



UNIVERSITI PUTRA MALAYSIA

***RELATIONSHIP BETWEEN SEDENTARY BEHAVIOUR, WORK
FACTORS AND SLEEP QUALITY WITH FATIGUE
AMONG GOVERNMENT OFFICE WORKERS IN PUTRAJAYA***

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SLEEP QUALITY WITH FATIGUE AMONG GOVERNMENT OFFICE WORKERS
IN PUTRAJAYA**



BY

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ABSTRACT

RELATIONSHIP BETWEEN SEDENTARY BEHAVIOUR, WORK FACTORS AND SLEEP QUALITY WITH FATIGUE AMONG GOVERNMENT OFFICE WORKERS IN PUTRAJAYA

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Introduction: Nowadays, fatigue is known as an occupational hazard that are impairing workers' performance due to modernisation era whereby sedentary office based work are required. However, there are insufficient large population studies among working population especially office workers. A gold standard is also not available to measure fatigue in Malaysia. **Objective:** A cross-sectional study was conducted to evaluate the relationship between sedentary behaviour (SB), work factors and sleep quality with fatigue among government office workers. **Methodology:** 126 government office workers in Putrajaya were randomly selected, aged within 20 to 60 years old. The PSQI was used to assess sleep quality while OFER15 were used to measure fatigue. Pedometer and OSPAQ were used to measure SB. **Results:** There were 41 male and 85 female office workers who worked for 8 hours per day and used computer at least for 7 hours in workplace. Our findings illustrated that 34% of office workers had higher fatigue while 66% of the office workers had better recovery ability. SB did not significantly associated with fatigue. Having poor sleep quality, longer computer usage and being single significantly correlated with higher level of fatigue and lower recovery ability at ($p < 0.05$) level. **Conclusion:** In sum, marital status, using computer for too long and having impaired sleep influenced fatigue among government office workers.

Keywords: Fatigue, sedentary behaviour, sleep quality, sitting, office workers

ABSTRAK

HUBUNGKAIT ANTARA PERLAKUAN SEDENTARI, FAKTOR KERJA DAN KUALITI TIDUR DENGAN KELETIHAN DALAM KALANGAN PEKERJA PEJABAT KERAJAAN DI PUTRAJAYA

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Pengenalan: Pada masa kini, keletihan dikenali sebagai hazard pekerjaan yang merosakkan prestasi pekerja kerana pekerjaan pejabat yang semakin sedentari merupakan keperluan dalam era pemodenan. Walau bagaimanapun, tiada kajian populasi besar dalam kalangan kumpulan yang bekerja terutamanya pekerja pejabat yang mencukupi sebagai bukti. Piawaian emas juga tiada untuk menjadi kayu pengukur keletihan di Malaysia. **Objektif:** Kajian keratan rentas dilakukan untuk mengkaji hubungkait antara tingkah laku tidak aktif (SB), faktor kerja dan kualiti tidur dengan keletihan di kalangan pekerja pejabat kerajaan. **Metodologi:** 126 pegawai pejabat kerajaan di Putrajaya dipilih secara rawak, berumur dalam lingkungan 20 hingga 60 tahun. *PSQI* digunakan untuk menilai kualiti tidur sementara *OFER15* digunakan untuk mengukur keletihan. Pedometer dan *OSPAQ* digunakan untuk mengukur SB. **Keputusan dan Perbincangan:** Terdapat 41 pekerja pejabat lelaki dan 85 wanita yang bekerja selama 8 jam sehari dan menggunakan komputer sekurang-kurangnya selama 7 jam di tempat kerja. Hasil kajian kami menunjukkan bahawa 34% pekerja pejabat mengalami keletihan yang lebih tinggi sementara 66% pekerja pejabat mempunyai kemampuan pemulihan yang lebih baik. SB tidak dapat dikaitkan dengan keletihan. Mempunyai kualiti tidur yang rendah, penggunaan komputer yang lebih lama dan bujang menunjukkan korelasi signifikan dengan tahap keletihan yang lebih tinggi dan kemampuan pemulihan yang lebih rendah pada tahap ($p < 0.05$). **Kesimpulan:** Ringkasnya, status perkahwinan, menggunakan komputer terlalu lama dan mendapat tidur yang tidak mencukupi mempengaruhi keletihan dalam kalangan pekerja pejabat kerajaan.

Kata kunci: keletihan, perlakuan sedentari, kualiti tidur, duduk, pekerja pejabat kerajaan

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LIST OF ABBREVIATIONS

ACC	Department of Account
AF	Acute Fatigue
CF	Chronic Fatigue
DCRM	Departments of Corporate Relation Malaysia
DAE	Department of Assessment and Evaluation
DLPM	Departments of Labour Peninsular Malaysia
DOF	Departments of Fisheries
HR	Department of Human Resources
ICT	Department of Information and Communications Technology
IR	Intershift Recovery
Mets	Metabolic equivalents
OFER15	Occupational Fatigue Exhaustion Recovery
OSPAQ	Occupational Sitting and Physical Activities Question
PSQI	Pittsburgh Sleep Quality Index/ Global sleep quality
PSQIDAYDYS	Days dysfunction due to sleepiness
PSQIDISTB	Sleep disturbance
PSQIDURAT	Sleep duration
PSQIHSE	Habitual sleep efficiency
PSQILATEN	Sleep latency
PSQIMEDS	Need of medications to sleep
PSQISLPQUAL	Subjective sleep quality
SB	Sedentary behavior

CHAPTER 1

INTRODUCTION

1.1 Study Background

Subjective experience of tiredness or lack of energy is defined as fatigue. According to Rose et al. (2017), increased risk of health problems such as cardiovascular disease, muscle problems, weight gain and also fatigue had direct relationship to sitting time. This study also mentioned sedentariness resulted to feeling fatigued or having less energy. According to Ellingson, Kuffel, Vack, & Cook (2014), estimation of population for fatigue prevalence ranged from 20% to 40%, and women have significantly higher fatigue compared to men. In addition, based on a study by Lu, Sesek, Megahed, & Cavuoto (2017), fatigue is a known forerunner to numerous perverse impacts towards health perspective in both acute and chronic implications. This include poor performance, low productivity, low work quality and increased incidence of labour casualties and human mistakes.

In addition, from a dimensional analysis of fatigue study relating to shift workers, Richter et al. (2016) estimated that 90% of shift workers had regular fatigue and sleepiness at the workplace. The Centers for Disease Control (CDC) surveyed adults in 29 US states found that 36.7% of employed adults reported sleeping less than 7 hours per night (Caldwell et al., 2019). Moreover, Seaman (2015), suggested that work-related fatigue has been imputed to top level and strong nature of the skills required, as

well as a disturbance in circadian rhythms that were resulted from impaired sleep or sleep deprivation.

We can see the increase in sedentary-based occupations due to technology advancement, in which sitting patterns in workplace have contributed considerably to prolonged sitting time throughout working hours. According to findings from Malaysian Adult Nutritional Survey (MANS) study in 2003, Malaysian adults spent 41% in sitting positing during working day. This suggested that the prevalence of sedentary behaviour in most countries is very high, especially in developed regions (Jamil et al., 2016).

Generally, sitting that linked to low levels of energy expenditure is referred as sedentary behaviour. Jamil et al. (2016) mentioned that sedentariness is distinguishable from physical inactive because the term refers to too much sitting rather than engaging with little exercise. Individuals may still be considered as sedentary even they are initially physically active because they involve in an immense amount of sedentary behaviour. For example, a French study showed that workers spend 10h/day sitting on workdays and 7.58h/day sitting on non-workdays averagely which showed strong positive correlation between sedentary behaviour at work and during leisure time (Xercise et al., 2019).

Apart from that, other work factors can influence fatigue in workplace. It is often not recognized that fatigue risks can be impacted, due to a variety of factors in a workplace setting. Fatigue can compromise workers' performance in four main

perspectives which are vigilance, emotional balance, mental and physical ability. According to Bazazan et al. (2017), occupational fatigue is connected to physical and mental health issues as well as to absenteeism, and can increase the risk of casualties in the workplace. More knowledge concerning the relation between sedentary behaviour, work factors and fatigue could have significant impacts to the workers. Therefore, this study aims to increase more reliable study in Malaysia regarding occupational sedentary behaviour by identifying the association between sedentary lifestyle, socio-demo, work factors and sleep quality with fatigue among office workers which will eventually improve designation of occupational system in Malaysia. By having a good and healthy occupation system in Malaysia, will eventually lead to the development of healthy workers that will produce a good quality of work performance in a safe manner.

1.2 Problem Statement

According to Jing, Wang, Lin, Lei, & Wang (2015), in primary care context, the generality of fatigue among general population ranges from 2.72% to 75.7%. Recent studies pointed out that time engaged with sedentariness may be a vital element for fatigue but has not been presented in large population based studies (Engberg et al., 2017). Fatigue is a multifactorial condition that eventually causes illness and productivity loss as it affects a huge number of employees (Santos et al., 2016). The Star Online (2016) reported that Malaysian females (67%) spent six to nine hours on their desks compared to males (64%). However, there is no established study that can prove sedentary behaviour can lead to prevalence of fatigue among office workers especially in Malaysia. Moreover, absence of gold standard to measure fatigue in

Malaysia as indicated by Fadhli et al. (2019) which leads to inability to assess the association between sedentariness with fatigue wholly. This is one of the factors that lead to lack awareness on occupational hazard which is sedentariness among workers in workplace.

In addition, fatigue has also been demonstrated to be four times likelihood to facilitate workplace impairment than drugs or alcohol (Sawatzky, 2018). However, fatigue in the workplace is often harder to assess compared to drugs and alcohol which are easier to be measured. Statistic reported that one out of seven employees (13.9%) scheduled the appointment with a general practitioner due to fatigue-related problems. (Tang, Li, & Huang 2016). Based on few studies, the reported conditions have included cancers, multiple sclerosis, rheumatologic conditions, diabetes, heart disease and Parkinson's Disease (Menzies et al., 2019). Menzies et al. (2019), also mentioned that fatigue majorly contributes to cognitive impairment, such as depression and anxiety. However, there are still insufficient evidence to investigate the link between fatigue and cognitive deterioration in people who had chronic diseases.

Nowadays, sedentary behaviour has become the new public health enemy and there are insufficient large population studies among working population especially office workers to establish a valid evidence on occupational sedentariness hazard and fatigue. According to Lurati (2018), sedentary workers from prolonged sitting may develop early muscle fatigue resulting from obstructed blood flow that prevents blood vessels from dilating and less production of nitric oxide. Pain is the subjective indicator of local muscle fatigue which will eventually lead to ligament and tendon injuries (Wickens et

al., 2011). A study also mentioned that workers reported experiencing reduced psychological fatigue such as improved focus and encouragement when they take turns sitting and standing throughout their workday compared to when they sat continuously (Mailey et al., 2017). A study also support these findings by stating that office workers reported sedentary behaviour make them feeling tired, fatigue or having less energy and the responses were characterised by being demotivated and felt lethargic (McGuckin et al., 2017). Veldhuijzen Van Zanten, Pilutti, Duda, & Motl (2016) stated that sedentary behaviour has been suggested to result in more deaths than smoking behaviour. To date, in the current situation in Malaysia, the public still perceive sedentary behaviour or sedentariness have the same meaning as physical inactivity which is not true as these two terms are separate entities and occur differently (Jamil et al., 2016).

In addition, based on the research conducted by Jamil et al. (2016), only few domestic studies are available for information and citation which shows there is big research gap in this field as most local articles mostly focused on physical inactivity rather than studies pertaining to sedentariness, which have not been well researched. The available studies on sedentary behaviour among Malaysians are only conducted exclusively during specific behaviours such as watching TV which does not represent the occupational sedentary hazard which will give an inaccurate result as it is not fully representative of what is happening in the current workplace situation.

Apart from that, according to Sadeghniaat-Haghighi and Yazdi, (2015) fatigue is a crucial issue in modern society, largely because of immense workplace demands, long duty periods, disrupted circadian rhythms, social and societal demands, and sleep

impairment. Most adult were recommended to get 7-9 hours of sleep per night by sleep experts, however many fail to obtain adequate sleep which leads to sleep loss. (Hirshkowitz et al., 2015). In Malaysia, a huge sample population-based study was not available for extrapolation, based on the whole working population (Aye et al., 2017).

All in all, it is essential to identify and measure the association of sedentariness, work factors and sleep quality that can lead to fatigue at the workplace to consider the appropriate preventative measures in reducing the risks and impacts that will impairs workplace performance.

1.3 Study Justification

According to New Straits Times (2017), organisation would lose about RM2.7 billion as Malaysian employees lose 67 days per year due to health related absenteeism and presenteeism. Presenteeism is when a sick employee still goes to work which will cause productivity toll, declined health, exhaustion and workplace epidemics. A study conducted by Aboagye (2019) have concluded exhaustion and burnout were caused by presenteeism, One of the factors that driven the occurrence of presenteeism is due to long hours spent at work, stress and others which eventually demonstrate how presenteeism relates to fatigue. Workplace fatigue also affects physical and mental health, increasing the chance of accidents and musculoskeletal complaints, and reducing performance and productivity (Santos et al., 2016). This to ensure workplace fatigue can be reduced to develop healthy workers and increase workers' performance

which will eventually prevent occurrence of incidence in workplace and also in Malaysian population.

Apart from that, as stated in the problem statement above, there is an absence of gold standard to measure fatigue itself in Malaysia (Fadhli et al., 2019). Thus, this is why it is essential for more studies on fatigue and new occupational hazard such as sedentariness to be conducted to identify and assess the association between sedentariness and work factors to fatigue among local office workers especially. This is because as the prevalence and statistics stated in recent studies have shown that occupational fatigue has become one of the significant occupational hazards as it has various of risks and health impacts.

Overall prevalence of sedentary behaviour in Malaysia was 23.5% (Jamil et al., 2016). There is also a work survey conducted by Herbalife which reveals that 10 Malaysian employees (86%) spent at least six hours a day sitting at their desk eating lunch by themselves for two to five times in a week averagely as reported in The Star Online (2016). According to Koh (2018), in workplace setting office workers sit for 76% of the day, averagely. Hence, evaluating sedentary behaviour must be performed across the whole waking day and not solely during definite behaviours such as watching TV, as discussed by Gierach et al., (2009).

There are also only few studies on sedentariness as local articles mainly done on lack of physical activity as both of the terms are perceived to have the same meaning which it is untrue as the two terms are in fact distinguishable from each other. In

addition, based on Jamil et al. (2016), the studies that were up to date, inaccurately classified sedentary time in accordance with scarcity of self-reported activeness as these studies should be assessed by measuring the actual time spent sitting instead of evaluating the degree of physical activity among respondents.

More epidemiologic evidence to define sitting time threshold for health purposes should be established so that local comparison can be made as international comparison will give a less accurate results. This is because by making international comparison, will certainly place Malaysia among countries with the lowest sitting time, estimated to be less by 120 minutes compared to the average 5 hours in representative population samples from 20 countries as noted by Bauman et al. (2011). This will eventually lead to an unrepresentative study for our country.

Furthermore, according to Powell & Copping (2016), fatigue can be created from two major physiological phenomena which are sleep impairment and disrupted circadian rhythms. Laggard reaction time and poor judgment resulting from excessive sleepiness in workplace especially for high risk jobs are hazardous as it may lead to accidents and injuries in workplace. In the problem statement above, also stated that there is also an absence of large population-based study based on the whole working population which lead to a less reliable evidence as we have no reliable and valid study as a standard. Aye et al. (2017) pointed out that no studies were conducted on workers from other industry sectors particularly office workers despite a preliminary sleep quality study had been performed among Malaysian nurses only, thus this will lead to an unrepresentative study for our country.

According to Bauman et al. (2011), also highlighted more research with goals to define descriptive epidemiology, theory, and health impacts of sedentary behaviour are required. Generally, office workers in Malaysia especially will be the target community who will be benefited from this study as they will be aware of the level of their sedentariness and know the health implications resulting from sedentary behaviour and adverse health impacts especially fatigue. Thus, by having the awareness appropriate preventative measures in reducing the risks and impacts that will impair workplace performance will be created. Hence, productivity loss will be reduced as well as boosting up the economy.

1.4 Conceptual Framework

Figure 1.1 illustrates the conceptual framework of this research that summarises the study on the sedentary behaviour, work factors and sleep quality that can lead to fatigue among office workers. The main goal of this research is to discover either sedentary behaviour at work, work factors and sleep quality affect fatigue. The sedentary behaviour of office workers was objectively measured using pedometer and subjectively evaluated by using Occupational Sitting and Physical Activity Questionnaire (OSPAQ). The readings obtained were supported with work activities which includes duration of office workers spend their times sitting, walking, standing and engaging with heavy work. Work factors, sleep quality and fatigue were assessed by using questionnaire. Three variables which are chronic fatigue, acute fatigue and intershift recovery were used to determine fatigue.

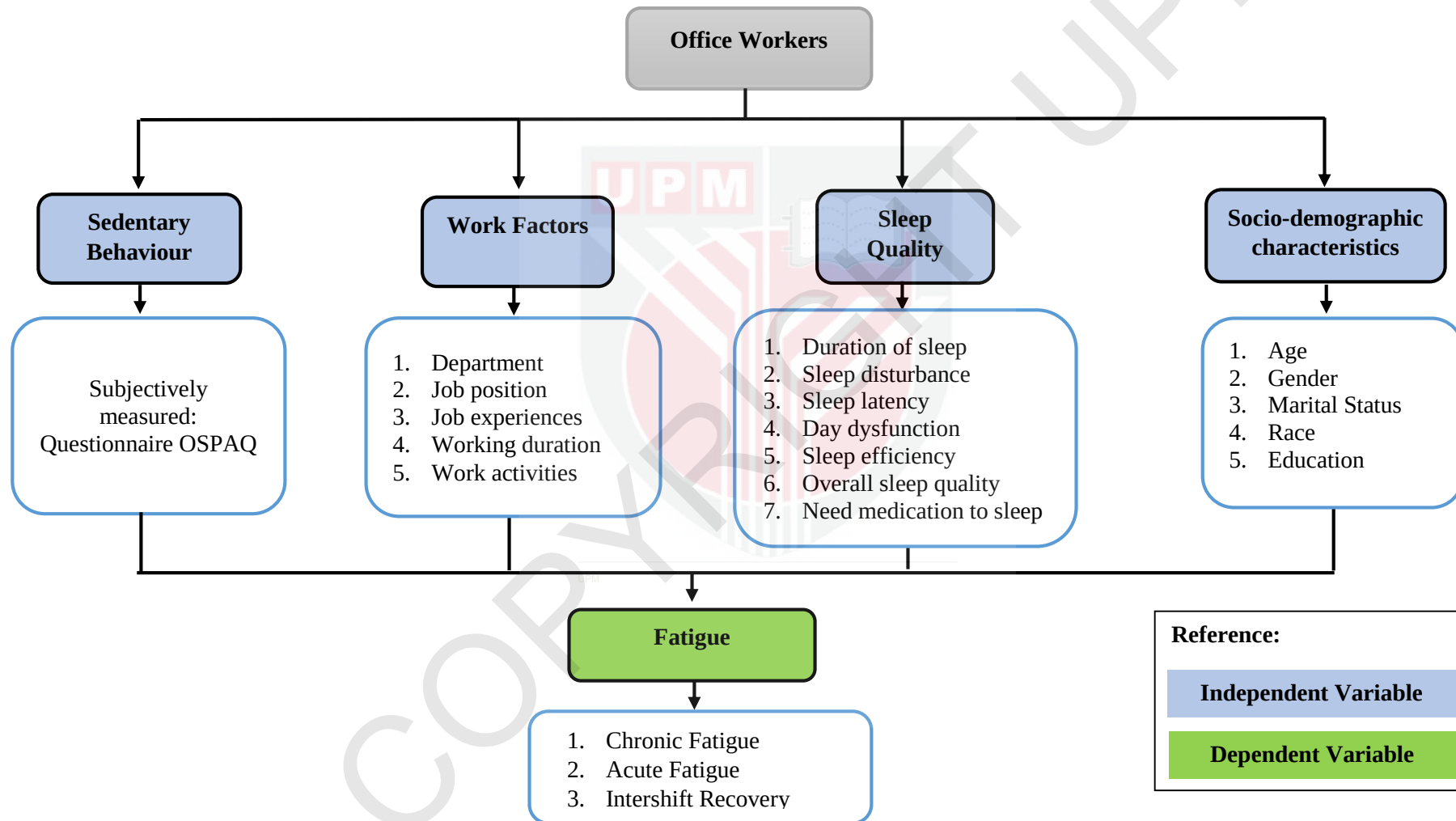


Figure 1.1 Conceptual Framework

1.5 Research Question(s)

Do sedentary behaviour, socio-demographic, work factors and sleep quality associate with fatigue?

1.6 Research Objectives

1.6.1 General objective

To identify the relationship between sedentary behaviour, socio-demographic, work factors and sleep quality with fatigue among government office workers in Putrajaya.

1.6.2 Specific objectives

1. To assess the sedentary behaviour, socio-demographic, work factors, sleep quality and fatigue among government office workers in Putrajaya.
2. To evaluate the relationship between socio-demographic characteristics and sleep quality among government office workers in Putrajaya.
3. To determine the relationship between socio-demographic characteristics and fatigue among government office workers in Putrajaya.
4. To evaluate the relationship between sedentary behaviour and fatigue among government office workers in Putrajaya.
5. To evaluate the relationship between work factors and fatigue among government office workers in Putrajaya

6. To determine the relationship between sleep quality and fatigue among government office workers in Putrajaya.
7. To evaluate the interrelationship between sedentary behaviour, socio-demographic, work factors and sleep quality with fatigue among government office workers in Putrajaya.

1.7 Study Hypothesis

H01: There is no significant mean difference of sleep quality with socio-demographic characteristics at p-value greater than 0.05.

H02: There is no significant mean difference of fatigue with socio-demographic characteristics at p-value greater than 0.05.

H03: There is no significant mean difference of fatigue with sedentary behaviour at p-value greater than 0.05.

H04: There is no significant mean difference of fatigue with work factors at p-value greater than 0.05.

H05: There is no significant mean difference of fatigue with sleep quality at p-value greater than 0.05.

H06: There is no significant mean difference of fatigue between sedentary behaviour, socio-demographic characteristics, work factors and sleep quality at p-value greater than 0.05.

1.8 Definition of Terms

1.8.1 Conceptual Definition

Fatigue

State of feeling very tired, weary or sleepy resulting from insufficient sleep, prolonged mental or physical work, or extended periods of stress or anxiety are defined as fatigue. Feelings of fatigue can be intensified by dull or repetitive tasks. Fatigue can be characterised as either acute or chronic.” (Canadian Centre for Occupational Health and Safety, 2017).

Sedentary Behaviour

Any behaviour described by an energy expenditure of ≤ 1.5 METs while in a sitting or reclining posture is defined as sedentary behaviour (Daneshmandi et al., 2017).

Work Factors

Work factors are characterised by including work scheduling, work environment and work tasks (Sawatzky, 2018).

Sleep Quality

Sleep quality is determined by several criterias, which included duration of sleep (4–10 hours daily), time needed to fall asleep, frequency of waking, and wellbeing at wake up (Kunzweiler et al., 2016).

Office Workers

According to Collins English Dictionary, office workers are defined as employees who work in an office, for example carrying out clerical or administrative work for an organization.

1.8.2 Operational Definition

Fatigue

Fatigue was measured using validated survey questionnaire which is Occupational Fatigue Exhaustion Recovery (OFER15) instrument which comprised of chronic fatigue (5 items), acute fatigue (5 items), and inter-shift recovery (5 items) which total to 15 items altogether. Mental, physical, and emotional components that are characteristics of persistent fatigue were captured by designation of the chronic fatigue subscale items. Meanwhile, inability or unwillingness to engage in activities outside the workplace as a direct consequence of previous activity were interpreted via acute fatigue subscales (Seaman, 2015).

Sedentary Behaviour

Sedentary behaviour was subjectively measured using questionnaire which is adapted from Occupational Sitting and Physical Activity Questionnaire (OSPAQ) and pedometer. The fraction of work time spent sitting, standing, walking, and doing heavy labour, as well as the total length of time worked in the past five working days were measure by OSPAQ.

Sleep Quality

Pittsburgh Sleep Quality Index (PSQI) survey (Shahid et al., 2012) was utilised to assess sleep quality which have been validated and reported to be reliable, sensitive and specific. This survey consists of 19-item survey with 7 domains: sleep duration (PSQIDURAT), sleep disturbance (PSQIDISTB), sleep latency (PSQILATEN), day dysfunction (PSQIDAYDYS), habitual sleep efficiency (PSQIHSE), subjective sleep quality (PSQISPLQUAL) and need of medications to sleep (PSQIMEDS). A total score or PSQI of equal or less than 5 is associated with good sleep quality and a score greater than 5 is associated with poor sleep quality. (Seaman, 2015).

CHAPTER 2

LITERATURE REVIEW

2.1 Fatigue Risk

Fatigue was defined as the state of feeling very tired, weary or sleepy resulting from insufficient sleep, prolonged mental or physical work, or extended periods of stress or anxiety by Canadian Centre for Occupational Health and Safety (2017). Fatigue can be either pathological or non-pathological. According to Jason, Evans, Brown, & Porter (2010), if it lasts fewer than 3 months and has an identifiable origin it is indicated as non-pathological and this type is resolved by treating the underlying conditions or diseases. Meanwhile for pathological fatigue is the prolonged fatigue which lasted for 1 and 5 months or chronic fatigue lasted 6 months and above. This type of pathological fatigue is also common among people with chronic illness which impaired a person's functional activity and quality of life.

Fatigue can be explicated by both central and peripheral mechanisms in the body. According to Jason et al. (2010), response deprivation in the neuromuscular system after central stimulation caused peripheral fatigue while central fatigue is facilitated

by the central nervous system and is described by a failure to transmit motor impulses or conduct voluntary activities. In addition, Lin et al. (2015) stated that there are multiple causes of fatigue which includes medical causes, lifestyle related causes such as poor sleep quality and sedentary lifestyle and the third cause due to workplace related such as workplace stress. Jing et al. (2015) pointed out the approximate prevalence of fatigue in the U.S. workforce was 37.9% but in China was 82.1%. Thus, this shows that China has a higher prevalence of fatigue. Vocational strains, work overload, frequent overtime hours, shift and piece-rate work, less leisure time and frequent conflicts with boss or colleagues consistently linked with fatigue (Rose et al., 2017). Overall, Rose et al. (2017) also stated that fatigue was also related with adverse health behaviour, current and previous depression.

Based on a report of the Health and Safety Executive, lower vigilance, laggard reaction times as well as difficulties with focus and poor decision-making were experienced by workers with high levels of fatigue (Choobineh et al., 2018). Stevelink, Fear, Hotopf, & Chalder (2019) also stated that 35–69% of people with chronic fatigue syndrome (CFS) or myalgic encephalomyelitis (ME), are not working because of their disease. There are 3 levels of fatigue in order to indicate the severity of consequences. National Safety Council (2018) stated that the 3 levels are:

- i) Reduced Cognitive Performance Fatigue which causes declined in vigilance, attention, concentration and other cognitive factors with 97% respondents reported having decreased cognitive performance.

- ii) Microsleeps have been detrimental to workers if they're performing a safety critical task and previous year, 47% of the workers were reported to experience microsleeps.
- iii) Increased Safety Risk whereby fatigued employees with deteriorated cognitive performance and microsleeps prevents worker to conduct his work safely.

Fatigue also has major impacts on society which can be seen in the declination of workers' productiveness due to the detrimental nature of fatigue. Based on a study by Lin et al. (2015) it is estimated that the cost loss resulted from declined labour production capabilities totalled up to \$9.1 billion per year in whole United States. This shows that fatigue is an extraordinary public health issue that need more studies to be conducted that can be referred as gold standard to further investigate fatigue and its risk factors.

2.2 Sedentary Behaviour as fatigue risk

Prolonged sitting in workplace has been ascertained as the main factor of fatigue in lumbar and trunk muscles, which eventually develop overall body fatigue (Ahmed et al., 2016). Prolonged sitting promotes deconditioning, which negatively impacts workers' capabilities and also lead to development of cardiovascular issues (Bauman et al., 2013). According to a study conducted by Wickens, Lee, Liu, & Gordon- Becker

(2011), the heart of sedentary employee may be unable to pump adequate blood quickly to muscles for proper oxygenation, which may cause early muscle fatigue. This will then cause these sedentary workers unable to execute the demands of an increasing workloads. In addition, from early muscle fatigue will then lead to local muscle fatigue as whole body fatigue develops rapidly which will eventually affect other pulmonary functions and develop other chronic diseases such as type 2 diabetes, obesity and cardiovascular disease (Lurati, 2018).

Moreover, 12 out of 20 countries reported the median for sitting times were 5 hours/day (Daneshmandi et al., (2017). Populations in Sweden and the U.S. (NHANES) were reported averagely to be engaged with 7 to 8 hours of sedentary time per day using accelerometer (Bauman et al., 2011). In general, according to Prince, Elliott, Scott, Visintini, & Reed (2019), jobs that hugely involved sitting such as drivers, office workers and call centre participated in immense amount of sitting time at work compared to other active jobs.

2.3 Socio demographic status as a fatigue risk

2.3.1 Age

Age was a valuable predictor of fatigue as stated in a study conducted by Jing et al., (2015). According to Lin et al. (2015), elder people at age 70, 78, and 85 have

the fatigue prevalence of 29%, 53%, and 68%, respectively which indicates that the elder population was more likely to experience fatigue. This shows that it is a normal physiological occurrence that elderly people having low energy and having more barriers to carry out daily activities than younger people. Jing et al. (2015) also stated that reduced physiological functions and enhanced ailments from various diseases due to aging process further contribute to linked fatigue with age strongly.

2.3.2 Gender

Majority sources revealed that fatigue was more predominant in women compared to men however, few findings cited no gender differences in prevalence of fatigue (Tang et al., 2016). There is also a difference in morbidities and degree of fatigue between gender but the hidden reasons for these gender differences remained unknown. Ellingson et al. (2014) found out that women who were less active to meet the minimum of activeness but at the same time having a lesser time engaging with sitting idly continuously had lower levels of fatigue compared to their friends who are sufficiently active but have higher sedentariness. Based on a study conducted by Jing et al. (2015), among general population, higher number of women had symptoms of fatigue instead of men which 33.9% of middle-aged and elderly females experienced fatigue. This gender differences may also because of women may experiencing higher extent of stress than men as women have different social functions and physiological traits such as enhanced menopausal symptoms and decreased estrogen levels. However, Lin et al. (2015) found out that more men aged 45 and older in China experienced

fatigue. Peng et al. (2012) even pointed out frequencies of fatigue increased up 81.8% male workers in China. This shows that gender may be a predictor for fatigue and more studies are needed.

2.3.3 Marital Status

Marital status was essentially linked with fatigue as by Jing et al. (2015) found out that married respondents had a smaller prevalence of fatigue and after adjusting for covariates, the association remained the same. This may be due to married couple have partners to share their life events. Moreover, the feelings of mental and physical exhaustion and fatigue may alleviated by having a bigger social encouragement from families (Jing et al., 2015).

2.3.4 Race

Based on a study conducted by Ahmed et al. (2016), it is observed that there is a substantially lower perceived fatigue in the Western population when compared to Asian population. There has been a significant rapid rising trend in the change of fatigue over time for Asian respondents compared to Westerners which was revealed by post-hoc analysis. These lower correlations may indicate that the Westerners possess a better strategy to manage fatigue compared to the Asian. Some past evidences revealed level of fatigue was reduced via fatigue risk managing strategy

(Åhsberg, 2000). According to Cordero et al. (2012) it is found that minority ethnic groups have a significantly higher fatigue than majority ethnic groups.

2.3.5 Education

Based on a study conducted by Jing et al. (2015) indicated that having higher education level substantially linked with higher level of fatigue. Previous studies cited that there is a relationship between fatigue and employment status but the conclusions remain unclear. Tang et al. (2016) found out that young people that were employed during the school year have poorer health perception and related with higher degree of chronic fatigue.

2.4 Work Factors as a fatigue risk

Based on a study conducted by Dorrian et al. (2011) span of work-tasks or number working periods at the workplace and workloads are one of the main factors that considerably impacts fatigue. Despite the consistent growth in mentally demanding occupations, only few studies have been carried out to determine how severity of stressful jobs could have enhanced fatigue in the population. According to Ahmed et al. (2016), prolonged period of mentally demanding jobs impose a high level of stress which may result in fatigue apart from physically jobs which caused physical fatigue and casualties. Rose et al. (2017) stated that the relationship between fatigue and work-

related stressors remained significant after adjusting for social factors, health demeanour, current and past depression.

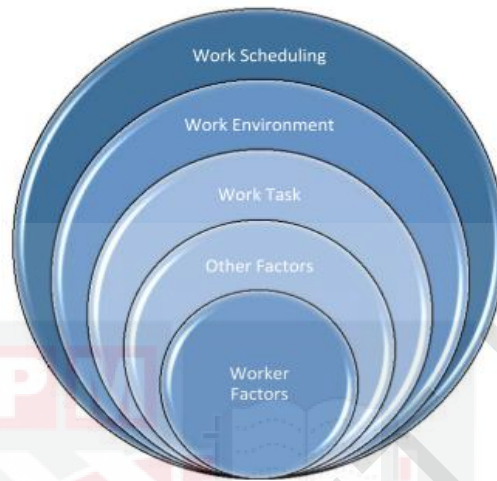


Figure 1.2 Work Factors influencing Fatigue (Sawatzky, 2018)

According to Sawatzky (2018), the key areas that influenced fatigue in workplace are work scheduling, work environments, work tasks and worker factors. Work environments include psychosocial factors that can effect mental fatigue such as stressful work environments. Hadgraft et al. (2016) mentioned that workload pressures and existing workstation arrangements which are mainly monitor-based work became a barrier in minimizing their prolonged sitting time in work environment. Next, work tasks can be recognized whether it can induce or add more burden to worker leading to fatigue in workplace. Meanwhile, worker factors are not within the work environment as it is the risks created from the individuals themselves. Factors that influence worker susceptibility to fatigue include age, overall health, lifestyle,

sleep disorders, chronotypes, habits, and medications (Sawatzky, 2018). This shows that there are multiple risk factors that can lead to fatigue.

2.5 Sleep Quality as fatigue risk

National Safety Council (2018), stated that fatigue and sleep are linked in two primary ways which are the duration of sleep in a 24-hour period, and continuous waking time. According to a study conducted by Hystad, Nielsen, & Eid (2017), it was revealed that poor sleep quality was positively corresponded with fatigue. Prefrontal cortex of the cerebrum was affected by sleep loss, which is the one accountable for most decisions and judgments, and significantly lowers execution capability and reaction time (Phatrabuddha et al., 2018). From a research conducted by Aye et al. (2017), the available data for sleep impairment ranges from 18% in Europe to 23% in the United States and 21% in Brazilian workers. Meanwhile in Asia, the morbidities of impaired sleep quality in working people is 44% in Hong Kong, 30-40% in Japanese white-collar workers and 34% in the Philippines daytime hospital employees. Aye et al. (2017) also found out that Myanmar migrant workers in Malaysia was 62.5%. which was slightly lower compared to Iranian professional fire fighters with a prevalence of 69.9%. This shows that trend of poor sleep quality is increasing among workers and excessive sleepiness in workplace is a serious occupational hazard.

Powell & Copping (2016) stated that people who do not meet sleep necessities at night will demonstrated a degree of fatigue deterioration which are hazardous in workplace as fatigue has shown to be assisted to a large number of fatalities and casualties. Wadsworth, Allen, Wellens, McNamara, & Smith (2006) also stated that sleep spans of 6.5 hr or less can be deadly and that sleep decreased by 1.3 to 1.5 hr per night can reduce daytime vigilance up to 32%. A study that was conducted among seafarers found out that a good and adequate sleep plays a vital role in recovery. In addition, sociodemographic backgrounds are also risk factors associated with sleep quality. Based on few studies, women reported significantly having poor sleep quality than males.

According to a study by Nazatul et al. (2008), marital status and age related with disrupted sleep. The study found that married nurses that had children had higher prevalence of impaired sleep in comparison to unwed nurses. Nurses age ranged 50 to 59 years had better sleep quality in contrast to other age group (Nazatul et al, 2008). Socio-economic status (SES) can be assessed from education, employment and finances. Higher income group of people also associated with good sleep quality as stated cited by Hinz et al. (2017) whereby among the professional status group, full-time working people had low sleep impairments. According to Weeks (2015), there were significant associations between sleep quality with low SES, ie. lower education, lower income, lack of employment, and absence of health insurance.

CHAPTER 3

METHODOLOGY

3.1 Study Design

A cross-sectional study design was used to reach the research objectives. By using this design of study has the advantage whereby it is possible to determine the prevalence of an outcome or risk factor (Omar, 2015). This study was conducted from March to June 2020. In addition, the primary aim of this study is to determine the association between socio-demo, sedentary behaviour, work factors and sleep quality with fatigue among government office workers.

3.2 Study Location

This study was conducted at Ministry of Human Resources in Putrajaya. Putrajaya was chosen as study location because it is the centre for federal administration which consists of large population of office workers. It was also convenient to collect data since Putrajaya is near to University Putra Malaysia (UPM) so it will be time efficient. Then, the ministry was selected by convenience sampling as this method is useful since this study will be conducted in short period of time.

3.3 Study Sample

Respondents were recruited via simple random sampling by table of random numbers based on the name list of workers that was obtained from the administration section of the ministry. All workers had equal chances to be selected as participants.

The inclusion criteria for this study was Malaysian office workers that used computer more than 4 hours. The age also took into account, the employees with age ranging from 18 to 60 years old and have been working minimum of 1 year. (Daneshmandi et al., 2017)

Besides that, the exclusion criteria for this study was office workers that had less exposure to the influence of the organisation due to part time working hours and pregnant employees (Hadgraft et al., 2016).

3.4 Sample size

Sample size calculation was based on 95% confidence interval with probability $\alpha \leq 0.05$ by Kirkwood and Sterne (2003) method. The prevalence of fatigue is considered in this study based on previous study.

$$N = \frac{P(1-P)}{e^2}$$

Where,

N = Sample population

P = Estimated prevalence or proportion in population based on previous studies

e = Error of margin

By referring to previous study on Fatigue and Related Factors of the Population of Working Ages in Hubei Province (China) cited by Jing et al. (2015) whereby the prevalence of fatigue 82.1% . The total number of sample size is calculated as follows where;

$$P = 0.82$$

$$e = 0.05$$

$$N = \frac{0.82(1-0.82)}{(0.05)^2}$$

$$N = 59 \text{ respondents}$$

To prevent from any drop out cases, 20% of sample size will be added. Therefore, the total office workers that will be included in this study are 71 respondents. But, to ensure the strength of this study, 150 respondents will be recruited.

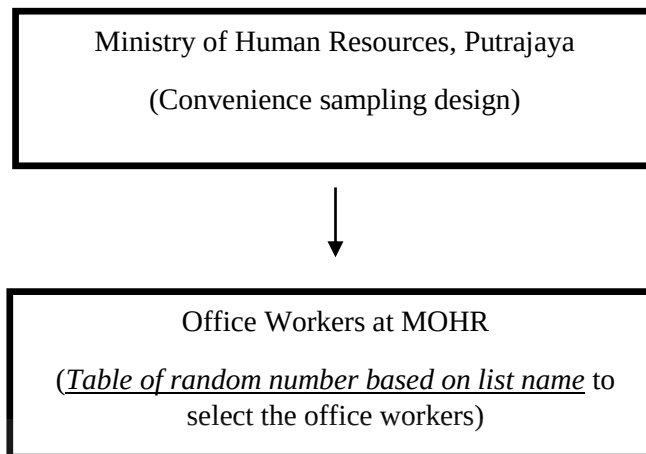


Figure 3.1 Study flow chart

3.5 Study Instruments

3.5.1 Survey

Self-administered questionnaire was used to collect the required data from each participant. The questionnaire was available in Bahasa Malaysia version. The total questions in this study were 39 items and estimated to be answered in 20 minutes by the respondents. The translation from the original English-version to Malay-version was confirmed and validated through back to back translation by the supervisor. The translation was reviewed by research's supervisor to ensure the quality of the translation. Before distributing of questionnaire, the purpose of this study and how many sections that are needed to be answers were explained to the respondents. In addition, consent form was also given to the respective respondents to get their consent to participate in this study before the questionnaires are given. All questionnaires were

collected right after the respondents had answered all the questions. The questionnaire consists of 4 sections:

Section A: Respondent Background (Socio Demographic)

The aim of this section is to gain an overall understanding about the general information related to age, gender, education level, marital status and chronic disease record.

Section B: Working Characteristics

This section requires the respondents to give information on the types of shift, working departments, working experiences, work position and working duration. Questions also included the adapted Occupational Sitting and Physical Activities Question (OSPAQ) which measured the proportion of work time spent sitting, standing, walking, and doing heavy labour, as well as the total length of time worked in the past five working days (Jancey et al., 2014). The OSPAQ indicated good or excellent test-retest reliability, as reflected by the intraclass correlation coefficient (ICCs) for minutes spent sitting (0.66), standing (0.83) and walking (0.77) in the office workplace setting (Jancey et al., 2014). The scoring method for this section was based on percentage and written by the respondent. Scoring: Minutes sitting per workday = (Item 1/Item 2) * Item 3a. Similar calculations were done for another 3 work activities.

Section C: Sleep Quality

This section requires the respondents to give information about their sleep quality adapted from The Pittsburgh Sleep Quality Index (PSQI) survey which is a 19-self rated questions. These 19 items were then grouped into seven components scores: sleep duration, sleep disturbance, sleep latency, day dysfunction, habitual sleep efficiency, subjective sleep quality and need of medications, whereby each weighted equally on 0 to 3 scale. The score of each seven subscales were then summed up to yield a global PSQI score which has a range of 0 to 21 (0 = better, 21 = worse). A total score or PSQI of equal or less than 5 is associated with good sleep quality and a score greater than 5 is associated with poor sleep quality (Buysse et al., 1989)

Section D: Work-Related Fatigue

As part of the survey, Occupational Fatigue Exhaustion Recovery (OFER15) instrument was used to measure work-related fatigue among office workers (Seaman, 2015). The OFER15 is a 15-item scale with three subscales: chronic fatigue (5 items), acute fatigue (5 items), and inter-shift recovery (5 items). Items are scored on a Likert-type scale, with response options ranging from 0 to 6 (0 = strongly disagree, 6 = strongly agree). Then, the scoring is completed by summing the item Likert responses, dividing by 30 and multiplying by 100 (e.g. OFER-acute fatigue = $\text{sum of items 6-10} / 30 \times 100$). Higher scores on the chronic and acute fatigue subscales indicate more fatigue, while a higher score on the inter-shift recovery subscale indicates more recovery between work shifts. Instrument authors report reliabilities of the three

subscales, on Cronbach's α coefficients, of 0.84 for the acute fatigue and inter-shift recovery subscales and 0.86 for the chronic fatigue subscale. The OFER15 has been validated to measure work-related fatigue in several populations (Winwood et al., 2005).

3.5.2 Pedometer

Pedometers are battery-operated movement monitors that are attached to the waistband in the midline of the thigh or at the hips and was designed to measure the number of steps that a person takes during ambulatory activity such as walking or running (Berlin et al., 2006). According to a study conducted by Anastasia et al. (2017), sedentary is labelled as <5000 steps per day, slow-active (5000–7499 steps per day), somewhat active (7500-9999 steps per day), and active (≥ 10000 steps per day), based on a frequently used sedentary cut point and Freedson threshold.



Figure 3.2 Position of pedometer at waistline

Table 3.1 shows the procedure of using pedometer to measure sedentary behaviour among respondents.

1	Briefing was given by researcher to the respondents before distributing the pedometers.
2	Each participant was given a pedometer to be worn at waistline above right or left hipbone and worn during working hours only.
3	The pedometer must be worn for 5 consecutive days to represent a week of working days.
4	The reading of steps were self-recorded by respondents in the log sheet provided.

3.5.3 Google Form

Due to the limitation during movement control order (MCO) resulted from pandemic Covid-19, paper-based questionnaire was substitute by google form. This online survey consisted of the same 39 items as hardcopy questionnaire. Since on field data collection cannot be conducted, google form link was distributed via email address and WhatsApp. A section was created to brief about the study purpose and consent permission to use their data in the research prior respondents filled up the survey. There were 72 responses received via google form and then the data were analysed and computed using IBM SPSS 25.0

3.6 Data Collection

This study was proceeded upon the approval from the respective Ministry in Putrajaya. Before conducting data collection, briefing was given to the participants by

the researcher by group about the objectives of this study. A set of questionnaires was given to each 150 participants. Participant Information sheet which contain a brief explanation about the study was included in the questionnaire. Once participants agreed to participate in the study, he or she signed the consent form prior to the administration of the questionnaire. Under the supervision of the researcher, the participants answered the self-administered questionnaire containing the 4 sections on socio-demographic data, working characteristics, sleep quality and fatigue. The total item was 39 and estimated to be answered in 20 minutes by the participants. All questionnaires were collected right after the participants had answered all the questions by researcher. After the questionnaires have been received by researcher, a log sheet and pedometer were given to each participant to be worn for 5 consecutive working days. Reading of step will be self-recorded by participants for each day using a log sheet that have been distributed. Then, SPSS Version 25.0 was used to key in data and analysed.

3.7 Data Analysis

The data obtained were analysed by using IBM SPSS Version 25.0. The type of analyses used for this study as shown in table 3.2 and 3.3 are based on the specific objectives in this study.

Table 3.2 shows descriptive analysis

DESCRIPTIVE DATA			
Objectives	Variables	Type of Variables	Statistical measurements
To identify the sedentary behaviour among government office workers in Putrajaya.	Sedentary behaviour	Continuous data	Mean and standard deviation
	Sitting		
	Walking		
	Standing		
	Heavy work		
To identify the socio-demographic background among government office workers in Putrajaya.	Age	Continuous data	Mean and standard deviation
	Races	Categorical data	Percentage and Frequency
	Gender		
	Educational level		
	Income level		
To identify work factors among government office workers in Putrajaya.	Department	Categorical data	Percentage and Frequency
	Job Position		
	Job Experience	Categorical data	Percentage and Frequency
	Working hours	Continuous data	Mean and standard deviation

To determine sleep quality among government office workers in Putrajaya.	Duration of sleep	Continuous data	Mean and standard deviation
	Sleep disturbance	Categorical data	Percentage and Frequency
	Sleep latency		
	Day dysfunction		
	Sleep efficiency	Continuous data	Mean and standard deviation
	Overall sleep quality	Categorical data	Percentage and Frequency
	Need medication to sleep		
To determine fatigue level among government office workers in Putrajaya.	Chronic fatigue	Categorical data	Percentage and Frequency
	Acute fatigue		
	Inter-shift recovery		

Table 3.3 shows inferential analysis

Specific objectives	Dependant variable	Independent variable	Parametric test
To evaluate the relationship between socio-demographic characteristics and sleep quality among respondents.	Sleep Quality	Age	Pearson Correlation
		Races	One-way ANOVA
		Gender	Independent T-test
		Educational level	One-way ANOVA
		Income level	Pearson Correlation
To determine the relationship between socio-demographic characteristics and fatigue among respondents.	Fatigue	Age	Pearson Correlation
		Races	One-way ANOVA
		Gender	Independent T-test
		Educational level	One-way ANOVA

		Income level	Pearson Correlation
To evaluate the relationship between sedentary behaviour and fatigue among respondents.	Fatigue	Sedentary behaviour	Pearson Correlation
		Sitting	Pearson Correlation
		Walking	Pearson Correlation
		Standing	Pearson Correlation
		Heavy work	Pearson Correlation
To evaluate the relationship between work factors and fatigue among respondents.	Fatigue	Department	One-way ANOVA
		Job position	Independent T-test
		Job experience	Pearson Correlation
		Working days	Pearson Correlation

To determine the relationship between sleep quality and fatigue among respondents.	Fatigue	Sleep Quality	Pearson correlation
To evaluate the interrelationship between sedentary behaviour, work factors and sleep quality with fatigue among respondents.	Fatigue	Sleep Quality	MANOVA
		Duration of computer usage	
		Marital Status	

3.8 Quality Control

Before data collection, researchers need to make sure the instrument used was functioning well. Pilot study was done to test for the reliability and validity of the pedometer which was compared with OMRON step counter. The results obtained for reliability using ICC between the two were ICC: 0.81, $p < 0.01$. For convergent validity showed moderate correlation with Omron at $r: 0.67$, $p < 0.01$. This shows that the pedometer was reliable to be used. Step count data of the pedometer for 5 days were recorded by respondents to ensure more than two times the value was taken to get an average value for each pedometer. Apart from that, the questionnaires used had been verified by the supervisor before submitted for the ethical consideration by ethic committees. The questionnaires had undergone back to back translation from Bahasa Malaysia and English. The questionnaires were reviewed for completeness filled by respondents.

3.9 Ethical Consideration

Ethics Committee has been approved this study; this study has been reviewed and approved by Ethic Committee for Research Involving Human Subjects (JKEUPM), University Putra Malaysia. The JKEUPM reference Number was UPM/TNCPI/RMC/JKEUPM/1.4.18.2 (JKEUPM-2019-500). The permission and approval to conduct data collection for this study had been obtained from the administrative government body which is specifically the Ministry of Human Resources in Putrajaya.

CHAPTER 4

RESULTS

4.1 Descriptive Analyses

4.1.1 Socio-demographic characteristic of respondents

This study was carried out at several government agencies in Putrajaya. The socio-demographic data were collected using self-administered questionnaire and google form. Pregnant employees were disqualified from this study as this may affect the quality of the study as pregnant workers were already fatigue. Descriptive analysis was used to determine the distribution of socio-demographic characteristic of respondents. Table 4.1 showed the distribution of socio-demographic of respondents. A total of 126 office workers which comprised of 41 males (32.5%) and 85 females (67.5%) with age ranged within 20 to 60 years old. Majority of the respondents were Malay, 117 (92.9%) and the remaining were Bumiputera Sabah and Sarawak. Most of them were married with percentage of 83.3%. For education level, those with bachelor's degree were 55 respondents (43.47%). Followed with those who graduated with diploma, master's degree and completed high school.

The reported mean for monthly income level was RM 7956.24. 109 out of 126 respondents were non-smoker with percentage of 86.5% and only 8 respondents suffer from chronic diseases such as diabetes, prostate cancer and hypertension.

Table 4.1: Distribution of socio-demographic characteristics of respondents (N=126)

Variables	<i>f</i> (%)	Mean $\pm$ SD
Age (Years)		40.04 $\pm$ 8.57
Gender		
Male	41 (32.5%)	
Female	85 (67.5%)	
Race		
Malay	117 (92.9%)	
Bumiputera Sabah and Sarawak	9 (14.3%)	
Marital status		
Single	17 (13.5%)	
Marital experience	105 (83.3%)	
Divorced	2 (1.6%)	
Single mother	1 (0.8%)	
Single father	1 (0.8%)	
Educational level		
SRP/PMR/SPM	21 (16.7%)	
Diploma	29 (23.0%)	
Bachelor's Degree	55 (43.7%)	
Master's Degree	21 (16.7 %)	
Monthly income level (RM) (N = 118)*		7956.24 $\pm$ 5930.68
Smoking Status		
Smoker	17 (13.5%)	
Non-smoker	109 (86.5%)	
Chronic Diseases		
Yes	8 (6.3%)	
No	126 (93.7%)	

4.1.2 Working characteristics among respondents

Table 4.2 shows the results of descriptive analysis for working characteristics of respondents. There were several ministries involved which included seven departments involving various job positions. 30 out of 126 respondents working in Human Resources department with percentage of 23.8 %. Most of them were permanently work there and only two of them were contract office workers (1.6%). 54.8% of them were supporting staffs and the remaining were administrative officer with grade 41 and above. The daily working duration of the workers were 8 hours per day and they used computer at least for 7 hours. The mean of working experiences were 11.7 years. Those who did not use computer and have less than one-year experience was not being selected in this study.

Table 4.2: Descriptive analysis of working characteristics of respondents (N=126)

Variables	<i>f</i> (%)	Mean $\pm$ SD
Departments		
Department of Account	30 (23.8%)	
Department of Information and Communication Technology	6 (4.8%)	
Department of Human Resources	36 (28.6%)	
Department of Labour of Peninsular Malaysia	24 (19.0%)	
Department of Corporate Relation Malaysia	20 (15.9%)	
Department of Fisheries	6 (4.8%)	
Department of Evaluation and Assessment	4 (3.2%)	
Work Status		
Permanent	124 (98.4%)	
Contract	2 (1.6%)	
Work Position		
Administrative Officer	57 (45.2%)	
Supporting Staff	69 (54.8%)	
Work experience (Years)		11.79 $\pm$ 7.85
Duration of Computer Usage (hours)		7.55 $\pm$ 1.78
Working Days (Days)		4.85 $\pm$ 1.39

4.1.3 Sedentary behaviour among respondents

Pedometer and questionnaire adapted from Occupational Sitting and Physical Activity Questionnaires (OSPAQ) were used to measure sedentary behaviour.

However, only 43 out of 126 respondents were able to wear and record their readings due to movement control order (MCO) in Malaysia because of worldwide pandemic, Covid-19. Thus, it was impossible to give pedometer directly to the respondents as they were all working from home. Table 4.3 illustrates that mean of steps per day by the respondents was 2616 steps per day. Our findings for work activities per day showed that the respondents spent their time in sitting position for 237.45 minutes/day. Average minutes for standing was 92.57 minutes and they walked for 108.03 minutes/day. The workers also engaged with heavy work at least for 46.08 minutes/day.

Table 4.3: Distribution of sedentary behaviour of respondents (N=126)

Variables	Mean ± SD
Reading of Pedometer (steps/day)	
Average Reading (N=43)	2616.08 ± 1576.30
Work Activities (minutes/day)	
Sitting	237.45 ± 93.45
Standing	92.57 ± 43.49
Walking	108.03 ± 56.97
Heavy Work	46.08 ± 44.56

Table 4.4 illustrates that only 3 office workers were active, (7.0%) while the others were sedentary. When the work activities were broken down into below average and upper average value, it showed that 56.3% of the respondents spent longer time sitting than average. Majority of the respondents (63.5%), also spent longer time standing than the average value during work. Meanwhile for walking, it was shown

that more workers (57.1%), walked less than the average and more respondents engaged with heavy work tasks (51.6%) than the average.

Table 4.4: Distribution of sedentary level of respondents (N=126)

Variables	<i>f</i> (%)
Reading of Pedometer (steps/day)	
Average Reading (N=43)	
Sedentary	43 (93.0%)
Active	3 (7.0%)
Work Activities (minutes/day)	
Sitting	
Below average	55 (43.7%)
Above average	71 (56.3%)
Standing	
Below average	46 (36.5%)
Above average	80 (63.5%)
Walking	
Below average	72 (57.1%)
Above average	54 (42.9%)
Heavy Work	
Below average	61 (48.4%)
Above average	65 (51.6%)

4.1.4 Sleep quality among respondents

Sleep quality was assessed using validated questionnaire which adapted from Pittsburgh Sleep Quality Index (PSQI) which comprised of 7 domains whereby each domain represents specific questions. Table 4.5 summarises the number of workers scored for each scale in each domain and for global sleep quality (PSQI). Score 0 indicated better while score 3 indicated worse. The severity increased from better to worse in ascending order. For duration of sleep (PSQIDURAT), it showed that 78 respondents had shorter duration of sleep. Meanwhile for sleep disturbance (PSQIDISTB) it showed that majority of respondents, 66.7% had no sleep disturbances. For sleep latency (PSQILATEN), the results illustrated that more respondents, 42.1% take longer time to fall asleep. For day dysfunction due to sleepiness (PSQIDAYDYS), it showed that 57.1% respondents had trouble to stay awake while driving, eating meals or engaging in social activity only less than once a week and had not trouble to keep enough enthusiasm to get things done. For sleep efficiency (PSQIHSE), it showed that majority of respondents, 57.9% did sleep adequately. For subjective sleep quality (PSQISLPQUAL), it showed that majority of the respondents, 65.9% had a fairly good sleep quality and 96.8% of the respondents did not take any medications to sleep. To sum up for PSQI, 67.5% of the respondents had poor sleep quality as a total score more than 5 indicated poor sleep quality while total score less than 5 indicated good sleep quality.

Table 4.5: Descriptive analysis of sleep quality among respondents based on score (N=126)

Variables	Score	f (%)
Duration of Sleep (PSQIDURAT)	0	23 (18.3%)
	1	25 (19.8%)
	2	48 (38.1%)
	3	30 (23.8%)
Sleep Disturbance (PSQIDISTB)	0	7 (5.6%)
	1	84 (66.7%)
	2	33 (26.2%)
	3	2 (1.6%)
Sleep Latency (PSQILATEN)	0	22 (17.5%)
	1	33 (26.2%)
	2	53 (42.1%)
	3	18 (14.3%)
Day Dysfunction (PSQIDAYDYS)	0	39 (31.0%)
	1	72 (57.1%)
	2	14 (11.1%)
	3	1 (0.8%)
Sleep Efficiency (PSQIHSE)	0	73 (57.9%)
	1	11 (8.7%)
	2	21 (16.7%)
	3	21 (16.7%)
Subjective Sleep Quality (PSQISLPQUAL)	0	23 (18.3%)
	1	83 (65.9%)
	2	20 (15.9%)
	3	0
Need Medications to Sleep (PSQIMEDS)	0	122 (96.8%)
	1	2 (1.6%)
	2	2 (1.6%)
	3	0
Global Sleep Quality (PSQI)	Good Sleep Quality (<5)	41 (32.5%)
	Poor Sleep Quality (>5)	85 (67.5%)

4.1.5 Fatigue among respondents

Fatigue was measured using validated questionnaire which adapted from Occupational Fatigue Exhaustion Recovery (OFER15) which assessed 3 parameters, chronic fatigue, acute fatigue and intershift recovery. Table 4.6 summarises the mean average score among respondents. The mean values for chronic fatigue, acute fatigue and intershift recovery were 41.03, 44.51 and 64.74. This showed that majority of the respondents had better recovery ability as the results had higher score on intershift recovery subscale. Table 4.7 illustrates the severity of fatigue whereby each subscale was categorised into low, low/moderate, moderate/high and high. Based on the results tabulated, it showed that the respondents had severity of low to moderate fatigue and moderate/high recovery ability.

Table 4.6: Distribution of Fatigue of respondents (N=126)

Variables	Mean ± SD
Chronic Fatigue	41.03 ± 21.58
Acute Fatigue	44.51 ± 21.37
Intershift Recovery	64.74 ± 18.08

Table 4.7: Descriptive analysis of fatigue among respondents based on levels (N=126)

Variables	<i>f</i> (%)
Chronic Fatigue	
Low	36 (28.6%)
Low/Moderate	34 (27.0%)
Moderate/High	28 (22.2%)
High	28 (22.2%)
Acute Fatigue	
Low	33 (26.2%)
Low/Moderate	33 (26.2%)
Moderate/High	29 (23.0%)
High	31 (24.6%)
Intershift Recovery	
Low	35 (27.8%)
Low/Moderate	33 (26.2%)
Moderate/High	35 (27.8%)
High	23 (18.3%)

4.2 Inferential analyses

4.2.1 To evaluate the relationship between socio-demographic characteristics and sleep quality among respondents.

Pearson's correlation was used to identify the correlation between sleep quality with age and monthly income as shown in table 4.8. The results illustrate that there are no significant correlation between PSQI with age and monthly income. However, when sleep quality was analysed based on domains, the results showed that having longer sleep duration and more efficient sleep were significantly correlated with higher age. Whereby PSQIDURAT showed ($r = 0.187$, $p < .036$) and PSQIHSE showed ($r = 0.189$, $p < .034$). Day dysfunction due to sleepiness (PSQIDAYDYS) showed ($r = -0.186$, $p < .043$) was significantly correlated with monthly income which indicated that respondents with lower income level had higher daytime dysfunction.

Table 4.8: The correlation between sleep quality with age and monthly income among respondents (N=126)

Variables	Age		Monthly Income	
	r	p-value	r	p-value
Global Sleep Quality (PSQI)	0.140	0.119	0.022	0.815
Duration of Sleep (PSQIDURAT)	0.187	0.036*	0.161	0.080
Sleep Disturbance (PSQIDISTB)	-0.015	0.868	-0.057	0.537
Sleep Latency (PSQILATEN)	0.105	0.241	-0.013	0.886
Day Dysfunction (PSQIDAYDYS)	-0.138	0.123	-0.186	0.043*
Sleep Efficiency (PSQIHSE)	0.189	0.034*	0.080	0.386
Subjective Sleep Quality (PSQISLPQUAL)	-0.013	0.889	-0.093	0.314
Need Medications to Sleep (PSQIMEDS)	0.167	0.062	0.126	0.172

*Correlation is significant at the 0.05 level

Table 4.9 and 4.10 summarise the results for mean comparison of sleep quality between gender and between different marital statuses. Independent t-test was used to determine the mean comparisons and the only significant difference found for subjective sleep quality was female had poorer subjective sleep quality (PSQISLPQUAL), where ($M = 1.06$, $SD = 0.564$) with $p < 0.022$.

Table 4.9: Mean comparison of sleep quality between different genders (N=126)

Variables	Mean (SD)		t-value	p-value
	Male	Female		
Global Sleep Quality (PSQI)	6.56 (2.739)	7.52 (3.497)	-1.538	0.127
Duration of Sleep (PSQIDURAT)	1.54 (0.925)	1.74 (1.082)	-1.041	0.300
Sleep Disturbance (PSQIDISTB)	1.15 (0.527)	1.28 (0.590)	-1.254	0.212
Sleep Latency (PSQILATEN)	1.41 (0.999)	1.59 (0.917)	-0.967	0.335
Day Dysfunction (PSQIDAYDYS)	0.85 (0.760)	0.80 (0.594)	0.433	0.666
Sleep Efficiency (PSQIHSE)	0.76 (1.044)	1.00 (1.254)	-1.078	0.283
Subjective Sleep Quality (PSQISLPQUAL)	0.80 (0.601)	1.06 (0.564)	-2.319	0.022*
Need Medications to Sleep (PSQIMEDS)	0.05 (0.218)	0.05 (0.305)	0.032	0.974

*p-value is significant at the 0.05 level

Table 4.10: Mean comparison of sleep quality between different marital statuses
(N=126)

Variables	Mean (SD)		t-value	p-value
	Single	Married		
Global Sleep Quality (PSQI)	6.82 (3.127)	7.34 (3.325)	-0.602	0.548

Then, one-way ANOVA was used to determine the different of mean of sleep quality between races and between educational levels. Table 4.11 illustrates that there was no significant mean difference between sleep quality and races. Based on table 4.12, there are significant mean difference of sleep duration between different educational levels where ($p < .047$). Further post-hoc analysis was done however, there was no significant mean difference within the group as shown in table 4.13.

Table 4.11: Mean comparison of sleep quality between different races (N=126)

Variables	Mean (SD)		t-value	p-value
	Malay	Bumiputera Sabah & Sarawak		
Global Sleep Quality (PSQI)	7.23 (3.273)	6.89 (3.689)	0.299	0.765
Duration of Sleep (PSQIDURAT)	1.69 (1.013)	1.44 (1.333)	0.691	0.491
Sleep Disturbance (PSQIDISTB)	1.25 (0.586)	1.11 (0.333)	0.690	0.491
Sleep Latency (PSQILATEN)	1.54 (0.961)	1.44 (0.726)	0.287	0.290
Day Dysfunction (PSQIDAYDYS)	0.82 (0.651)	0.78 (0.667)	0.189	0.850
Sleep Efficiency (PSQIHSE)	0.90 (1.170)	1.22 (1.481)	-0.787	0.433
Subjective Sleep Quality (PSQISLPQUAL)	0.98 (0.572)	0.89 (0.782)	0.462	0.645
Need Medications to Sleep (PSQIMEDS)	0.05 (0.289)	0.00 (0.00)	0.530	0.597

Table 4.12: Mean comparison of sleep quality between different educational levels (N=126)

Variables	Mean (SD)				F-value	p-value
	SPM (N = 21)	Diploma (N = 29)	Degree (N = 55)	Master (N = 21)		
Global Sleep Quality (PSQI)	6.48 (2.695)	6.97 (2.872)	7.56 (3.775)	7.33 (3.055)	0.618	0.605
Duration of Sleep (PSQIDURAT)	1.33 (1.017)	1.38 (1.115)	1.91 (0.986)	1.81 (0.928)	2.271	0.047*
Sleep Disturbance (PSQIDISTB)	1.14 (0.573)	1.34 (0.614)	1.20 (0.590)	1.29 (0.463)	0.656	0.581
Sleep Latency (PSQILATEN)	1.33 (0.913)	1.55 (0.736)	1.49 (1.034)	1.81 (0.981)	0.953	0.417
Day Dysfunction (PSQIDAYDYS)	0.95 (0.740)	0.97 (0.499)	0.75 (0.700)	0.67 (0.577)	1.419	0.240
Sleep Efficiency (PSQIHSE)	0.57 (0.926)	0.72 (1.131)	1.16 (1.302)	0.90 (1.136)	1.656	0.180
Subjective Sleep Quality (PSQISLPQUAL)	1.10 (0.539)	0.93 (0.593)	1.02 (0.623)	0.81 (0.586)	1.007	0.392
Need Medications to Sleep (PSQIMEDS)	0.05 (0.218)	0.07 (0.371)	0.04 (0.270)	0.05 (0.218)	0.085	0.968

*p-value is significant at the 0.05 level

Table 4.13: Post-hoc analysis of duration of sleep with different educational levels (N=126)

Educational Level	Mean differences	p-value	95% CI
SPM vs Diploma	-0.46	0.999	(-0.80 – 0.71)
SPM vs Bachelor's Degree	-0.576	0.125	(-1.25 – 0.10)
SPM vs Master's Degree	-0.476	0.427	(-1.29 – -0.34)
Diploma vs Bachelor's Degree	-0.530	0.109	(- 1.14 – 0.08)
Diploma vs Master's Degree	-0.430	0.452	(-1.19 – 0.33)
Bachelor's Degree vs Master's Degree	0.100	0.981	(0.58 – 0.78)

4.2.2 To determine the relationship between socio-demographic characteristics and fatigue among respondents.

Pearson's correlation was used to identify the relationship between fatigue with age and monthly income as shown in table 4.14. The results illustrate that there are no significant correlation between fatigue with age and monthly income. Table 4.15, 4.16 and 4.17 summarize the results for mean comparison of fatigue between different genders, marital statuses and races. Independent t-test was used to determine the relationship and the only significant difference was respondents who were single had higher chronic fatigue compared to married respondents where ($p < .016$).

Table 4.14: The correlation between fatigue with age and monthly income among respondents (N=126)

Variable	Age		Monthly Income level	
	r	p-value	r	p-value
Chronic Fatigue	-0.110	0.219	-0.108	0.241
Acute Fatigue	-0.028	0.758	-0.004	0.968
Intershift Recovery	0.128	0.153	0.118	0.201

Table 4.15: Mean comparison of fatigue between different genders (N=126)

Variables	Mean (SD)		t-value	p-value
	Male	Female		
Chronic Fatigue	44.63 (25.645)	39.29 (19.246)	1.305	0.194
Acute Fatigue	45.53 (24.411)	44.02 (19.881)	0.371	0.711
Intershift Recovery	63.01 (20.163)	65.57 (17.054)	-0.743	0.459

Table 4.16: Mean comparison of fatigue between different marital statuses (N=126)

Variables	Mean (SD)		t-value	p-value
	Single	Married		
Chronic Fatigue	52.75 (23.957)	39.20 (20.712)	2.454	0.016*
Acute Fatigue	43.92 (24.586)	44.59 (20.954)	-0.121	0.904
Intershift Recovery	60.19 (18.837)	65.44 (17.949)	-0.114	0.267

*p-value is significant at the 0.05 level

Table 4.17: Mean comparison of fatigue between different races (N=126)

Variables	Mean (SD)		t-value	p-value
	Malay	Bumiputera Sabah & Sarawak		
Chronic Fatigue	40.34 (20.521)	50.00 (32.744)	-1.297	0.197
Acute Fatigue	44.59 (21.104)	43.33 (26.034)	0.170	0.865
Intershift Recovery	65.01 (17.959)	61.11 (20.412)	0.622	0.535

Then, one-way ANOVA was used to determine the relationship between fatigue with educational level. Table 4.18 illustrates that there was no significant mean difference of fatigue between different educational levels. For table 4.19, there was significant mean difference of fatigue with smoking status. The results showed that smoker had higher acute fatigue compared to non-smoker where ($p < .046$).



Table 4.18: Mean comparison of fatigue between different education levels (N=126)

Variables	Mean (SD)				F-value	p-value
	SPM (N = 21)	Diploma (N = 29)	Degree (N = 55)	Master (N = 21)		
Chronic Fatigue	46.83 (24.071)	37.70 (18.921)	41.03 (20.815)	39.84 (24.641)	0.752	0.523
Acute Fatigue	48.89 (29.180)	38.621 (19.201)	44.67 (19.779)	47.84 (18.681)	1.205	0.311
Intershift Recovery	58.25 (21.359)	67.59 (16.854)	64.48 (17.358)	67.94 (17.590)	1.375	0.254

4.2.3 To evaluate the relationship between sedentary behaviour and fatigue among respondents.

Pearson's correlation was conducted to assess the relationship between sedentary behaviour and fatigue. As stated in table 4.20, 4.21 and 4.22, the average reading of pedometer, sitting per day, standing per day, standing per day, walking per day and heavy work per day showed no significant correlation with fatigue.

Table 4.19: The correlation between sedentary behaviour and chronic fatigue among respondents (N=126)

Variables	Chronic Fatigue	
	r	p-value
Pedometer (N=43)	-0.024	0.878
Sitting per day	0.119	0.186
Standing per day	-0.034	0.706
Walking per day	-0.016	0.860
Heavy work per day	-0.034	0.706

Table 4.20: The correlation between sedentary behaviour and acute fatigue among respondents (N=126)

Variables	Acute Fatigue	
	r	p-value
Pedometer (N=43)	-0.066	0.673
Sitting per day	0.060	0.502
Standing per day	-0.014	0.876
Walking per day	-0.032	0.722
Heavy work per day	-0.037	0.681

Table 4.21: The correlation between sedentary behaviour and intershift recovery among respondents (N=126)

Variables	Intershift Recovery	
	r	p-value
Pedometer (N=43)	0.215	0.166
Sitting per day	-0.007	0.936
Standing per day	-0.060	0.501
Walking per day	-0.005	0.960
Heavy work per day	-0.037	0.682

4.2.4 To evaluate the relationship between work factors and fatigue among respondents.

One-way ANOVA was used to determine the relationship between fatigue with departments as there were more than 3 departments involved by comparing the mean differences between the departments. Table 4.22, showed that there was no significant relationship between fatigue and departments. Meanwhile for table 4.23, our findings found that fatigue did not significantly associated with job positions.

Then, Pearson correlation was used to determine the relationship between computer usage and working experience with fatigue among respondents. Based on table 24.4, computer usage showed significant correlation with chronic fatigue ($r = -0.190$, $p < .033$), acute fatigue ($r = -0.233$, $p < .009$) and intershift recovery ($r = 0.189$, $p < .034$) respectively. These results showed that the longer duration of computer usage, the lower level of chronic and acute fatigue but the better recovery ability.

Table 4.22: Mean comparison of fatigue between different departments among respondents (N=126)

Variables	Mean (SD)							F-value	p-value
	DACC (N=30)	DICT (N=6)	DHR (N=36)	DCRM (N=20)	DLPM (N=24)	DOF (N=6)	DAA (N=4)		
Chronic Fatigue	40.67(16.78)	41.67(26.40)	42.87(25.99)	36.83(17.79)	44.03(20.76)	47.78(26.72)	19.17(13.44)	1.033	0.407
Acute Fatigue	41.82(18.88)	62.22(15.73)	46.48(23.94)	41.17(21.17)	45.14(19.88)	48.89(22.37)	26.67(22.27)	1.438	0.206
Intershift Recovery	66.67(15.19)	60.00(24.94)	63.61(21.04)	67.33(15.55)	62.36(14.95)	56.11(26.28)	81.67(8.82)	1.104	0.364

DACC = Account; DICT = Information and Communications Technology; DHR = Human Resources; DCRM = Departments of Corporate Relation Malaysia; DLPM = Departments of Labour Peninsular Malaysia; DOF = Departments of Fisheries; DDA = Department of Assessment and Evaluation

Table 4.23: Mean comparison of fatigue between different job positions (N=126)

Variables	Mean (SD)		t-value	p-value
	Administrative Officer (N=57)	Support Staff (N=69)		
Chronic Fatigue	42.81(22.04)	39.57(21.24)	0.838	0.403
Acute Fatigue	47.80(20.76)	41.78 (21.64)	1.581	0.116
Intershift Recovery	65.73(17.26)	63.91(18.82)	0.560	0.576

Table 4.24: The correlation between duration of computer usage and working experience with fatigue among respondents (N=126)

Variables	Computer usage		Working Experience	
	r	p-value	r	p-value
Chronic Fatigue	-0.190	0.033*	0.024	0.792
Acute Fatigue	-0.233	0.009*	0.058	0.521
Intershift Recovery	0.189	0.034*	-0.079	0.382

*correlation is significant at the 0.05 level (2-tailed)

4.2.5 To determine the relationship between sleep quality and fatigue among respondents.

Pearson's correlation was conducted to assess the relationship between global sleep quality and fatigue. Based on the results tabulated in table 4.25, poorer sleep quality significantly correlated with higher chronic fatigue. However, the results also showed that poorer sleep quality significantly correlated with lower recovery ability. Whereby the values showed chronic fatigue ($r = 0.223$, $p < .012$) and intershift recovery ($r = -0.342$, $p < .00$) to sleep quality. Moreover, when sleep quality was broken down into domains, having higher PSQIDAYDYS and lower PSQISLPQUAL significantly correlated with higher chronic fatigue and acute fatigue. However, the results for intershift recovery showed that, having poorer sleep latency, poorer PSQISLPQUAL and higher PSQIDAYDYS significantly correlated with lower recovery ability.

Table 4.25: The correlation between sleep quality with fatigue among respondents (N=126)

Variables	Global Sleep Quality (PSQI)	
	r	p-value
Chronic Fatigue	0.223	0.012*
Acute Fatigue	0.173	0.052
Intershift Recovery	-0.342	<0.001*

*correlation is significant at the 0.05 level (2-tailed)

Table 4.26: The correlation between domains of sleep quality with fatigue among respondents (N=126)

Variables		Chronic Fatigue	Acute Fatigue	Intershift Recovery
PSQIDURAT	r	-0.016	0.043	-0.072
	p-value	0.860	0.631	0.421
PSQIDISTB	r	0.105	0.074	-0.151
	p-value	0.095	0.411	0.091
PSQILATEN	r	0.150	0.107	-0.260
	p-value	0.095	0.232	0.003*
PSQIDAYDYS	r	0.493	0.273	-0.452
	p-value	<0.001*	0.002*	<0.001*
PSQIHSE	r	0.070	0.064	-0.143
	p-value	0.438	0.475	0.109
PSQISLPQUAL	r	0.209	0.205	-0.382
	p-value	0.019*	0.022*	<0.001*
PSQIMEDS	r	0.089	0.031	-0.114
	p-value	0.320	0.732	0.204

PSQIDURAT= Duration of Sleep; PSQIDISTB = Sleep Disturbance; PSQILATEN = Sleep Latency; PSQIDAYDYS = Day Dysfunction due to Sleepiness; PSQIHSE = Sleep Efficiency; PSQISLPQUAL= Subjective Sleep Quality; PSQIMEDS = Need medications to sleep

*correlation is significant at the 0.05 level (2-tailed)

4.2.6 To evaluate the interrelationship between sedentary behaviour, work factors and sleep quality with fatigue among respondents.

A multivariate analysis of variance (MANOVA) was performed to further investigate the significant variables to fatigue. Three dependent variables were used: CF, AF and IR. The independent variables were marital status, computer usage and sleep quality. Table 3 illustrates that there was a statistically significant mean difference between sleep quality, $F(3, 119) = 4.925, p = .03$; Wilks' Lambda = .890. and marital status $F(3, 119) = 4.732, p = .04$; Wilks' Lambda = .893 on the combined three measures of fatigue. When the results for the dependent variables were considered separately, see table 4, our findings revealed that only sleep quality showed significant association to the three variables of which are CF ($F = 6.041, p = .015$); AF ($F = 4.140, p = .044$) and IR ($F = 14.792, p = .001$). Meanwhile, the mean score for the three measures of fatigue differ between different marital status and sleep quality was measured. In the posthoc analyses, the mean of CF was significantly different between different marital status where marital status only showed significant association with CF ($F = 8.023, p = .005$). Thus, this showed that sleep quality is the most significant factor that affected fatigue as having poor sleep quality lead to higher level of fatigue and had lower recovery ability.

Table 4.27: The multivariate analysis (MANOVA) between significant variables with fatigue among respondents (N=126)

Variables	Fatigue		
	Wilk's Λ	F	p-value
Marital Status	0.893	4.925	0.004*
Computer Usage	0.964	1.468	0.227
Global Sleep Quality (PSQI)	0.890	4.732	0.003*

*Statistically significant at $p < 0.05$ level

Table 4.28: Tests of between-subject effects analysis among significant variables with fatigue (N=126)

Variables	CF		AF		IR	
	F	p-value	F	p-value	F	p-value
Marital Status	8.023	0.005*	0.001	0.976	2.232	0.138
Computer Usage	0.785	0.377	0.504	0.479	0.585	0.446
Global Sleep Quality (PSQI)	6.041	0.015*	4.140	0.044*	14.792	< 0.001*

*Statistically significant at $p < 0.05$ level

CHAPTER 5

DISCUSSION

5.1 The relationship between socio-demographic characteristics and sleep quality among respondents.

Based on our findings, global sleep quality (PSQI) did not significantly associated with age and monthly income. However, when analysed based on domains, the results showed that having longer sleep duration and more efficient sleep were significantly correlated with higher age. This study is similar to other studies where age is significantly associated with sleep quality (Nazatul et al, 2008). A study by Reis et al., (2016) also found out that sleep disturbances normally increase with age. This showed that sleep quality is partially significantly associated with higher age as sleep quality depends mostly on the habitual sleep of an individual. According to a study by Christie et al., (2016) found out that there were no significant difference in PSQI scores across younger, middle-aged or older age groups. This may lead to the underestimation of problem in older cohort by the subjective measures of sleep quality.

In addition, based on our findings, respondents with lower income level had higher daytime dysfunction. This indicated that people who had higher

socioeconomic status or more financially stable had a good sleep quality. According to a study by Hinz et al., (2017), found that number of respondents whom had poor quality was three times higher among unemployed compared to full time workers. This was also supported by a study which revealed that the main procyclical reason would be because a declination in economy activities contribute to higher number of insomnia or sleepiness resulted from worry and stress. (Antillón et al., 2014). Mental health problems often associated with sleep impairments and stress also been found to influence insomnia, thus these factors may be affecting these findings. However, other studies also argued that higher state unemployment rates associated with higher sleep time. Asgeirsdottir et al. (2014) revealed that more people obtained the recommended hours of sleep in Iceland after the economic crisis compared to before having the crisis. These contradict findings showed that there are also other factors driving this relationship, thus further studies are required.

Our study also found that female had poorer subjective sleep quality. This is influenced by females' social role whereby some of the respondents got up from sleep every night to feed milk to their young children. A study conducted by Weeks (2015) stated that for a woman with roles of a spouse and a mother greatly influenced sleep quality. Burgard et al. (2010), also argued that women having poor sleep as they were influenced by providing night time care for their children and breastfeeding activities. Physical structure and culture background also play essential roles in gender differences but need further study. Moreover, our findings found that longer sleep duration significantly associated with higher educational level. This indicated as level of awareness increases, better understanding on sleep

quality also increases. This is similar to the study by Weeks (2015), found that as the years of education increases, sleep quality also increases.

5.2 The relationship between socio-demographic characteristics and fatigue among respondents.

Our findings found no significant relationship between fatigue with age and monthly income. Even though, based on few studies mentioned that age was a valuable predictor of fatigue and some studies mentioned no significant association. Our findings also did not found fatigue to be significantly associated with gender and educational level. Thus, this inconclusiveness may need to proceed for further study.

However, our findings revealed that respondents who were single had higher chronic fatigue compared to married respondents. This may due to single individuals do not have a partner to share burdens or problems. Jing et al. (2015) stated that married couple had bigger social support that helped to alleviate mental and physical fatigue. Single individuals may also have been doing more than 1 job or overtime to support their family which may lead to higher fatigue compared to married couple. According to an article from Astro Awani (2020), future projections obtained from Malaysian Institute of Economic Research ((MIER) shown that 2.4 million Malaysians are likely to lose their jobs after COVID-19 due to retrenchments. For such reasons, many employees are now forcing themselves to work overtime and having 2 or more supporting jobs.

5.3 The relationship between sedentary behavior and fatigue among respondents.

Our findings found there were no significant relationship between sedentary behaviour (SB) with fatigue. This is because the average reading of pedometer, sitting per day, standing per day, walking per day and heavy work per day showed no significant mean difference with fatigue. The reason why our findings showed no significant may be due to the limited sample sizes in our study. Only 43 respondents got to be assessed using pedometer thus lead to insufficient of pedometer data due to movement control order regarding COVID19. Meanwhile the remaining respondents were solely measured using OSPAQ where can lead to incorrect reporting of their sitting behaviours. Headly (2018) also highlighted the importance of sample sizes in objective studies as smaller sample sizes may lead to the inability to compare SB among various groups.

In addition, our findings on SB was not significant due to the inability to capture sedentary behaviour during the whole working day. This was supported by Sonnentag (2001) which mentioned that the situational well-being at the end of the work day might have an impact on the choice of leisure time activities for an individual. This shows that even though employees might engage with prolonged sitting during working hours, but they might spend their evening after work by playing football or go for a jog to ease their work strains. This lead to a higher physical activity which makes sedentariness less severe when viewed in a whole working day.

Our findings showed no significant relationship between SB and fatigue may also due to the measurement tool (pedometer) used. Headley (2018) stated that the major strength of their study was the usage of activPAL3, an accelerometer device that efficiently measured SB as activPAL3 had the capability as it is a posture based monitor. However, pilot study was done to test for the reliability and validity of the pedometer which was compared with OMRON step counter. The results obtained for reliability using ICC between the two were ICC: 0.81, $p < 0.01$. For convergent validity showed moderate correlation with Omron at $r: 0.67$, $p < 0.01$. This shows that the pedometer was reliable to be used.

5.4 The relationship between work factors and fatigue among respondents.

We found that there was no significant relationship between fatigue with departments and job positions. However, computer usage showed significant correlation with chronic fatigue, acute fatigue, intershift recovery respectively. The results showed that the longer duration of computer usage, the lower the level of chronic and acute fatigue but the better the recovery ability. This was supported by Virtanen et al. (2020) which stated that senior employees have better recovery skills due their longer experience and expertise in their working careers. Thus, this proved that an older worker develops better strategies to increase they recovery ability during work so that they do not get tired easily.

Daneshmandi et al. (2017) stated in their study due to nature of work which is desk-based jobs created a barrier to other movements other than sitting down thus, making employees exhausted during their working day. Hadgraft et al. (2016) also found that computer-based jobs make office workers became too immersed in work and not realising how much time had passed in front of their computer. Excessive exposure on work tasks and stressors in work environment may affect how fatigued a person can be (Aüôú, 2003).

5.5 The relationship between sleep quality and fatigue among respondents.

Our findings found that poorer sleep quality significantly correlated with higher chronic fatigue. The findings also revealed that poorer sleep quality significantly correlated with lower recovery ability. This is similar to other studies which reported inadequate sleep is a primary cause of fatigue impairment (Powell & Copping, 2016). Choobineh et al. (2018) also mentioned that chronic and acute fatigue were significantly higher among employees who had sleep problems compared to those without sleep issues. This is because sleep quality is essential in human body especially for cognitive functions. Sleep has been found to play a vital role in most biological and psychological regeneration processes (Kolo et al., 2017). This is why having a quality and adequate sleep is the utmost important because our body repairs during sleep time just as how nutrition are essential for optimal health and happiness.

Powell & Copping (2016) also mentioned that sleep loss is one of the major physiological phenomena that have been demonstrated to create fatigue whereby the consequences are slowed reaction time or poor attentiveness. Thus, based on the significant correlations between sleep quality and fatigue indicated these two were interrelated with each other, but distinct phenomena since each has various different causes. As such, further study need to be conducted as they need to be examined via different methods and tools in order to establish a gold standard to measure fatigue.

5.6 The interrelationship between sedentary behavior, work factors and sleep quality with fatigue among respondents.

For the last hypothesis, our findings found that marital statuses and sleep quality also interrelated together to relate with fatigue. As mentioned in previous discussion, this may due to the reason that single individual need to work multiple jobs in the current tough economy situation post COVID-19 pandemic. Thus this will lead to sleep impairment as there are increasing workloads will eventually lead to fatigue as well. There is also a study found that sleep disturbance was found among married nurses compared to single nurses. This results may be influenced due to married couple had more children thus more night time care was provided for their children and breastfeeding, hence family and domestic work would lead to fatigue.

Powell & Copping (2016) also mentioned that sleep loss is one of the major physiological phenomena that have been demonstrated to create fatigue whereby the consequences are slowed reaction time or poor attentiveness. Thus, this supported our findings which proved that sleep quality is the most significant contributor to fatigue. However, as these two variables were interrelated with each other, both has various different causes. For such reasons, further study need to be conducted as they need to be examined via different methods and tools to ensure an established study for a large working population.

CHAPTER 6

CONCLUSION

This study examined the relationship between sedentary behaviour and sleep quality with fatigue among government agencies in Putrajaya. The factors that have been evaluated were socio-demographic, work factors, sleep quality and fatigue. The outcome from this study was that 65.9% of the respondents had better recovery ability and 34.1% of the respondents were more fatigue. Our study also found 67.5% of the respondents experienced poor sleep quality. However, sedentary behaviour and marital status showed significant differences on fatigue, $p < 0.05$. MANOVA analysis proves that PSQI and marital status interrelated with each other to cause fatigue. To sum up, there were significant relationship between fatigue with work factors and sleep quality. However, there was no significant relationship between fatigue with sedentary behaviour.

In addition, the strengths and limitations of this study shall be acknowledged. The main strength of this study was high response rate whereby 80% of response were received. Only small percentage of drop outs due to exclusion of criteria and incomplete questionnaires. Pregnant employees and working less than one-year experience were removed from this study.

However, there are some limitations that need to be improved for future studies. Insufficient evidence to determine the main factor and causality due to the study design. The sample size is also small and not strong enough to extend the study across various groups. Moreover, only certain portion of government offices were selected due to the sampling design of the study location which was convenience sampling. This study only included sedentary behaviour at workplace which do not represent a whole day of an individual's life. The individual might be an active person after the working hour ended. Apart from that, self-reported data for OSPAQ by the respondents may also lead to recall biases. For such reason, all these factors might had impacted the findings of this study.

Next, for recommendations, further study need to be conducted as cross sectional study do not suffice. Larger sample size is required to get a more significant results whereby Malaysian government officers should be included nationwide in the study to resemble large population based study for working populations especially for government officers. This will lead to a study that have an extensive result across various different type of groups. Random sampling on study location should also be conducted to ensure a random probability is obtained. Anthropometric measurements should be included especially BMI and smoking status, as many studies shown these variables strongly influenced fatigue.

Last but not least, overall these findings are potentially useful to management especially top managers, employers and decision makers in determining the factors or possible causes that might affect the level of fatigue among employees. Lu et al., (2017)

mentioned that fatigue is a known precursor that can impact health in both acute and chronic implications. This include reduced performance, productivity, quality of work and increased incidence of labour accidents and human errors. Hence, managers, superiors and top level management should start educate awareness to themselves and workers in order to understand better how important to have a good sleep quality and staying active to reduce or prevent fatigue impairment rather than improvising the current workplace design because safety and health starts with ourselves first. This will eventually lead into producing employees who work healthily, happily and safely in workplace.

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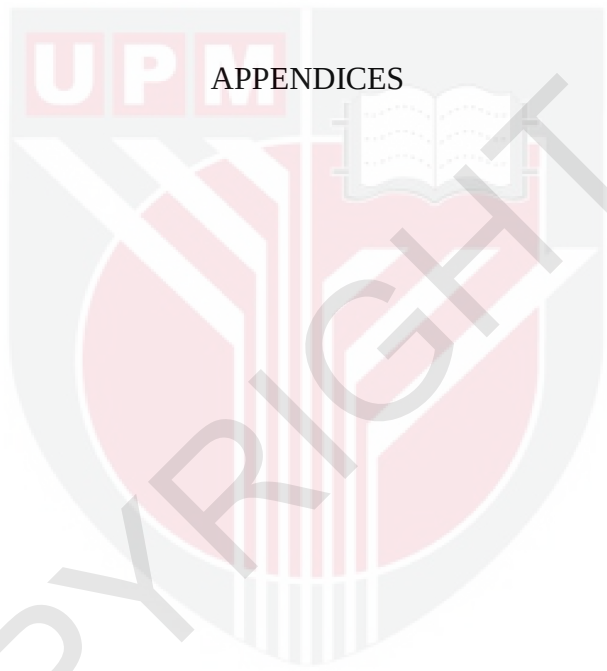
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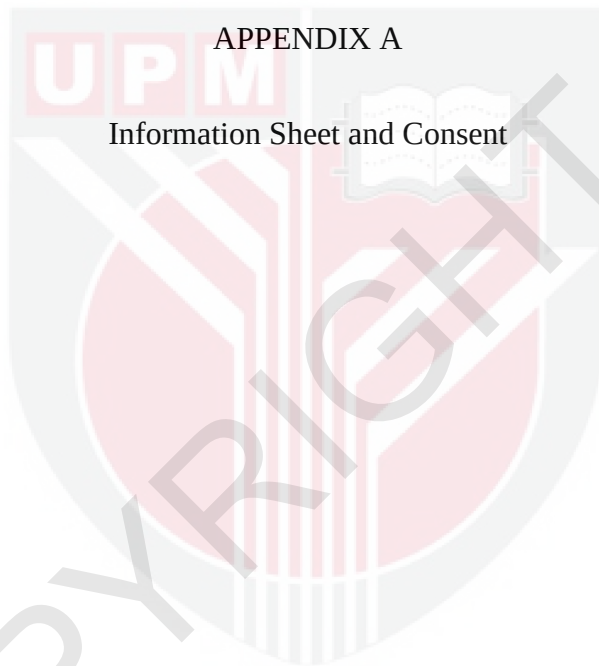
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APPENDICES



APPENDIX A
Information Sheet and Consent





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

BORANG 2.4: PENERANGAN DAN PERSETUJUAN RESPONDEN

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik.

1. TAJUK KAJIAN

Hubungkaitan antara Perlakuan Sedentari, Faktor Kerja dan Kualiti Tidur dengan Keletihan Dalam Kalangan Pekerja Pejabat di Bangunan Pentadbiran Putrajaya.

2. PENGENALAN

Kini, keletihan di tempat kerja dikenali sebagai hazard pekerjaan baru yang memberi kesan kepada prestasi pekerja dan juga menyebabkan peningkatan insiden kemalangan pekerja di tempat kerja. Kajian penyelidikan lanjut tentang pembolehubah adalah penting untuk menubuhkan kajian yang berpiawai di Malaysia dan juga mencari langkah pencegahan yang munasabah untuk menghasilkan pekerja yang sihat dengan kualiti yang baik dan juga mengurangkan kebarangkalian kecederaan dan kemalangan di tempat kerja.

3. APAKAH YANG PERLU ANDA LAKUKAN?

Anda telah dipilih untuk mengambil bahagian dalam kajian ini kerana anda memenuhi kriteria inklusif and eksklusif. Penyertaan anda adalah secara sukarela dan anda boleh menarik diri dari kajian ini pada bila-bila masa. Responden juga tidak akan diberi apa apa bayaran.

Selepas membaca lembaran maklumat ini dan memahami kandungan, anda perlu menandatangani borang persetujuan responden jika anda bersetuju untuk mengambil bahagian dalam kajian ini. Untuk kajian ini, anda akan diminta:

1. Selesaikan soal selidik mengenai maklumat sosio-demografi, maklumat pekerjaan umum, kualiti tidur dan keletihan di tempat kerja.
2. Memakai alat pedometer untuk mengukur tahap sedentari semasa waktu bekerja sahaja.

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Responden bukan pekerja tetap kerana mempunyai kurang pendedahan kepada organisasi dan pekerja yang hamil.

5. APAKAH FAEDAH MENYERTAI KAJIAN INI?

a) KEPADA ANDA SEBAGAI PESERTA?

Individu boleh menjadi lebih berwaspada terhadap kelakuan sedentari semasa bekerja dan mungkin boleh mengamalkan gaya hidup yang lebih aktif.

b) KEPADA PENYELIDIK?

Penyelidik berharap agar penemuan kajian ini akan menyediakan data untuk mengetahui tahap sedentari dan tahap keletihan di kalangan pekerja pejabat untuk mencadangkan peningkatan dan mengurangkan tingkah laku sedentari di kalangan pekerja pejabat.

6. ADAKAH IA BERISIKO?

Tiada risiko yang mungkin berlaku. Kajian ini bukanlah invasif.

7. ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA?

Ya. Kami akan mengambil langkah-langkah keselamatan untuk melindungi kerahsiaan maklumat dan identiti anda. Identiti dan maklumat yang diberikan dalam soal selidik adalah sulit, termasuklah sekiranya keputusan kajian diterbitkan, selaras dengan undang-undang atau peraturan yang berkaitan. Rekod kertas akan dihapuskan dengan mesin shredder dan dikitar semula, manakala rekod elektronik akan dihapuskan secara kekal.

8. SIAPA YANG SAYA PERLU HUBUNGI SEKIRANYA SAYA MEMPUNYAI SOALAN TAMBAHAN SEMASA MENGIKUTI PENYELIDIKAN INI?

Sekiranya anda mempunyai sebarang soalan mengenai kajian ini, anda boleh menghubungi penyelidik atau penasihat penyelidik.

Thaqifah Rusydina bt Tarmizi (Penyelidik)
Bacelor Sains (Kesihatan Persekitaran dan Pekerjaan)
Jabatan Kesihatan Persekitaran dan Pekerjaan
Universiti Putra Malaysia
019-6803874
tofahdna@gmail.com

Prof. Madya Dr. Imiza Rasdi (Penasihat Penyelidik)
Ketua unit Kesihatan Perkerjaan
Jabatan Kesihatan Persekitaran dan Pekerjaan
Universiti Putra Malaysia

9. PERSETUJUAN

Saya..... No Kad Pengenalan.
beralamat.....
.....dengan ini bersetuju untuk mengambil bahagian secara sukarela dalam
penyelidikan yang tersebut di atas *(kajian klinikal/percubaan ubat-ubatan/rakaman video/kumpulan
sasaran/temuduga/ soal selidik).

Saya telah diberi penjelasan secara menyeluruh mengenai penyelidikan ini dari segi metodologi, risiko
dan komplikasi (seperti tertulis pada Helaian Penerangan Responden). Saya memahami bahawa saya
berhak menarik diri dari penyelidikan ini pada bila-bila masa tanpa memberi sebarang alasan. Saya juga
memahami bahawa sebarang maklumat yang berkaitan identiti saya akan dirahsiakan.

Saya* berminat / tidak berminat untuk mengetahui keputusan kajian yang melibatkan saya.

I setuju/tidak bersetuju untuk imei/gambar/rakaman video/ rakaman suara digunakan dalam apa jua
bentuk penerbitan atau pembentangan. (sekiranya berkaitan).

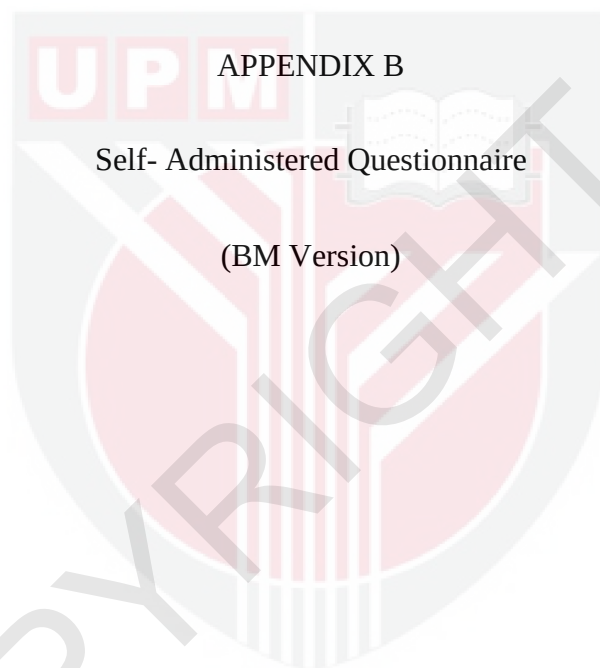
*potong yang tidak berkenaan

Tandatangan Tandatangan
(Responden) (Saksi)

Tarikh Nama
No. K/P:

Saya mengesahkan bahawa saya telah menerangkan kepada responden ini sifat dan tujuan
penyelidikan yang tersebut di atas.

Tarikh Tandatangan
(Penyelidik)



APPENDIX B

Self- Administered Questionnaire

(BM Version)

Tarikh:

No ID:

No Telefon:



BORANG KAJI SELIDIK

Jabatan Kesihatan Persekitaran dan Pekerjaan

Fakulti Perubatan dan Sains Kesihatan,

Universiti Putra Malaysia

NO	TAJUK KAJIAN	NAMA PENKAJI
1	HUBUNGKAITAN ANTARA PERLAKUAN SEDENTARI, FAKTOR KERJA DAN KUALITI TIDUR DENGAN KELETIHAN DALAM KALANGAN PEKERJA PEJABAT DI BANGUNAN PENTADBIRAN PUTRAJAYA	THAQIFAH RUSYDINA BT TARMIZI

ARAHAN: SOALAN INI MENGANDUNGI 4 BAHAGIAN. SILA JAWAB SEMUA BAHAGIAN

BAHAGIAN A: LATAR BELAKANG SOSIO-DEMOGRAFIK

BAHAGIAN B: CIRI PEKERJAAN

BAHAGIAN C: KUALITI TIDUR

BAHAGIAN D: KELETIHAN DI TEMPAT KERJA

Kajian ini adalah untuk tujuan akademik. Segala maklumat adalah sulit. Terima kasih atas kerjasama anda.

BAHAGIAN A: LATAR BELAKANG SOSIO-DEMOGRAFIK

ARAHAN: Sila tandakan jawapan anda dan isi jawapan di ruangan yang disediakan untuk soalan dibawah

1. Umur: _____ tahun
2. Jantina:
☐ Lelaki ☐ Perempuan
3. Status perkahwinan:
☐ Bujang ☐ Ibu Tunggal
☐ Berkahwin ☐ Bapa Tunggal
☐ Berceraai
4. Bangsa:
☐ Melayu ☐ Cina
☐ India ☐ Lain-lain: _____
5. Taraf pendidikan tertinggi:
☐ SRP/PMR/SPM ☐ Ijazah Sarjana
☐ Diploma ☐ PhD
☐ Ijazah Sarjana Muda
6. Pendapatan isi rumah (RM): RM _____
7. Adakah anda merokok?
☐ Ya ☐ Tidak
8. Adakah anda sedang mengandung? (Bagi wanita sahaja)
☐ Ya ☐ Tidak
9. Adakah anda menghadapi sebarang penyakit kronik seperti seperti darah tinggi, diabetes, kanser dan penyakit jantung.
☐ Ya: _____ ☐ Tidak

BAHAGIAN B: CIRI PEKERJAAN

ARAHAN: Sila tandakan jawapan anda dan isi jawapan di ruangan yang disediakan untuk soalan dibawah

10. Nyatakan jabatan/unit anda bekerja sekarang: _____
11. Nyatakan pangkat/kedudukan anda sekarang: _____
12. Status pekerjaan anda:
☐ Tetap ☐ Kontrak
13. Berapa lama anda telah bekerja dalam persekitaran ini?
Nyatakan: _____ tahun
14. Berapa lama anda menggunakan komputer/komputer riba sehari?
☐ Ya; ☐ Tidak menggunakan komputer
Nyatakan: _____ jam
15. Sepanjang 7 hari yang lalu, berapa hari anda bekerja?
Nyatakan: _____ hari

Bagi soalan no. 16 (a), (b), (c) dan (d), sila pastikan jumlah peratusan adalah 100% setelah ditambah keempat-empat kategori sepanjang 7 hari lalu.

16. Sila nilaikan aktiviti sewaktu anda bekerja secara purata mengikut kategori dibawah:
- | | |
|-----------------------------|---------|
| a) Duduk (termasuk memandu) | _____ % |
| b) Berdiri | _____ % |
| c) Berjalan | _____ % |
| d) Kerja berat | _____ % |

Jumlah= 100%

BAHAGIAN C: KUALITI TIDUR

ARAHAN: Soalan yang berikut hanyalah berdasarkan kualiti tidur pada bulan lepas sahaja. Sila tandakan jawapan anda dan isi jawapan di ruangan yang disediakan untuk soalan dibawah

17. Sepanjang bulan lepas, kebiasaannya pada jam berapakah anda tidur?

Waktu tidur: _____

18. Sepanjang bulan lepas, berapa lamakah selalunya anda mengambil masa untuk tidur setiap malam?

Bilangan minit: _____ minit

19. Sepanjang bulan lepas, kebiasaannya pada jam berapakah anda bangun dari tidur?

Waktu bangun: _____

20. Sepanjang bulan lepas, kebiasaannya berapa jam anda dapat tidur malam yang lena?

Jumlah jam anda tidur setiap malam: _____ jam

ARAHAN: Tandakan (/) pada jawapan yang paling sesuai untuk setiap soalan.

21. Sepanjang bulan lepas, berapa kerap anda mengalami masalah semasa tidur kerana situasi berikut:

1	Tiada	2	Kurang dari seminggu	3	Sekali atau dua kali seminggu	4	Seminggu 3 kali atau lebih
---	-------	---	----------------------	---	-------------------------------	---	----------------------------

SITUASI	1	2	3	4
Tidak boleh tidur dalam masa 30 minit				
Terjaga pada tengah malam atau awal pagi/petang				
Harus bangun untuk ke tandas				
Tidak boleh bernafas dengan selesa				
Batuk atau berdengkur dengan kuat				
Berasa terlalu sejuk				
Berasa terlalu panas				
Mengalami mimpi buruk				
Mengalami kesakitan				
Lain-lain. Sila nyatakan: _____				

22. Sepanjang bulan lepas, berapakah anda menilai kualiti tidur anda secara keseluruhan?

☐ Sangat Baik

☐ Memuaskan

☐ Tidak Memuaskan

☐ Sangat Teruk

23. Sepanjang bulan lepas, berapa kerap anda:

SITUASI	1	2	3	4
Mengambil ubat untuk membantu anda tidur (yang dipreskripsi atau melalui kaunter)				
Mengalami masalah untuk kekal jaga semasa memandu, makan atau terlibat dalam aktiviti sosial				

24. Sepanjang bulan lepas, adakah anda mengalami masalah untuk kekalkan semangat yang cukup untuk memastikan semua hal diselesaikan?

☐ Tiada masalah

☐ Masalah yang kecil sahaja

☐ Masalah yang sederhana

☐ Masalah yang sangat besar

BAHAGIAN D: KELETIHAN DI TEMPAT KERJA

ARAHAN: Bahagian ini akan menentukan tahap keletihan berkaitan kerja anda. Jika anda merasakan tiada jawapan yang paling tepat, sila tandakan jawapan yang paling hampir.

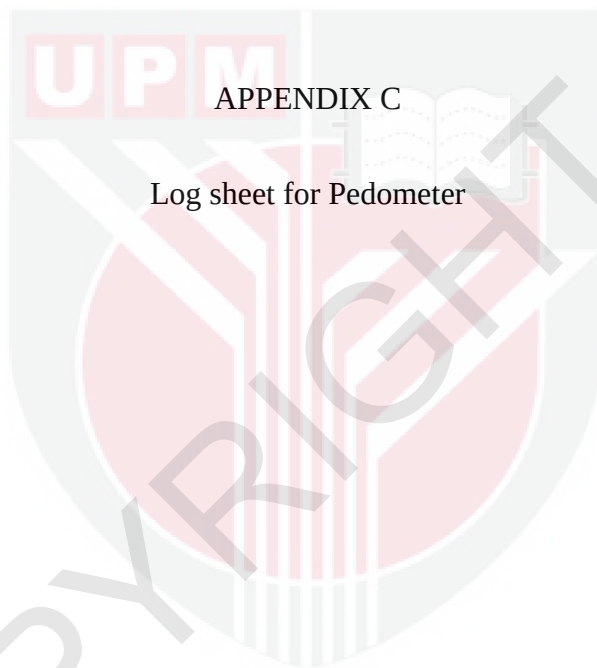
0	Sangat tidak setuju	1	Tidak setuju	2	Lebih kurang tidak bersetuju	3	Tidak pasti
4	Lebih kurang bersetuju	5	Setuju	6	Sangat setuju		

NO.	SITUASI	0	1	2	3	4	5	6
25.	Saya sering berasa sangat letih pada tahap yang maksimum dengan kerja/tugasan saya.							
26.	Saya sering menghadapi kesukaran untuk bangun bekerja pada hari kerja yang berikutnya							
27.	Saya sering tertanya-tanya berapa lamakah saya dapat bertahan untuk terus bekerja							
28.	Saya berasa bahawa kebanyakan masa saya adalah "hidup untuk bekerja"							
29.	Terlalu banyak perkara yang diharapkan daripada saya di tempat kerja							
30.	Selepas tempoh kerja biasa, saya hanya mempunyai sedikit tenaga yang tinggal							
31.	Saya biasanya berasa sangat letih selepas balik dari kerja							
32.	Kerja saya ini menghabiskan tenaga saya sepenuhnya setiap hari							
33.	Saya biasanya mempunyai banyak tenaga untuk meluangkan masa bersama keluarga atau kawan-kawan.							
34.	Saya biasanya masih mempunyai banyak tenaga untuk hobi dan aktiviti lain selepas selesai bekerja pada hari tersebut.							
35.	Saya tidak pernah mempunyai masa yang mencukupi untuk memulihkan semula tenaga sepenuhnya di							

	antara hari bekerja sebelum dan hari bekerja berikutnya							
36.	Walaupun saya letih pada satu hari bekerja tetapi saya biasanya berasa segar semula pada hari bekerja berikutnya.							
37.	Tenaga saya jarang pulih sepenuhnya di antara hari-hari bekerja							
38.	Memulihkan diri dari keletihan bekerja setiap hari tidak menjadi masalah bagi saya							
39.	Saya selalunya masih merasa letih dari hari sebelum apabila memulakan hari yang baru							

Soalan tamat

Terima kasih atas kerjasama anda.



APPENDIX C

Log sheet for Pedometer

LOG SHEET

NAME			
ID NO :	PEDOMETER NO. :		
NO. TEL :			

DAY 1

Date	Start Time	End Time	Steps

DAY 2

Date	Start Time	End Time	Steps

DAY 3

Date	Start Time	End Time	Steps

DAY 4

Date	Start Time	End Time	Steps

DAY 5

Date	Start Time	End Time	Steps

LOG SHEET

NAME			
ID NO :	PEDOMETER NO. :		
NO. TEL :			

DAY 1

Date	Start Time	End Time	Steps

DAY 2

Date	Start Time	End Time	Steps

DAY 3

Date	Start Time	End Time	Steps

DAY 4

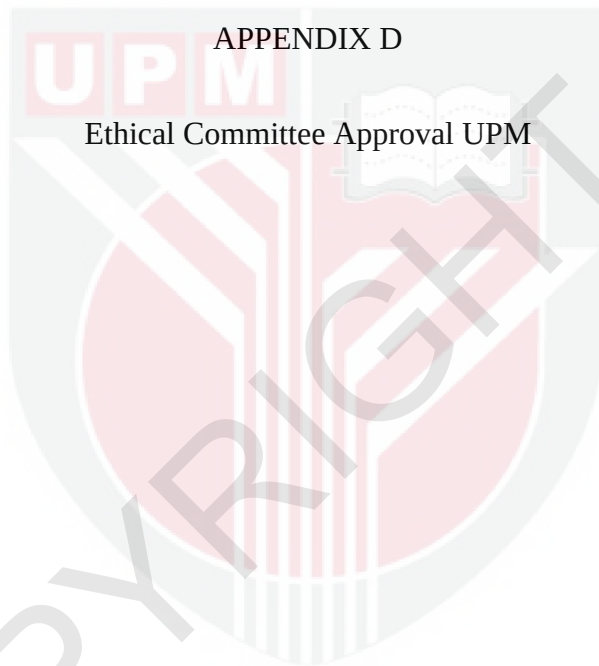
Date	Start Time	End Time	Steps

DAY 5

Date	Start Time	End Time	Steps

APPENDIX D

Ethical Committee Approval UPM



**ETHICS COMMITTEE FOR RESEARCH INVOLVING HUMAN SUBJECTS
(JKEUPM)
UNIVERSITI PUTRA MALAYSIA**

Research title	: Association Between Sedentary Behaviour, Work Factors and Sleep Quality with Fatigue Among Office Workers in Administrative Building in Putrajaya.
Study Site	: Government agencies, Putrajaya.
JKEUPM Ref No.	: JKEUPM-2019-500
Researcher	: Thaqlifah Rusydina Tarmizi
Supervisor	: Assoc. Prof. Dr. Izniza Rasdi

Documents received and reviewed with reference to the above study:

1. Ethics Application Form, Version 1 dated 29/11/2019
2. Respondent Information Sheet & Consent (English), Version 2 dated 14/1/2020
3. Respondent Information Sheet & Consent (Malay), Version 2 dated 14/1/2020
4. Proposal (English), Version 2 dated 14/1/2020
5. Questionnaires/ Interviews (English), Version 1 dated 29/11/2019
6. Questionnaires/ Interviews (Malay), Version 1 dated 29/11/2019
7. Curriculum Vitae of:
 - a. Assoc. Prof. Dr. Izniza Rasdi
 - b. Thaqlifah Rusydina Tarmizi

The University Research Ethics Committee, Universiti Putra Malaysia (JKEUPM) operates in accordance to the ICH-GCP Guidelines.

Decision by JKEUPM:

- ☒ Approved
- ☒ **Permission MUST BE OBTAINED** from the respective hospitals/ institutions before conducting the research
- ☐ Disapproved

Please note that the approval is **VALID UNTIL 21 JANUARY 2021**

Researchers should comply with the following:

- I. Complete a Study Final Report upon study completion (Form 3.2).
- II. Ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.
- III. Applicable for Clinical Trial Studies and Clinical interventional Studies only: Progress Report has to be submitted to JKEUPM at every 6 months from the date of approval (Form 3.1). Report

APPENDIX E

Permission letter to Ministry of Human Resources of Malaysia

(MOHR)