) studied how the COVID-19 pandemic affected physical activity and sedentary behaviour. This is a cross-sectional study of 3052 people in the United States. The entire United States was declared in a state of emergency on March 16, 2020. Adults' physical activity levels changed as a result of self-isolation and other restrictive approaches. During the COVID-19 pandemic, this study discovered that weekly physical activity decreased among previously active participants but remained substantially unchanged among previously inactive participants. Respondents who were in self-isolation were the most likely to be physically inactive, with a drop of 43% in physical activity. Psychological problems such as depression and anxiety can develop as a result of a decrease in physical activity levels.

Similarly, Zheng et al. (2020) carried out another study to determine a sedentary lifestyle among young adults during the COVID-19 pandemic. This was a cross-sectional and longitudinal study of young individuals between the ages of 18 and 35. The International Physical Activity Questionnaires (IPAQ) were used to determine physical activity levels, which

were classified into three categories: vigorous physical activity (VPA), moderate physical activity (MPA), and walking. Only 30% of the respondents met the physical activity guidelines, while 57.8% of the participants were physically inactive, according to the findings. Besides, three-quarters of the participants reported that their physical activity level decreased due to increased sedentary behavior and sleep time during the COVID-19 pandemic.

2.4 Prevalence of physical inactivity

2.4.1 Worldwide

According to Guthold et. al (2018), global age-standardised prevalence of physical inactivity was 27.5% (95% CI: 25.0%, 32.2%) in 2016, with a difference between gender of more than 8 percentage points (95% CI: 23.4%, 21.1–30.7, in men compared to 31.7%, 28.6–39.0, in women). The highest levels in 2016, were in women in Latin America and the Caribbean was 43.7% (95% CI: 42.9%, 46.5%), South Asia was 43.0% (95% CI: 29.6%, 74.9%), and high-income Western countries was 42.3% (95% CI: 39.1%, 45.4%), whereas the lowest levels were in men from Oceania was 12.3% (95% CI: 11.2%, 17.7%). Prevalence in 2016 was more than twice as high in high-income countries 36.8% (95% CI: 35.0%, 38.%) as in low-income countries 16.2% (95% CI: 14·2%, 17·9%), and physical inactivity has increased in high-income countries over time 31.6% (95% CI: 27.1%, 37.2%) in 2001.

2.4.2 Malaysia

A survey was carried out among Malaysian aged 16 years and above to identify the prevalence of physical inactivity. International Physical Activity Questionnaire (IPAQ) was used to determine the level of physical activity. Physical activity levels were categorised into 3: inactive (category 1), minimally active (category 2), and HEPA active (category 3). They found

out that 66.5% of adults were physically active (95% CI: 65.6%, 67.6%). Out of 66.5%, a majority of 41.1% of adults were minimally active. Another 33.5% of adults were reported as physically inactive. The respondents from Penang were having a higher prevalence of physical activity (95% CI: 70.3%, 78.3%), followed by Kelantan (95% CI: 70.6%, 77.6%) and Pahang (95% CI: 70.6%, 77.1%) (National Health and Morbidity Survey, 2015).

The Global Health Observatory (2018) reported that among adults aged 18 years old and above in Malaysia, the prevalence of physical inactivity for male is 36.64% (95% CI: 26.6%, 43.6%) and females is 42.79% (95% CI: 32.7%, 53.5%) and age standardizes estimate for both sex is 38.75% (95% CI: 29.7%, 48.6%). Lian et al. (2016) stated that obesity and rates of non-communicable diseases linked to physical inactivity have risen significantly in Malaysia over the last 20 years. Malaysia has also been described as one of the least physically active countries in the world with more than 60% of adults being sedentary.

2.4.3 University students

From the research conducted by Goje et al. (2014), it is found that the prevalence of physical inactivity among UPM first-year undergraduate students is 41.4% (proportion of respondents that are of the low physical activity level), 58.3% are of moderate level and only 0.3% are of the high physical activity level. It can also be said that 41.4% of the respondents are those whose physical activity levels are below 600 Met-minutes/week. This is also supported by research conducted on college students' physical activity (PA) behaviors. The researchers reported that about 40% to 50% of college students were physically inactive (Keating et al., 2010).

Pauline (2013) also conducted research on physical activity among college students. Godin Leisure-Time Exercise Questionnaire (GLTEQ, Godin & Shephard, 1985) was used to assess physical activity levels. The total physical activity (TPA) score was determined by multiplying the MET values by the frequencies of activity for each level of physical activity. Overall, 49.4% of the students were involved in 20 or more minutes of vigorous physical activity 3 or more days per week, 15.4% of the participants engaged in 30 minutes or more of moderate physical activity 5 or more days per week and, 18.2% of the students were physically inactive as they didn't involve in any activities. Approximately half of the students met the American College of Sports Medicine (ACSM) and the American Heart Association (AMA) recommendations for vigorous physical activity. Similarly, a study carried out among college students in the United States fewer students engaged in physical activity (46.7%). The involvement of students in physical activity decreases as they enter college from high schools (males 74% to 52%; females 68% to 44%) (Nelson et al., 2007).

2.5 Associated factors

2.5.1 Sociodemographic factors

2.5.1.1 Age

Age is also a part of socio demographic factors that have been studied to identify its association with physical activity. Teh et al. (2013) conducted a cross sectional study to determine prevalence of physical activity and the associated factors of it. This study was carried out among 19,145 young adults aged 16 years and above in Malaysia. The study showed that more than half of the respondents were physically active (95% CI: 63.1, 65.5) but physical inactivity levels increased with advancing age. Another study conducted in the United States focused on the decline in physical activity among adolescent students as it became a public

concern. The data was based on the 2001 Youth Risk Behavior Survey (n=13,503) and the 2001 Ontario Student Drug Use Survey (n=1322). Physical activity is measured by the number of days of vigorous physical activity in a week. There was a steady decline in physical activity among adolescents between the ages of 14 and 18 years (Allison et al., 2007).

Salamudin et al. (2013) surveyed on physical activity index among Malaysian youth aged 18 between 25 years old. The researchers included age in the analysis because they believe that it is an important factor in determining physical activity level. In this research, a post-hoc test was conducted because gender analysis showed a significant difference in physical activity index between ages ($F=25.15$, $p<0.05$). According to the post-hoc test, adolescents at the age of 21 are more active than other age groups. However, the physical inactivity among youths aged 22 and above increased due to work and studies. This survey showed that physical activity declines with increasing age. Therefore, there is sufficient evidence to prove the association between age and physical inactivity. However, previous research has not addressed this association during COVID-19 pandemic. Research should be conducted during COVID-19 pandemic to understand the effect of age on physical activity.

2.5.1.2 Gender

Rajappan et al. (2015) studied the prevalence of physical activity level among Asia Metropolitan University (AMU) students in Malaysia. This study mainly focused on the socio demographics factors that can lead to physical inactivity. The most important element that influences physical activity is gender. Physical inactivity is common in both genders, but the rate of physical inactivity is higher in females than males as female students are more likely to focus on other weight management methods. This is a cross-sectional study carried out among 100

students consisting of 50 males and 50 females. The researchers used International Physical Activity Questionnaire (IPAQ) to identify the physical activity level among university students. Female students had a higher prevalence of physical inactivity than male students. According to this study, females are more likely to be physically inactive compared to males. This is proved by the research data that shows 30% of female participants involved in low physical activity whereas only 14 % of male participants in the low physical activity group. According to this study, increase in age reduces the physical activity level because involvement of students in physical activity greatly reduces as they step into university from high school.

There is another study conducted in Malaysia to identify the physical activity index among Malaysian youths (Salamudin et al., 2013). This study was conducted by a random sampling method of youths in Klang Valley. The research proved that there is an association between age and physical inactivity. According to this survey, females are more physically inactive with 31.3% counted as sedentary compared with males (23%). Even though there is not much difference in the percentage, further tests showed that there is a significant difference between males and females in physical activity involvement ($t=3.92$, $p<0.05$). Similarly, both of the studies strongly support that there is an association between gender and physical activity. Furthermore, these two studies focused on students which will be helpful in providing supportive information for this research. However, there is not enough evidence to prove this association during COVID-19 outbreak as limited studies were conducted during this pandemic. This research will help to find if there is a relationship between physical activity and gender particularly during COVID-19 pandemic.

2.5.1.3 Ethnicity

Crespo et al. (2000) studied the prevalence of physical inactivity and the association between ethnicity. They find the highest rate of physical inactivity among Mexican-Americans (40%), followed by Blacks (35%) and then Whites (18%). Marshall et al. (2007) investigated the association between physical inactivity and racial groups. The results showed that White men and women were more physically active compared to non-Hispaninc Black men and women. Another study was conducted among 2,688 participants who were selected from 2003 to 2004 NHANES. The results showed that physical inactivity was associated with ethnicity. Hispanic women reported to be more physically active at the age between 40 and 59. Besides, hispanic men were more physically active compared to White and Black men (Hawkins et al., 2009).

Another strand of study by Lian et al. (2016) revealed that, Chinese engaged significantly less physical activity compared to Malay and other races. When further analyzed into the different levels of physical activity, one-way ANOVA showed significant differences among ethnicity in terms of light exercise ($p<0.01$), moderate activity ($p<0.05$) and vigorous activity ($p<0.01$). Tukey post-hoc tests revealed that Chinese (SD=5.86) engaged significantly less light exercises compared to Malay (SD=5.22) and Indian (SD=5.77), whereas other races engaged more in vigorous activity compared to Malay, Chinese and Indian.

2.5.1.4 Part time work

Pruitt and Springer (2010) studied the association between part time work and physical activity among high grade students in the United States. Three indicators of physical activity (overall physical activity, vigorous exercise, and sports team participation) were identified among 10^{th} and 12^{th} grade black and white students. The researchers used a linear regression

model to assess the associations of hours of working with three physical activity indicators. 10th grade students' work hours per week were categorised into four: do not work, work ≤ 10 hours a week, work >10 and ≤ 20 hours, and work >20 hours per week. The results for each category were presented as 63.5%, 20.6%, 10.6% and 5.3% respectively. The results among 12th grade students showed 25.4% do not work, 21.0% work ≤10 hours, 27.4% work >10 and ≤20 hours, and 26.8% work >20 hours per week. Students who were working more than 10 or 20 hours per week involved in less physical activity ($p<0.05$). According to this survey, higher levels of work intensity are associated with physical inactivity. This study shows that there is an association between part time work and physical activity but it mainly focused on high-grade students. Therefore, further studies are needed to identify the association among university students especially during COVID-19 outbreak.

2.5.1.5 Programme

Naim et al. (2016) studied the association on physical inactivity among medical and non medical students. A cross sectional study conducted on 100 medical students and 200 non-medical students from University Malaysia Sabah's undergraduate students. International Physical Activity Questionnaire (IPAQ) short form was used to determine the physical activity level. 49% of the medical students reported to be physically inactive while only 35% non-medical students were physically inactive (OR=1.79, 95% CI = 1.10, 2.91). Thus, the study suggested that the prevalence of physical inactivity among medical students was higher compared to non-medical students. Rejali and Mostajeran (2013) studied the physical activity level among 399 medical and public health students in Isfahan University of Medical Sciences, Iran. 48.6% of students reported to be active for moderate physical activity while 32.6% reported

to be active for severe physical activity. Sex and student's study course were significantly associated with physical activity. Medical students of basic sciences had the lowest rate of activity at home and students of public health had the highest rate of walking among other students studied.

2.5.2 Perceived Benefits and Barriers towards Physical Activity

According to Rosenstock (1966), the original purpose of the developers of the Health Belief Model (HBM) was to concentrate the efforts of researchers seeking to improve public health by recognizing why people do not take preventive measures to promote health. For example, based on HBM conducted on multiple sclerosis patients, they think that, even in the scope of their illness, they will benefit from physical activity and stay healthy. They also accept the fact that their degrees of disability limit their capacity for exercise. Since self-efficacy and perceived exercise benefits are important determinants of physical activity, efforts to encourage health should be directed at these modifiable factors. Instead of general health problems, participant expectations of vulnerability to harmful health effects were more based on physical conditioning and functioning.

Ar-yuwat et al. (2013) stated that self-efficacy and perceived advantages of exercise were the most important HBM predictors of physical activity. Nevertheless, behavior was not affected by signs of intervention or perceived advantages. Perceived advantages, barriers, and signs of physical activity did not vary by sex. According to this study, from the three health belief model variables, only perceived barriers variable was significantly and inversely associated with the level of physical activity ($p<0.05$). Wan Omar et. al (2013) claimed that the desire to exercise can also be motivated by emphasizing the perceived advantages of physical activity, such as

positive health benefits, leisure benefits and average weight. In these motivational interviews, students could recognize personal limitations such as lack of time, sunburn due to walking outside, non-supportive climate, traffic risk, crimes, etc which lead to physical inactivity.

Garza et al. (2013) studied self-efficacy for physical activity using Eating and Exercise Confidence Scale. According to this study, respondents were having moderately high degree physical activity related self-efficacy with a mean score of 3.6 ± 0.88. Almost half of the respondents (44%) reported to receive a healthcare provider recommendation to increase their physical activity levels. Besides, physical activity level was significantly lower for those respondents who reported receiving a recommendation to increase their levels of PA from their healthcare provider (12.6 ± 7.22) compared to those who did not (20.8 ± 8.67) ($p<0.001$).

2.5.3 Body image

Based on a research conducted by Mama et al. (2011), the association between body image and physical activity among Latina and African American women was studied using Pulvers' culturally relevant body image questionnaire to measure perceived and desired body images and the International Physical Activity Questionnaire (IPAQ) long form was used to measure self-reported physical activity by type and intensity. It was reported that normal weight women did more physical activity, like one would predict, but women who wanted a smaller physical appearance did not do significantly more physical activity than women who wanted to gain weight to be overweight or obese. According to this study, objectively measured PA was significantly associated with body max index ($p<0.01$). These results were in contrast to the previous research that has demonstrated that the perception of body image is an important indicator of the practice of health behavior, such as physical exercise, which can regulate or

discourage weight gain in young adult African American women. In their research, there was no significant connection between desired body image and physical activity. Therefore, they suggested further work is needed to fully understand this relationship.

Based on the other research conducted by Añez et al. (2018), which study about the association between body image dissatisfaction, physical activity and screen-time in Spanish adolescents, it was found that high level of body image dissatisfaction (65.9%) is one of the barriers to practising physical activity ($p<0.05$). This study used the BD subscale of the Eating Disorders Inventory-3 (EDI-3) (Garner, 2004), in its Spanish validated version (Elosua et al., 2010) to measure dissatisfaction with one's body and MVPA questionnaire to measure the level of physical activity.

Based on the research by El Ansari (2011), they hypothesized that students who perceive their body image as 'just right' may have greater association in the inverse relationship between depression and physical activity compared to students who perceive their body image as 'overweight.' However, the inverse association was only significant among those with elevated M-BDI scores for students who perceived themselves as overweight. This may be clarified in the sense that the inverse relation between depression and physical activity can be down modulated by a 'distorted' body image. In other words, the negative effect of a 'distorted' body image on depression will down modulate the positive effect of physical activity on depression. A 'distorted' body image may be compared remotely to physical impairment in this way, which is a highly important confounding predictor since it is associated with both a greater risk of depression and reduced levels of physical activity. In this study also they suggested that, when the students who are doing well with the academic activities were pleased with their weight/body image, they

were more prone to be inactive, but more probable to be physically active when they viewed themselves as overweight.

2.5.4 Internet addiction

Towne et al. (2017) conducted a study about physical activity among university students and to determine the factors associated. One of the elements that influences the degree of physical activity among the younger generation is the usage of technology. Technology-related behaviour was assessed using types of devices used such as smartphone, tablet, laptop, desktop computer and duration of use. Technology use was classified into four categories which were low, low-moderate, moderate-high, and high. 32% of the respondents were classified in the lowest technology use category for using technology at or lower than 6 hours per day whereas approximately 27% of the respondents were categorized in the highest technology use group for using technology for 12 or more hours per day on average. The results of physical activity by technology use showed that about 31% (n=128) of the respondents were categorized as having at or lower than 6 h of technology use per day on average. The participants classified as having more than 8 h of technology use per day on average were 28% (n=115). These two categories of respondents were those who met the guidelines of physical activity. Most of the respondents (37%, n=27) who were at or lower than 6 hours of technology use per day on average were among those who did not meet the physical activity guidelines. The result of this research indicated that students are more likely to meet the physical activity guidelines although there was an increase in daily usage of technology.

Sahin and Lok (2018) studied the association between physical activity levels and internet addiction of adults. The researchers used International Physical Activity Questionnaire

(IPAQ) to determine the physical activity levels and Young Internet Addiction Test Short Form (YIBT-KF) to assess internet addiction. 18.6% of the respondents were physically inactive while another 43.92% were minimally active. 47.42 ± 3.25 was the mean score of the internet addiction scale. Relationship between participants' physical activity and internet addiction showed a moderate relation in a negative direction ($p<0.05$). The findings showed that as the internet addiction level increases, the physical inactivity among adults also increases.

The finding is similar to Kim et al. (2015) who studied the relationship between smartphone addiction and physical activity. Smartphones and the internet have made life easier but excessive use can decrease physical activity. Updating social media and high internet browsing are sedentary behaviours that can lead to low levels of physical activity. Smartphone Addiction Proneness Scale (SAPS) is a reliable and valid diagnostic scale used to determine the risk of smartphone addiction among adolescents. The results showed that 60.0% (n = 66; 34.63 ± 3.55) of the respondents were no-risk smartphone users, 20.9% (n=23; 41.43 ± 0.99) were potential-risk smartphone users, and high-risk smartphone users were about 19.1% (n=21; 46.24 ± 3.22). The study also found that the level of smartphone addiction differed between male and female where more female students (32.6%) were high risk smartphone users compared with male students (10.4%). There was a significant correlation between smartphone addiction level and physical activity level such as average number of walking and consumed calories per day. The average number of walking steps and average consumed calories per day in respondents with high-risk addiction were significantly lower ($p<0.001$). The recommended moderate-to-vigorous physical activity is equivalent to 7,100 to 11,000 steps per day. However, high-risk smartphone users in this study took an average of 4,000 steps per day only. From this study, it can be inferred that smartphone addiction has an adverse impact on physical activity.

However, only limited research about smartphone and internet addiction related to physical activity are available especially during COVID-19 pandemic. Further studies are needed to validate the relationship with internet addiction and physical activity among university students.

2.5.5 Academic activities

Previous studies have examined the link between physical activity and academic performance (Howie and Pate, 2012; Donnelly et al., 2016). Intervention studies to date have tended to measure specific outcomes, such as minutes of physical activity or sitting time, without considering flow-on effects to other domains of time use. For example, laboratory-based intervention studies using the behavioral economics model have investigated how manipulation of sedentary behaviors affect physical activity levels (Epstein, Roemmich, & Paluch, 2005). However, an understanding of ripple effects can inform interventions. For example, if increased physical activity participation were shown to be related to reduced participation in school work, special attention may be needed during intervention design to ensure adolescents' academic performance would not be compromised.

A study on The Elasticity of Time: Associations Between Physical Activity and Use of Time in Adolescents investigated the time spent in each domain (Sleep, Screen, Social School-Related) was calculated for each 24-hour recall and averaged across the recalls, weighting school and non school days equally. Values for all use of time variables were adjusted for age and sex. For each of the superdomains, the difference in the time devoted to a reference activity for every extra hour devoted to a criterion activity was calculated. These relationships were calculated by simple linear regression, with the reference activity as the dependent variable

and the criterion activity as the independent variable. The cross-elasticity relationship was operationalized as the slope of the line expressed in minutes of the reference activity per hour of the criterion activity. The 95% confidence intervals are reported for all slopes.

The most elastic activities were screen time and, somewhat surprisingly, school-related time. It showed that school-related activities were very inelastic relative to sport, whereas school-related activities were much more elastic relative to play and active transport, where one extra hour entailed differences of −19 and −17 minutes respectively. However the associated differences in study and homework (−2 minutes) and reading (−4 minutes) were modest across the physical activity macrodomains. Overall, the screen and school superdomains showed the greatest elasticity, while other domains were relatively inelastic. It found encouraging relationships between physical activity and the major time use domains, with screen time apparently highly elastic, particularly in relation to physical activity. This approach to physical activity data analysis has the potential to model the net health effects of interventions and to inform intervention strategies allowing targeting of more elastic behaviors that may be more susceptible to change (Olds et al., 2012).

2.6 Conceptual Framework

The following is the conceptual framework of this study:

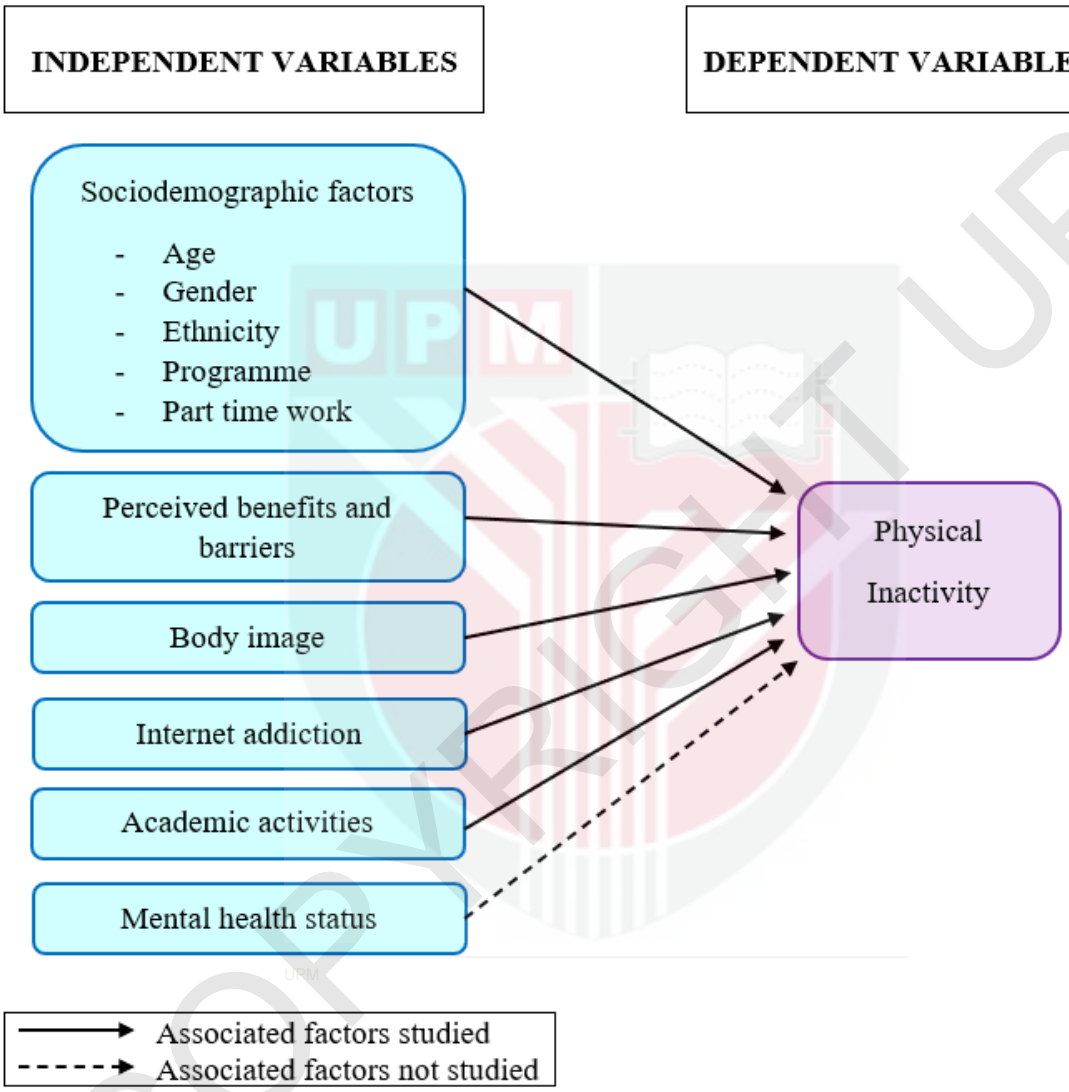

Figure 2.1. Conceptual Framework of the Factors Associated with Physical Inactivity

CHAPTER 3

METHODOLOGY

3.1 Study Location

This study was conducted in the Faculty of Medicine and Health Sciences, University Putra Malaysia.

3.2 Study design

A cross-sectional study was conducted through an online google form questionnaire.

3.3 Study duration

The study was carried out between 20 December 2020 and 5 July 2021. Data collection started between April 7th 2021 and May 13th 2021.

3.4 Sampling

3.4.1 Study population

The study population was undergraduate students of Faculty of Medicine and Health Sciences, University Putra Malaysia.

3.4.2 Sampling population

The sampling population was undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia in semester 2020/2021.

3.4.3 Selection criteria

3.4.3.1 Inclusion criteria

Undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia who can give their consent in this study.

3.4.3.2 Exclusion criteria

The undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia who are on leave or deferring in the study will be excluded.

3.4.4 Sampling frame

The list of matriculation number of first year to final year students studying in the Faculty of Medicine and Health Sciences, University Putra Malaysia in semester 2020/2021 which was arranged in ascending order, by programme and year of study.

3.4.5 Sampling unit

Each undergraduate student of the first year to final year in the Faculty of Medicine and Health Sciences, University Putra Malaysia.

3.4.6 Sampling method

A convenience sampling method was used. Convenience sampling is a non-probability sampling method. A total of 1389 eligible undergraduate students approached through Email. Emails were sent three times to each eligible student. Questionnaires were then sent via *Whatsapp* personally when targeted responses were not received. The google form was closed once targeted responses of 670 received.

3.4.7 Sample size

Formula:

$$n = \frac{\{[z(1-\alpha/2)\times\sqrt{2P\ (1-P)}] + [z(1-\beta)\times\sqrt{P1(1-P1) + P2\ (1-P2)}]\}^2}{(P1-P2)^2}$$

$$n = \frac{\{[1.96\times\sqrt{2(0.268)\ (1-0.268)}] + [0.84\times\sqrt{0.333(1-0.333) + 0.203(1-0.203)}]\}^2}{(0.333-0.203)^2}$$

n = 181

n_{new1} = 181 x 2 = 362

Where,

z(1-α/2) = Standard error associated with 95% confidence interval = 1.96

z(1-β) = Power of 80% = 0.84

P1: 18-21 years old participants with low physical activity = 0.333 (Rajappan et al., 2015)

P2: 22-25 years old participants with low physical activity = 0.203 (Rajappan et al., 2015)

P: $\frac{P1+P2}{2}$ = 0.268

Adjusted for the estimated respondent rate of 60%:

n_{new2} = n_{new1} / response rate

n_{new2} = 362 / 0.6

n_{new2} = 603

Adjusted for expected proportion eligible of 90%:

n_{new3} = n_{new2} / proportion eligible

n_{new3} = 603 / 0.9

n_{new3} = 670

Therefore, **670** respondents were required for this study.

3.5 Variables

3.5.1 Dependent variable

Physical inactivity was the only dependent variable of this study.

3.5.2 Independent variables

The independent variables included sociodemographic factors such as age, gender, ethnicity, programme and part time work. The other independent variables were perceived benefits and barriers towards physical activity, body image, internet addiction and academic activities.

3.6 Data collection

3.6.1 Instruments

Data collection for this research was conducted using a sheet of self-administered questionnaires and online surveys through google form. Questionnaire distributed via Email and Whatsapp to undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia. The questionnaire consisted of six sections as follow:

3.6.1.1 Section A - Socidemographic factors

Section A provided information on socio-demographic characteristics of the respondents. Self-administered socio demographic questions include age, gender, ethnicity, current year of study, programme and part time work. The questions were in English language.

3.6.1.2 Section B - Physical activity level

International Physical Activity Questionnaire (IPAQ) - short form used to assess the physical activity level among respondents. The reliability for this questionnaire was Cronbach alpha of 0.80 (Youthrex Research & evaluation eXchange, 2002). IPAQ assessed types of intensity of physical activity and sitting time that respondents do as part of their daily lives. This section consisted of 7 items which were open ended questions surrounding individuals' last 7-day recall of physical activity. Total physical activity computed in Metabolic Equivalent of Task (MET) - min/week.

3.6.1.3 Section C - Internet addiction test

The Internet Addiction Test (IAT) was a 20-item scale that measures presence and severity of Internet dependency among adults (Young, 1998). The reliability coefficient Cronbach alpha was calculated as 0.90 for (IAT) questionnaire (Keser et al., 2013). Each statement in the IAT questionnaire is weighted along a 6-point Likert-scale continuum that ranges from 0 = less extreme behavior to 5 = most extreme behavior for each item. The maximum score for this questionnaire was 100 and the higher score represents the higher level of severity of Internet addiction. Scores of 0 to 30 indicate a normal level of Internet usage; total scores that range from 31 to 49 reflect the presence of a mild level of Internet addiction; 50 to 79 is for the presence of a moderate level; and scores of 80 to 100 reflect a severe dependence upon the Internet.

3.6.1.4 Section D - Exercise Benefits / Barriers Scale (EBBS)

The Exercise Benefits/Barriers Scale (EBBS) was designed to identify perceived benefits of and perceived barriers to exercise (Sechrist et al., 1987). The questions were in English. Calculation of Cronbach's alpha for the (EBBS) questionnaire yielded a standardized alpha of 0.952 (Sechrist et al., 1987). The test-retest reliability was 0.953 on the Benefits Scale and 0.886 on the Barriers Scale. This questionnaire consisted of 11 items and the instrument score had four-response, based on forced-choice Likert-type format with responses ranging from strongly disagree (1) to strongly agree (4). Scores on the total instrument ranged from 11 to 44. As the score increases, the more positively the individual perceives exercise. When the Benefits Scale was used alone, the score range was between 6 and 24 whereas when the Barriers Scale was used alone, scores range between 5 and 20.

3.6.1.5 Section E- Dresden Body Image Questionnaire (DBIQ)

The Dresden Body Image Questionnaire (DBIQ-NL) consisted of 10 items with positively and negatively worded items (reversely coded) that had four subscales including body acceptance, vitality, physical contact, and self-aggrandizement (Scheffers et al., 2017). The scale used was based on the level of agreement which is scored based on a 5-point Likert scale ranging from "Strongly disagree [1], Disagree [2], Neutral [3], Agree [4], Strongly agree [5]". The intraclass correlation coefficients (ICC) between test and retest scores on the (DBIQ-NL) scale were 0.88 and on the (DBIQ-NL) subscales were 0.82 for vitality, 0.80 for body acceptance, 0.78 for self-aggrandizement, and 0.64 for physical contact.

3.6.1.6 Section F - Academic activities

The Self Administered Questionnaire (SAQ) used to assess the association between physical inactivity with the time allocated by the students for academic activities and screen time per week. The questionnaire consisted of 6 items; Q1, Q2, Q3 were the open ended questions which assessed the time allocated by the students for academic activities and screen time per day and per week while Q4, Q5, Q6 were the Yes or No questions which related the physical inactivity with academic activities. Q4, Q5 and Q6 also used to support the perceived barriers questionnaire.

3.6.2 Techniques

The information was obtained using Google Form through a questionnaire that was distributed via WhatsApp and Email to undergraduate students from Faculty of Medicine and Health Sciences, University Putra Malaysia during the data collection period that started on April 7th 2021 and ended on May 13th 2021. The respondents were required to complete the survey before the deadline. The study was carried out through an online platform so the participants could fill in the form at a suitable place and time for them. Not only that, interaction with people was reduced and social distancing was practised through this online data collection during this COVID-19 pandemic.

3.7 Quality control

3.7.1 Validity and reliability

Self-Administered Questionnaire (SAQ) composed of relevant data such as age, gender, ethnicity, current year of study, area of study, part time work and also academic activities used to identify the sociodemographic characteristics and academic activities of the sample. Pre-testing of the questionnaires to the 10% of the sample size was carried out before the actual week of data collection. The alpha from Cronbach computed. To verify the internal accuracy and the reliability of the questions, Cronbach alpha was used. Supervisors and co-supervisors assessed the validity of the content to ensure that the content of the questions satisfies the analysis criteria. In order to ensure face validity, the structure of questions and time required to answer the questionnaires was also assessed. The input of the participants in the pretest was collected. Then, depending on all the above, the questions adjusted. The results generated would therefore be valid and reliable.

International Physical Activity Questionnaire (IPAQ) - short form was used to assess the physical activity level among respondents. The reliability for this questionnaire was Cronbach alpha of 0.80 (Youthrex Research & evaluation eXchange, 2002).

The Internet Addiction Test (IAT) was a 20-item scale that measures presence and severity of Internet dependency among adults (Young, 1998). The reliability coefficient Cronbach alpha was calculated as 0.90 for (IAT) questionnaire (Keser et al., 2013). Therefore, it was a valid and reliable instrument to measure presence and severity of Internet dependency among adults.

To determine perceptions of individuals concerning the benefits of and barriers to participating in exercise, the Exercise Benefits/Barriers Scale (EBBS) was used. Among published international studies, the Exercise Benefits/Barriers Scale (EBBS) designed by Sechrist et al. was valid and reliable instrument with the score of Cronbach's alpha coefficients for the total scale, benefits and barriers subscales were 0.952, 0.953 and 0.866, respectively (Cruciani et al., 2011).

To examine vitality, self-acceptance, self-aggrandisement and physical closeness, The Dresden Body Image Questionnaire was used. According to a research by Scheffers et al. (2017), the DBIQ-NL and its subscales showed sufficient internal consistency. While based on a very limited study, test-retest reliability was also good. The intraclass correlation coefficients (ICC) between test and retest scores on the DBIQ-NL scale were 0.88 and on the DBIQ-NL subscales are 0.82 for vitality, 0.80 for body acceptance, 0.78 for self-aggrandizement, and 0.64 for physical contact. The correlations were comparatively slight between the subscales, providing support for the instrument's multidimensionality. Validation of the physical contact and vitality subscales by correlating them with other indices demonstrated strong validity of the model.

3.8 Operational definition of terms

Dependent variable

No.	Term	Definition
1.	Physical inactivity	Physical inactivity defined as someone who is unable to meet the minimum 600 MET-minutes/week. A short version of the International Physical Activity Questionnaire [IPAQ (English version)] used to determine the level of physical activity. This questionnaire was freely accessible, and it did not require authorization to use it. The questionnaire is composed of four elements that will measure sitting time, walking, activities of moderate intensity, and activities of vigorous intensity. Based on the number of days and minutes of execution of the tasks, each of the activities was scored. The score sum (vigorous + moderate & walking) was then calculated on the basis of the IPAQ guideline analysis (IPAQ Research Committee, 2005). The score was classified after that as: a. <600 MET-minutes/week = Low level PA b. 600 – 2999 MET-minutes/week = Moderate level PA c. ≥ 3000 MET-minutes/week = High level PA Based on the above categories, the level of physical activity was further categorised into two groups, and the analysis used this categorisation as follow: 1. Active (moderate and high-level PA) 2. Inactive (low-level PA)

Table 3.1. Operational Definition of Dependent Variable

Independent variables:

No.	Term	Definition
1.	Age	A self report of respondents' age in 2021
2.	Gender	A self report of Male or Female
3.	Ethnicity	A self report of Malay, Chinese, Indians and Others
4.	Programme	The respondents' study programme in the university
5.	Part Time Work	Yes or No
6.	Perceived benefits and perceived barriers	Factors that referred to a respondent's perception of the effectiveness of performing physical activity to reduce the threat of illness or disease and a person's feelings on the obstacles to performing physical activity. Perceived benefits and barriers were assessed using the benefit subscale of the Exercise Benefits/Barriers Scale (EBBS) questionnaire (Sechrist et al., 1987). Scores on the total instrument can range from 11 to 44; 6-24 for Benefits Scale and 5-20 for Barriers Scale. As the score increases, the more positively the individual perceives exercise. Benefits scale: Q1, Q2, Q3, Q5, Q7, Q8 Barriers scale: Q4, Q6, Q9, Q10, Q11
7.	Body Image	The level of self-aggrandizement, body acceptance, physical contact and vitality. The criteria assessed using the Dresden Body Image Questionnaire (DBIQ). The score was in the range of 10-50. Higher scores indicate a more positive body image. Self-aggrandizement and body acceptance: Q1, Q2, Q3 Physical contact: Q4, Q5, Q6

		Vitality: Q7, Q8, Q9, Q10
8.	Internet Addiction	The presence and severity of Internet dependency among adults using Internet Addiction Test. A 5-point Likert-scale was used and the maximum score was 100. The scores for normal level of Internet usage, mild, moderate and severe level of Internet addiction are 0-30, 31-49, 50-79 and 80-100 respectively. Salience-related items: Q10, Q12, Q13, Q15, and Q19 Excessive use-related items: Q1, Q2, Q14, Q18, and Q20 Neglect work-related items: Q6, Q8, and Q9 Anticipation-related items: Q7 and Q11 Lack of Control-related items: Q5, Q16, and Q17 Neglect of Social Life-items: Q3 and Q4
9.	Academic activities	The time allocated for academic purposes include studying, completing assignments and other university activities and its association with physical inactivity.

Table 3.2. Operational Definition of Independent Variables

3.9 Data analysis

IBM Statistical Package for Social Sciences (SPSS) version 26 was used to analyse the data. Descriptive statistics used to describe the prevalence of physical inactivity among respondents and the results presented in frequency and percentage. For continuous data, median and interquartile range (IQR) was used for the not normally distributed data while mean (SD) used for normally distributed data. Mann-Whitney Test was used to assess the association between continuous independent variables and dependent variable. Moreover, Chi-square test used to assess the association between categorical data of dependent and independent variables. Normality was checked statistically for continuous data using the Kolmogorov-Smirnov test and

Shapiro-Wilk test while graphically using histogram, stem and leaf and box plot. The significance of the independent factors on physical inactivity was assessed using multiple logistic regression, which included all independent factors that had previously been found to be significant in bivariate chi square and Mann-Whitney tests. The level of significance was set at $p<0.05$ and the analysis was with 95% confidence interval.

3.10 Ethical consideration

The research proposal was submitted for review and approval to the Ethic Committee for Research Involving Human Subjects (JKEUPM) (Reference number: JKEUPM-2021-117). Besides, approval was obtained from the Dean of Faculty of Medicine and Health Sciences as this research involves all the undergraduate students in the faculty. The respondents' data and details were kept confidential and not named. Prior to performing the analysis, informed consent was sought from the respondents.

3.11 Limitation

The validity might be limited as this study focuses only on students from the Faculty of Medicine and Health Sciences, University Putra Malaysia. The findings cannot be generalized to represent the students from other faculties in University Putra Malaysia or other universities in Malaysia. Furthermore, a cross-sectional study can not be used over time for the analysis of behaviors. In addition, it would not be possible to identify the exposure or end result as a cause or effect in this research. Confounding factors might not be shared evenly between groups that are compared, and bias and consequent misinterpretation may result from this uneven distribution. Moreover, a larger scale study involving all university students in Malaysia is not

able to be conducted due to time constraints. Finally, the study was conducted via online questionnaires only. This might lead to other limitations among respondents as they may have unstable internet connection at home or college and face difficulties in clarifying their doubts through online platforms.

3.12 Expected result

We expected to see a significant association between the prevalence of physical inactivity among respondents during this pandemic time with factors that we studied such as sociodemographic factors, perceived benefits and barriers, body image, internet addiction and academic activities. Data analysis was done using SPSS version 26 and the outcome assessed and further discussed in Chapter 4. We hope that the result of this study will be helpful to us as an addition to the knowledge on physical inactivity among undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia. While the results of the research are not precise to depict all students in Malaysia, we wished that the findings could still be used as a reference for future research.

3.13 Budget

The expected budget for this research:

No.	Items	Estimated cost
1	Hardcover and thesis research paper binding	RM 150.00
2	Printing	RM 30.00
	Total:	RM 180.00

Table 3.3. Expected Budget for Research

CHAPTER 4

RESULT

4.1 Response Rate

From the 670 respondents required for this study, 670 respondents participated in this study. The response rate of our study calculated using the formula below:

Response rate = Total response / Total of eligible respondents approached × 100%

670 / 670 × 100% = 100%

The response rate for this study was 100%.

4.2 Normality Assessment

Normality assessment of continuous variables such as age, internet addiction score, perceived benefits and barriers score, body image score, and academic activities were determined statistically using Shapiro-Wilk test and graphically using histogram, stem and leaf and box plot. Variables are normally distributed if the p-value of Shapiro-Wilk is more than 0.05. Table 4.1 shows Normality test for continuous variables. All the p-values were less than 0.05. Therefore, all the numerical variables were not normally distributed.

Table 4.1 Normality test for continuous variables

Variables	Skewness (SE)	Skewness/ SE	Shapiro-Wilk test	Histogram/ Stem & Leaf/ Box Plot	Skewed To
Age	0.789 (0.094)	8.393	$p < 0.05$	Not normally distributed	Left
Internet Addiction Score	-0.192 (0.094)	-2.043	$p < 0.05$	Not normally distributed	Right
Perceived Benefits Score	-1.108 (0.094)	-11.787	$p < 0.05$	Not normally distributed	Right
Perceived Barriers Score	0.376 (0.094)	4.000	$p < 0.05$	Not normally distributed	Left
Body Image Score	-0.024 (0.094)	-0.255	$p < 0.05$	Not normally distributed	Left
Total academic hours per week	1.262 (0.094)	13.426	$p < 0.05$	Not normally distributed	Left
Screening time per day	1.271 (0.094)	13.521	$p < 0.05$	Not normally distributed	Left
Total Physical Activity	1.326 (0.094)	14.106	$p < 0.05$	Not normally distributed	Left

4.3 Characteristics of Respondents

4.3.1 Socio-demographic Characteristics

Table 4.2 shows the distribution of respondents by their socio-demographic characteristics. Ages of participants range from 20 to 26 with mean age (SD) of 21.38 (0.048), and the median age of 21 years old and the IQR of 2. For gender, the results indicated that most of the respondents were females, 521 (77.8%). Malays constitute the major (63.1%) ethnic group among the respondents followed by Chinese (17.9%), Indians (15.0%) and the least is others

(4.0%). According to the degree programme, Doctor of Medicine students constitute the major (51.5%) participants, followed by Bachelor of Science Environmental and Occupational Health students (13.0%), Bachelor of Science Nutrition and Community Health students (10.0%), Bachelor of Biomedical Sciences (9.7%), Bachelor of Science Dietetic (8.2%) and Bachelor of Nursing (7.7%). Most of the participants (94.2%) did not do any part time job.

Table 4.2: Distribution of Respondents by Socio-Demographic Characteristics

Socio-demographic variables	n	%
Age		
20	192	28.7
21	212	31.6
22	147	21.9
23	68	10.2
24	43	6.4
25	7	1.1
26	1	0.1
Gender		
Male	149	22.2
Female	521	77.8
Ethnicity		
Malay	423	63.1
Chinese	120	17.9
Indians	100	15.0
Others	27	4.0
Programme		
Doctor of Medicine	345	51.5
Bachelor of Biomedical Sciences	65	9.7
Bachelor of Science Environmental and Occupational Health	87	13.0
Bachelor of Science Dietetic	54	8.1
Bachelor of Science Nutrition and Community Health	67	10.0
Bachelor of Nursing	52	7.7
Medical students	345	51.5
Health sciences students	325	48.5
Part time work		
Yes	39	5.8
No	631	94.2

4.3.2 Internet addiction

Table 4.3 shows students' responses to the Internet Addiction Test. The total score ranged between 0 to 99 with the median of 52 and IQR of 22. The respondents were classified into four groups of internet addiction levels which are normal, mild, moderate, and severe based on their Internet Addiction Test score. The scores for normal, mild, moderate, and severe levels of Internet addiction are 0-30, 31-49, 50-79 and 80-100 respectively. From the table, the majority of the respondents are of moderate level of internet addiction (51.4%, n=345), followed by mild (31.4%, n=211), normal (12.8%, n=86) and severe (4.3%, n=29).

Table 4.3: Distribution of Respondents by Internet Addiction

	Median	IQR	n	%
Internet Addiction Score	52	22		
Internet Addiction Group				
Normal			86	12.8
Mild			211	31.5
Moderate			344	51.4
Severe			29	4.3

4.3.3 Perceived Benefits and Barriers Score

Table 4.4 shows the distribution of respondents by perceived benefits and barriers score. The range score for benefits scale was 6 to 24 with the median score of 22 and IQR of 5. The range score for barriers scale was 5 to 20 with the median score of 11 and IQR was 5.

Table 4.4: Distribution of Respondents by Perceived Benefits and Perceived Barriers

	Median	IQR
Perceived Benefits Score	22	5

Perceived Barriers Score	11	5

4.3.4 Body image score

Table 4.5 shows the distribution of respondents by body image score. The range for body image score was 10-48 with the median score of 30 and IQR of 7.

Table 4.5: Distribution of Respondents by Body Image

	Median	IQR
Body Image Score	30	7

4.3.5 Academic activities

Table 4.6 shows the distribution of respondents by academic activities. The median score of the academic hours per week was 28 and IQR was 26. The median score of the screening time was 5 and IQR was 4.

Table 4.6: Distribution of Respondents by Academic Activities

	Median	IQR
Academic hours per week	28	26
Screening hours per days	5	4

4.4 Prevalence of Physical Inactivity

Table 4.7 shows the distribution of respondents by physical activities. Based on the total MET score, the respondents were divided into three categories which are Low, Moderate and High level of physical activity. The percentage and frequency for Low, Moderate and High level of physical activity are (29.4%, n=197), (49.0%, n=328) and (21.6%, n-145) respectively. 29.4% of the respondents whose physical activity levels are below 600 MET-minutes/week (Low level) are considered as physically inactive. 70.6% respondents whose activity is equal to or above 600 MET-minutes/week (Moderate and High level) are considered as physically active.

Table 4.7: Distribution of Respondents by Physical Activities

	Median	IQR	n	%
Total MET	1285.00	2331		
Level of Physical Activity				
Low			197	29.4
Moderate			328	49.0
High			145	21.6
Level of Physical Activity				
Active			473	70.6
Inactive			197	29.4

4.5 Association of the independent variables and prevalence of physical inactivity

Table 4.8 shows the association between socio-demographic factors and level of physical activities, the result shows that the prevalence of physical inactivity is significantly higher in females (31.5%) than in males (22.1%), ($\chi 2 = 4.859$, p=0.027). For ethnicity, the prevalence of physical inactivity is higher in Chinese (34.2%), followed by Malay (30.5%), Others (22.2%) and Indians (21.0%) while those who did part time job were more physically active compared to

those who did not do part time job. However, there is no significant association between the ethnicity of the respondents, and part time job with the prevalence of physical inactivity. However, the respondents' programme has a significant association with the level of physical activities. According to the table, it shows that the prevalence of physical inactivity among Bachelor of Science Dietetic students is the highest (40.7%), followed by Bachelor of Science Nutrition and Community Health (38.8%), Bachelor of Nursing (36.5%), Bachelor of Science Environmental and Occupational Health (32.2%), Bachelor of Biomedical Sciences (26.2%) and the least is Doctor of Medicine (24.6%), ($\chi 2 = 11.902$, p=0.036).

Table 4.8: Association between Socio-Demographic Factors and Physical Activity Level

Socio-demographic variables	Level of Physical Activities		$\chi 2$	p Pearson chi-square
	Inactive n (%)	Active n (%)		
Gender			4.859	0.027*
Male	33 (22.1%)	116 (77.9%)		
Female	164 (31.5%)	357 (68.5%)		
Ethnicity			5.628	0.131
Malay	129 (30.5%)	294 (69.5%)		
Chinese	41 (34.2%)	79 (65.8%)		
Indians	21 (21.0%)	79 (79.0%)		
Others	6 (22.2%)	21 (77.8%)		
Programme			11.902	0.036*
Doctor of Medicine	85 (24.6%)	260 (75.4%)		
Bachelor of Biomedical Sciences	17 (26.2%)	48 (73.8%)		
Bachelor of Science Environmental and Occupational Health	28 (32.2%)	59 (67.8%)		
Bachelor of Science Dietetic	22 (40.7%)	32 (59.3%)		
Bachelor of Science Nutrition and Community Health	26 (38.8%)	41 (61.2%)		

Bachelor of Nursing	19 (36.5%)	33 (63.5%)	7.781	0.005**
Medical students	85 (24.6%)	260 (75.4%)		
Health sciences students	112 (34.5%)	213 (65.5%)		
Part time work			1.577	0.209
Yes	8 (20.5%)	31 (79.5%)		
No	189 (30.0%)	442 (70.0%)		

*Significant at p<0.05; **Significant at p<0.01; *Significant at p<0.001

Table 4.9 shows no significant association between the internet addiction level of the respondents and levels of physical activity.

Table 4.9: Association between Internet Addiction and Level of Physical Activities

Internet Addiction	Level of Physical Activities		$\chi 2$	p Pearson chi-square
	Inactive n (%)	Active n (%)		
Internet Addiction Group			2.830	0.419
Normal	23 (26.7%)	63 (73.3%)		
Mild	55 (26.1%)	156 (73.9%)		
Moderate	111 (32.3%)	233 (67.7%)		
Severe	8 (27.6%)	21 (72.4%)		

According to Table 4.10, it is shown that there is a significant difference between perceived exercise benefits (p<0.001), barriers perception to exercise (p=0.002) and body image perception (p=0.001) with prevalence of physical inactivity. However, age, internet addiction, academic activities and screening do not show any significant association with the prevalence of physical inactivity. Physical inactivity is significantly higher in lower perceived benefits score, lower body image score. Contrarily, physical inactivity is significantly higher in higher perceived barriers to exercise score.

Table 4.10: Association between numerical independent variables (age, internet addiction score, perceived benefits score, perceived barriers score, body image score, academic activities & screening time) and Physical Activity Level (n=670)

Numerical independent variables	Mean rank		Median (IQR)		Z	p Mann-Whitney test
	Inactive	Active	Inactive	Active		
Age	324.13	340.24	21 (2)	21 (2)	-1.016	0.310
Internet addiction score	350.67	329.18	54 (24)	51 (22)	-1.309	0.190
Perceived benefits score	271.01	361.97	20 (5)	22 (5)	-5.552	<0.001*
Perceived barriers score	371.00	320.71	12 (4)	11 (4)	-3.078	0.002**
Body image score	295.57	352.13	29 (7)	30 (7)	-3.452	0.001**
Academic activities	344.15	331.90	28 (34)	28 (24)	-0.747	0.455
Screening time	351.09	329.01	5 (5)	5 (4)	-1.356	0.175

*Significant at p<0.05; **Significant at p<0.01; *Significant at p<0.001

4.6 Multiple logistic regression

Table 4.11 depicts the Multiple Logistic Regression of Factors of Physical Inactivity. It was performed to assess the impacts of the independent variables on physical inactivity. The process contains inclusion of all independent variables which have been previously shown to be significant in Pearson chi square and Mann-Whitney test. It has explained between 6.9% (Cox and Snell R square) and 9.9% (Nagelkerke R square) of the variances in the levels of physical

activities and the prediction increases to 71.2%. The chi-square value for Hosmer Lemeshow test is 7.073 with significant level of 0.529 indicating that the model is worthwhile and fit (p>0.05).

In this final model, as shown in table, the odds of becoming physically inactive is almost 2 times higher in health sciences students than in medical students (OR = 1.577, 95% CI = 1.109, 2.243, p<0.05). The odds of being physically inactive is lower among those with higher perceived benefits score (OR = 0.872, 95% CI = 0.823, 0.923, p<0.001). The other variables such as gender, perceived barriers and body image were not significantly associated with the prevalence of physical inactivity among undergraduate students in Faculty of Medicine and Health Sciences, University Putra Malaysia during Covid-19 pandemic in multivariate logistic regression analysis.

Table 4.11 Multiple Logistic Regression of Factors of Physical Inactivity

Variables	Wald	Adjusted OR	95% CI	p
Gender				
Female	0.660	1.206	0.767, 1.896	0.416
Male		1.000		
Programme				
Health Sciences	6.427	1.577	1.109, 2.243	0.011**
Medicine		1.000		
Perceived benefits score	22.342	0.872	0.823, 0.923	<0.001*
Perceived barriers score	2.185	1.044	0.986, 1.106	0.139
Body image score	2.137	0.976	0.944, 1.008	0.144

Enter variable selection was used.
*Significant at p<0.05; **Significant at p<0.01; *Significant at p<0.001

CHAPTER 5

DISCUSSION

5.1 Introduction

Physical activity is defined by the World Health Organisation, WHO (2020), as “any movement produced by skeletal muscles that involve energy expenditure”. Regular physical activity improves physical and mental wellbeing and avoids non-communicable diseases. Noncommunicable diseases (NCDs) and mortality are primarily caused by physical inactivity around the world. In Malaysia, the Global Health Observatory (2018) reported that among adults aged 18 years old and above in Malaysia, the prevalence of physical inactivity for a male is 36.6% and female is 42.8% and age-standardized estimate for both sexes was 38.8%.

There are a few factors contributing to the prevalence of physical inactivity based on previous studies such as age, ethnicity, perceived benefits and perceived barriers towards physical activity, internet addiction, body image and academic activities.

The emphasis of this research is on physical inactivity, which has become a problem among university students as a result of the COVID-19 pandemic. This study determined the prevalence of physical inactivity among undergraduate students, as well as the significant factors related to it during COVID-19 pandemic lockdown. There has only been a little research on physical inactivity among Malaysian university students up to this point. To our knowledge, there is a lack of evidence for the association between physical inactivity among university students during the COVID-19 pandemic. As a result, this research added to the existing information about the impacts of the COVID-19 pandemic on physical inactivity. Furthermore,

the findings of this study will assist university administrators in reinforcing information and developing appropriate programmes to assist students under the particular conditions of pandemics.

5.2 Characteristics

5.2.1 Sociodemographic Characteristics of the respondents

The total number of respondents participating in this study was 670. All of them were undergraduate students of the Faculty of Medicine and Health Sciences, University Putra Malaysia. Ages of participants range from 20 to 26 with mean age (SD) of 21.38 (0.048), and the median age of 21 years old and the IQR of 2. For gender, the majority of the respondents were females, 521 (77.8%). Malays constitute the major (63.1%) ethnic group among the respondents followed by Chinese (17.9%), Indians (15.0%) and the least is others (4.0%). According to the degree programme, Doctor of Medicine students constitute the major (51.5%) participants, followed by Bachelor of Science Environmental and Occupational Health students (13.0%), Bachelor of Science Nutrition and Community Health students (10.0%), Bachelor of Biomedical Sciences (9.7%), Bachelor of Science Dietetic (8.2%) and Bachelor of Nursing (7.7%). Most of the participants (94.2%) did not do any part time job.

5.2.2 Internet Addiction

Based on the Internet Addiction Test, the total score ranged between 20 to 100 with the median of 52 and IQR of 22. The respondents were classified into four groups of internet addiction levels which are normal, mild, moderate, and severe based on their Internet Addiction Test score. From Table 4.3, the majority of the respondents 51.4% (n=345) are of moderate level

of internet addiction, followed by mild (31.4%, n=211), normal (12.8%, n=86) and severe (4.3%, n=29).

5.2.3 Perceived Benefits and Barriers towards Physical Activity

The median score of the benefits scale was 22 and IQR was 5. Median score of the barrier scale was 11 and IQR was 5. The score range for the Benefits Scale is 6-24 and 5-20 for Barriers Scale. As the score increases, the more positively the individual perceives exercise.

5.2.4 Body image

The score was in the range of 10-50. Higher scores indicate a more positive body image. The median score of the body image was 30 and IQR was 7.

5.2.5 Academic activities

The median score of the academic hours per week was 28 and IQR was 26. The median score of the screening time was 5 and IQR was 4.

5.2.6 Prevalence of physical inactivity

Of all the 670 respondents, the prevalence of physical inactivity or low physical activity level among students in Faculty of Medicine and Health Sciences, University Putra Malaysia during Covid-19 pandemic is 29.4%, 48.9% are of moderate level and 21.8% are of the high physical activity level. It can also be said that 29.4% of the respondents are those whose physical activity levels are below 600 MET-minutes/week. Those respondents whose activity is equal to or above 600 MET-minutes/week (moderate and high) added up to 70.6% and could be referred to as physically active. The findings of the prevalence of physical inactivity is low compared to

the previous study due to a few reasons such as age. This is because ages between 20-26 are most likely to be physically active compared to the other age groups. Moreover, the students are all medical and health sciences students who are aware and know about the benefits of physical activity. This leads them to be more physically active compared to other students. Even if they are busy with the academic activities, it is not a barrier for the students to practise physical activity as it may reduce stress level and may lead to ideal body image.

5.3 Association between Sociodemographic Factors and Physical Activity Level

5.3.1 Age

Based on our study, there is no statistically significant correlation between age of respondents and level of physical activities. In other words, age does not give an impact on the level of physical activities among undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia during COVID-19 pandemic lockdown.

This finding is not consistent with a study conducted by Salamudin et al. (2013) that surveyed on physical activity index among Malaysian youth aged 18 between 25 years old. The researchers included age in the analysis because they believe that it is an important factor in determining physical activity level. In this research, a post-hoc test was conducted because gender analysis showed a significant difference in physical activity index between ages ($F=25.15$, $p<0.05$). This survey showed that physical activity declines with increasing age. Allison et al. (2007) conducted a study that focused on the decline in physical activity among adolescent students. The data was based on the 2001 Youth Risk Behavior Survey (n=13,503) and the 2001 Ontario Student Drug Use Survey (n=1322). Physical activity is measured by the

number of days of vigorous physical activity in a week. There was a steady decline in physical activity among adolescents between the ages of 14 and 18 years.

During the COVID-19 pandemic lockdown, our research found no significant link between respondents' age and their level of physical activity among undergraduate students at the University Putra Malaysia's Faculty of Medicine and Health Sciences. This result is in direct opposition to the findings of the other research. This can be due to a number of methodological differences among the studies which made it challenging to both compare the outcomes of different studies. Thus, we believe that we should consider the subject's physical condition rather than the subject's age when conducting research on the level of physical activity.

5.3.2 Gender

According to our study, Multiple Logistic Regression showed there is no significant association between gender and level of physical activities among undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia during COVID-19 pandemic lockdown ($p>0.05$).

This finding is not consistent with a study by Rajappan et al. (2015) conducted in Malaysia to assess the physical activity level among Asia Metropolitan University (AMU) students. According to this study, females are more likely to be physically inactive compared to males. This is proved by the research data that shows 30% of female participants involved in low physical activity whereas only 14% of male participants in the low physical activity group. This finding is also consistent with another study conducted in Malaysia to identify the physical activity index among Malaysian youths (Salamudin et al., 2013). According to this survey, females are more physically inactive with 31.3% counted as sedentary compared with males

(23%). Even though there is not much difference in the percentage, further tests showed that there is a significant difference between males and females in physical activity involvement ($t=3.92$, $p<0.05$).

Therefore, our study found no substantial link between gender and degree of physical activity among undergraduate students at the University Putra Malaysia's Faculty of Medicine and Health Sciences during the COVID-19 pandemic lockdown due to presence of methodological discrepancies across the research, which made it difficult to both analyse the data and compare the findings of other investigations. Moreover, this may be due to the target group of different populations where it indicates different levels of physical activity.

5.3.3 Ethnicity

There is no statistically significant correlation between ethnicity of respondents and level of physical activities in this study. In other words, ethnicity does not play a role on the level of physical activities among undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia during COVID-19 pandemic lockdown.

This finding is not consistent with a study conducted by Lian et al. (2016) that showed Chinese engaged significantly less physical activity compared to Malay and other races. When further analyzed into the different levels of physical activity, one-way ANOVA showed significant differences among ethnicity in terms of light exercise ($p<0.01$), moderate activity ($p<0.05$) and vigorous activity ($p<0.01$). Tukey post-hoc tests reported that Chinese ($SD=5.86$) engaged significantly less light exercises compared to Malay ($SD=5.22$) and Indian ($SD=5.77$), whereas other races engaged more in vigorous activity compared to Malay, Chinese and Indian.

Our research found no correlation between respondents ethnicity and their degree of physical activity during the COVID-19 pandemic lockdown among students at the University Putra Malaysia's Faculty of Medicine and Health Sciences. This finding differs from that of previous research may be due to methodological limitations which need to be considered in future studies. Firstly, there is a need for consistency in the measurement of physical activity. Secondly, there are a range of complex factors such as socioeconomic status and body composition which affect both physical activity and ethnicity. Studies have failed to account for these differences limiting the ability to generalise that ethnicity is an independent risk factor for physical activity.

5.3.4 Programme

According to our study, there is significant association between programme and level of physical activities among undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia during COVID-19 pandemic lockdown ($p<0.05$). This suggests that the programme of study is one of the most important factors that determines whether one is physically active or inactive.

This finding is in line with a study conducted on physical inactivity among 300 undergraduate students from University Malaysia Sabah (medical and non-medical students). According to this study, 49% of medical students were physically inactive compared to non-medical students (35%). Therefore, the prevalence of physical inactivity was higher among medical students compared with non-medical students (OR = 1.79, CI = 1.10, 2.91) (Naim et al., 2016). This study shows that the programme of respondents can be associated with level of physical activity. Another study also indicates a significant relationship between physical activity

and students' course of study ($p<0.05$). This study found that medical students of basic sciences had the lowest rate of physical activity at home. Moderate activity in MSc students (58.8%) and severe activity in BSc of public health (40.5%) were observed (Rejali and Mostajeran, 2016). Thus, our study is comparable with previous studies where there is a significant association between programme and physical activity level among undergraduate university students.

5.3.5 Part time work

There is no statistically significant correlation between part time work and level of physical activities in this study. To rephrase it, part time work does not play a role on the level of physical activities among undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia during COVID-19 pandemic lockdown.

This finding is not consistent with a study that studied the association between part time work and physical activity among high grade students in the United States. The results showed that students who were working more than 10 or 20 hours per week involved in less physical activity ($p<0.05$). According to this survey, higher levels of work intensity are associated with physical inactivity. This study shows that there is an association between part time work and physical activity (Pruitt and Springer, 2010).

Our study showed no significant association between part time work of respondents and level of physical activities among students. This result is in contrast with the findings obtained from the other study. This is due to the fact that the majority of previous investigations were done prior to the COVID-19 pandemic. Current type of research has not been done in a long

time, especially during this pandemic. Furthermore, this might be owing to the target group's diverse demographic, which signals various sorts of part-time jobs and physical activity.

5.4 Association between Internet addiction and Physical Activity Level

The results of our study shows that there is no significant association between internet addiction and level of physical activities among undergraduate students in the Faculty of Medicine and Health Sciences, UPM during Covid-19 pandemic lockdown. This finding is similar to the study conducted among Vietnamese youths and adolescents that did not show any relation between internet addiction and physical activity (Dang et al., 2018).

However, a study conducted among 73,238 Korean adolescents aged 12–18 years stated the association of physical activity with problematic internet use. According to this study, physically inactive respondents are more likely to be problematic internet users (AOR = 0.78, 95% CI = 0.73, 0.82, $p<0.001$) (Park, 2014). Another study also found that physical activity level decreased when internet addiction increased. This study carried out among 100 adults showed a moderate relation between physical activity and internet dependency in negative direction ($p<0.05$). In other words, respondents with more internet use had a low level of physical activity (Sahin and Lok, 2018). This study was also consistent with another study carried out to identify the association between internet use and fitness among college students. Greater internet use negatively affects the intensity of exercise ($p<0.001$). In this study, respondents who used the internet for less than 1 hour per day reported a mean of 3.2 days per week of physical activity (SD = 2.0), whereas those with more than 3 hours of internet usage reported 1.4 (SD = 2.1) (Moreno et al., 2013).

Our study shows contradictory results for the association between physical activity level and internet addiction. This is because most of the previous studies were conducted before COVID-19 pandemic. Related research was not conducted recently especially during this pandemic. Moreover, this can be due to the different population as the target group where it indicates different levels of internet usage and physical activity. This contraindication can be also due to the method used to assess internet usage as different methods or questions were used in previous research.

5.5 Association between Perceived Benefits and Barriers and Physical Activity Level

We studied the association between health beliefs which consists of perceived exercise benefits and perceived barriers to exercise towards the prevalence of physical inactivity among the undergraduate students in the Faculty of Medicine and Health Sciences, UPM during Covid-19 pandemic lockdown. Perceived benefits towards exercise are significantly associated with the prevalence of physical inactivity, however, perceived barriers to exercise show no significant association with the prevalence of physical inactivity. The respondents with lower perceived exercise benefits score tend to be more physically inactive.

According to Blake et al. (2017), the level of physical activity among healthcare students was significantly associated with self-efficacy level for exercise ($r=0.40$, $p<0.01$), perceived benefits to barriers to exercise ($r=0.36$, $p<0.01$), and perceived support from friends and family ($r=0.46$, $p<0.01$). Because nursing and medicine students receive specialised instruction in health-related information, including the good health effects of exercise, we should predict greater levels of physical activity among them than in the general population. One reason is that healthcare students' opinions of the advantages and obstacles to physical activity may differ from

those of regular student samples or a larger demographic due to their education and knowledge. Using simple correlation, Brown (2005) discovered that there is a substantial connection between physical activity (weekly kilocalories) and reported advantages ($p<0.05$), but not with perceived obstacles ($p>0.05$). However, the association between perceived benefits and barriers to physical activity groups (active and inactive) are insignificant with the $p>0.05$ for both aspects.The poor findings indicate the necessity for uniform testing since the use of individualised benefits and obstacles scales may be distorting this connection needlessly. Another reason for the low associations might be because the EBBS questionnaire was not applicable to his sample size. A study by Arzu et al. (2006) showed that there are significant differences between internal and external barriers with the prevalence of physical inactivity among a small sample of Turkish university students. The most prevalent barriers among these students are a lack of time to exercise, a lack of energy, and a lack of enthusiasm. In relation to the study, perceived barriers are not significant with prevalence of physical inactivity due to the study field which requires the students to walk to the learning place such as in the hospital.

In addition, the college also provides conducive facilities for the respondents to exercise every day. Lack of time to exercise is not the excuse for the respondents to not practice physical activity because of the perception towards the exercise that can relieve stress after whole-day lectures and classes.

5.6 Association between Body Image Perception and Physical Activity Level

In our study, we also did the research on the association between body image perception and level of physical activities among undergraduate students in the Faculty of Medicine and Health Sciences, UPM during Covid-19 pandemic lockdown. The findings of our study shows

that there is no significant association between body image perception and level of physical activities among students.

This finding comes from a survey of 277 British secondary school pupils aged 11 to 14 who were asked about their body image and physical activity. There were no significant links between body image and physical activity in this research ($p>0.05$) (Duncan et al., 2004). Gaddad et al. (2018) conducted a study to assess the relationship between physical activity and body image among adolescents between the age group of 13 and 18 years. In this study, multiple linear regression indicated that there is no statistically significant relationship between physical activity and body image in both males and females. Thus, our results were the same as previous studies as there is no association between level of physical activity and body image perception.

5.7 Association between Academic Activities and Physical Activity Level

There is no statistically significant correlation between academic activities and level of physical activities in this study. Three questions about respondents' opinions were asked in the questionnaire regarding academic activities and physical activity to support the findings. The result showed that the majority of respondents allocate some time to do physical activity despite having a busy academic schedule (51.2%). This was supported by most of the respondents' opinion that being involved in physical activities will not affect their academic performance (73.6%). On the other hand, 493 of the respondents agreed that the time they spent on academic activities prevented them from being physically active (68.5%). However, respondents' opinion was contraindicated with the results of our study that showed that academic activities had no impact on the amount of physical activity among undergraduate students at the University Putra Malaysia's Faculty of Medicine and Health Sciences during the COVID-19 pandemic lockdown.

This finding is not consistent with a previous study that studied the association between physical activity and academic performance (Howie and Pate, 2012; Donnelly et al., 2016). Also another study which is in contrary with our research finding which is a study on The Elasticity of Time: Associations Between Physical Activity and Use of Time in Adolescents investigated the time spent in each domain (Sleep, Screen, Social School-Related) was calculated for each 24-hour recall and averaged across the recalls, weighting school and non school days equally. It discovered positive links between physical activity and the major time use categories, with screen time seeming to be extremely elastic, especially in obese teenagers and in connection to physical activity. This method of analysing physical activity data has the ability to predict the net health impacts of treatments and to influence intervention plans by allowing for the targeting of more malleable habits that are more likely to change (Olds et al., 2012).

Our study showed no significant association between academic activities of respondents and level of physical activities among students. This outcome differs from the findings of previous research, most likely due to the fact that the target group in each study is different, indicating various degrees of academic endeavors and physical activity.

CHAPTER 6

CONCLUSION

6.1 Conclusion

In conclusion, the prevalence of physical inactivity among undergraduate students in the Faculty of Medicine and Health Sciences during COVID-19 pandemic lockdown is lower than other local studies among university students. Although it is low, it does not represent the whole population therefore, the public health interventions still need to be enhanced to reduce the prevalence of physical inactivity among the whole population.

6.2 Study strength

This study adds important evidence to the limited literature investigating determinants of prevalence of physical inactivity among university students. In contrast to many previous studies, these data came from a large population-based sample, unlike many earlier researches. As a result, the findings are more generalizable and less likely to represent unique programme experiences. Because of the large sample size, the results could be adjusted for a variety of sociodemographic and health-related characteristics, as well as physical activity. Additionally, this research was conducted utilising an online data collection strategy that was not only cost effective but also allowed us to get targeted sample size.

6.3 Study Limitation

There are some limitations in our study. Firstly, the study is limited to undergraduate students in the faculty which are unable to reflect the whole population in Malaysia. Moreover, a larger scale study involving all university students in Malaysia is not able to be conducted due to time constraints. Furthermore, a cross-sectional study can not be used over time for the analysis of behaviors. In addition, the association between factors and outcome cannot be 100% achieved in cross-sectional study. We used Google Form to blast the questionnaire and the medium was through email and Whatsapp. Therefore, there is a high probability that the majority of the targeted respondents ignore the questionnaire. Moreover, we are also unable to clarify the certain questions that might be misinterpreted by the respondents. There are some measurement instruments that are first time used and some were validated a long time ago. Besides, physical activity level was assessed using questionnaires that provide a crude measurement of physical activity and subjected to recall bias. Therefore, the result might not portray the actual physical activity level of the respondents. Short IPAQ was used in this study due to time constraints, which could not differentiate the type of physical activity among the respondents. On the other hand, association between mental health status and physical inactivity was not studied due to time constraints as well. In addition, The scale used to assess internet addiction does not take into account smartphone or screen time consumption, which might have been a major contributing factor which is most probably why our study also showed no association between online addiction and physical inactivity.

6.4 Recommendations

The prevalence of physical inactivity is higher in females compared to males. Therefore, it is recommended for the university authorities to enhance the physical activity campaign among students especially female students to improve this condition. Objective measures of physical activity such as accelerometers (activity watches) and pedometers (step-counters) should be included to minimize the self-reported estimated error. Further studies are recommended to further investigate the social and physical environmental barriers that affect physical activity among the university students in Malaysia. The association between mental health status and physical inactivity during COVID-19 pandemic should be studied in future studies. The findings of this study might be used to help researchers better understand how various factors influence students' physical inactivity. Exploring these aspects might serve as a foundation for future interventions aimed at increasing physical activity. Given the drastic shift in lifestyle associated with physical inactivity during the COVID-19 pandemic, it is obvious that people during this period of social isolation are becoming significantly more physiologically fragile, compromising their capacity to fight a prospective COVID-19 infection. Hence, the findings suggest that regular physical activity should be promoted as part of home quarantine measures during the COVID-19 pandemic, and physical exercise programmes should be supported as long as they conform to the appropriate social distance. On the other hand, association between mental health status and physical inactivity was not studied due to time constraints as well. In addition, The scale used to assess internet addiction does not take into account smartphone or screen time consumption, which might have been a major contributing factor which is most probably why our study also showed no association between online addiction and physical inactivity.

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APPENDICES

Appendix A: Sample Size Estimation

No	Objectives	Formula	Sample size	Reference
1	To determine the association between age and physical inactivity.	$n = \frac{\{[z(1-\alpha/2)\times\sqrt{2P\ (1-P)}] + [z(1-\beta)\times\sqrt{P1(1-P1) + P2\ (1-P2)}]\}^2}{(P1-P2)^2}$ P1: 18-21 years old participants with low physical activity = 0.333 P2: 22-25 years old participants with low physical activity = 0.203	**n=181**	Rajappan et al. (2015)
2	To determine the association between gender and physical inactivity.	P1: Male students with physical inactivity = 0.188 P2: Female students with physical inactivity = 0.48	n=40	Goje et al. (2014)
3	To determine the association between race and physical inactivity.	P1: Malay with low physical activity = 0.259 P2: Non-malay with low physical activity = 0.118	n=120	Rajappan et al. (2015)
4	To determine the association between perceived benefits and perceived barriers and physical inactivity.	P1: Respondents with low self-efficacy and physical inactivity = 0.507 P2: Respondents with high self-efficacy and physical inactivity = 0.333	n=125	Goje et al. (2014)
5	To determine the association between internet addiction and physical inactivity.	P1: The prevalence of physical activity among respondents with low internet dependency = 0.30 P2: The prevalence of physical activity among respondents with high internet dependency = 0.16	n=141	Sahin and Lok (2018)

Appendix B: Gantt Chart

Month / Activity	December	January	March	April	May	June	July
Proposal preparation							
Proposal submission							
Proposal presentation							
Submission of proposal for ethical approval							
Data collection and data analysis							
Submission of data analysis report							
Final report writing							
Poster preparation							
Final report presentation							
Submission of Poster and Scientific Article							
Poster competition							
Submission of log book and hard bound copy final report							

Appendix C: Questionnaire

PHYSICAL INACTIVITY AND ITS ASSOCIATED FACTORS AMONG UNDERGRADUATE STUDENTS IN FACULTY OF MEDICINE AND HEALTH SCIENCES, UNIVERSITY PUTRA MALAYSIA DURING COVID-19 PANDEMIC LOCKDOWN

Section A: Sociodemographic factors

Instruction: Please answer all the questions in this section and tick [/] for appropriate answers.

AGE : _____

GENDER :

- ☐ Male
- ☐ Female

ETHNICITY :

- ☐ Malay
- ☐ Chinese
- ☐ Indian
- ☐ Others (Please state _____)

CURRENT YEAR OF STUDY :

- ☐ Year 1
- ☐ Year 2
- ☐ Year 3
- ☐ Year 4
- ☐ Year 5

PROGRAMME :

- ☐ Doctor of Medicine
- ☐ Bachelor of Biomedical Sciences
- ☐ Bachelor of Science Environmental and Occupational Health
- ☐ Bachelor of Science Dietetic
- ☐ Bachelor of Science Nutrition and Community Health
- ☐ Bachelor of Nursing

PART TIME WORK:

- ☐ Yes
- ☐ No

Section B: Physical Activity Level

Instruction: Please answer all the questions in this section and tick [/] for appropriate answers.

Think about all the vigorous activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

1. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?
   _____ days per week
   If there is no vigorous physical activities, Skip to question 3

2. How much time did you usually spend doing vigorous physical activities on one of those days?
   _____ hours, _____ minutes per day

Think about all the moderate activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, cycling at a regular pace, or doubles tennis? Do not include walking.
   _____ days per week
   If there is no moderate physical activities, skip to question 5

4. How much time did you usually spend doing moderate physical activities on one of those days?
   _____ hours, _____ minutes per day

Think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

5. During the last 7 days, on how many days did you walk for at least 10 minutes at a time?
   _____ days per week
   If there is no walking, skip to question 7

6. How much time did you usually spend walking on one of those days?
   _____ hours, _____ minutes per day

The last question is about the time you spent sitting on weekdays during the last 7 days. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the last 7 days, how much time did you spend sitting on a weekday?
   _____ hours, _____ minutes per day

Section C: Internet Addiction Test

Instruction: Read each statement carefully, based upon the 6-point Likert scale, please select the response (0, 1, 2, 3, 4 or 5) which best describes you during the past month.

The rating scale is as follows:
0 = Not Applicable
1 = Rarely
2 = Occasionally
3 = Frequently
4 = Often
5 = Always

1	How often do you find that you stay online longer than you intended?	0	1	2	3	4	5
2	How often do you neglect household chores to spend more time online?	0	1	2	3	4	5
3	How often do you prefer the excitement of the Internet to intimacy with your partner?	0	1	2	3	4	5
4	How often do you form new relationships with fellow online users?	0	1	2	3	4	5
5	How often do others in your life complain to you about the amount of time you spend online?	0	1	2	3	4	5
6	How often do your grades or school work suffer because of the amount of time you spend online?	0	1	2	3	4	5
7	How often do you check your email before something else that you need to do?	0	1	2	3	4	5
8	How often does your job performance or productivity suffer because of the Internet?	0	1	2	3	4	5
9	How often do you become defensive or secretive when anyone asks you what you do online?	0	1	2	3	4	5
10	How often do you block out disturbing thoughts about your life with soothing thoughts of the Internet?	0	1	2	3	4	5
11	How often do you find yourself anticipating when you will go online again?	0	1	2	3	4	5

12	How often do you fear that life without the Internet would be boring, empty, and joyless?	0	1	2	3	4	5
13	How often do you snap, yell, or act annoyed if someone bothers you while you are online?	0	1	2	3	4	5
14	How often do you lose sleep due to being online?	0	1	2	3	4	5
15	How often do you feel preoccupied with the Internet when off-line, or fantasize about being online?	0	1	2	3	4	5
16	How often do you find yourself saying "just a few more minutes" when online?	0	1	2	3	4	5
17	How often do you try to cut down the amount of time you spend online and fail?	0	1	2	3	4	5
18	How often do you try to hide how long you've been online?	0	1	2	3	4	5
19	How often do you choose to spend more time online over going out with others?	0	1	2	3	4	5
20	How often do you feel depressed, moody, or nervous when you are off-line, which goes away once you are back online?	0	1	2	3	4	5

Section D: Exercise Benefits/Barriers Scale (EBBS) for Physical Activity Scale

Instruction: Read each statement carefully, based upon the 4-point Likert scale, please select the response (1, 2, 3 or 4) which best describes you.

The rating scale is as follows:
1 = Strongly disagree
2 = Disagree
3 = Agree
4 = Strongly agree

1	I enjoy exercise.	1	2	3	4
2	Exercise decreases feelings of stress and tension for me.	1	2	3	4
3	Exercise improves my mental health.	1	2	3	4
4	Exercising takes too much of my time.	1	2	3	4
5	I will prevent heart attacks by exercising.	1	2	3	4
6	Exercise tires me.	1	2	3	4
7	Exercise increases my muscle strength.	1	2	3	4
8	Exercise gives me a sense of personal accomplishment.	1	2	3	4
9	There are too few places for me to exercise.	1	2	3	4
10	My family members and close friends do not encourage me to exercise.	1	2	3	4
11	I am too embarrassed to exercise.	1	2	3	4

Section E: Dresden Body Image Questionnaire (DBIQ)

Instruction: Read each statement carefully, based upon the 5-point Likert scale, please select the response (1, 2, 3, 4 or 5) which best describes you.

The rating scale is as follows:
1 = Strongly disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly agree

1.	There are lots of situations in which I feel happy about my body.	1	2	3	4	5
2.	I find it pleasant and exhilarating when someone looks at me attentively.	1	2	3	4	5
3.	I choose clothing that hides the shape of my body.	1	2	3	4	5
4.	I like it when people put their arms around me.	1	2	3	4	5
5.	I do not like people touching me.	1	2	3	4	5
6.	I consciously avoid touching other people.	1	2	3	4	5
7.	I have lots of energy.	1	2	3	4	5
8.	I am in good physical condition.	1	2	3	4	5
9.	I lack energy and motivation.	1	2	3	4	5
10.	I quickly reach my physical limits.	1	2	3	4	5

Section F: Academic activities

Instruction: Please answer all the questions in this section and tick [/] for appropriate answers.

1. During the last 7 days, how many days do you allocate to do academic activities (studying, completing assignments, and other university events)?
   _____ days

2. How much time per day do you allocate to do academic activities (studying, completing assignments, and other university events)?
   _____ hours

3. How much time per day do you allocate for screen time?
   _____ hours

4. Do you allocate some time to do physical activity despite having a busy academic schedule?
   ☐ Yes
   ☐ No

5. Does the time you spend on academic activities prevent you from being physically active (studying, completing assignments, and other university events)?
   ☐ Yes
   ☐ No

6. Do you think being involved in physical activities will affect your academic performance?
   ☐ Yes
   ☐ No

Appendix D: JKEUPM Informed Consent Form

JAWATANKUASA ETIKA UNIVERSITI UNTUK PENYELIDIKAN MELIBATKAN MANUSIA (JKEUPM)
UNIVERSITI PUTRA MALAYSIA, 43400 UPM SERDANG, SELANGOR, MALAYSIA

FORM 2.4: RESPONDENT'S INFORMATION SHEET AND INFORMED CONSENT FORM

Please read the following information carefully and do not hesitate to discuss any questions you may have with the researcher.

1. STUDY TITLE :
PREVALENCE OF PHYSICAL INACTIVITY AND ITS ASSOCIATED FACTORS AMONG UNDERGRADUATE STUDENTS IN FACULTY OF MEDICINE AND HEALTH SCIENCES, UNIVERSITY PUTRA MALAYSIA DURING COVID-19 PANDEMIC LOCKDOWN

2. INTRODUCTION:
Physical inactivity is the main cause of noncommunicable diseases and mortality. It also became a concern among university students due to COVID-19 pandemic. From the previous study conducted by Goje et al. (2014), it is found that the prevalence of physical inactivity among UPM first-year undergraduate students is 41.4%. This is also supported by research conducted on college students' physical activity (PA) behaviors. The researchers reported that about 40% to 50% of college students were physically inactive (Keating et al., 2010). Therefore, the general objective of this study is to determine the prevalence of physical inactivity and its associated factors among undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia during COVID-19 pandemic lockdown.

3. WHAT WILL YOU HAVE TO DO?
You are required to answer a set of questionnaires honestly. The questionnaire consists of 6 sections on sociodemographic factors, physical activity level, internet addiction test (IAT), Exercise Benefits / Barriers Scale (EBBS), Dresden Body Image Questionnaire (DBIQ) and academic activities. The questionnaire will be fully in English language. The time taken to respond to the whole question is approximately 10 minutes. The participation in this study is voluntary and no honorarium is paid to the respondents. If you voluntarily agreed to participate in this study, you are required to sign the consent form that is attached in this form. You are also allowed to withdraw from this study at any time without providing any reason.

4. WHO SHOULD NOT PARTICIPATE IN THE STUDY?
The undergraduate students in the Faculty of Medicine and Health Sciences, University Putra Malaysia who are on leave or deferring in the study.

5. WHAT WILL BE THE BENEFITS OF THE STUDY:

(a) TO YOU AS THE SUBJECT?
There is no direct benefit to you from participating in this study. However, your information given in this study may add to the body of knowledge on the current prevalence of physical inactivity and its associated factor during pandemic.

(b) TO THE INVESTIGATOR?

Data obtained from the respondents will assist the investigator to determine the association of age, gender, race, programme, part time work,perceived benefits and perceived barriers towards physical activity, body image, internet addiction and academic activities with the prevalence of physical inactivity during Covid-19 pandemic. Also, the results will be beneficial for the university authorities to plan programs to encourage physical activity during an emergency and critical period such as during the pandemic.

6. WHAT ARE THE POSSIBLE RISKS?

There will be no risk towards the respondents participating in this study except time taken to answer the questionnaire.

7. WILL THE INFORMATION THAT YOU PROVIDE AND YOUR IDENTITY REMAIN CONFIDENTIAL?

Yes. Your identity and information will be kept confidential. When publishing the result, your identity will not be revealed

8. WHO SHOULD YOU CONTACT IF YOU HAVE ADDITIONAL QUESTIONS DURING THE COURSE OF THE RESEARCH?

I. A.P Dr. Salmiah binti Md. Said, **Senior Medical lecturer at the Faculty of Medicine and Health Sciences**: 013-6362574 / salmiahms@upm.edu.my
II. IDr. Ahmad Zaid Fattah bin Azman, **Senior Medical lecturer at the Faculty of Medicine and Health Sciences:** 016-6521141 / azfa@upm.edu.my
III. Nurul Hidayah binti Ismail Farook Ameerali, **Year 2 Medical Student of Faculty of Medicine and Health Sciences:** 017-6265143 / 200760@student.upm.edu.my
IV. Khirthanaa A/P Suparmaniam, **Year 2 Medical Student of Faculty of Medicine and Health Sciences:** 019-4791508 / 202314@student.upm.edu.my
V. Nuzul Aiman Syafiq bin Mohd Yoki, **Year 2 Medical Student of Faculty of Medicine and Health Sciences:** 0139575234 / 202213@student.upm.edu.my

*Please initial here if you have read and understood the contents of this page*_____

9. CONSENT

I …… Identity Card No. …… address……..... …….. hereby voluntarily agree to take part in the research stated above *(clinical /drug trial/video recording/ focus group/interview-based/ questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential and all information provided with regard to my identity will remain private and confidential.

I * wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable)

* delete where necessary

Signature ……..……. Signature ……..…….
(Respondent) (Witness)

Date :…….. Name :……..

I/C No. :……..

I confirm that I have explained to the respondent the nature and purpose of the above-mentioned research.

Date ……..…… Signature ……..…….
(Researcher)

Appendix E: JKEUPM Approval Letter

Ref. no: UPM/TNCPI/RMC/JKEUPM/1.4.18.2 (JKEUPM)
Date: 22 March 2021

Dear Prof./Dr./Mr./Ms.,

APPLICATION FOR JKEUPM ETHICAL CLEARANCE: APPROVED

With reference to the above, I am pleased to inform you that your application for ethical clearance for the research project entitled **'Prevalence of Physical Inactivity and its Associated Factors among Students in the Faculty of Medicine and Health Science, University Putra Malaysia during COVID-19 Pandemic'** has been approved.

Please note that the official letter of approval will be issued as soon as possible. However, the ethical clearance is considered effective from the date of this email, and you may now proceed with your research.

Kindly remind the ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.

Researchers should also complete a Study Final Report upon study completion. The form can be obtained from the Ethics Committee for Research Involving Human Subjects (JKEUPM) website (http://www.tncpi.upm.edu.my/faildokumen).

If you have any enquiries, please contact Ms. Nurulhasanah Ishak (03-97691605) or Ms. Nor Ellia Abd Ajis (03-97691244).

Note: Please use this reference number for any transaction.
- JKEUPM-2021-117

Thank you.

Yours faithfully,

Prof. Dr. Zamberi Sekawi
Chair
Ethics Committee for Research Involving Human Subjects
Universiti Putra Malaysia