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### ABSTRACT.

*Poor sleep quality due to physical inactivity and excessive use of gadgets is one of the issues faced by young adults. Unfortunately, there is limited data regarding sleep quality characteristics among young adults' population in Malaysia. Therefore, this study aimed to investigate the relationship between physical activity, sleep quality, and daytime sleepiness among young adults in Ipoh. Total of three hundred thirty-five (N=335) young adults in Ipoh (male= 191, female= 144) age between 18-25 years old were participated in this study. Participants completed the International Physical Activity Questionnaires-Short Form (IPAQ-SF), Pittsburgh Sleep Quality Index (PSQI), and Epworth Sleepiness Scale (ESS). Results indicated that there was no significant correlation between physical activity and sleep quality ( $p>0.05$ ) or between physical activity and daytime sleepiness ( $p>0.05$ ). However, a significant correlation was found between sleep quality and daytime sleepiness ( $p<0.05$ ,  $r= -0.278$ ). The findings demonstrated that most of the variables in this study are not interdependent to each other except between sleep quality and daytime sleepiness. Objective measurement should be considered in future studies to provide additional insight into variables information.*

**Keyword.** Physical activity, sleep quality, daytime sleepiness, young adults

## INTRODUCTION

Sleep is important for many reasons, including optimizing sports performance, reducing depression level, conserving energy, boosting immune function, and promoting physical and mental recovery (Randjelović et al., 2018). Physiologically, sleep plays an essential part in individuals' physical well-being as it is involved in repairing and rejuvenating the heart and blood vessels while maintaining a healthy balance of hormones (Lavie, 2015). Besides that, sleep also aids emotional well-being and promotes healthy brain functions by supporting memory consolidation, regulating mood, and fostering creativity (Walker, 2017).

Sleep quality refers to the degree to which a person can sleep without experiencing difficulty, which is associated with sleep latency, sleep duration, sleep disturbances, daytime dysfunction, sedative medication, sleep efficiency and subjective sleep satisfaction (Mollayeva et al. 2016; Krystal & Edinger, 2008). Studies have explored the connection between sleep quality and daytime drowsiness in young adults (Liu et al., 2020; Alshahrani et al., 2019). To improve sleep quality and reduce daytime sleepiness, it is important for individuals to educate themselves on how to achieve efficient sleep.

Poor sleep quality affects a wide range of population, including youngsters, students, adults, and senior citizens (Mollayeva et al. 2016; Krystal & Edinger, 2008). According to Giri et al. (2013), youngsters have a higher incidence of sleep-related issues than adults due to their specific lifestyle. A study done by Lund et al. (2010) found that 70% of college students reported insufficient sleep, with an average of only 6.5 hours of sleep per night. Irregular sleep schedules, lack of time management, and high levels of academic and social stress can contribute to poor sleep quality in students and youngsters (Brown et al., 2002). Bad sleep hygiene and emotional tension are also contributing to poor sleep quality among this age group (Randjelović et al., 2018).

Engaging in activities that disrupt sleep before bedtime, such as coffee consumption, personal computer and smartphone usage has been found to contribute to daytime sleepiness among youngsters (Hershner and Chervin, 2014). Research has demonstrated that the use of smartphones with light-emitting diode backlight screens can disrupt sleep and disturb the body's natural sleep-wake cycle (Chang et al., 2014). Poor sleep quality can lead to daytime sleepiness, characterized by an increased tendency to fall asleep and feeling drowsy (Chasens et al., 2009). This daytime sleepiness can have a negative impact on one's quality of life. Inadequate sleep quality can have long-term health implications, contributing to the development of severe medical conditions such as heart disease, diabetes, and obesity, while also detrimentally affecting one's overall quality of life (Zuraikat et al., 2020).

Physical activity has been associated with quality of sleep that reduces daytime sleepiness. In a study conducted by Hsu et al. (2019), the findings revealed that high school students who engaged in physical activity for more than 3.5 hours per week had improved sleep quality. Additionally, Ströhle (2008) suggests that getting at least 60 minutes of daily physical activity is associated with adequate quality sleep. However, the relationship between physical activity and sleep quality has produced inconsistent results across studies (Quick et al., 2015; Lund et al., 2010; Chen et al., 2006; Krueger & Friedman, 2009). Some studies have reported that a higher level of physical activity is linked to better sleep quality (Chen et al., 2006; Krueger & Friedman, 2009), while others have found no significant association (Quick et al., 2015; Lund et al., 2010). Besides that, prior studies have mainly focused on specific groups

such as older adults and students (Nurismadiana and Khuan, 2018; Farah et al., 2019) but there is limited data regarding sleep quality characteristics among young adults' population in Malaysia. Therefore, the purpose of this study was to investigate the relationship between physical activity, sleep quality, and daytime sleepiness among young adults in Ipoh, Malaysia.

## METHODS

### *Participants*

Total of three hundred thirty-five (N=335) young adults in Ipoh (male= 191, female= 144) age between 18-25 years old were participated in this study. Informed consent was obtained from all participants prior to the commencement of the study with explanation on the study objective and potential benefits. All procedures were conducted in accordance with the Declaration of Helsinki and approved by the Institution's Ethics Committee.

### *Instrumentations*

#### *International Physical Activity Questionnaire-Short Form (IPAQ-SF)*

The IPAQ-SF is a tool for monitoring physical activity within adult populations (15-69 years old). This questionnaire comprises 7 question items that requires participants to recall their physical activity over the past 7 days. The IPAQ short form encompasses three types of activities (walking, moderate intensity activities, and vigorous intensity activities) across four domains: leisure time physical activity, work-related physical activity, transport-related physical activity, and domestic and gardening activities. Each type of activity (walking, moderate intensity, and vigorous intensity) is scored based on the duration in minutes and the number of days engaged in that activity. The scores are categorized as low activity, moderate activity, or high activity. An expressed MET-Min/Week is assessed using a standard calculation formula from the score obtained in question items. The questionnaires demonstrate high reliability, with a correlation coefficient of 0.84 for the total IPAQ-SF score.

#### *Pittsburgh Sleep Quality Index (PSQI)*

The PSQI developed by Buysse et al. (1989) was used to assess sleep quality over a period of one month. It consists of 19 question items that are categorized into 7 components. Each component is scored on a scale of 0 to 3, resulting in a total score ranging from 0 to 21. The sum of the component scores is used to determine the global score for sleep quality (a score higher than 5 indicates poor sleep quality, while a score lower than 5 indicates good sleep quality). The Cronbach's alpha value for this questionnaire is 0.70 indicating acceptable reliability.

#### *Epworth Sleepiness Scale (ESS)*

The ESS is a questionnaire designed to assess the level of daytime sleepiness (Johns, 1991). It consists of 8 items, and each item is rated on a scale of 0 to 3. The 4-point scale is used to rate the likelihood of dozing off in eight different situations. The total score is from 0-24, which higher score than >11 indicates high risk for sleepiness and lower score than <11 indicates low

risk sleepiness. The Cronbach's alpha value for this questionnaire is 0.70 showing satisfactory reliability.

### *Statistical Analysis*

Statistical analysis was carried out using Statistical Packaging for Social Sciences (SPSS) Statistics version 25. Descriptive statistics (mean  $\pm$  SD) was used to report the demographic data of the study. The Pearson correlation test was used to measure the relationship between variables. Statistical significance level was accepted at  $p < 0.05$ .

## **RESULTS**

Total of three hundred thirty-five (N=335) young adults in Ipoh (male= 191, female= 144) age between 18-25 years old were participated in this study. Participants' level of education ranged from postgraduate to diploma studies.

Majority of the respondents (n=167, 49.9%) have moderate level of physical activity, while only 14.6% respondents (n=49) are inactive with low physical activity. Most of the young adult participated in this study are poor sleeper (n=215, 64.2%). For the daytime sleepiness scale result, 76.4% of the respondents have low risk for sleepiness. Table 1 presents the descriptive data for the physical activity level, sleep quality and daytime sleepiness. Table 2 provides the mean  $\pm$  SD for the physical activity, sleep quality and daytime sleepiness.

*Table 1: Physical Activity Level, Sleep Quality and Daytime Sleepiness*

	Frequency (n)	Percent (%)
<i>Physical Activity</i>		
Low PA (Inactive)	49	14.6
Moderate PA (Minimally Active)	167	49.9
High PA (Active)	119	35.5
Total	335	100.0
<i>Sleep Quality</i>		
Good Sleeper	120	35.8
Poor Sleeper	215	64.2
Total	335	100.0
<i>Daytime Sleepiness</i>		
Low Risk for Sleepiness	256	76.4
High Risk for Sleepiness	79	23.6
Total	335	100.0

*Table 2: Mean  $\pm$  SD for Physical Activity, Sleep Quality and Daytime Sleepiness*

	Mean	SD
Physical Activity (IPAQ-MET)	2722.54	2157.69
Sleep Quality (PSQI)	6.95	3.50
Daytime Sleepiness (ESS)	8.50	4.58

The results of the correlational analysis are presented in Table 3. A significant negative correlation was found between sleep quality and daytime sleepiness ( $p < 0.05$ ,  $r = - 0.278$ ).

However, there was no significant correlation between physical activity and sleep quality ( $p>0.05$ ) or between physical activity and daytime sleepiness ( $p>0.05$ ).

Table 3: *Correlation between Physical Activity, Sleep Quality and Daytime Sleepiness*

	Physical Activity	Sleep Quality	Daytime Sleepiness
Physical Activity		-0.015	0.021
Sleep Quality	-0.015		-0.278*
Daytime Sleepiness	0.021	-0.278*	

Note. \*  $p < .05$

## DISCUSSION

The objective of this study is to investigate the relationship between physical activity, sleep quality and daytime sleepiness among Ipoh young adults. The findings of this study showed that physical activity and sleep quality or physical activity and daytime sleepiness are not interdependent to each other, except a correlation observed between sleep quality and daytime sleepiness.

Engaging in a moderate level of physical activity does not seem to significantly impact the sleep quality or vice versa. These results are similar to those reported by Wang and Boros (2019). It is speculated that the age might have an impact on indicating significant findings in this study. As the participants' age increases, the association between physical activity and sleep quality may become prominent (Wang & Boros, 2019). This discovery is consistent with earlier research done by Kakinami et al. (2017), Holfeld & Ruthig (2014) and Benloucif et al. (2004), which demonstrated that older adults experience better improvements in sleep quality compared to younger adults when physical activity are modified to their age level. There is a possibility of a connection between physical activity and sleep quality in older adults. According to Carney et al. (2006), the behaviour of the young adults plays bigger role in determining sleep quality than the physical activity does. Screen time behaviour with blue light exposure can disrupt the body's natural sleep cues, gives bad impact on circadian rhythm and decrease sleep quality (Stefan, 2018; Chang et al., 2014). In contrast, Kakinami et al. (2017) and King (1997) found that moderate intensity physical activity improves sleep quality and sleep duration. These findings could be attributed to the use of experimental trials in both studies with more controlled procedures, which rely less on the physical activity habits.

The physical activity also seems to have little influence on daytime sleepiness of the young adults in this study ( $p>0.05$ ). Daytime sleepiness refers to a strong desire to sleep in a variety situation, and it is related with impaired daytime functioning when individuals are expected to be awake and aware of the surroundings (Randjelović et al. 2018). The association between daytime sleepiness and physical activity is not straightforward and appears to more closely related to individual sleep quality. Findings from this study align with previous research done by Hsu et al. (2019) and Yang et al. (2016) indicating that physical activity level is not significantly associated with daytime sleepiness. However, Chasen et al. (2007) found contradict finding that suggested a link between lower physical activity and daytime sleepiness. Sedentary behaviour and physical activity level alone may not have a significant impact on daytime sleepiness. Other factors such as sleep quality, dietary and individual differences may play more prominent roles in determining daytime sleepiness. It is important to consider the complexities of individual lifestyle in exploring the link to daytime sleepiness (Morrison &



Riha, 2012). Young adults especially students are prone to daytime sleepiness often due to irregular sleep-wake schedules or insufficient sleep duration (Huang et al., 2014; Taher et al., 2012). There is bidirectional relationship between physical activity and daytime sleepiness. Sleep related daytime dysfunctions can reduce the physical activity level. The motivation, energy levels and fatigue sensations may make it difficult to stay active throughout the day.

The current study reveals a significant negative relationship between sleep quality and daytime sleepiness ( $p < 0.05$ ,  $r = -0.278$ ). The present findings indicates that higher sleep quality is associated with decreased daytime sleepiness. This research outcome supports the work of other studies in this area linking sleep quality and daytime sleepiness (Nurismadiana & Khuan, 2018; Gjevrev et al., 2013). Even though, daytime sleepiness is common among young adults who mostly are students (Gradisar et al., 2011), a good sleep quality may reduce the incidence. Students in particular are more likely to experience daytime sleepiness as a result of irregular sleep-wake cycles or sleep deprivation (Huang et al., 2014; Taher et al., 2012). According to Zailinawati et al. (2009), the medical students show higher prevalence of excessive daytime sleepiness compared to the general population. In contrast, Ahmed et al. (2009) found that no association between sleep quality and falling asleep during daytime.

## CONCLUSION

This study set out to examine the relationship between physical activity, sleep quality and daytime sleepiness. The findings have shown that there is interdependency between sleep quality and daytime sleepiness. However, physical activity and sleep quality or physical activity and daytime sleepiness failed to reject the null hypotheses. The link between sleep quality and daytime sleepiness appears to exist, although the correlation between these variables is weak. Improving sleep quality may contribute to a reduction in daytime sleepiness. Therefore, addressing sleep quality as part of the strategy and approach to managing daytime sleepiness is recommended, taking into consideration the individual factors. The present study lays the groundwork for future research into sleep quality among young adult in Malaysia. The study should be repeated using objective measurement such as accelerometer usage to gain further insights into the variables under investigation. Including objective measures can provide more accurate and detailed information on the subjects, allowing for a more comprehensive understanding of the research variables.

### Conflict of interest:

Raja Ahmad Mustaqim Raja Ismail, Sharifah Maimunah Syed Mud Puad, Raja Nurul Jannat Raja Hussain, Nurul Ain Abu Kassim, Mardiana Mazaulan and Muhamad Noor Mohamed declare that they have no conflict of interest.

### Authors' contributions:

Raja Ahmad Mustaqim Raja Ismail carried out this study and drafted the manuscript, Sharifah Maimunah Syed Mud Puad participated in the design of the study and wrote the manuscript, Raja Nurul Jannat Raja Hussain performed the data analysis and participated in the design of the study, Nurul Ain Abu Kassim, Mardiana Mazaulan and Muhamad Noor Mohamed reviewed the manuscript. All authors read and approved the final manuscript.

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