RELATIONSHIP BETWEEN SCREEN TIME, PHYSICAL ACTIVITY LEVEL AND SLEEP QUALITY AMONG MALE AND FEMALE STUDENTS FROM UNIVERSITY TUNKU ABDUL RAHMAN (UTAR) DURING TRANSITION TO COVID-19 ENDEMIC

By

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ABSTRACT

RELATIONSHIP BETWEEN SCREEN TIME, PHYSICAL ACTIVITY LEVEL AND SLEEP QUALITY AMONG MALE AND FEMALE STUDENTS FROM UNIVERSITY TUNKU ABDUL RAHMAN (UTAR) DURING TRANSITION TO COVID-19 ENDEMIC

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COVID-19 pandemic is declared by world health organisation as an international health emergency and this pandemic have induced lockdown and in Malaysia this is called Movement control order (MCO). MCO have several movement restrictions that result in changes in people's lifestyle behaviour, among those are increase in screen time, decrease in physical activity and decrease in sleep quality. Among the most affected population is university students become even before that students have increased usage of electronic device, less engagement in physical activity and more occurrence of sleeping problems. In addition, university is considered a key transition from adolescence to adulthood. The objective of this study was to determine the relationship between screen time, physical activity level and sleep quality among male and female students from UTAR during transition to COVID-19 endemic. This study was a cross-sectional study which included 482 university students (47.3% male, 52.7% female) that were recruited using convenience sampling method. The validated Screen Time Questionnaire, International Physical Activity Questionnaire (IPAQ) and

Pittsburgh Sleep Quality Index (PSQI) were distributed through online questionnaire via Google Form. IPAQ score, screen time usage and Global PSQI score were calculated, then the correlation between these variables and comparison between gender were conducted using SPSS Version 26. The result outcome had discovered that majority of the participants had a moderate screen use, moderate physical activity level and poor sleep quality during transition to COVID-19 endemic. There was no significant correlation between screen time and physical activity level (r=0.057, p=0.214), physical activity level and sleep quality (r=0.024, p=0.596), and screen time and sleep quality (r=0.089, p=0.052). There was no significant difference in screen time between male and female students (p=0.752). Also, physical activity level (p=0.001) and sleep quality (p=0.002), were significantly different between gender, with male students having higher physical activity level and poorer sleep quality than females.

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I also want to express my gratitude to my family and coursemates for their assistance throughout this period. Last but not least, I would like to thank all the participants who were willing to cooperate and sacrifice time to help me in this study.

DECLARATION

I hereby declare that the project report is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.

JENNY ONG XIAO THONG

APPROVAL SHEET

This final year project entitled "**RELATIONSHIP BETWEEN SCREEN TIME, PHYSICAL ACTIVITY LEVEL AND SLEEP QUALITY AMONG MALE AND FEMALE STUDENTS FROM UNIVERSITY TUNKU ABDUL RAHMAN (UTAR) DURING TRANSITION TO COVID-19 ENDEMIC"** was prepared by JENNY ONG XIAO THONG and submitted as partial fulfilment of the requirements for the degree of Bachelor Science (Hons) Dietetics at Universiti Tunku Abdul Rahman.

Approved by:

Date: 31/05/2023

(ENCIK MUHAMMAD ZULHUSNI BIN SUHAIMI)

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Date: 31/05/2023

PERMISSION SHEET

It is hereby certified that **JENNY ONG XIAO THONG** (ID No. **20ADB01648**) had completed this final year project entitled "**RELATIONSHIP BETWEEN SCREEN TIME, PHYSICAL ACTIVITY LEVEL AND SLEEP QUALITY AMONG MALE AND FEMALE STUDENTS FROM UNIVERSITY TUNKU ABDUL RAHMAN (UTAR) DURING TRANSITION TO COVID-19 ENDEMIC**" under the guidance and supervision of ENCIK MUHAMMAD ZULHUSNI BIN SUHAIMI from the Department of Allied Health Sciences, Faculty of Science.

I hereby give permission to the University to upload the softcopy of my final year project in pdf format into the UTAR Institutional Repository, which may be made accessible to the UTAR community and public.

Yours truly

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(JENNY ONG XIAO THONG)

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LIST OF ABBREVIATIONS

COVID-19	Coronavirus Disease
IPAQ	International Physical Activity Questionnaire
MCO	Movement Control Order
MET	Metabolic Equivalent of Task
MVPA	Moderate to Vigorous Intensity Physical Activity
NHMS	National Health and Morbidity Survey
PSQI	Pittsburgh Sleep Quality Index
SD	Standard Deviation
SOP	Standard Operating Procedure
SPSS	Statistical Package for the Social Sciences
STQ	Screen Time Questionnaire
UTAR	University Tunku Abdul Rahman
WHO	World Health Organisation

CHAPTER 1

INTRODUCTION

World Health Organisation (WHO) declared COVID-19 pandemic as an international health emergency on January 30, 2020. By the end of April 2020, due to its rapid spreading rate and being highly contagious, the virus had already infected more than 3 million people worldwide, result in more than 200,000 deaths. The exponential growth in COVID-19 cases and the concern on the collapse of the national health system have induced government across the globe to enforce various degree of societal level lockdown. Similar situations occur in Malaysia, where Prime Minister Tan Sri Muhyiddin Yassin attempts to contain the spread of COVID-19 by implementing few phases of lockdown known as Movement Control Orders (MCO), which last for one year, seven months and two weeks, respectively, until the movement restriction is lifted on November 1, 2021. The implementation of MCO implied that Malaysian citizens must remain confined at home during this period, and only allowed to go out within a certain period to buy primary necessities such as food, medicine or seek for medical care. In addition, with the closure of school and university, shut down public sport facilities and the suspension of any gathering, social and sport event, as well as prohibiting leisure time activity such as walking and jogging in the park. Work or school related task had to be performed within their own home through internet connection and web conferencing tools (Zaccagni, Toselli and Barbieri, 2021). Although this restriction measure was the best alternatives to prevent the spread of COVID-19 while still allow remote learning continued during MCO,

this long-term movement restriction may result in changes in lifestyle behaviour and impact university student's screen time, physical activity and sleep quality. These health-related factors may be associated in which affect university students' overall wellbeing.

This study will focus on the university students because research has shown that even before the pandemic, students were vulnerable and under immense pressure due to academic burden, uncertainty about the future, or relationship issues. In addition to the transition to online learning, university students' lifestyle have been negatively affected, as a result of isolation, fear of contracting deadly disease, and financial hardships. The home confinement not only disrupts their regular daily schedule, but it has also decreased their opportunity and engagement in physical activity, increased their reliance on electronic devices, resulting in increased screen time exposure. This eventually had an impact on their sleeping patterns because they spend more time in bed, which reduces sleep quality and increases the likelihood of sleeping problems. In addition, most recent studies on the effect of the COVID-19 pandemic have primarily focused on the general population; thus, this study will focus on university students to provide more interesting insight, because lockdown has completely changed their mode of study, lifestyle behaviour, and quality of life.

COVID-19 pandemic-induced societal lockdown has resulted in a significant decrease in physical activity, screen time, and sleep quality among the affected population, which may have an adverse effect on overall health.

1.1 Screen time

COVID-19 induced lockdown led to e-learning which linked to excessive use of screen time on electronic gadgets that result in poor sleep quality. Based on the Oxford English Dictionary, screen time was defined as the "times spent on using a device such as television, computer or games console", while World Health Organization (2019) defines screen time as "time spent passively watching screen-based entertainment" which excluded the screen activities that required physical activity, thus WHO indirectly classify screen-based activities as a sedentary activity. The concerns about the negative impact of screen time on people's wellbeing have remain a societal conversation, regularly voice out in academic, media circle and policy. There is some evidence that consistently showed negative correlation of screen time and lifestyle behaviours, which as refer to the concept of displacement of time, screen time are expected to expand under social distancing orders, thus the opportunities and time for physical activity reduced. This is because university students transition their main learning or leisure activity from physical to online, thus they have longer screen time than activity that require body movement. According to Rundle et al. (2020), screen time is related to weight gain that can escalate to obesity, negative mood, and other behavioural problems. This is because screen time increase the odd of having higher sedentary time, also there is an association of screen time and snaking (Twenge et al., 2017). Besides that, Cuello-Garcia, Pérez-Gaxiola and Amelsvoort (2020) discovered a drastic increase of social media use, because when people confine at home, they mainly watch television, check their social media or gaming. Another research has suggested that the frequent usage of social media have an adverse impact on circadian rhythms, mental health and

sleep quality (Scott and Woods, 2019). Also, sleep latency and sleep inertia were shot up because of increase of screen time induced by lockdown. Sleep quality was influenced by the usage of screen time, which Foerster et al. (2019) found that screen time within two hours before bed have negative effect on sleep quality. As melatonin, a hormone that induce sleepiness tend to be more sensitive to light, will be suppressed by the artificial light from screen-based device, especially in the context of COVID-19 home confinement when the students tend to scroll through their phone on their bed with the light off. This lead to higher rate of insomnia, higher level of fatigueless, delayed bedtime. Pointing out that high rate of screen time causes poor sleep quality which is relatively associated to obesity, overweight and mental health (El-Sheikh and Sadeh, 2015).

1.2 Physical activity level

Enforcement of home confinement in majority of countries has a critical change in people's daily routines and their opportunities for being involve in voluntary activity and be active (Schmidt et al., 2020). According to Bohn et al. (2015), physical activity is defined as a movement of body or modifiable behaviour that provide prevention against non-communicable diseases. Bohn et al. (2015) also reported that physical inactivity causes 5 million deaths worldwide, and the economy of health system may even worsen in this pandemic period. For instance, a further increase in body mass index would worsen the condition of obese patients; while for cardiac patients to reduce cardiovascular risk, it is essential for them to conduct daily moderate physical activity (Gielen et al., 2015). In which reduced in physical activity due to lockdown might cause adverse effect on the control of chronic health syndrome. As according to Owen

et al. (2010), home confinement for an extended period of time leads to sedentary behaviour, such as prolonged sitting, which lowers muscular activity and increases the risk of chronic illnesses, such as cancer, type 2 diabetes, obesity, and cardiovascular disease. Furthermore, being confine at home indicate less exposure to sunlight and fresh air, which could compromise the capability of the immune system to the new viral infection (Zaccagni, Toselli and Barbieri, 2021). In addition, Hands et al. (2011) stated that due to lockdown, engagement of children and adolescents on physical activity have significantly reduced, which is associated with increased screen time among children and adolescents.

1.3 Sleep quality

Another issue that arises during the COVID-19 pandemic is poor sleep quality, which affects most of the people. According to Cheng et al. (2012) stated that sleep is a part of circadian rhythm which related to autonomous nervous systems functions that modulating hormone release, cardiovascular activity, and glucose regulation, which sleep quality have a major effect on morbidity. Sleep quality still lack exact definition, thus it can be defined in different form, which the simplest form is “how good or bad the sleep is”, or sleep quality is refer to the collective of sleep measures that involve sleep duration, sleep onset latency, efficiency of sleep and sleep disruptions (Ohayon et al., 2017). When come to assessing sleep quality, it often incorporates a self-rating that reflect the individual’s satisfaction with their sleep, which the most used is Pittsburgh Sleep Quality Index (PSQI) that examine on the subject’s past month sleep measure (Krystal and Edinger, 2008). As throughout our live we spend more than 30.0% of our time sleeping and our daily wear of major body system such as circulatory,

central nervous and respiratory system is repaired during sleep. So generally speaking, good quality of sleep is a predictor for the wellness of health and having a 7 to 8 hours sufficient restful sleep each night was undeniable a requirement for good health (Golem et al., 2014). Based on research by carried out by Kripke et al. (2002) reported that for those that sleep for less than 3.5 to 4.5 hours or more than 8.5 hours, both cause the risk of death to increase by more than 15.0%. While sleep problem is a common issue in modern society, it has a significant occurrence among university students because poor academic achievement has been found to associated with poor sleep quality. The poor sleep quality prevalence among university student conducted by Yang et al. (2003) have shown to range from 19.2% to 57.5%. In addition of the lockdown restriction cause by COVID-19, it has intensity fear, anxiety and stress level, then increase incidence for sleep problem and insomnia. Moreover, in cross sectional and longitudinal studies has shown that sleep quality to associated with diabetes, obesity and cardiovascular diseases, in which a prolonged deprivation of sleep led to decrease in the efficiency of immune system and increase risk for adverse syndrome (St-Onge, Mikic and Pietrolungo, 2016). Also, poor sleep quality is related to lifestyle behaviours including exercise and excessive internet use (Bixler, 2009).

The purpose of this study is to look at the association between screen time, physical activity, and sleep quality among male and female students at University Tunku Abdul Rahman (UTAR) during the COVID-19 Pandemic. The underlying hypothesis is that there is an association between screen time, physical activity and sleep quality among university students.

1.4 Problem statement

Although there has been research into screen time, physical activity, and sleep quality, the findings may only be applicable to people prior to the COVID-19 pandemic lockdown, and it may not be applicable to university students during the pandemic. As pandemic is still a recent and unpredictable situation for most people, a study focusing on this timespan could provide important information that reflect the lifestyles of individuals during such a period.

This study is conducted because there is lacking on studies that contribute to the growing literature highlighting the correlation between screen time, physical activity and sleep quality on health outcomes particularly among university students. In exploring the association between screen time, physical activity and sleep quality, some studies have found a link between screen time, physical activity, and sleep quality, others have found contradictory evidence, indicating that there is still insufficient evidence to investigate the effect of confinement on these three variables. Besides that, there is lacking studies in gender focus study for university students in these multiple variables, particularly lack of methodological comparability between male and female, moreover most of the relevant studies have relatively low representativeness of most sample. Through this study, we could understand to what extent are the changes of screen time, physical activity and sleep quality during this lengthy restrictions, and which variables is gender specific and its outcomes. Next, the available findings suggests that the impact of these three variables on different gender can range from physical to psychosocial condition with varying risks, therefore it require this present study that centralized on the association between

screen time, physical activity and sleep quality, which may explain the prevalence of diseases, causality or the consequences of long-term home confinement. Also, the recent findings on the prevalence of adverse health outcomes demonstrated the requirement for an ecological evaluation on the adverse effect of screen time, physical activity, and sleep quality.

One thing to note is the variation in different studies outcome could be due to the influence of different methodology, study areas and sociocultural norms in different population groups, vary in age group and gender. There is limited comparability between relevant studies due to different countries react to the pandemic with different policy measures that possibly affected the university students' screen time, physical activity and sleep quality. Different measures taken to response to the pandemic also produced different patchwork for many natural experiments that could provide a fascinating insight into how people behave when under long term restrictions. Another important aspect to investigate from the situation is to what extend the university students will modify their lifestyle behaviour, for example how will the university students change their organized physical activity to either self-determined physical activity or instead transfer it to screen time and other sedentary behaviours.

Therefore, this is the first study aim to determine within university students whether there is an relationship between screen time, physical activity level and sleep quality during transition to COVID-19 endemic in Malaysia, which have specific focus on possible gender effect. Moreover, this study will apply objective measurement to evaluate the physical activity and sleep quality

of university students. The limitation of other studies such as the researchers mostly focuses on the screen time on smartphone use, while this present study aims to includes various electronic devices such as television (TV), TV connected devices, computer/laptop, smartphone, and tablet. In addition, the screen time usage between weekday and weekend may vary due to having different daily schedule, thus the difference in average time for those days will be take in account for this study. The inclusion of screen time for wide variety of electronic gadgets and the average time of screen time might influence the result of this study. This study will investigate on large population of university students which would be more advantageous in generalizing the general lifestyle behaviour of university students during lockdown. As the collected response will be self-reported may lead to confirmation bias and respondent bias that affect the study outcomes, which the previous study result may either biased the result upward or biased the result downward, meaning the outcome might overestimate the true effect or underestimate the effect of lockdown respectively. Thus, the findings of this study will be interpreted with caution.

By examine the relationship between screen time, physical activity and sleep quality among university student, this study determines how these three variables can be affected by this lengthy restriction with the aim to develop a fundamental in establishing an appropriate recommendation or guidelines for healthy lifestyle and lifestyle modifications during such a period.

1.5 Study objective

1.5.1 General objective

To determine the relationship between screen time, physical activity and sleep quality among male and female students from UTAR during transition to COVID-19 endemic.

1.5.2 Specific objectives

1. To determine the screen time, physical activity level and sleep quality among male and female students from UTAR during transition to COVID-19 endemic.
2. To study the relationship between screen time and physical activity level among male and female students from UTAR during transition to COVID-19 endemic.
3. To study the relationship between screen time and sleep quality among male and female students from UTAR during transition to COVID-19 endemic.
4. To study the relationship between physical activity level and sleep quality among male and female students from UTAR during transition to COVID-19 endemic.
5. To compare the screen time, physical activity level and sleep quality among male and female students from UTAR during transition to COVID-19 endemic.

1.6 Research hypothesis

1. Female students from UTAR have higher screen time, lower physical activity level and lower sleep quality than male students during transition to COVID-19 endemic.
2. There is a significant relationship between screen time and physical activity level among male and female students from UTAR during transition to COVID-19 endemic.
3. There is a significant relationship between screen time and sleep quality among male and female students from UTAR during transition to COVID-19 endemic.
4. There is a significant relationship between physical activity level and sleep quality among male and female students from UTAR during transition to COVID-19 endemic.
5. There is a significant difference between the screen time, physical activity level and sleep quality among male and female students from UTAR during transition to COVID-19 endemic.

CHAPTER 2

LITERATURE REVIEW

2.1 Screen time among university students

Akulwar-Tajane et al. (2020) conducted a cross-sectional study which targeted university student in K.J. Somaiya College of Physiotherapy, Mumbair, India, the usage of any screen-based mobile device, including a phone, laptop, tablet, and television were reported by the individual in order to analyse their usage of digital device during lockdown. This study suggested that 94.7% participants had increased screen time during lockdown, in which 43.3% of participants use more than 6 hours on digital device daily. The screen time activities predominantly were 40.0% for entertainment, 34.0% for educational purpose while 30.6% for social networking and communication. This finding suggests that during the pandemic there was a drastic increase of screen time among university students, due to them staying at home, and their easy access to internet for entertainment and social networking purpose.

According to Majumdar, Biswas and Sahu (2020), they reported that during lockdown, in order to connect online for social networking, people increased reliance on various electronic gadgets, thus increased screen time. Before lockdown, students reported to spend 6.4 ± 2.9 hours per day duration of time on their laptop computer, the duration significantly increased to 8.2 ± 3.4 hours per day during the lockdown. Moreover, there is a drastic increase for usage of cell phone and television. If compare between different

electronic gadgets, cell phone use was the one increased significantly. The reason is that due to social distancing and isolation during lockdown, the situation has affected student's mental well-being, therefore students increased dependence on electronic devices to escape the loneliness. In addition, cell phone is more commonly used for online learning, social media updates, new feed checking and gossiping.

Akulwar-Tajane et al. (2020) suggested that high screen time negatively impacting one's sleep cycle and physical health, because 48.0% of the students had the opinion that sitting in front of screens for excessive hours had negatively affect their overall wellbeing. One or more health symptoms such as lack of concentration, tiredness, lack of energy, weight gain etc were mentioned by 87.3% of participants. This finding is supported by Madhav, Sherchand and Sherchan (2017) found a higher likelihood that people rank their health as "poor" was among individuals with low levels of physical exercise in combination with excessive screen time. Overall, several studies suggested that screen time had increased during lockdown, the reason due to reliance of university students on electronic device for entertainment, education and socialize purpose.

2.2 Screen time between gender

Hammoudi et al. (2021) carried out a study to estimate the phone screen time and its association with different aspects, they discovered that there was a significant difference between male and female students in the duration of screen time usage. The cut-off values of 6 hour and 7 hours of phone screen time were used to divide the result, which 7 hours of phone usage was identified as the

critical screen time. Based on the survey conducted by Wilkinson (2021) in United States suggested that during pandemic, the usage of smartphone increased up to 5.67 hours per day. By comparing between participants with screen time of group with <6 hours or <7 hours to group with ≥6 hours or ≥7, they discovered that the latter group had a greater ratio of female students and greater level of insomnia, bedtime procrastination, anxiety and depression than the former groups. Although there are no standardized guidelines on the phone use duration for adults, but this research showed that higher duration of phone use was related to higher level of insomnia, anxiety, depression and higher chance of having BMI of ≥25 kg/m^2 or overweight. Thus, they concluded that the critical screen time for adults should be 7 hours of phone use, which associated with higher risk for physical and mental health issues, however the best way is to limit the screen time as much as possible.

Qin et al. (2020) conducted a cross-sectional study to assess during home confinement how adult Chinese citizens in China have changes in daily routine. The result observed that during home quarantine, screen time more than 4 hours per day, more precisely 261.3 ± 189.8 minutes during home quarantine. If compare between age group, young adults aged 20 to 24 and 25 to 29 have the highest screen times. In addition, for adult aged range of 20 to 24 and 25 to 29 have longer screen time because popularity of video games and social platform that mostly draw this age group of adults. The increased in screen time without a doubt have led to the decline of physical activity level, which vigorous, moderate and light intensity of activity level were 226.7 ± 163.4 minutes, 251.4 ± 178.4 minutes and 277.7 ± 200.7 minutes respectively. It is said that screen

time is the key factor in evaluating the adult's health behaviours, as from this research observed that the Chinese adults have more than 4 hour per day screen time, they concluded that by having screen-based entertainment for 2 hour per day was related to higher prevalence for all-cause mortality by 48.0%, while 4 hour per day was associated up to 125.0% in the risk for cardiovascular diseases (Stamatakis et al., 2011).

This research suggested that female possibly have higher rate of screen time however there is still insufficient of concrete evidence. Also, it was suggested that screen time to be associated with various adverse health outcome such as type 2 diabetes, obesity and cardiovascular disease within young adults. So, the best strategy for young adults to cut down on screen time is to participate in physical activity.

2.3 Physical activity level among university students

A study by Ammar et al. (2020) aimed to assess how a prolonged restrictions can affect physical activity and eating behaviours. The International Physical Activity Questionnaire Short Form (IPAQ-SF) can assess the collected data into each item in such vigorous intensity, moderate intensity and walking in order to determine the total time engaged in physical activity per week. The preliminary data was collected from an online survey which compare physical activity (PA) before and during COVID-19 home confinement period. The research discovered that home confinement had a detrimental effect on all levels of physical activity, while daily sitting time increased by more than 28.0%. Theoretically speaking, there was still abundance physical activity guidance and

class available online so home quarantine should not prevent people from exercising. However, the findings still show a decrease in all physical activity level during confinement. This is because the restriction reduced access to physical activity facilities which cause the decline in participation and engagement in physical activity. These findings suggest that solely with home activities has not been adequate to maintain their normal physical activity. According to Akulwar-Tajane et al. (2020) they observed that during the lockdown, students that engage in physical exercises regularly at home for minimum 3 to 5 days a week was 65.3%. The students performed physical exercise such as 44.0% of aerobic exercises, 27.3% of yogasana, 23.4% of resistance training, 18.7% of pranayama and 2.6% of indoor walking. Next, Ammar et al. (2020) discovered the decreased in physical activity come along with increased in sitting activities. Meanwhile there was a 35.0% decline in the number of days per week walking, which is a reduction of 2.45 days, if compare with the number of walking days before confinement. Furthermore, because people spend more time staying in their home, this result in the sitting behaviour having the most drastic increased. Before COVID-19 pandemic, 24.0% of sample reported sitting for 6 to 8 hour a day, while during confinement, the percentage increased to 29.0%. While for sample who reported sitting for more than 8 hour a day, the percentage have shot up from 16.0% to 40.0%, when compare before and during confinement. These data suggested that 41.0% of sample increased 1 hour or less in their sitting behaviour, however more than 27.0% of the sample had increased by five hours. Patterson et al. (2018) concluded that sitting for 6 to 8 hour a day is a threshold value that result in increased risk for disease and mortality.

Bertrand et al. (2021) carried out a study on university students from 2 universities in the Province of Saskatchewan, Canada, in order to assess physical activity and sedentary behaviour of university students during COVID-19 which consider a week of physical activity and sedentary behaviour. This study examined on how COVID-19 confinement affect the dietary intake, physical activity, and sedentary behaviour of university student. The result validates the research's hypothesis in which there was a drastic increased in the sedentary behaviour, decreased in physical activity level, and adversely impacted the university student's nutrient and caloric intake during COVID-19 confinement. During the pandemic, the percentage of participants meeting the guidelines was 9.6%. 90.0% of participants that met the guidelines before the pandemic had become less active during pandemic, on the other hand 10.0% of them shown to be more physically active. Conversely, 55.0% of participants that did not meet the guidelines had become less active, while 45.0% became more active. In regard of the engagement in moderate to vigorous intensity physical activity (MVPA) in minutes per week had declined from 85 ± 58 minutes to 65 ± 53 minutes. The average amount of time engage in sedentary activity before pandemic was 8.3 ± 3 hours per day increased to 11 ± 4 hours per day during COVID-19. Before COVID-19 pandemic, there was 54.0% of the participants met the Canadian 24-Hour Movement Guidelines for Adults for sedentary behaviour, which is 8 hours or less per day. Then during the pandemic only 30.0% met the guidelines. This research outcome can be explained that as according to the Government of Saskatchewan, the province of Saskatchewan had implemented extremely strict measures in response to the COVID-19 during the months of April and May 2020. Thus, the level of physical activity declined as

the result of closure of gym and other recreational facilities by government, university, and private sectors. Another explanation is the transition from face-to-face learning to remote learning by Universities of Saskatchewan and Regina, so students no longer actively commuting to school. In short, these findings demonstrated the decrease in physical activity and the increase of sedentary lifestyle during COVID-19 because of home confinement.

2.4 Physical activity level between gender

According to Hammoudi et al. (2021) there is a possibility that there are sex-specific differences in term of physical activity, as it was discovered that male students engaged in more vigorous physical exercise than female students. However, this finding is not appropriate to take as evidence for the difference in physical activity between gender due to the highly disproportionate gender which among the participants, 18.8% were male and 81.2% were female.

Bertrand et al. (2021) discovered that for the minutes per week spend in MVPA had significantly affect by sex of participants. If compare with male, females use more time carried out MVPA. The amount of time spends engaging in MVPA for both female and male declined from 89.4 ± 70 minutes per week to 73.3 ± 55.3 minutes per week and from 72.5 ± 62.5 minutes per week to 40.5 ± 35.7 minutes per week respectively. By comparing the physical activity between sex, they concluded that females had higher physical activity level before and during COVID-19 pandemic, however this finding contradict with previous study in literature which suggest males are more active than females (Colley et al. 2011). The outcome of the result contradict with previous study

could be explained due to the sample having imbalance ratio of males to females, with 76.0% of women in the sample. Other possible interpretation is that females were more likely to engage in physical activity during university enrolment because that is the time where body weight is likely to increase, and female tend to get motivation induce by peer pressure thus have the urge to lose weight or weight maintenance. Hence, the results outcome was inconsistent and unable to determine which gender have greater physical activity level during lockdown period, which could be due to low representative sample.

2.5 Sleep quality among university students

Shrestha et al. (2021) conducted a cross-sectional study among undergraduate medical students at Nepalese Army Institute of Health Sciences, Kathmandu, Nepal, in order to examine the effect of COVID-19 pandemic on the sleep quality of medical students. The data is collected by using Pittsburgh Sleep Quality Index (PSQI) to obtain questions concerning participants' sleep habits and quality during the previous months and the questions consist of seven components which are sleep latency, subjective sleep quality, sleep efficiency, sleep duration, sleep disturbance, daytime dysfunction and use of sleeping medications. The questionnaire was distributed via online using Google form. After analysing the data, they discovered poor quality of sleep was experienced by 30.4% of medical students, however prior to the pandemic, a study conducted on the Nepalese medical students had 44.2% of students having poor sleep quality (Sundas et al., 2020). Another study's result aligns with this study which it revealed that during COVID-19 pandemic, 34.6% of medical students with poor sleep quality in India (Saraswathi et al., 2020). These findings could be

explained by referring to Zhou et al. (2020) which also showed that among adolescents and young adult students had high prevalence of sleep disorders because pandemic cause the experience of extreme stress and anxiety.

In contrast, another study conducted in Nepalese general population and health care workers had revealed that because of pandemic, the medical students in Nepal had a low level of psychological distress, thus they had better sleep quality (Shrestha et al., 2020). When compared to research on Saudi Arabian physician showed that 24.7% of participants having difficulty falling asleep within 30 minutes three time or more in a week, compared with Alnofaiey et al. (2020) with 14.3% participant. Besides that, if compared with second-year student, fourth-year students were found to be less likely to experience poor sleep quality, the explanation may be due to fourth year students have greater exposures during higher academic classes and more academic experience, thus have better stress management. On the other hand, a study in China contradicts the result as it suggests that the senior high school students experience greater academic burden leading to more sleeping problems, if compared with junior high students (Zhou et al., 2020). The variation between different research outcome could be due to different study sites, sociocultural norm, study methodology and academic demands within demographic group.

Another cross-sectional study conducted by Mishra et al. (2022) which use Pittsburgh Sleep Quality Index (PSQI) questionnaire to investigate sleep quality and mental health status of students, the findings showed that during COVID-19 lockdown period, 45.0% of undergraduate medical students enrolled

in Kalinga Institute of Medical Science, KIIT University, Bhubaneswar had experience poor sleep quality. Another study by Sundas et al. (2020) observed a consistent result, which poor sleep quality were experienced by 44.0% of Lathmandu medical college students. While a study by Saguem et al. (2022) found a much higher percentage of medical students had poor sleep quality which was 72.5%. In term of other PSQI element for this study, the most common was sleep disturbance with 85.2%, followed by 73.2% for daytime dysfunction, 42.6% for longer sleep latency and 14.8% for use of sleep medication. Overall, these studies found that stress and academic burden has cause more university students to experienced poor sleep quality during COVID-19.

2.6 Sleep quality between gender

Shrestha et al. (2021) found that poor sleep quality was more prevalent among female students. The same result observed in a study by Surani et al. (2015) observed that more female Pakistani medical student had poor sleep quality than male, which 44.0% poor sleeper for female while 32.8% for male. Similarly, based on research conducted in Saudi Arabia during COVID-19 pandemic, Goweda et al. (2021) discovered that sleep disorders were more common in female medical students. The possible explanation for women experiences poor sleep quality than men was due to more occurrence of sleep disorders symptoms. Thus, we should have greater emphasis on programs that enhance the sleep quality of female among medical students. Thus, these studies reported that if compare with male, female more likely to experience poor sleep quality.

2.7 Relationship between screen time, physical activity level and sleep quality

Abid et al. (2021) conducted a cross sectional study that designed to determine how movement restriction affect sleep quality, technology use and physical activity among Tunisian boys and girls within the age range of 5 to 12 years. The main finding indicated that particularly for girl, home confinement had reduced their sleep quality. During the confinement, the physical activity level had decreased, and screen time had increased for Tunisian children. Tunisian children during confinement have adversely affect their sleep leading to higher PSQI score which indicate poorer sleep. Refer to research by Cellini et al. (2020), due to long term of home confinement, poor sleep quality was associated to greater level of anxiety, depression, and stress. The result of this study indicated that during confinement, boys have better sleep quality than girls, in another word, this study concluded that girl experienced more sleep problems and poorer sleep quality. Baker, Yűksel and Zambotti (2020) suggested that the gender differences in sleep outcomes could be due to the the influence of hormonal changes. Based on the European Academy for Cognitive Behavioral Therapy for Insomnia stated that home confinement has result in extreme stressful situation for an unknown duration, which cause greater level of stress and anxiety, it also affects sleep quality (Baglioni et al., 2019). Other factors associated to sleep disruption as such reduce sunlight exposure, decline in physical activity and more psychological distress (Sinha, Pande and Sinha, 2020). Thus, these findings should be considered while advocating for child-friendly lifestyle choices during and after confinement.

Moreover, this study observed a rise in screen time of Tunisian children on both daytime and night-time digital media usage. It is observed that during confinement, girls have the higher usage of digital devices than boys. Meanwhile, contradictory findings were found in numerous research that examined gender-related differences in the usage of screen-based technology. For instance, Jago et al. (2014) showed that boys utilize more screen time than girls. While majority of previous studies on this matter demonstrated a mixed result, which a study by Barnett et al. (2010) observed that boys spend more time on computer and internet, while girls use more time on television and video games. These findings suggest that similar research could be conducted to determine the influence of children's preferences. Also, in this present study showed that higher digital media use at night result in sleep distribution of children, which explained by Expert from the National Institute for Sleep and Vigilance that it could be due to digital technologies disrupt circadian phase and cause sleep deterioration (LeBourgeois et al., 2017).

Due to closure of school and accompany with home confinement, the present study observed that children become more inactive, in which can lead to detrimental effect on the physical and psychological health of children. As during the lockdown, there was restriction on opportunities for movements such as physical activity classes or any sort of leisure outdoor activity. Similarly, a study on Chinese children reported a decrease of 2.3 hour per week of sport activities and 435 minutes per week of physical activity. Also, it is found that the closure of school during weekends and summer vacation had lead to weight gain, and this weight gain had been associated with irregular sleep schedules,

decrease in physical activity and increase duration for digital media use (Xiang, Zhang and Kuwahara, 2020). This finding was backed up by Wang et al. (2019) that explored on the school break time frame, such as weekends and summer vacations, and it showed weight gain is associated to decrease of physical activity, inconsistent sleep patterns and increase time spent using digital media.

This research concluded that for both genders, there were decline in physical activity which followed by greater PSQI score, in another word, decrease in physical activity led to poorer sleep quality. Due to movement restriction, the reduce in physical activity and increase screen time had increased the likelihood of sleep disturbances. Thus, during home confinement it is advised to increase physical activity level and decrease sedentary habits, to improve their quality of sleep. These research outcomes found that there is an association between screen time, physical activity and sleep quality.

2.8 Relationship between screen time and physical activity level

Research by Fobian, Avis and Schwebel (2016) suggested that the association between physical activity and screen time is complicated and inconsistent due to influence of smartphone use, sleep patterns or other sedentary behaviours. The research concluded that screen time negatively affected sleep quality while physical activity improves sleep quality. Further research is necessary to examine the benefits of various types of exercise interventions. Next, Qin et al. (2020) observed that if the participants engage in vigorous physical activity, they will be very likely to use less screen time. This result was supported by a previous study conducted by Celis-Morales et al. (2018) stated that participants

with high screen time are relatively associated with physical inactivity, moreover, high level of fitness can prevent from the adverse effects of excessive screen time such as mortality, cardiovascular disease and cancer risk. In short, increase in screen time exposure lead to low level of physical activity.

2.9 Relationship between screen time and sleep quality

Majumdar, Biswas and Sahu (2020) discovered a negative association between increased cell phone usage with sleep duration. Excessive screen time had a negative impact on health, which significantly reducing the duration and quality of sleep. The explanation as refer to research carried out by Calvo and Tapia-Ayuga (2020), when using the device at night, blue light from the screens had appear to suppresses melatonin production, which melatonin responsible in sleep induction. Another research that supported this explanation is conducted by Vallance et al. (2015), they suggested that for both adults and children, exposure to blue light before bed time is related to decreased in sleep duration and sleep inefficiency. The research concluded that screen time increased significantly during pandemic, meanwhile it also affects physical activity, thus poor physical health and poor sleep quality.

Mishra et al. (2022) reported that students who have higher screen time duration are associated with poor sleep quality. As study by Natarajan et al. (2020) also demonstrated a significant association between increased screen time duration and poor sleep quality. The explanation is by the concept of displacement of time, meaning as more time spent on screen time, less time is less for other activities such as physical activity that could possibly improve

sleep quality. Also, the arousal induced by electronic devices lead to sleeping difficulty, as mentioned the blue light emitted from electronic gadgets supress the melatonin production, thus reduce the feeling of sleepiness. In general, there was found that screen time adversely associated with sleep quality, which higher screen time led to poorer sleep quality.

2.10 Relationship between physical activity level and sleep quality

Mishra et al. (2022) observed that student who less participate in exercise which are less than 3 days in a week, they have the 1.8 times odds of experiencing poor sleep quality than students who exercise as frequent as more than 3 days in a week. Studies by Chennaoui et al. (2015) demonstrated that there is a complex interaction between physical activity and sleep as it involved physiological and psychological pathways. Overall, this study suggested that there is an association between physical activity and sleep quality.

2.11 Factor affecting screen time, physical activity level and sleep quality

As mentioned above there were several studies showed that screen time, physical activity and sleep quality affected one of another. However, let us dive into factor that influenced each of the variables. Factor that affects screen time during the pandemic induced lockdown, is that university students turned to social platform or video conferencing tool, as it was the best way to communicate and connect with people while stay isolated from close contact. Moreover, the transition of conventional face to face lectures to virtual classroom, also assignment and examination was conducted via online to allow an effective teaching and learning process. Thus, for university student to maintain academic continuity,

they have no choice but to adopt the sedentary high screen time behaviour (Tan, Tan and Tan, 2022). Indirectly, increase in screen time from digital social interactions had both positive and negative association with well-being of an individual. Pandya and Lodha (2021) showed that people more frequently used digital and social media are happier than those who never use internet at all more likely to be least happy. On the other hand, student may experience more stress due to doing assignment or checking email and getting distracted by digital message. As students' dependence on electronic device in order to build and sustain relationship, but for a prolonged period it may lead to them feeling qualitatively lonely.

Factor that leads to low physical activity among university students was the increase of sedentary activities and time restriction. As the learning method change to virtual classroom, the students will need to sit in front of their laptop during the virtual class, also when their completing their assignment, in which increase their sitting time. During lockdown, the sport or recreational place have been shut down, there is no opportunity for students to engage in outdoor physical activity, student no longer actively commuting bus or walking to school. Although online physical activity lesson is available, university students usually have been overloaded by assignment and revision and distracted by online activity causing insufficient of time for any physical activity (Bertrand et al., 2021).

Factor that affects sleep quality as refer to Romero-Blanco et al. (2020) stated that during pandemic, student being under an immense pressure to

perform well academically, relationship difficulties, feeling of loneliness, uncertainty about their future and fear of infection make them vulnerable to mental health problem. They may experience anxiety, depression, and mood disorders, which this mental issue affected students' sleeping patterns. Thus, students may encounter more insomnia symptoms or spend more time in bed, have short sleep duration etc.

CHAPTER 3

MATERIALS AND METHODOLOGY

3.1 Research design

The study design of this research is observation study, which is categorized into descriptive study. The research design is cross-sectional study which is carried out through online questionnaire via Google form.

3.2 Study location

This study was conducted at UTAR Kampar Campus and Sungai Long Campus. The data collection was started from 1 December 2022 to 9 December 2022 through online questionnaire via Google form.

3.3 Study population

For this study, the target population is the university students of both gender from different faculties and courses at University Tunku Abdul Rahman (UTAR). The target sample of this study has included students from both Kampar campus and Sungai Long campus.

3.4 Sampling method

The sampling design of this study is non-probability sampling, more particularly convenience sampling which the samples are chosen by availability group of respondents, thus bring advantage of resources and time. This is because there is a limited short timespan to complete this research and this sampling method

allow easier access to targeted population and economically inexpensive, thus is useful in these small scaled studies.

3.5 Inclusion criteria

All the subjects must be students who enrolled fulltime at University Tunku Abdul Rahman (UTAR), either student from foundation and undergraduate are included to be respondent. The age group between 18 years to 30 years, the subject should be literate enough to understand the questionnaire, mentally stable, non-smokers and without any chronic disease or medical condition and no regular intake of medications that could induce changes in study variables (ex. antidepressant, opioids). Subject gave their consent to participate in this study.

3.6 Exclusion criteria

Subjects being a smoker, suffering from any chronic disease such as diabetes, hypertension, mental illness, asthma and other systemic diseases, and subjects with regular intake of medicine were excluded in this study. Subject which undergoes specialized diet such as attending weight management programme, pregnant or have disability, undergoes any diet related surgery. Subject that declined to participate in the study also were excluded. With a defined inclusion and exclusion criteria, we can narrow down the target groups into a high-threshold strategy. Thus, we can expect a data collection from a representative sample that allow a better generalization on university students.

3.7 Sample size calculation

The minimum sample size will be 379. The sample size of this study is determined and calculated by using Cochran's sample size formula (1963) for finite population as stated below:

$$Sample\ size = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N}\right)}$$

$$Sample\ size = \frac{\frac{1.96^2 \times 0.5(1-0.5)}{0.05^2}}{1 + \left(\frac{1.96^2 \times 0.5(1-0.5)}{0.05^2 \times 26000}\right)} = 378.57 \approx 379$$

z = z-score

N = population size

e = margin of error

p = population proportion

The inputs of this equation are:

z-score = 1.96 (95% confidence interval with ±5% precision),

N = 26000 (Total number of students from UTAR Kampar Campus),

e = 0.05 (5%)

p = 0.5

3.8 Data collection

The data collection was carried out by distributing the questionnaire via online tool, Google form, and the link was shared to target population via snowball technique. Internet-mediated questionnaire is used due to it being cost-effective, allow fast analysis, easier to use by researcher and subject, also it allows more

accurate and faster data collection. The participation of subject in the study was completely voluntary.

There are a total of 4 sections will be included in the questionnaire which listed below.

Section A: Sociodemographic Data

Section B: International Physical Activity (IPAQ) Questionnaire

Section C: Screen time Questionnaire

Section D: Pittsburgh Sleep Quality Index (PSQI)

3.8.1 Sociodemographic data

The subject's sociodemographic data such as sex, age, weight, height and courses of study will collect in the first part of the questionnaire.

3.8.2 International Physical Activity (IPAQ) Questionnaire

Physical activity will be evaluated by using International Physical Activity (IPAQ) questionnaire, specifically the IPAQ short "last 7 days" which has been used an instrument to monitor physical activity and inactivity. IPAQ short "last 7 days" is recommended because there is no difference in reliability and validity between short and long IPAQ form, while long form provide more detail on physical activity, short form is more feasible to administer which more suitable for this study. The IPAQ short form which excluded questions related to walking and pace of bicycling, while included sitting time. IPAQ has been validated by Craig et al. (2003) in a study that examine the physical activity level of the subject while take in the measure on the intensity of exercise and sitting time during their daily lives. The IPAQ short form consist of 7 questions focus on the

past 7 days on their duration and frequency of physical activity which categorized into three types of as such walking (W), moderate-intensity activities (M) and vigorous-intensity activities (V). Several options will be provided for each question and the subjects should choose the most relevant answer, then the collected score will be calculated by using the Metabolic Equivalent of Task (MET) values as shown below, which the MET value allow the categorisation of low, moderate and high physical activity level.

Walking MET-minutes/week = 3.3* walking minutes*walking days

Moderate MET-minutes/week = 4.0*moderate-intensity activity minutes*moderate days

Vigorous MET-minutes/week = 8.0*vigorous-intensity activity minutes*vigorous-intensity days

Combined total physical activity MET-min/week = Walking + Moderate + Vigorous MET-min/week scores.

Based on MET value, the categorisation of activity level as shown below:

Table 3.1: Classification of physical activity level

Physical Activity Level	Requirements
Low	• No activity is reported **OR** • The activity is reported but not enough to meet the criteria of Moderate and High physical activity level
Moderate	Any one of the following 3 criteria: • 3 or more days of vigorous activity for at least 20 minutes per day **OR** • 5 or more days of moderate-intensity activity or walking for at least 30 minutes per day

Table 3.1 continued

Physical Activity Level	Requirements
	OR 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities which reach a minimum for at least 600 MET-min/week
High	Any one the following criteria: • Vigorous-intensity activity for at least 3 days and accumulating at least 1500 MET-minutes/week **OR** • 7 or more days of any combination of walking, moderate-intensity or vigorous intensity activities which achieve a minimum for at least 3000 MET-minutes/week

3.8.3 Screen Time Questionnaire

Screen time will be measured by using Screen Time Questionnaire (STQ), this 18-item screen time questionnaire was validated by Vizcaino et al. (2019). In order to assess the subject's screen time before and after COVID-19, they will be asked to complete the questionnaire for "before COVID-19" and "after COVID-19", while consider the average screen time usage of each weekday and weekend for before and after the pandemic. This study examined on how COVID-19 confinement cause changes in the screen time of subjects. This questionnaire consists of five categories of devices, which are television (TV), TV connected devices (e.g., Video games console, streaming devices), computer/laptop, smartphone, and tablet. These categories can quantify the usage of different form of screen-based devices among university students. The subjects will be instructed to estimate the total time spend for each device in hours and minutes, further the total time is quantified into minutes. As screen time usage vary during weekday and weekend, therefore screen use during weekday, weeknight, and weekend (Saturday or Sunday) are asked in separate questions. Moreover, screen time usage

when engaging in physical activity is excluded, because sedentary behaviour negatively effects physical health consequently health outcomes, the questionnaire was split into two section which are “Primary activity” indicate that screen use is the main activity and “Background use” defined as “the use of a television or another screen near you while performing other activities”. The participants can be categories based on total screen time into three different screen time. Those who in the lowest median of screen use were categorized as “light user”, those in middle median were categorized as “moderate user” and those in the highest median were categorized as “heavy user”.

3.8.4 Pittsburgh Sleep Quality Index (PSQI)

The last section will assess on the sleep quality by using Pittsburgh Sleep Quality Index (PSQI) which were validated by Wang et al. (2022) to determine sleep disorder among the frontline health care workers fighting against COVID-19 pandemic. PSQI evaluate the sleep quality during the previous one month which able to rule out majority of temporary or persistent sleeping problems. The PSQI included 19 self-rated questions which analyse on many different factors relating to sleep quality, which included the estimation for sleep duration and latency and of its frequency and the severity of sleep-related problems. These 19 items then yield into seven component scores which are subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunction, which each weighted equally on a 0 to 3 scale. For all seven components, a score of “0” indicates no difficulty, while a score of “3” indicate severe difficulty.

The scoring for each seven components as follows:

i. **Component 1: Subjective sleep quality**

Refer to question 6, assign component 1 scores as follows:

Table 3.2: Component 1 (Subjective sleep quality)

Response	**Score**
"Very good"	0
"Fairly good"	1
"Fairly bad"	2
"Very bad"	3

ii. **Component 2: Subjective latency**

Refer to question 2, assign scores as follows:

Table 3.3: Component 2 (Subjective latency)

Response	**Score**
15 or less minutes	0
16 to 30 minutes	1
31 to 60 minutes	2
More than 60 minutes	3

Refer to question 5a, and assign scores as follow:

Table 3.4: Component 2 (Subjective latency)

Response	**Score**
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

Sum up the score from question 2 and 5a, assign component 2 score as below:

Table 3.5: Component 2 (Subjective latency)

Sum of question 2 and 5a	**Score**
0	0
1-2	1
3-4	2
5-6	3

iii. **Component 3: Sleep duration**

Refer to question 4, and assign component 3 score as follows:

Table 3.6: Component 3 (Sleep duration)

Response	Score
More than 7 hours	0
6-7 hours	1
5-6 hours	2
Less than 5 hours	3

iv. **Component 4: Habitual sleep efficiency:**

1. Obtain the number of hours slept from question 4
2. Calculate the number of hours spent in bed as follows:

   Getting up time (from question 3) – bedtime (from question 1) = Number of hours spent in bed
3. Calculate habitual sleep efficiency as follows:

   (Number of hours slept/Number of hours spent in bed) x 100 = Habitual sleep efficiency (%)
4. Assign component 4 score as follows:

   Table 3.7: Component 4 (Habitual sleep efficiency)

Habitual sleep efficiency (%)	Score
More than 85%	0
75-84%	1
65-74%	2
Less than 65%	3

v. **Component 5: Sleep disturbances**

1. Refer to question 5b to 5j, and assign score for each question as follows:

   Table 3.8: Component 5 (Sleep disturbances)

Response	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

2. Add up the scores from questions 5b to 5j

3. Assign component 5 score as follows:

Table 3.9: Component 5 (Sleep disturbances)

Sum of question 2 and 5a	Score
0	0
1-9	1
10-18	2
19-27	3

vi. **Component 6: Use of sleeping medication**

Refer to question 7, and assign component 6 score as follows:

Table 3.10: Component 6 (Use of sleeping medication)

Response	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

vii. **Component 7: Daytime dysfunction**

1. Refer to question 8, and assign score as follows:

Table 3.11: Component 7 (Daytime dysfunction)

Response	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

2. Refer to question 9, and assign score as follows:

Table 3.12: Component 7 (Daytime dysfunction)

Response	Score
No problem at all	0
Only a very slight problem	1
Somewhat of a problem	2
Avery big problem	3

3. Add the score from question 8 and 9

4. Assign component 7 score as follows:

Table 3.13: Component 7 (Daytime dysfunction)

Sum of question 8 and 9	Score
0	0
1-2	1
3-4	2
5-6	3

viii. **Global PSQI Score**

Add the seven components score

The sum of the seven components scores then obtain a global PSQI score that range from 0 to 21, which "0" indicates no difficulty, while "21" indicates severe difficulties in all components, thus with higher scores meaning worse sleep quality. The global PSQI score of 0 to 4 indicate a normal sleep quality, while scores 5 or greater indicate a poor sleep quality, which the subjects has at least two components have severe difficulties, or more than three components in which they have moderate difficulties (Buysse et al., 1989).

3.9 Data entry and statistical analysis

The collected data in this study was analysed using IBM Statistical Package for the Social Science (SPSS) Software Version 26. The collected data were presented in mean and standard deviation (SD), the *p* value less than 0.05 was considered as statistically significant. The physical activity level, screen time and sleep quality status were represented by IPAQ score, mean screen time of weekday and weekend and Global PSQI score respectively which were depicted with descriptive analysis that consist of mean and standard deviation that illustrated in the form of histogram.

3.9.1 Pearson and Spearman correlation test

Pearson correlation test and Spearman correlation test was used to investigate the correlation between two numerical variables. Before conducting the correlation test, normality of the data was determined, if the data is normally distributed, parametric test which is Pearson correlation test is used. On the other hand, if the data was not normally distributed, spearman correlation test which is a non-parametric test was applied to measure the correlation between physical activity level and screen time, physical activity level and sleep quality status as well as screen time and sleep quality status.

3.9.2 Mann Whitney Test

Mann Whitney test was applied to examine whether there is a significant difference between two independent groups. This test was applied to compare the differences in the mean IPAQ score, mean screen time of weekday and weekend and Global PSQI score between male and female respondents.

3.10 Ethical approval

The ethical approval of this study had been approved by UTAR Scientific and Ethical Review Committee, in short SERC in 2023.

CHAPTER 4

RESULTS

4.1 Sociodemographic data

4.1.1 Gender

In this present study there was a total of 482 respondents which included 228 male (47.3%) and 254 female (52.7%) as shown in Table 4.1 and Figure 4.1.

Table 4.1: Frequency and percentage analysis for gender

Gender	Number of Respondents (n)	Percentage (%)
Male	228	47.3%
Female	254	52.7%

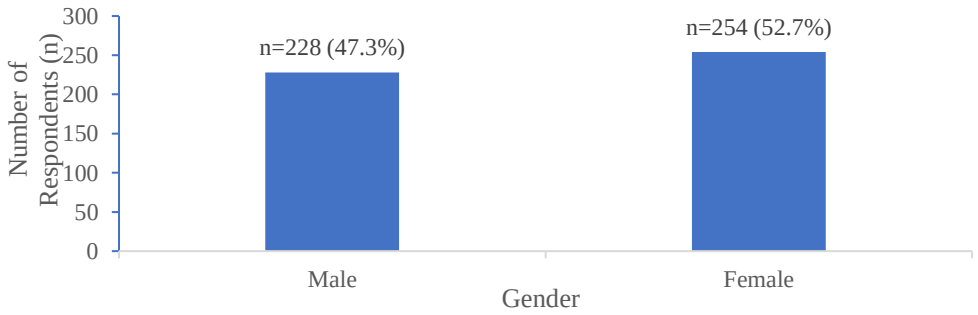

Figure 4.1: Number of respondents according to gender

4.1.2 Age group

Among 482 respondents in this study, majority of the respondents (255) of them were within the age group of 18 to 20 years old with a percentage of 52.9%. Age group of 21 to 23 years old contributed to 44.6% with the frequency of 215, followed by the age group of 24 to 26 years old and 27 to 29 years old

contributed to 2.3% and 0.2% with frequency of 11 and 1 respondents respectively as shown in Table 4.2 and Figure 4.2.

Table 4.2: Frequency and percentage analysis for age group of respondents

Age Group	Number of Respondents (n)	Percentage (%)
18 – 20	255	52.9
21 – 23	215	44.6
24 – 26	11	2.3
27 - 29	1	0.2

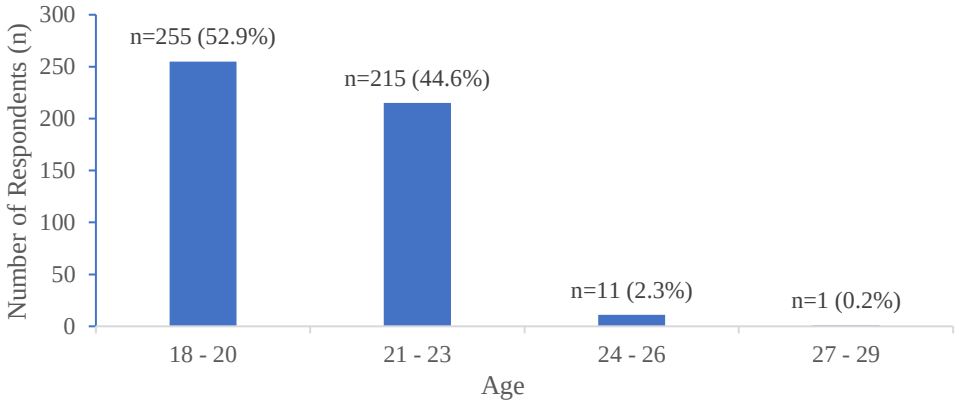

Figure 4.2: Number of respondents according to age group

4.1.3 Faculty and course of study

Majority of the respondents of this study is from Faculty of Science (21.2%), Lee Kong Chian Faculty of Engineering and Science (20.3%) and Faculty of Business and Finance (18.3%). While majority of them is from Bachelor of Science (Honours) Dietetics (12.7%) as shown in Table 4.3.

Table 4.3: Frequency and percentage analysis for faculty and course of study

Faculty	**Frequency**	**Percentage (%)**
M. Kandiah Faculty of Medicine and Health Sciences	10	2.1
Bachelor of Medicine and Bachelor of Surgery	3	0.6
Bachelor of Nursing (Honours)	2	0.4
Bachelor of Physiotherapy (Honours)	5	1.0

Table 4.3 continued

Faculty	Frequency	Percentage (%)
Centre for Foundation Studies	22	4.6
Foundation in Arts	15	3.1
Foundation in Science	7	1.5
Lee Kong Chian Faculty of Engineering and Science	98	20.3
Bachelor of Biomedical Engineering with Honours	4	0.8
Bachelor of Science (Honours) Applied Mathematics with Computing	2	0.4
Bachelor of Science (Honours) Architecture	1	0.2
Bachelor of Science (Honours) Quantity Surveying	7	1.5
Bachelor of Engineering (Honours) Electronics (Computer Networking)	1	0.2
Bachelor of Telecommunications Engineering with Honours	1	0.2
Bachelor of Chemical Engineering with Honours	11	2.3
Bachelor of Civil Engineering with Honours	7	1.5
Bachelor of Electrical and Electronic Engineering with Honours	10	2.1
Bachelor of Materials Engineering with Honours	2	0.4
Bachelor of Mechanical Engineering with Honours	8	1.7
Bachelor of Mechatronics Engineering with Honours	12	2.5
Bachelor of Science (Honours) Software Engineering	15	3.1
Bachelor of Science (Honours) Actuarial Science	17	3.5
Faculty of Engineering and Green Technology	21	4.4
Bachelor of Science (Honours) Construction Management	2	0.4
Bachelor of Engineering (Honours) Electronic Engineering	10	2.1
Bachelor of Engineering (Honours) Environmental Engineering	4	0.8
Bachelor of Science (Honours) Environmental, Occupational Safety and Health	1	0.2
Bachelor of Engineering (Honours) Industrial Engineering	3	0.6
Bachelor of Engineering (Honours) Petrochemical Engineering	1	0.2

Table 4.3 continued

Faculty	Frequency	Percentage (%)
Faculty of Information and Communication Technology	62	12.9
Bachelor of Computer Science (Honours)	37	7.7
Bachelor of Information Systems (Honours) Business Information Systems	2	0.4
Bachelor of Information Systems (Honours) Information Systems Engineering	5	1.0
Bachelor of Information Technology (Honours) Computer Engineering	3	0.6
Bachelor of Information Technology (Honours) Communications and Networking	12	2.5
Bachelor of Information Systems (Honours) Digital Economy Technology	3	0.6
Faculty of Science	102	21.2
Bachelor of Science (Honours) Food Science	7	1.5
Bachelor of Science (Honours) Biomedical Science	18	3.7
Bachelor of Science (Honours) Dietetics	61	12.7
Bachelor of Science (Honours) Biotechnology	4	0.8
Bachelor of Science (Honours) Biochemistry	1	0.2
Bachelor of Science (Honours) Logistics and International Shipping	7	1.5
Bachelor of Science (Honours) Statistical Computing and Operations Research	4	0.8
Faculty of Accountancy and Management	25	5.2
Bachelor of Accounting (Honours)	14	2.9
Bachelor of Economics (Honours) Global Economics	1	0.2
Bachelor of International Business (Honours)	6	1.2
Bachelor of Building and Property Management (Honours)	3	0.6
Bachelor of Finance (Financial Technology) with Honours	1	0.2
Faculty of Business and Finance	88	18.3
Bachelor of Commerce (Honours) Accounting	20	4.1
Bachelor of Business Administration (Honours) Risk Management	1	0.2
Bachelor of Business Administration (Honours)	18	3.7
Bachelor of Business Administration (Honours) Banking and Finance	11	2.3
Bachelor of Business Administration (Honours) Entrepreneurship	3	0.6

Table 4.3 continued

Faculty	Frequency	Percentage (%)
Bachelor of Economics (Honours) Financial Economics	8	1.7
Bachelor of Finance (Honours)	14	2.9
Bachelor of Marketing (Honours)	9	1.9
Bachelor of Business Administration (Honours) Retail Management	2	0.4
Bachelor of Business Administration (Honours) in Logistics and Supply Chain Management	2	0.4
Faculty of Arts and Social Science	34	7.1
Bachelor of Arts (Honours) English Education	1	0.2
Bachelor of Arts (Honours) English Language	3	0.6
Bachelor of Communication (Honours) Advertising	2	0.4
Bachelor of Communication (Honours) Public Relations	6	1.2
Bachelor of Social Science (Honours) Psychology	19	3.9
Bachelor of Social Science (Honours) Guidance & Counseling	3	0.6
Faculty of Creative Industries	20	4.1
Bachelor of Communication (Honours) Broadcasting	3	0.6
Bachelor of Arts (Honours) Graphic Design and Multimedia	4	0.8
Bachelor of Corporate Communication (Honours)	3	0.6
Bachelor of Arts (Honours) Game Design	2	0.4
Bachelor of Early Childhood Education (Honours)	4	0.8
Bachelor of Arts (Honours) Digital Animation	2	0.4
Bachelor of Science (Honours) Game Development	2	0.4

4.2 Screen time

The mean of weekday and weekend primary screen use of respondents in this study for television, TV-connected devices, laptop/computer, smartphone and tablet as shown in Table 4.4.

Table 4.4: Mean and standard deviation analysis for primary screen use of each device in weekday, weeknight and weekend of respondents

Primary Screen Time	Weekday Mean (SD)	Weeknight Mean (SD)	Weekend Mean (SD)	Weekday and weekend Mean (SD)
Television	17.50 (59.695)	9.74 (29.239)	27.38 (66.602)	22.44 (54.876)
TV-connected devices	21.69 (68.669)	15.37 (61.395)	22.81 (73.135)	22.25 (63.911)
Laptop/computer	295.15 (169.017)	146.93 (124.613)	265.49 (183.084)	280.32 (150.309)
Smartphone	290.27 (163.748)	179.06 (122.711)	333.62 (184.923)	311.95 (153.268)
Tablet	68.44 (119.673)	35.39 (68.765)	66.30 (120.671)	67.37 (112.811)
Total	693.06 (300.944)	386.48 (250.210)	715.59 (314.496)	704.33 (271.248)

The mean of weekday and weekend background screen use of respondents was 185.24 ± 181.448 minutes as shown in Table 4.5.

Table 4.5: Mean and standard deviation analysis for background screen use of each device in weekday, weeknight and weekend of respondents

	Weekday Mean (SD)	Weeknight Mean (SD)	Weekend Mean (SD)	Weekday and weekend Mean (SD)
Background screen time	180.90 (197.719)	103.99 (118.482)	190.34 (192.070)	185.24 (181.448)

The primary screen use of male respondents for television, TV-connected devices, laptop/computer, smartphone and tablet throughout weekday, weeknight and weekend as shown in Table 4.6.

Table 4.6: Mean and standard deviation analysis for primary screen use of each device in weekday, weeknight and weekend of male respondents

Primary Screen Use	Weekday	Weeknight	Weekend	Mean of weekday and weekend
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Television	15.18 (49.230)	8.02 (26.263)	24.08 (63.286)	19.63 (49.117)
TV-connected devices	24.25 (68.488)	18.73 (72.500)	27.76 (76.023)	26.01 (65.307)
Laptop/computer	301.19 (163.952)	153.67 (126.213)	302.85 (187.610)	302.02 (152.387)
Smartphone	271.60 (155.820)	156.88 (112.945)	330.57 (186.748)	301.08 (151.583)
Tablet	55.26 (109.115)	28.46 (64.609)	50.55 (107.198)	52.91 (101.465)
Total	667.4914 (285.319)	365.77 (255.695)	735.80 (326.785)	701.65 (273.175)

The primary screen use of female respondents for television, TV-connected devices, laptop/computer, smartphone and tablet throughout weekday, weeknight and weekend as shown in Table 4.7.

Table 4.7: Mean and standard deviation analysis for primary screen use of each device in weekday, weeknight and weekend of female respondents

Primary Screen Use	Weekday	Weeknight	Weekend	Mean of weekday and weekend
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Television	19.59 (67.757)	11.17 (31.508)	30.33 (69.434)	24.96 (59.557)
TV-connected devices	19.39 (68.885)	12.21 (48.956)	18.37 (70.294)	18.88 (62.568)
Laptop/computer	289.73 (173.581)	140.88 (122.615)	231.95 (172.510)	260.84 (145.989)
Smartphone	307.04 (169.103)	198.73 (127.893)	336.37 (183.596)	321.70 (154.411)
Tablet	80.26 (127.471)	41.60 (71.655)	80.44 (130.189)	80.35 (120.832)
Total	716.004 (313.091	403.82 (244.049)	697.45 (302.539)	706.73 (270.018)

The background screen use in weekday, weeknight and weekend of male and female respondents as shown in Table 4.8 and Table 4.9.

Table 4.8: Mean and standard deviation for background screen use in weekday, weeknight and weekend of male respondents

Variable	Weekday	Weeknight	Weekend	Mean of weekday and weekend
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Background screen use	176.54 (201.534)	102.43 (120.489)	186.37 (197.071)	181.04 (185.643)

Table 4.9: Mean and standard deviation for background screen use in weekday, weeknight and weekend of female respondents

Variable	Weekday	Weeknight	Weekend	Mean of weekday and weekend
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Background screen use	184.11 (194.495)	104.98 (116.822)	193.89 (187.806)	189.00 (177.882)

The classification of total primary screen usage which 41.1% was light user, 51.2% was moderate user and 7.7% was heavy user as shown in Table 4.10.

Table 4.10: Classification of total primary screen time usage

Screen Use	Frequency	Percentage (%)
Light	198	41.1
Moderate	247	51.2
Heavy	37	7.7

4.3 Physical activity level

The physical activity level of the respondents that were assessed based on their calculated MET values then classify into three categories which were low, moderate and high. Majority of the respondents which was 47.1% of them have moderate physical activity level. 27.0% of the respondents had low physical

activity level, followed by 25.9% achieve high physical activity level as shown in Table 4.11 and Figure 4.3. Based on the frequency and percentage analysis, there were higher prevalence of respondents with moderate physical activity level which indicated that most respondents were physically active.

Table 4.11: Frequency and percentage analysis for physical activity level of respondents

Physical activity level	Number of Respondents (n)	Percentage (%)
Low	130	27.0
Moderate	227	47.1
High	125	25.9

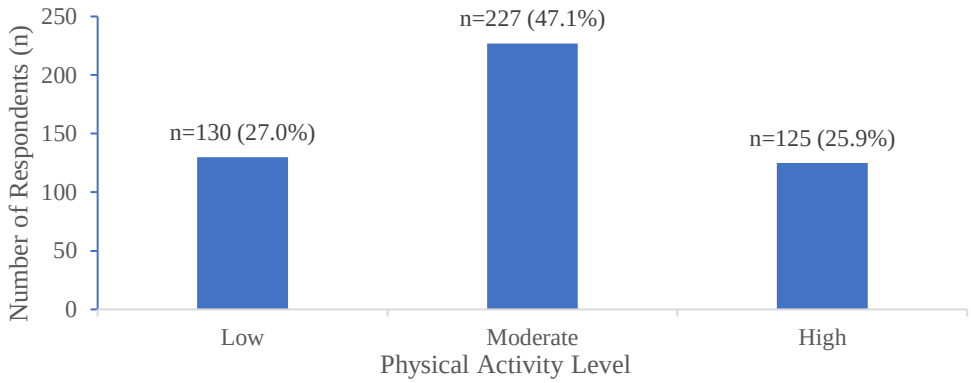

Figure 4.3: Frequency analysis for physical activity level of respondents

The MET-minutes/week of the respondents in this study had the mean of 2108.32 ± 2252.441. Mean of MET-minutes/week for male and female respondents were 2562.84 ± 2682.089 and 1700.32 ± 1684.640 respectively as shown in Table 4.12.

Table 4.12: Mean and standard deviation analysis for met-minutes/week of respondents

Physical Activity MET (min/week)	Male	Female	Total
Walking MET	1251.44 (1378.666)	1168.51 (1193.947)	1207.74 (1283.952)
Moderate MET	471.93 (791.397)	242.83 (533.555)	351.20 (677.071)
Vigorous MET	839.47 (1617.414)	288.98 (822.445)	549.38 (1290.766)
Total Physical Activity MET	2562.84 (2682.089)	1700.32 (1684.640)	2108.32 (2252.441)

Among male respondents, most of them had moderate physical activity level with 100 respondents (43.9%), followed with 79 respondents (34.6%) and 49 respondents (21.5%) achieved high and low physical activity level respectively. Among female respondents, majority of them had moderate physical activity level with 127 respondents (50.0%), followed by 81 respondents (31.9%) and 46 respondents (18.1%) had achieved low and high physical activity level respectively as shown in Table 4.13 and Figure 4.4.

Table 4.13: Frequency and percentage analysis for physical activity level among male and female respondents

Physical activity level	Male		Female	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Low	49	21.5	81	31.9
Moderate	100	43.9	127	50.0
High	79	34.6	46	18.1

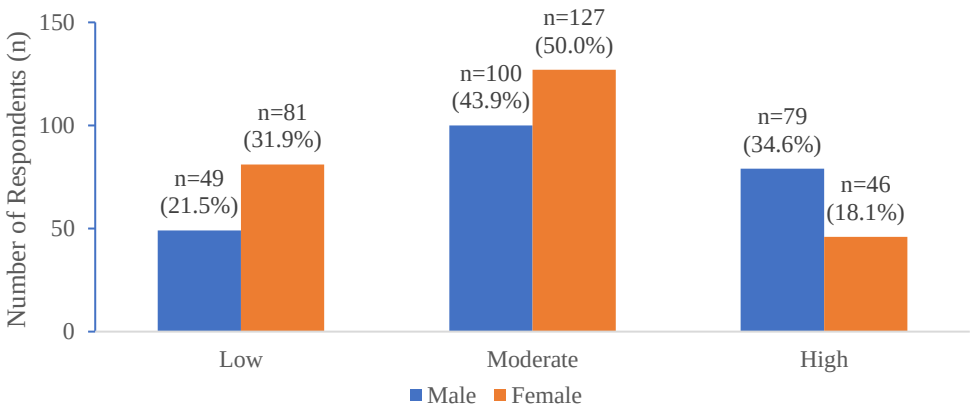

Figure 4.4: Frequency analysis for physical activity level among male and female respondents

Sitting time of the respondents regardless of the gender had the mean of 427.70 ± 195.538 minutes. Male respondents have mean sitting time of 428.25 ± 195.391 minutes, while female respondents have mean sitting time of 427.21 ±196.055 minutes (as shown in Table 4.14).

Table 4.14: Mean and standard deviation analysis for sitting time of respondents

Variable	Male	Female	Total
Sitting Time	428.25 (195.391)	427.21 (196.055)	427.70 (195.538)

4.4 Sleep quality

Sleep quality status were determined with Global PSQI score which was calculated after sum up each score from all seven components of PSQI. A total of 5 or more Global PSQI score signify poor sleep quality. Meanwhile Global PSQI score that have less than 5 indicated good sleep quality. Among 482 respondents, a total of 205 respondents (42.5%) had good sleep quality whereas 277 respondents (57.5%) had poor sleep quality. Half of the respondents have poor sleep quality as shown in Table 4.15 and Figure 4.5.

Table 4.15: Frequency and percentage analysis for sleep quality status of respondents

Sleep Quality Status	Number of Respondents (n)	Percentage (%)
Good sleep quality	205	42.5
Poor sleep quality	277	57.5

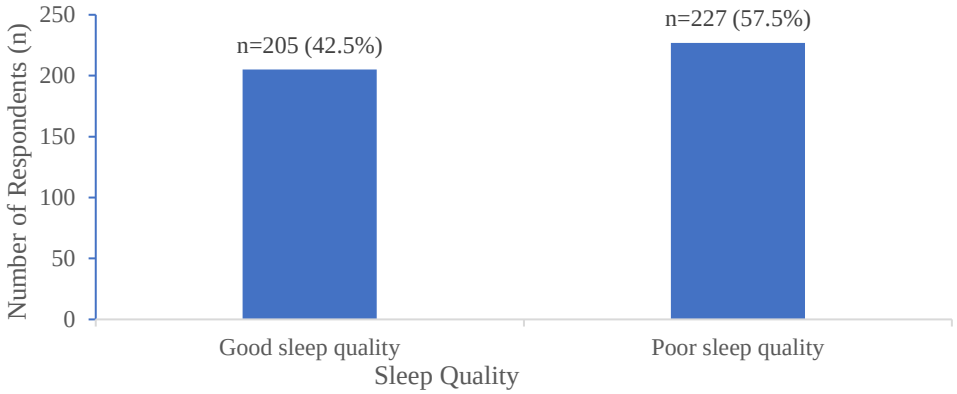

Figure 4.5: Frequency analysis for sleep quality of respondents

The mean of each PSQI component for male and female were as shown in Table 4.16.

Table 4.16: Mean and standard deviation analysis for PSQI component score of respondents

PSQI Component		Mean (SD)		
		Male	Female	Total
Component 1	Subjective sleep quality	1.17 (0.708)	0.99 (0.680)	1.07 (0.698)
Component 2	Sleep latency	1.20 (0.910)	1.02 (0.919)	1.11 (0.918)
Component 3	Sleep duration	0.68 (0.904)	0.56 (0.846)	0.62 (0.875)
Component 4	Habitual sleep efficiency	0.41 (0.737)	0.39 (0.745)	0.40 (0.740)
Component 5	Sleep disturbance	1.02 (0.531)	0.98 (0.503)	1.00 (0.516)
Component 6	Use of sleep medication	0.07 (0.351)	0.02 (0.125)	0.04 (0.259)
Component 7	Daytime dysfunction	1.07 (0.797)	1.05 (0.870)	1.06 (0.835)
Global PSQI Score		5.61 (2.620)	5.00 (2.839)	5.29 (2.751)

Among male respondents, 80 respondents (35.1%) had good sleep quality while 148 respondents (64.9%) had poor sleep quality. Among female respondents, 125 respondents (49.2%) and 129 respondents (50.8%) had good sleep quality and poor sleep quality respectively as shown in Table 4.17 and Figure 4.6.

Table 4.17: Frequency and percentage analysis for sleep quality among male and female respondents

Sleep Quality Status	Male		Female	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Good sleep quality	80	35.1	125	49.2
Poor sleep quality	148	64.9	129	50.8

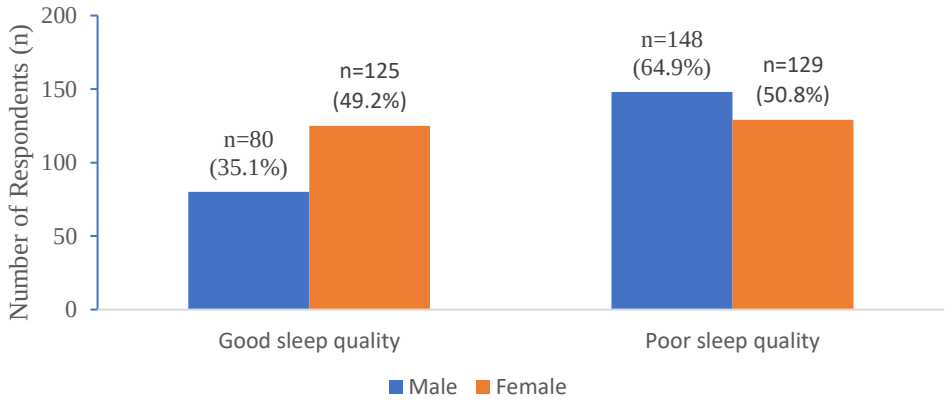

Figure 4.6: Frequency and percentage analysis for sleep quality among male and female respondents

4.5 Correlation of screen time and physical activity level

There is no significant correlation between physical activity level and screen time (r=0.057, p=0.214) as shown in Table 4.18.

Table 4.18: Correlation between screen time and physical activity level

	Screen time	
	r	*p* value[a]
Physical activity level	0.057	0.214

[a]Spearman correlation, $p<0.05$

4.6 Correlation of physical activity level and sleep quality

There is no significant correlation between physical activity level and screen time (r=0.024, p=0.596) as shown in Table 4.19.

Table 4.19: Correlation between Physical Activity Level and Sleep Quality

	Sleep Quality	
	r	*p* value[a]
Physical activity level	0.024	0.596

[a]Spearman correlation, $p<0.05$

4.7 Correlation of screen time and sleep quality

There is no significant correlation between physical activity level and screen time (r=0.089, p=0.052) as shown in Table 4.20.

Table 4.20: Correlation between screen time and sleep quality

	Sleep quality	
	r	*p* value[a]
Screen Time	0.089	0.052

[a]Spearman correlation, $p<0.05$

4.8 Comparison in screen time between male and female respondents

There is no a significant difference of median screen time between male and female university students (p=0.752) (As shown in Table 4.21).

Table 4.21: Comparison of screen time between male and female respondents

	Median (IQR)		Z statistic	*p* value*
	Male	Female		
Screen Time	682.50 (360.00)	675.00 (317.13)	-0.316	0.752

*****Mann Whitney Test, $p < 0.05$

4.9 Comparison in physical activity level between male and female respondents

There is a significant difference of median physical activity level between male and female university students (p=0.001) (Table 4.22). In summary, if compare between male and female respondents, more female respondents had low and moderate physical activity level, while more male respondents had high physical activity level than female respondents.

Table 4.22: Comparison of physical activity between male and female respondents

	Median (IQR)		Z statistic	*p* value*
	Male	Female		
Physical Activity Level	1455 (3288.75)	1053 (1881.00)	-3.450	<0.001

*****Mann Whitney Test, $p < 0.05$

4.10 Comparison in sleep quality between male and female respondents

There is a significant difference of sleep quality between male and female university students (p=0.002), which male students had poorer sleep quality than female students (As shown in Table 4.23).

Table 4.23: Comparison of sleep quality between male and female respondents

	Median (IQR)		Z statistic	*p* value*
	Male	Female		
Sleep Quality	6.00 (3)	5.00 (4)	-3.075	0.002

*****Mann Whitney Test, $p < 0.05$

CHAPTER 5

DISCUSSION

5.1 Screen time among university students

The screen time of the respondents was evaluated by using Screen Time Questionnaire by measuring 5 electronic devices to obtain the total screen time, then based on the total screen time, the respondents were categorized into light, moderate and heavy user. The result shown that the total mean of primary screen time usage from all 5 devices were 704.33 ± 271.248 minutes, which approximately around 11.7 hours. Classification of total primary screen time usage reported 41.1% as light user, 51.2% as moderate user and 7.7% as heavy user.

According to Sabri, Zaini and Rahman (2021), among 320 participated university students, majority of them (68.4%) had reported an increase in screen time during the pandemic. A cross-sectional study by Akulwar-Tajane et al. (2020) reported 43.3% of participants use more than 6 hours on digital device daily, while Majumdar, Biswas and Sahu (2020) and Benaich et al. (2021) discovered the screen time usage is 8.2 ± 3.4 hours and 7.0 ± 7.0 hours per day during the lockdown respectively. Another research that has classify the screen time user into three categories and the result was align with present study with 46.1% light user, 26.5% moderate user and 27.4% heavy user (Montagni et al., 2016).

In this study, it was reported the respondents use many devices and they own at least one screen based mobile device with smartphones being the most popular electronic gadget, with television and other portable digital devices coming in second and third. Majority of the university students can easily accessible to the internet and they participate in various digital media activities on their social media accounts. This finding was evident that technological usage has been shifted to smartphones because smartphone inclusion of all internet features and mobile application. In addition to the transition to COVID-19 endemic that caused a major disruption to routine and various research reported increased frequency in technology use especially among university students. Statistical metrics released by commercial media company (YouTube, Zoom, Amazon, Netflix, Facebook) shown that global use of the internet for leisure and social networking is increasing as more individuals are forced to stay at home (Chanchani, 2020; Winther and Byrne, 2020).

The result outcome could be explained by as university students still prefer to interact socially online for social support and social connection to combat loneliness even though social distance is no longer relevant. Additionally, social media and video games give university students a safe place to disconnect escape from reality while still offer social interaction. The extended lockdown period allows university students to have some free time in hand, this potentially crease some quiet time for which they reflect to work on themselves and work on a personal development. On the other hand, this gives university student freer hour to increase usage and more reliance on digital devices, result in digital device addiction.

Another explanation for the high screen time can be explained from a scientific perspective. Screen use releases dopamine in the brain which similar to how cocaine adversely impacts the brain's frontal cortex. Moreover, screen time triggers a pleasure or reward cycle similar to that of drugs and we now have access to an almost infinite number of societal stimuli thanks to smartphones for example likes, positive recognition from peers, laughing faces, notification from close ones has the ability to be a dopamine influx and positive social stimulus. Thus, screen time can be kind of a digital drug for brain which caused people build reliance on electronic devices (Akulwar-Tajane et al., 2020). The reason for discrepancies between research outcome could be due to the association between behaviours and varied policies for lockdown in different country.

Even though smartphones are now among the most widely used and significant communication tools, their excessive use has become a global social problem and users often develop dependency on it. This topic needs to be further investigated, with an emphasis on what roles technology plays in lifestyles behaviours, given the high rate of smartphone use among university students.

5.2 Physical activity level among university students

Physical activity level of the respondents was assessed by using International Physical Activity Questionnaire Short Form (IPAQ-SF), then the respondents were classify based on their calculated MET values, into categories of low, moderate and high physical activity level. The result outcome from this study showed that among respondents, there was a higher prevalence of respondents with moderate physical activity level which contributed to 47.1% of the total

respondents, followed by 27.0% respondents having low physical activity level and 25.9% respondents had achieved high physical activity level.

According to WHO physical activity guidelines, adults aged 18 to 64 years old is recommended to accumulate at least 150 minutes of MVPA per week. Meanwhile for this study, there was only 36.5% of the respondents achieved this guideline. For local research, 20.4% of Malaysian university students were physically inactive (Tan, Tan and Tan, 2021), while a previous national health survey shown 25.1% of Malaysian do little to no exercise (Institute for Public Health, 2019). In contrast, previous study in Indonesia that discovered 48.0% of them met the WHO physical activity guidelines (Suherman, Sultoni and Zaky, 2021), another research that reported 74.0% of young adults in Spain had met the guidelines (Sañudo, Fennell and Sánchez-Oliver, 2020).

Based on the present result, 73.0% of the respondents were physically active, which similar to the latest National Health and Morbidity Survey (NHMS) 2019 had discovered that among Malaysian adults, there were 74.9% were physically active (Institute for Public Health, 2019). According to Akulwar-Tajane et al. (2020), they discovered that 65.3% of students routinely exercise at home for at least three to five days a week during the lockdown. Result outcome of Giustino et al. (2020) was align with the present study, which discovered 24.9% of low physical activity level, 51.0% of moderate physical activity level and 24.1% have high physical activity level. Based on Australian Healthy Survey (2013) found that 53.0% of those aged 18 to 24 were classified as having a moderate level of physical activity.

However, there was still 27.0% of the respondents had only achieved low physical activity level, meaning they lived a sedentary lifestyle or being physically inactive. The similar result outcome can be found on Abdel-Salam and Abdel-Khalek (2016) which discovered 33.2% of university students with low physical activity level based on the calculated MET minutes/week in IPAQ. Ács et al. (2020) also reported 29.3% of them lived a sedentary lifestyle with little to no exercise. Also, there were several previous studies that reported a significant decrease in physical activity during COVID-19 pandemic (Ammar et al., 2020; Lesser and Nienhuis, 2020; Bertrand et al., 2021).

Surprisingly, Lau et al. (2021) conducted a cross sectional study among 313 university students respectively in Malaysia shown majority of the participants (64.2%) classify as high physical activity level during pandemic, and Sabri et al. (2021) that investigated on 658 Malaysian university students also found most of the students (62.6%) had an increase in physical activity level during pandemic and at the same time, sedentary behaviour had decreased. These findings supported by another research that found university students' physical activity increased significantly during lockdown with increase in day engaged in exercise and the total duration of physical activity per week (Romero-Blanco et al., 2020).

When it comes to decreased in physical activity and increased in sedentary lifestyle among university during the transition to COVID-19 endemic, a few possible explanations can be proposed. First, there was a significant reduction in the availability of places to exercise due to the closure of sports

centers, parks, and playgrounds. In addition, although recreational facilities within universities had recently open up access to the students, however barriers to physical activity included time restraints, a lack of enthusiasm in sport and some cannot tolerate physical activity still decreased university students' engagement in sport (López-Valenciano et al., 2021). Other reason could be due to lack of equipment, lack of spaces available for exercise, the absence of a personal trainer, coach or training partner and a lack of sufficient training equipment (De Oliveira Neto et al., 2020; Karuc et al., 2020). Moreover, previous transition to remote teaching had yet to resumed completely to physical learning, thus there was a reduced mobility both by foot and vehicle.

The explanation for university students being more physically active were because prior to the lockdown, university students reported most of them lack of free time to the engaged in physical activity (Tiggemann and Williamson, 2000). Since time constraints are the barriers to exercise, then during movement restriction may have open a window of opportunity which an individuals may have more time for other activities and may have contributed to increase in moderate-vigorous physical activity in university students (Karuc et al., 2020). Also, government release public message to urge public to be physically active, this may possibly increase awareness of university students to go for a walk and participate in physical activity. Moreover, with the increase in social support from family and friends that support physical exercise (Khoo et al., 2020). However, they have no choice but to modify the exercise into a home-based setting and it is possible that some people cannot adjust their usual physical activity to their homes (Battaglia et al., 2020).

The discrepancy in relevant research outcome can be attributed by the varied measures taken by government during quarantine, for example physical activity were allowed by government in some country, while some did not. Also, take in the consideration of type of targeted population, availability of room for exercise and culture around physical activity (Tison et al., 2020; Benaich, 2021).

If compared with moderate and vigorous activity, walking activity of this study was 1207.74 ± 1283.952 min/week which was the activity with the highest times, this study displayed walking as the most frequently performed activity during transition to COVID-19 endemic. There appears to be a chance to increase university students' physical activity level by participating in walking-related activities. Research outcome from Saint-Maurice et al. (2020) suggests to walk at least 4000 steps per day to counteract mentioned negative effect and to improve overall wellbeing. However, there was lack of studies focus on contribution of walking activity to increase physical activity level, and these previous studies were mainly focusing on older adults (Besser and Dannenberg, 2005; Kassavou, Turner and French, 2013; Audrey, Procter and Cooper, 2014; Goodman et al., 2014). Moreover, for healthy individuals there were no studies that solely assessed walking outcome with a focus to meet the exercise guidelines (Geddes et al., 2009; Latimer-Cheung et al., 2013; Pearson et al., 2015; Kim et al., 2019; Kalb et al., 2020). This study gap suggests that by promoting walking programs might be an essential element to encourage physical active lifestyle of university students by increasing walking intensity, frequency and distance. But to prevent university student discourage by the fluctuating restriction and uncertainties with COVID-19 endemic, it is important

to addressing factor such as lack of access to recreational facilities and sport related group activities to be one of the obstacles to participating in physical activity. To develop an intervention to reverse physical inactiveness during endemic will require more data on education, behaviour change, psychological and physiological effect with walking activity.

Not only physical activity improves well-being, and being physically active is a crucial element meet the need for success and at the same time boost one's self-esteem, while minimizing the incidence of developing metabolic and cardiovascular disease. The advantages for university students following these guidelines improve health wellbeing by decreasing risk of coronary heart disease premature death, type 2 diabetes, stroke etc., while being physically active help improve fitness, body composition, lose weight and indicator of mental health (Tremblay et.al., 2011; Berezowski et al., 2017).

5.3 Sleep quality among university students

The sleep quality status of the respondents was assessed by using Pittsburgh Sleep Quality Index (PSQI) with seven components to obtain the Global PSQI score, those who below 5 scores were good sleeper, those who have 5 or more scores were poor sleepers. In this study, the result discovered that respondents had a higher prevalence of poor sleep quality which contributed by 57.5% of respondents, while 42.5% of respondents had good sleep quality.

The result indicated that sleep quality among university students is poor which is aligned with two previous studies reported that 54.7% and 57.5% of the

university students found to be suffering from poor sleep quality respectively (Suen et al., 2008; Cheng et al., 2012). Similar result presented by Sañudo, Fennell and Sánchez-Oliver (2020), which 58.0% of participants reported being poor sleepers during the lockdown phases, with a significant increase in PSQI score in quality of sleep and having delayed wake up time. Moreover, according to research by Sundas et al. (2020) on Nepalese medical students, 44.2% of them had poor sleep quality.

In contrast, two cross sectional study among medical students reported only 30.4% and 34.6% of them experienced poor sleep quality (Saraswathi et al., 2020; Shrestha et al., 2021). Meanwhile, Saguem et al. (2022) discovered that medical students had a much greater prevalence of poor sleep quality, which was 72.5%.

The inconsistent result between previous relevant studies could possibly due to PSQI questionnaire only assessed sleep quality in the previous month and university students more susceptible to changes in daily routine. If compared first year students who experienced first time moving out of family house to third year students who had already accustomed to living outside of home, this factor may affect their sleep habits and quality. Moreover, freshman university students regain new freedoms in managing their own schedule which they are likely to develop poor sleep habits (Tsai and Li, 2004). During this transition to COVID-19 endemic caused social restrictions that affected sleep habits, which included staying up late and spending more time in bed which all result in poorer sleep quality (Altena et al., 2020). According to Sleep Foundation (2020)

explained that after being confine at home for a prolong period with low level of natural light indoor, had caused decreased in light-based cues for sleep and wakefulness which important for our circadian rhythm.

According to British Sleep Society (2019) found that about three-quarters of people in the United Kingdom noticed change in theirs sleep after the pandemic, including less than half of the respondents were getting refreshing sleep due to their sleep continues being disrupted by recurring pandemic anxieties. As according to Cellini et al. (2020) the increase in sleeping difficulties was more pronounced in those who had higher level of stress, anxiety and depressive symptoms as well as the feeling of elongation of time. Similar stress level can be observed in local studies which reported that more than half of the students reported anxiety, depression, somatic symptoms and moderate to high stress, further consequently arise sleeping problems (Kong et al., 2022). Benham (2020) observed that higher level of psychological stress was associated with significant later bedtime and waketime, as well as evidence of greater sleep latency, greater usage of sleep medication and poorer sleep efficiency. Additionally, university students had no choice but to continues adjust their lifestyle to several policies implemented by government and obliging to constant updated standard operating procedure (SOP) by university to reduce the spread of COVID-19, this have been proven to have adverse impact on people's sleep patterns (AlSaif, 2019). This transition introduces irregularities and uncertainties that adds difficulty in adjust to a new daily schedule, in addition with the changing schedules leading to fluctuating wake times and bedtime, which result in triggering oversleeping or reduced sleeping times, both causing

individual to groggy, irritable during the day. Nearly everyone was impacted by economic issues, although now economic activity had rebound, concern on income, saving and making ends meet still burden many university students (National Sleep Foundation, 2020). For those that had their loved one who is sick or passed away from COVID-19 diseases, they will experience grief, trauma, and depression leading to worsen sleeping problems. In other words, even though we were at the stage of endemic, the general public still encounter psychological issue from COVID-19 pandemic that have an indirect impact on sleep quality (Ministry of Health Malaysia, 2023).

An interesting insight suggested that among people recovered from COVID-19 had begun to appear a more perplexing symptom, which those recovered experienced changes in concentration, headaches, brain fog, muscle weakness and most frequently, insomnia (Hamblin, 2020). This shown in research by Xu et al. (2022) investigated that notably high rate of respondent (26.5%) had insomnia, while Huynh et al. (2022) reported one-third (34.5%) of the respondents experienced mild to moderate symptoms of insomnia. The possible explanation for it was due to recovered patients were anxious and fearful of social isolations practices and mandatory home confinement, all combine to increase the rate of sleep disturbance. In addition, these individuals were more likely to experience insomnia because of the multiple pressure they were under including property loss, possibility of reinfection, alienation from other and social isolation (Huynh et al., 2022). Zitting et al. (2018) outlined that one of the risk factors for insomnia condition was younger age, because younger age was biologically more susceptible to sleep loss, combine with environment

and lifestyle factors including caffein consumption, electronic media, social jetlag which all contribute to chronic sleep deficiency. Sleep pressure accumulates faster in younger adults, as the sleep pressure builds up in our body, it increases the awake time, meaning the stronger the pressure, the longer we stay awake and less sleep they got (Zitting et al., 2018). Meanwhile, if compared with older adults, more younger adults use the internet and smartphones and negative news on social media might increase the occurrence of insomnia disorder (Bo et al., 2020). This reason may be explained on why most university students still experienced poor sleep quality during transition to endemic, as the students may encounter sleeping problems as the post recovery of COVID-19 diseases.

However, there was almost half (42.5%) of respondents had good sleep quality. The reasoning could be due to social support was found to be significantly correlated to sleep quality. Those with less social support were compared by Grey et al. (2020) with those with higher social support, and they found that poor sleep quality was 52.0% less likely to occur among those with more social support, similarly a robust association between social support and better sleep outcomes was shown in meta-analytic review (Kent de Grey et al., 2018). Another study outlined that loneliness was associated with poor sleep quality which outlined that social networking is a key element that affect sleep quality (Luanaigh and Lawlor, 2008). The correlation between social support and sleep quality were reasonable because previous findings were consistently showing a decrease risk of insomnia in those with supportive social and physiological network from family or close friends (Huynh et al., 2022). As

during transition to endemic, university students have transition to physical learning and home confinement was lifted, this increase chance of communication with their course mates and more contact with family and loved ones during this endemic stage, thus more university students had good quality of sleep.

In short, transition to endemic introduced immense stress and irregularities lead to more changes in sleep and more sleeping problems, however with a good social support, their sleep quality may have improvement.

5.4 Correlation between screen time and physical activity level

In present study, we hypothesized there is a significant correlation between screen time and physical activity among male and female students from UTAR during transition to COVID-19 endemic. The association between these two variables was determined in this study and there is no significant correlation between physical activity level and screen time (r=0.057, p=0.214).

Several previous research reported no association between screen time usage and physical activity in adolescent and young adults (Jackson et al., 2011; Vicente et al., 2016; Williams et al., 2016). Meanwhile according to Abid et al. (2021), participants in Tunisia were spending more time watching screens while engaging in less physical exercise and Qin et al. (2020) suggested that participants are much more likely to have lower screens time if they participate in vigorous physical exercise. These findings were supported by a previous study by Celis-Morales et al. (2018) concluded that those with high screen time

usage are significantly associated with being physically inactive. The idea being that as more time spend on screen time usage, sitting and watching television, playing computer games or scrolling on phones eventually take time away from doing any forms of physical activity (Akulwar-Tajane et al., 2020).

Current study show there is no significant association between screen time and physical activity level, this could be possibly explained by referring to the present study literature review. Literature review shown that during this transition to COVID-19 endemic, most of the university students have low physical activity level and high screen time, while present study reported most participants had moderate physical activity and moderate screen time. This may possibly a contributing factor that led to the insignificant correlation between screen time and physical activity. Another possible explanation could be due to other confounding factor that were not controlled in this study, as according to research by Fobian, Avis, and Schwebel (2016), result outcome focus on the association between physical activity and screen time was inconsistent due to the impact from smartphone use, sleep patterns, and other sedentary behaviours that making it complex, while stress, social support and accessibility to physical activity may also be the confounding factor that contribute to the insignificant correlation (Cuello-Garcia, Pérez-Gaxiola and Amelsvoort, 2020; Qin et al., 2020).

The negative association between screen time and physical activity shown in previous research could be explained by the concept of displacement of time, as more time spend on screen time, less time will be available for

physical activity. This pandemic caused changes in daily routines, with more time spent at home, they more likely to engage in screen use related behaviours. Moreover, activities related to screen use mainly associated with behaviours that are sedentary, such as lying down and sitting which attribute to decrease in physical activity (Celis-Morales et al., 2018; Qin et al., 2020). Besides that, the closure of recreational facilities, park and community gym have limited people opportunities to engage in physical activity and social support is an important motivator for physical activity. Without an access to these facilities and in-person social interaction, people may have turned to screen use for entertainment and social purpose, leading to increase screen time and decreased physical activity (Cuello-Garcia, Pérez-Gaxiola and Amelsvoort, 2020).

The variation in relevant research outcome was due to limitation in methodology, because screen time have a wide range of method and no standardized instruments to quantify screen time use, this limits the ability for equal comparison on result and for conclusion.

5.5 Correlation between physical activity level and sleep quality

In this current study hypothesized that there is a significant correlation between physical activity level and sleep quality among male and female students from UTAR during transition to COVID-19 endemic. The association between these two variables was investigated and result shown that there is no significant correlation between physical activity level and screen time (r=0.024, p=0.596).

Studies by Chennaoui et al. (2015) suggested that there is an association between physical activity and sleep quality, however they indicated that the interaction was complicated due to the physical activity and sleep quality both have involved in physiological and psychological pathways. Previous study outlined the significant association between physical activity and sleep pattern as their result outcome shown the engagement in physical exercises had a positive impact on 65.3% of the participants by having less reported sleep complaints (Akulwar-Tajane et al., 2020). A meta-analysis on six studies showed that physical activity resulted in a slight increase in young adults' subjective sleep quality among those with sleep problems as evidenced by 4 months of aerobic exercise significantly increased sleep quality for those with insomnia while also lowering their daytime sleepiness (Reid et al., 2010). Sañudo, Fennell and Sánchez-Oliver (2020) and César, Dalinda, and Nadia (2022) discovered a significant association between time spent on moderate intensity activities with sleep quality, and they suggested physical activity as significant predictor of restful sleep, as evidenced by Altena et al. (2020) suggested that due to home confinement people have a lower level of activity thus lead to poorer sleep patterns. However, a study reported sleep time improved during quarantine could be independent from involvement of physical activity, the explanation may be due to people having more time to rest and there is no need to wake up early for school or work (Potter et al., 2016).

There is no significant correlation between physical activity level and sleep quality in this present study. The possible explanation could refer to the current literature review reported majority respondents having low physical

activity level, while present study discovered most of the respondents had moderate physical activity level, and this may be the reason it led to the insignificant correlation between the variables. Potter et al. (2016) and César, Dalinda, and Nadia (2022) suggested the inconsistent correlation between physical activity level and sleep quality may due to the impact of stress, socioeconomic status and lifestyle behaviours, and future research should develop a framework to control on these confounding factors.

The reason for the significant correlation between physical activity and sleep quality in previous relevant study is explained by The National Sleep Foundation (2013) suggested that by having regular exercise in the morning or afternoon have the effect to increase body temperature by a few degrees. As the day go on, the body temperature decreases back to its normal range and this can induce drowsiness and help us easier falling into sleep. Moreover, people will be exposed to natural light when exercise outdoors, this is an important element to establish a good sleep-wake cycle that reduce the occurrences of sleeping problems when it comes to bed time. Other research paper provide explanation as such exercise improves your mood by releasing chemicals like endorphins and serotonin that can help reduce anxiety and stress and alleviate symptoms such as social withdraw. This finding suggested that exercise may offer the most potential to those experienced severe or ongoing sleep disorders. This can be applied into the context of COVID-19 which students may experience immense stress that led to more sleeping problems, and by being physically active can act as a form of distraction and mood enhancement that help improve sleep quality (Blumenthal et al., 2007).

In order to lessen the negative effects of the COVID-19 outbreak on university students, physical activity emerges as a feasible, affordable, and simple to execute intervention strategy. Although the findings of our analysis of the variables' correlations do not indicate causation, they still can be helpful in planning future studies to evaluate the impact of physical activity on sleep quality. In the future, a clinical evaluation of physical activity's impact on sleep quality is required.

5.6 Correlation between screen time and sleep quality

In present study, we hypothesized there is a significant correlation between screen time and sleep quality among male and female students from UTAR during transition to COVID-19 endemic, which screen time decrease sleep quality. In this study, the association between these two variables was examined and there is no significant correlation between screen time and sleep quality (r=0.089, p=0.052).

Lee and Ogbolu (2018) found no association between screen time and sleep quality, as they concluded that media use had no effect on sleep duration. Similar result can be found on Gaina et al. (2005) and Yen et al. (2008) on short nocturnal sleep duration and subjective insomnia in excessive use of high-tech devices.

Possible explanation on the insignificant correlation between screen time and sleep quality could possibly due to current literature review shown majority of the respondents had high screen time, however present study reported most

of the participants had moderate screen time. Also, if compared with previous relevant studies that rules out the impact of factors such as stress, social roles and environmental factors, the present study do not control on these confounding factors which may be the contributor to the insignificant correlation between screen time and sleep quality (Carskadon, Acebo and Jenni, 2013; Fobian, Avis and Schwebel, 2016; Perrault et al., 2019).

Majumdar, Biswas and Sahu (2020) discovered a significant association between screen time usage (cell phone) with the amount of sleep, which excessive screen time significantly reducing sleep duration and quality. Two previous study demonstrated the significant association between those with higher screen time duration with poor sleep quality (Mishra et al., 2022; Natarajan et al., 2020).

Domoff et al. (2019) reported the use of electronic devices have a negative impact on duration of sleep, which those with greater smartphone use have been associated with shorter sleep duration. Similar result could be found on studies that measure general use of electronic device throughout the day and surprisingly a negative effect still found on the amount of sleep (Ekinci et al., 2014; Twenge, Krizan and Hisler, 2017). According to Lemola et al. (2014), Davey and Davey (2014) and Demirci, Akgönül and Akpinar (2015) that outlined greater screen use having positive correlation with sleep problems while negative correlation with sleep duration, also, screen use before bedtime was associated with more feeling of tiredness. The results of the previous research by Hjetland et al. (2021) show that screen time and sleep quality are

strongly negatively correlated which screen time before bedtime consistently had a negative impact on sleep. This finding was aligned with previous studies that reported young adults with greater screen time was related to higher level of poor in sleep duration, sleep efficient and sleep onset latency (Fossum et al., 2014; Levenson et al., 2016).

Screen use can have a major impact on physiological outcome especially sleep. As most of the university students have their own smartphone and other electronic devices, this can cause changes in sleep patterns during the transition period. They might have delayed sleep time and disrupted sleep phase due to physiological and environmental factors, such as increase in schoolwork, and club activities or part-time job, or stimulating activities (playing computer games, watching TV and internet surfing) (Carskadon, Acebo and Jenni, 2013). This pattern of sleep delaying led to a cycle of lack of sleep on weekday and forced waking at a biologically inappropriate time that result in poor sleep quality (Crowley, Acebo and Carskadon, 2007). During transition to COVID-19 endemic, most of the student reported changes in their sleep patterns and quality, as well as a variety of sleep issues. University students who lack sleep spend more time on social media sites like Facebook than their rested classmates, which makes the issue of technology replacing sleep even worse. A vicious cycle of less sleep and more social media use can result from being fatigued, which lead to even more social media use. Therefore, there is no denying the connection between screen time and sleep (Akulwar-Tajane et al., 2020; Wang et al., 2020).

National Sleep Foundation (2020) proposed for those having excessive screen time especially in later of evening can cause adverse effect on sleep. The brain can be stimulated by screen time in ways that make it difficult to shut down, while the natural production of melatonin, a hormone the body produces to support restful sleep, can be suppressed by the blue light from screens. A previous study also shown greater evening screen time was related to poorer sleep quality and quantity, thus this may suggest its evening screen time that led to the association between screen time and sleep (Christensen et al., 2016). While another research papers suggested that blue light suppress nocturnal changes in the concentration of melatonin and have a detrimental effect on human biological clocks (Higuchi et al., 2003; Lee and Ogbolu, 2018).

In short, the research on the association between screen time usage and sleep quality have always been inconsistent and complex because screen time has a negative impact on sleep in a few particular population (Fobian, Avis and Schwebel, 2016; Perrault et al., 2019). Also, the discrepancies in association between screen time and sleep quality could due to the difference method in measuring screen time.

5.7 Comparison in screen time between male and female respondents

In this current study, it was hypothesized that female students have a lower screen time than male students during transition to COVID-19 endemic. In term of screen time, there is no a significant difference of median screen time between male and female university students (p=0.752).

Benaich et al. (2021) found that Moroccan university students both groups' average daily screen time was 7.0 hours, with no significant gender differences. Similar result can be found in a systematic review that focus on Brazilian adolescents that reported there was no gender effect on screen time (Schaan et al., 2019).

In present study discovered an insignificant difference in screen time between male and female respondents. This could be possibly disclosed that before pandemic it found that male having higher screen time due to spending more time on playing video games (Marshall et al., 2004; He et al., 2009; Wang et al., 2018; Prince et al., 2020). While during pandemic, female have higher screen time due to social networking purpose (Abid et al., 2021; Hammoudi et al., 2021). Then during transition to endemic where female able to meet up with their close ones physically, while male involve more in outdoor activities rather than screen-based activities, thus both gender having less reliance on electronic devices possibly leading to the inconsistent outcome in screen time between gender. Also, previous study has control on leisure time activities, academic demand and social support in order to rule out the impact of these confounding factors on the final result (Boyle et al., 2012; Cui et al., 2022).

In a study conducted by Hammoudi et al. (2021) found that male and female students used screens for significantly different amounts of time. In which females use digital devices more frequently than boys while they are confined (Abid et al., 2021), meanwhile according to study by Jago et al. (2014) and Vicente et al. (2016) reported boys watch more television than girls.

Similarly, previous studies having mixed result, a study by Barnett et al. (2010) found that males use more time online and on computers, while girls spend more time watching television and playing video games. Meanwhile, Wang et al. (2018) found that males reported high screen time than female did and similar trends can be observed elsewhere (Marshall et al., 2004; He et al., 2009). Moreover, the likelihood of having excessive screen time was 4.55 times higher in men than in women, however, inconsistency was found in previous research which indicate a much higher rates in male (Lucena et al., 2015; Prince et al., 2020).

The significant difference between gender in screen time in previous study could be explained by the difference in leisure actives. Studies found that young male significantly use more leisure time to play video games which can increase their screen time, while female more likely participate in activities that may not require the use of screens such as reading and crafting (Prince et al., 2020). Second explanation is the differences in academic demand between gender. Male students more likely to enrol in programs that require more screen time such as computer science and engineering, on the other hand, female more likely to enrolled in programs that may lead to having less screen time, for example social sciences and humanities (Cui et al., 2022). Third explanation was both genders have differences in social support during this transition period. Male students require the use of screens to connect with friends through online gaming or social media, while female students prefer to communicate through video calls or phone calls, this was evidenced by gaming is less socially normative for female and female less likely to identify self as “gamers” and there

is a tendency for underreported, while male usually used video games for socialization (Boyle et al., 2012).

Since these sex-specific risk factors may predispose male and female university students to excessive screen time, thus development of specialised therapy and intervention methods are required.

5.8 Comparison in physical activity level between male and female respondents

In this current study, it was hypothesized that female students have a lower physical activity level than male students during transition to COVID-19 endemic. Regarding the physical activity level, there was a significant difference (p=0.001) between male and female respondents, whereby physical activity level of male was significantly higher than female students. 78.5% of male respondents have moderate and vigorous physical activity level, while female respondents were 68.1%.

According to the latest National Health and Morbidity Survey (NHMS) 2019 reported that male respondents (77.9%) were more physically active than females respondents (71.8%) (Institute for Public Health, 2019). Li et al., (2017) and Hammoudi et al. (2021) discovered that physical activity has a significant different in gender, which male students participated in more vigorous physical activity than female students. Li et al. (2017) reported the male group having a significantly higher total weekly energy expenditure and greater MET-min/week than female group. Benaich et al. (2021) reported that males engaged in

considerably more energy-intensive physical activity of moderate and vigorous intensity than females, conversely, physical inactivity was more prevalent in women than in men. Also, walking time of both genders decreased which female (93.0%) decreased more than male (88.0%). It is reasonable as there is decline in commuting, everyday activities, or occupational walking, such as campus walking between classes (Gallo et al., 2020).

On the other hand, Bertrand et al. (2021) also discovered that there are sex-specific differences in physical activity, however the result suggested that females engaged more time in MVPA than men. Gallo et al. (2020) reported females (61.0%) having higher physical activity level than male (56.0%). Another study had concluded that movement restriction had affected both physical activity of both genders as evidenced by a decline in MVPA, in which male had greater drop in their total weekly energy expenditure than female (Karuc et al., 2020).

The present finding suggested male students having higher physical activity level could be due to the difference in activity conducted by the genders, which the intensity of the activity attributed to the physical activity level. A survey reported that usually male were more likely than female to engage in heavy housework (gardening, washing window), golfing, moderate-heavy strength training and brisk walking, while female had higher tendency to conduct light housework (sweeping floor, washing dishes), yoga, aerobic exercise and leisurely walking (Li et al., 2017).

Since COVID-19 pandemic, the closure of gym and public recreation spots have largely restricted outdoor activities, this may have affected both genders' physical activity level. Li et al. (2017) suggested more female exercise indoors (59.0%) than male (44.0%), while more male exercise outdoor (30.0%) than female (22.0%). It is hypothesised that, compared to women, men prefer outdoor activities and exercise less frequently at home setting, therefore explained why female having greater physical activity level than male during home confinement period. Besides that, researches shown that the motives for exercise participation were different by gender, which male more likely to exercise for social and competitive reasons, while women have a greater tendency to report exercising for weight maintenance and physical condition. So, the closure of community gym and recreational sport were likely affecting their activity level (Tiggemann and Williamson, 2000; Savage et al., 2020). According to Molanorouzi, Khoo and Morris (2015), when males and females attended mixed-gender classes together, physical activity levels decreased more in females than in males. This is supported by previous study reported that male was more likely to participate in moderate and vigorous physical activity when driven by the desire to achieve mastery and male was more motivated by challenges and competition than female (Egli, et. al., 2011; Roychowdhury, 2012). Hence, it is possible that male was less motivated to exercise than females due to social isolation that limit competitive activities.

When it comes to outdoor physical activities, female may face more personal and cultural barrier than male. The information also demonstrated how

crucial it is public spaces, both indoors and outdoors to encourage both men and women to exercise.

5.9 Comparison in sleep quality between male and female respondents

In this current study, it was hypothesized that female students have a lower sleep quality than male students during transition to COVID-19 endemic. Regarding the sleep quality status, there was a significant difference (p=0.002) between male and female respondents, which female students had significantly better sleep quality than male students. 64.9% of male respondents reported having poor sleep quality while almost half (49.2%) of the female respondents had good sleep quality.

The present finding is supported which a significant difference was discovered on how gender affected sleep quality **(**Cheng et al., 2012), which shorter sleep duration and poorer sleep quality have been reported more in men than in women in multiple studies (Jean-Louis et al., 1998; Ban and Lee, 2001; Buboltz, Brown and Soper, 2001).

According to a study by Shrestha et al. (2021), female students were more prone to have poor sleep than male students. In research by Surani et al. (2015), it was found that more female Pakistani medical students had poor sleep than male students, with 44.0% of female students reporting poor sleep compared to 32.8% of male students. Several studies looking at the association between gender and sleep quality reveal that women have higher mean global PSQI scores indicate having poorer sleep quality than men (Amir-Abbas and

Mir, 2009; Orzech, Salafsky, and Hamilton, 2011; César, Dalinda, and Nadia, 2022). Wang et al. (2019) and Wong and Fielding (2011) with a control on sociodemographic, lifestyle factors have suggested that female were two times more likely to have poor quality of sleep than male. Meanwhile, there were a few research papers concluded that there were no gender differences on sleep quality (Tsai and Li, 2004; Yilmaz, Tanrikulu and Dikmen, 2017; Benaich, 2021).

We must acknowledge that there were gender variations in certain sleep parameters, in which there is sleep problems (sleep quality, sleep latency, number of nocturnal awakenings) that appear only after age 20. Hence, young people may start to experience sleep problems and gender differences appear in sleep patterns as a result of biological maturational processes. Other factors such as response to stress, lifestyle habits (smoking, exercise, eating) and family role could all contribute to gender differences in sleep quality (Tsai and Li, 2004). Female having poorer sleep quality could be due to female experienced more difficulties getting to sleep, frequent morning fatigue episodes, and frequent midday naps than male, while females needed more sleep than men did, and they showed more signs of daytime sleepiness (Cheng et al., 2012; Wang et al., 2020). As evidenced by research that suggested that female was more likely to be affected by insomnia disorder than males, which by 1.7 times more likely to have insomnia than men (Ohayon, 2002; Roth, 2019). Since insomnia develops following the start of menstruation in adolescence, the gender difference may be caused by hormonal differences. Besides that, insomnia may be caused by depression and anxiety, because research shown that female had almost twice as

likely to suffer from depression compared to men (Sassarini, 2016; Weibel et al., 2017).

In short, there is a gender effect on sleep quality status whereas male university students may more likely to have poor sleep quality than female.

5.10 Strength and limitation

As far as we are aware, this is the first study to evaluate the influence of the transition to COVID-19 endemic on screen time, physical activity level and sleep quality concurrently on the same sample. Another strength of this study was previous study were conducted either before or during pandemic, while present study conducted during transition to COVID-19 endemic, in addition with great amount of work has examined the association between screen time, physical activity level and sleep quality among university students. The strength of our study was the use of validated questionnaire which can provide a better quality and consistent data which contribute to more reliable research outcomes that could provide equal comparison. Also, by using online questionnaire was more time saving and cost efficient than physically face to face interviews.

There were several limitations need to be considered when interpreting the research outcome of this study. The data collected of physical activity, screen time and sleep quality represent a period of time which there were only few movements restriction, working and daily activities had long resumed to physical mode in Malaysia. Since this study included students from two region (Sungai Long and Kampar), it is worth to note that the effect of transition to

endemic may be different in each district as well as the restrictions level may not be generalizable to other region that were not represented in this study. Thus, the data must be interpreted in light of this time period and in particular location. This is because the effect of transition to COVID-19 endemic on these lifestyle variables were dynamic due to individual may experience different level of sleep problems, screen time usage and physical activity depend on the severity of COVID-19, their local restrictions and policies when transition to endemic. Therefore, the findings in this present study only can represent the impacts of COVID-19 during a transition to endemic period.

The data were collected retrospectively and the respondents were prompted to recall details about their physical activity, screen time and sleep quality on the period of transition to COVID-19 endemic. This result in the introduction of recall bias which caused the results outcome to be either overestimated or underestimated. Moreover, data collection was conducted in a web-based survey, thus there is a chance of selection bias. Self-reported data in this study were not supported with clinical and instrumental examination, thus the possibility of cognitive bias and social desirability in theses health behaviours need to be considered when interpreting the finding. Therefore, future research should use prospective measures including objective means of documenting lifestyle behaviour such as sleep diary, actigraphy recording, polysomnography can provide a more valid measurement and help elucidate these preliminary observations.

One of the most significant drawbacks of this study is its exploratory nature, this study being a cross sectional study leading to cause-and-effect relationships could not be examined. The scope of this study can only identify the association between the influential variables discussed above, however the reasoning and mechanism underlying these influential variables were not clarified and unable to draw a firm conclusion on how the variables differently affected for genders. Moreover, the lack of information on physical inactive, excessive screen time usage and sleep problems hampers comprehension of how this transition to COVID-19 endemic impacted certain variables. Future longitudinal studies are required to assess how adaptation from social isolation to social norm following a health emergency affect people's lifestyle behaviour.

Next, a restricted cohort of respondents were assessed which the sample consist of mainly Chinese population (97.3%) with mostly young adults within the age group of 18 to 27, and greater proportion of medical background students. For this reason, the finding from this study may not be suitable to extend estimation on university students in Malaysia at large, and the generalizability is restricted to different ethnic population and age groups. In addition, university students participated in this present study were going through their academic year, respondents' data may vary in other youth group and those who on vacation or time of examinations. Thus, time frame variation should be taken in account in affecting the result outcome. The result of this study may be influenced by psychosocial factors including life event and social support level; however, the existence of these issue was not examined. Future studies may require to conduct

individual interviews or other higher quality of design to investigate this issue during transition to COVID-19 endemic.

Another limitation of this study was other relevant studies had varying wats in analysing the data. For instance, this present study control by gender of the respondents, while previous research often focuses on many factors such as age, sex, race, socioeconomic status, year of study, etc. Given that there were no standardized measurement method or questionnaire particularly for screen time usage, different measurement method was applied in different studies and each have different features to capture the screen time usage. The discrepancies in measurement method may have introduce biases in estimating the prevalence of screen use and the strength of correlation between screen time with physical activity and sleep quality. Future research should standardise techniques for determining the extent of screen use and how it relates to different lifestyle outcomes.

Finally, this study excluded those undergoes weight loss programme, specialized diet, pregnant, those suffer from mental illness and have disability, which might confound the effect of respondents on physical activity, screen time and sleep quality. Moreover, with the exclusion of those who did not complete the questionnaire and those who excluded from data cleaning process might have influenced the research outcome.

5.11 Recommendation for future study

Future study to perform a prospective cohort study which data collection were assess in real time, and it can collect information with higher accuracy and more detailed and avoid problem like memory bias. Also, the studied population should have more inclusivity by having an equal representative of different ethnic to maximize generalizability among university students, moreover development of framework that control on other related factors suchas age, ethnicity, stress level, socioeconomic status, genetic etc. Future work on systematic data for recommended level of physical activity across all age groups are required to address its adverse effect to respective age groups. More research is required to construct a direct and standardized measure of physical activity based on population sample and age specific health outcomes while take in account of covariates such as age, gender, ethnicity etc. A large diverse trial should be conducted to examine if an alternative guideline is necessary.

Unlike Canada with their new Canadian Physical Activity Guidelines reported on how much time spend engaging in sedentary behaviour, Malaysia has a lack of guidelines to limit duration of sedentary behaviour such as sitting or watching television. This absence emphasis on the need to conduct more work in this area because development of guidelines can help outlined the importance of limiting sedentary behaviours and encourage an active lifestyle.

Given that this transition to endemic is anticipated to last for years, research data are critically needed to backup decision making on tailoring new guidelines and interventions for well-being in this time frame. Moreover, more

effort is needed to build public awareness, self-efficacy change message in order to provide supportive and timely psychosocial interventions that improve the variables discussed above. For instance, to maintain a normal sleep-wake cues and scheduled daily routine during this transition, a designed psychological support and interventions for sleep and circadian rhythms should be offer to most vulnerable groups such as students and women,

A national study with even representative sample is required to address issue of physical inactivity, excessive screen use and poor sleep quality in university students in Malaysia. To provide equal comparison between result and maximize the generalizability, future research should be conducted among various ethnic populations and in different district in Malaysia.

CHAPTER 6

CONCLUSION

In this study, most of the participants had a moderate screen use, moderate physical activity level and poor sleep quality during transition to COVID-19 endemic. Spearman correlation test were done and there was no significant correlation between screen time and physical activity level. There was no significant correlation between physical activity level and sleep quality. Also, there was no significant correlation between screen time and sleep quality. There was no significant difference in screen time between male and female students. Physical activity level was significantly different between gender, with male students having higher physical activity level. Sleep quality was significantly different between gender, male having poorer sleep quality than females.

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APPENDICES

APPENDIX A

The Relationship between Screen Time, Physical Activity and Sleep Quality among Male and Female Students from University Tunku Abdul Rahman (UTAR) during transition to Covid-19 Endemic

Dear respondents,

My name is Jenny Ong Xiao Thong, a Y3T2 students of Bachelor of Science (HONS) Dietetics from University Tunku Abdul Rahman (UTAR) Kampar campus.

I am currently working on my Final Year Project (FYP) entitled "**The Association between Screen Time, Physical Activity and Sleep Quality among Male and Female Students from University Tunku Abdul Rahman (UTAR) during Covid-19 Pandemic**".

I would like to invite you to participate in my FYP research study by completing this questionnaire. The entire questionnaire will take approximately 10 - 15 minutes to complete.

The questionnaire consist of FOUR sections:

1. Section A: Sociodemographic Data
2. Section B: International Physical Activity (IPAQ) Questionnaire
3. Section C: Screen Time Questionnaire
4. Section D: Pittsburgh Sleep Quality Index (PSQI)

Participants **MUST** meet the criteria below to participate

1. UTAR fulltime foundation and undergraduate student
2. Malaysian Citizen
3. 18 - 30 years old
4. No mental health disorders
5. Do not undergoes weight loss programme
6. Do not undergoes specialized diet
7. Not pregnant
8. Do not have disability

Any inquires, please do not hesitate to contact me through email jennyong00@1utar.my or Whatsapp 01110573367.

You participation are greatly appreciated.

Thank you very much and have a nice day!

* Indicates required question

1. By selecting **"Agree"**, indicate you fulfilled all the criteria to participate in this questionnaire *
   a) UTAR fulltime foundation and undergraduate student
   b) Malaysian Citizen
   c) 18 - 30 years old
   d) No mental health disorders
   e) Do not undergo weight loss programme
   f) Do not undergo specialized diet
   g) Not pregnant
   h) Do not have disability

   Mark only one oval.

   - ( ) Agree
   - ( ) Disagree
     *Skip to section 11 (**Thank you for your participation. Hope you have a great day.**)*

Consent

2. By selecting **"Agree"** , indicate you have agree to participate in this study, and you are free to withdraw at any time. *

   Any information provided will be kept confidential and be used for academic purpose only.

   Mark only one oval.

   - ( ) Agree
   - ( ) Disagree
     *Skip to section 11 (**Thank you for your participation. Hope you have a great day.**)*

Section A: Sociodemographic Data

3. **Gender** *

Mark only one oval.

- ◯ Male
- ◯ Female

4. **Age** *

_____

5. **Ethnic** *

Mark only one oval.

- ◯ Malay
- ◯ Chinese
- ◯ Indian
- ◯ Other: _____

6. **Faculty** (Write in full form) *
eg. Faculty of Science

_____

7. **Course of Study** (Write in full form) *
eg. Bachelor of Science (HONS) Dietetics

_____

8. **Utar email** *
eg. xxxxxx@1utar.my

_____

Section B: International Physical Activity (IPAQ) Questionnaire

The questions will ask you about the time you spent being physically active in the **last 7 days**. **Please try to answer each question** even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Vigorous Activities
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.

9. **Question 1**
   During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?
   Give the answer in "**days per week**" *(eg. 3 days per week)*

   If no vigorous physical activities, skip to question 3

10. **Question 2**
    How much time did you usually spend doing vigorous physical activities on one of those days?
    Give answer in **"hours and minutes per day"** *(eg. 2 hours 30 minutes per day)*

    Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

Section B: International Physical Activity (IPAQ) Questionnaire

Moderate Activities
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.

11. **Question 3**
During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.
Give answer in **"days per week"** *(eg. 3 days per week)*

If no moderate physical activities, skip to question 5

12. **Question 4**
How much time did you usually spend doing moderate physical activities on one of those days?
Give answer in **"hours and minutes per day"** *(eg. 2 hours 30 minutes per day)*

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

Section B: International Physical Activity (IPAQ) Questionnaire

Walking
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.

13. **Question 5** *
During the last 7 days, on how many days did you walk for at least 10 minutes at a time?
Give the answer in "**days per week**" *(eg. 3 days per week)*

14. **Question 6** *
How much time did you usually spend walking on one of those days?
Give answer in **"hours and minutes per day"** *(eg. 2 hours 30 minutes per day)*

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

Section B: International Physical Activity (IPAQ) Questionnaire

Sitting
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.

15. **Question 7** *
    During the last 7 days, how much time did you spend sitting on a week day? Give answer in **"hours and minutes per day"** *(eg. 2 hours 30 minutes per day)*

    Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

Section C: Screen Time Questionnaire

For the following set of questions, **primary activity** is defined as the main activity you are engaged in rather than using a television/other screen in the background while performing another activity such as cooking or exercising.

Screen use on an average weekday
Thinking of an **average weekday** (from when you wake up until you go to sleep), how much time do you spend using each of the following types of screen as the primary activity?
Give answer in hours and minutes. If zero, please type "0" in the box.

16. Television *

    Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

17. TV-connected devices (e.g. streaming devices, video game consoles) *

    Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

18. Laptop/computer *

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

19. Smartphone *

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

20. Tablet *

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

Screen use on an average weeknight

Now, thinking of an **average weeknight** (from when you return from work until you go to sleep), how much time do you spend using each of the following types of screen as the primary activity?

You must answer both hours and minutes only. If zero please type "0" in the box.

21. Television *

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

22. TV-connected devices (e.g. streaming devices, video game consoles) *

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

23. Laptop/computer *

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

24. Smartphone *

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

25. Tablet *

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

Screen use on an average weekend day

Now, thinking of an **average weekend day** (Saturday or Sunday), how many hours over the course of the whole day (from when you wake up until you go to sleep) do you spend using each of the following types of screen as the primary activity?
If zero please type "0" in the box.

26. Television *

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

27. TV-connected devices (e.g. streaming devices, video game consoles) *

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

28. Laptop/computer *

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

29. Smartphone *

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

30. Tablet *

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

Section C: Screen Time Questionnaire

For the following set of questions, **background screen** is defined as the use of a television or another screen near you while performing other activities such as exercising, cooking, and interacting with family/friends.

Example: *If you exercise in the morning for one hour while watching the TV news, you use your smartphone for one hour while eating lunch and an additional 30 minutes while eating dinner, you would estimate that you are exposed to 2 hours and 30 minutes of background screen use per day.*

31. **Background screen use on a regular weekday** *
Thinking about a **regular weekday** (Monday through Friday), on average, how many hours over the course of the whole day (from when you wake up until you go to sleep) are you exposed to background screen use?
If zero please type "0" in the box.

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

32. **Background screen use on a regular weeknight** *
Now we want to ask about **background screen use during the evening specifically**. On average, how many hours per evening (Monday through Friday) are you exposed to background screen use from when you return from work until you go to sleep?
If zero please type "0" in the box.

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

33. **Background screen use on a regular weekend day** *

Now we want to ask about **background screen use during the weekend**. Thinking about a regular weekend day (Saturday or Sunday), on average, how many hours over the course of the whole day (from when you wake up until you go to sleep) are you exposed to background screen use?
If zero please type "0" in the box.

Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)

Section D: Pittsburgh Sleep Quality Index (PSQI)

The following questions relate to your usual sleep habits during the **past month only**. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. **Please answer all questions.**

34. **Question 1** *

During the past month, what time have you usually gone to bed at night?

Example: 8:30 AM

35. **Question 2** *

During the past month, how long **(in minutes)** has it usually taken you to fall asleep each night? *eg. 30 minutes*

36. **Question 3** *

During the past month, what time have you usually gotten up in the morning?

Example: 8:30 AM

37. **Question 4** *

During the past month, how many **hours** of actual sleep did you get at night? (This may be different than the number of hours you spent in bed). *eg. 7 hours*

38. **Question 5** *

During the past month, how often have you had trouble sleeping because you...

Mark only one oval per row.

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a. Cannot get to sleep within 30 minutes				
b. Wake up in the middle of the night or early morning				
c. Have to get up to use the bathroom				
d. Cannot breathe comfortably				
e. Cough or snore loudly				
f. Feel too cold				
g. Feel too hot				
h. Have bad dreams				
i. Have pain				

39. j. Other reason (s) from mentioned above, please describe and also state the frequency *(eg. Stress, Once or twice a week)*
If no, skip to next question

40. **Question 6** *
During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

Mark only one oval.

- Not during the past month
- Less than once a week
- Once or twice a week
- Three or more times a week

41. **Question 7** *
During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Mark only one oval.

- Not during the past month
- Less than once a week
- Once or twice a week
- Three or more times a week

42. **Question 8** *

During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

Mark only one oval.

- ◯ No problem at all
- ◯ Only a very slight problem
- ◯ Somewhat a problem
- ◯ A very big problem

43. **Question 9** *

During the past month, how would you rate your sleep quality overall?

Mark only one oval.

- ◯ Very good
- ◯ Fairly good
- ◯ Fairly bad
- ◯ Very bad

44. **Question 10** *

Do you have a bed partner or room mate?

Mark only one oval.

- ◯ No bed partner or room mate
- ◯ Partner/room mate in other room
- ◯ Partner in same room but not same bed
- ◯ Partner in same bed

45. If you have a room mate or bed partner, ask him/her how often in the past month you have had

If choose "No bed partner or room mate", **skip to next section**

Mark only one oval per row.

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a. Loud snoring	◯	◯	◯	◯
b. Long pauses between breaths while asleep	◯	◯	◯	◯
c. Legs twitching or jerking while you sleep	◯	◯	◯	◯
d. Episodes of disorientation or confusion during sleep	◯	◯	◯	◯

46. e. Other restlessness from mentioned above while you sleep, please describe & state the frequency *(eg. Sleep talking, Once or twice a week)*
If no, skip to next section

Thank you for your participation. Hope you have a great day.

APPENDIX B

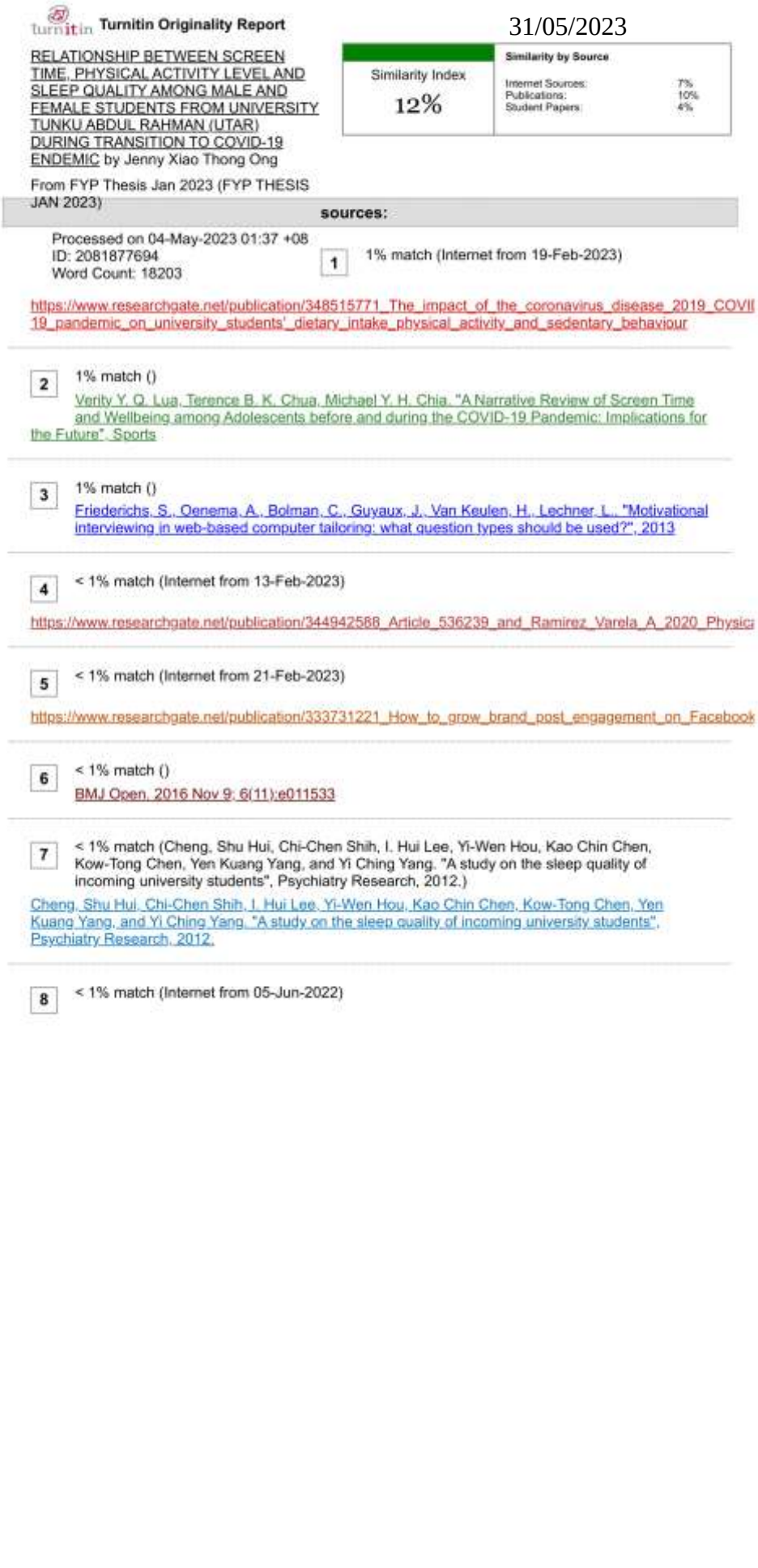
Table A.1: Test of normality

	Kolmogorov-Smirnov[a]	**Shapiro-Wilk**
	Sig.[b]	**Sig.[b]**
Screen time	0.000	0.000
Physical activity level	0.000	0.000
Sleep quality	0.000	0.000

[a]Lilliefors Significance Correction

[b]Significant value

APPENDIX C



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APPENDIX D

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FACULTY OF SCIENCE

Full Name(s) of Candidate(s)	Jenny Ong Xiao Thong
ID Number(s)	20ADB01648
Programme / Course	Bachelor of Science (HONS) Dietetics
Title of Final Year Project	Relationship between Screen Time, Physical Activity Level and Sleep Quality among Male and Female from UTAR during Transition to Covid-19 Endemic

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Signature of Supervisor
Name: MUHAMMAD ZULHUSNI BIN SUHAIMI
Date: 31/05/2023

Signature of Co-Supervisor
Name: _____
Date: _____