

RESEARCH ARTICLE

Nighttime exercise, sleep quality and Salah concentration of adult Muslims in Johor

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Abstract:

Exercise is a subcategory of physical activity which is structured, repetitive and purposeful. This study focuses on only one of the pillars of Islam, which is to perform the salah (prayer). Various research studies measure exercise with sleep outcome but none of the study focus on its relation to religious practice, thus how nighttime exercise affect sleep quality and its relation to religious practices of Muslim is yet to be known. A cross-sectional study using an online questionnaire was implemented to identify how nighttime exercise affect sleep quality and its relationship with religious practices among Muslim focusing on concentration in prayer or salah (fajr) which was done at the dawn by Muslims. A total of 176 Muslims young adults participated in this research. Overall, the results found that different types of night exercise intensity influence the ability of respondents to wake up early for fajr ($p=0.005$). In fact, poor sleep quality gives a significant impact to concentration in prayer (fajr) ($p<0.05$). However, poor sleep quality was not affected by different age intervals, duration and frequency, and type of night exercise intensity. Future study should focus on awareness of sleep hygiene among Muslims as in this study poor sleep quality was proven to give an impact. Moreover, future study needs to consider other reasons that contribute to their trouble sleeping despite doing nighttime exercise. For example, how religious the respondents are also can be considered as one the variables that may affect both abilities to wake up early for fajr and concentration in salah (fajr) following nighttime exercise.

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1. INTRODUCTION

Awtry and Balady (2010) mentioned that exercise intensity is referring to amount of energy required to perform physical activity per unit of time or resting oxygen requirement (metabolic equivalents [METs]), where one MET equals the amount of oxygen consumed by a resting, awake individual and is equivalent to 3.5 ml O₂/kg of body weight/minute. Light exercise includes those activities requiring less than 3 METs such as brisk walking and bowling, moderate activity includes activities requiring 3 to 6 METs for example fast walking, badminton and tennis, while vigorous activity includes activities requiring more than 6 METs such as running and jogging, long distance cycling, football and basketball (Awtry & Balady, 2010). Above all, exercise is associated with various benefits that help individuals to function effectively and boost their emotions to feel good and thus by being physically fit, it gives advantage to an individual's overall health (Abou Elmagd, 2016). Nighttime exercise is brought into focus in this study as the current fitness trend in Malaysia is that most Malaysians like to exercise during night.

Despite the sleep hygiene recommendations, where intensive exercising is not suggested within the last 3 hour before bedtime (Petruzzello et al., 1991 in Myllymäki et al., 2011), there are still people who exercise late at night as time restricts them from exercising during the day, maybe due to

work, study and any other factors. Sleep hygiene was described as habits and behaviors besides the environment that help in promoting sleep. Based on a study of effects of vigorous late-night exercise on sleep quality and cardiac autonomic activity by Myllymäki et al. (2011), individuals have less actual sleep time (min) and shortened sleep onset latency after exercise day than control day without exercise but have more sleep efficiency (%) where they have a greater proportion of non-REM sleep after exercise day than control day without exercise. Meanwhile, according to Oda et al. (2014), doing vigorous exercise before going to bed can cause a large physiologic excitement at bedtime hence might disrupt the onset of sleep and might affect overall sleep time of a person. Yamanaka et al. (2015) stated that physical exercise in the evening was reported to deteriorate sleep structure by increasing arousal and inadequate sleep hygiene besides heart rate increased and relaxation time decreased in subsequent sleep after evening exercise. Seo et al. (2013) revealed that exercise does give different effects or outcomes, based on the exercise type, duration, and hormone adaptation depending on time of the day exercise takes place. This was supported by a study done by Stutz et al. (2019) that mentioned although sleep-onset latency, total sleep time, and sleep efficiency (SE) might be impaired after vigorous exercise ending ≤ 1 hour before bedtime, exercise performed in the evening does not seem to negatively affect sleep but in fact, rather the opposite where the effects are small as several factors related to

physical exercise have been proposed to improve sleep, including an increase in body temperature before bedtime, enhanced vagal modulation, changes in cortisol and growth hormone secretion, and improved mood. The differences on the conclusion or results from previous study urge this study aimed to seek an answer on how and in what way nighttime exercise will affect sleep quality specifically among Malay young adults who need to wake up early for fajar every day and whether by doing nighttime exercise will affect their ability to wake up early for fajar.

This study focuses on only one of the pillars of Islam, which is to perform the salah (prayer). Bahammam & Gozal (2012) point out that Muslim population are strongly encouraged to go to bed early and waking in Islamic culture as they are required to wake up early to pray (Fajr) at dawn. However, only a proportion of Muslims follow prayer times strictly and wake up early on weekdays and weekends for dawn prayer (Bahammam & Gozal, 2012) although they are obligated to do so. Prayer is a major duty in life for a Muslim. Yusni et al. (2019) mentioned that the sharia or Islamic law dictating the prayers performed five times every day is obligatory and leaving it is sinful as declared in al Quran "Verily, Salah is an obligation on the believers to be observed at its appointed time." (Qur'an 4:103).

This study also aimed at raising awareness about good sleep habits, indirectly improving sleep diagnosis and treatment, as well as knowing whether nighttime exercise is suitable and recommended for Muslim, as nighttime exercise might affect their sleep quality hence may give impact on their religious practice in term of prayer, as in being able to wake up early in the next morning to pray for fajar following nighttime exercise and their concentration in prayer (khusyu'). Nevertheless, the relationship between nighttime exercise and sleep quality and the way it provides impact to religious practices of Muslim will be discussed in this study.

2. MATERIALS AND METHODS

For this research purpose, a cross sectional study was implemented by using an online questionnaire that was distributed among adults that live in Johor. Data was collected and then analyzed by using SPSS 20.0. This cross-sectional study was conducted at Johor involving Malay adults that are actively engaged in nighttime exercise in all ten districts of Johor which are Batu Pahat, Johor Bahru, Kluang, Kota Tinggi, Kulaijaya, Mersing, Muar, Pontian, Segamat and Tangkak. Malay adults with ages ranging from 20-44 years old were chosen as the target population as these age groups of adults are believed to be the most physically active compared to other age groups. Other than that, Malay ethnic have the least prevalence of physical inactivity among respondents aged 16 years and above in Malaysia by socio-demographic characteristics as stated by National Health and Morbidity Survey 2019. (NHSM, 2019). Convenience sampling was applied in this study.

Inclusion criteria for respondents includes those aged 20 to 44 years old, Malay, Muslims, live in Johor, understand basic English, exercise at night regularly and do not have sleeping disorders. While respondents who have other

medical conditions that may affect sleep quality for example kidney disease, thyroid disease, diabetes, and mental health disorder like depression were excluded from the study.

The questionnaire for this study contains four sections: Section A, which contains demographic data, Section B, which contains The Godin Leisure-Time Exercise Questionnaire (GLTEQ), Section C, which contains Pittsburgh Sleep Quality Index (PSQI) questionnaire and Section D, which contains Salah Flow Questionnaire (Focused Attention). In the demographic data, information about research including the intent of research, medium available to reach out researchers regarding research and the level of commitment required from participants is made available. Consent form was provided where the respondents need to agree on information relating with participant anonymity and participant confidentiality before respondents are required to fill in basic information about age, gender and religion. From The Godin Leisure-Time Exercise Questionnaire (GLTEQ), data relating to intensity and frequency of night exercise will be obtained. In order to know the exact nighttime exercise duration of the respondent, an additional question regarding duration of exercise per day will be added. 'How long do you exercise per day?' will be rated by respondents in minutes. To measure the quality and patterns of sleep, Pittsburgh Sleep Quality Index (PSQI) which are standardized, and self-report assessment were utilized.

As there are no methods for measurement that can assess the level of concentration (khusyu') during salah (prayer), an adapted questionnaire was developed from Salah Flow Questionnaire (SFQ), by Wael Abouelsaadat in his thesis submitted into Department of Computer Science, University of Toronto in 2012. With only 6 questions of focused attention items used to measure salah concentration taken from SFQ, a pilot study was conducted to establish the reliability of this instrument before actual data collection was started. The items include 'During Salah, I often have to repeat a Sura or Tahiyat because I feel I recited it mechanically.', 'After Salah, I am sometimes not sure about the actual number of steps I made.', 'After Salah, I sometimes feel guilty due to my performance.', 'I have to repeat a Salah after performing it because I feel it was not performed adequately.', 'I often make mistakes during Salah.', and lastly 'I am satisfied with my concentration level during Salah'. By applying rule of thumb by Browne (1995), a minimum of 30 respondents was needed for this questionnaire pilot study as Whitehead et al. (2016) mentioned that the simplest methods to apply are sample size rules of thumb when we want to estimate the sample size for the pilot trial. Pilot testing done for Salah Concentration Questionnaires yielded acceptable reliability of 6 items in the questionnaire was found by using Cronbach Alpha ($\alpha=0.733$) with a mild negative corrected item total correlation ($p= -0.255$) of item 6 which indicates that those with poor performance in prayer (fajr) are more likely satisfied with their concentration in prayer at the initial reliability testing using SPSS. Therefore item 6 was removed from the questionnaire to increase the reliability or internal consistency of the questionnaire and hence produce good internal consistency ($\alpha=0.890$).

Aiming proper main data collection through online or digital platforms, questionnaires were distributed to various social media and social networks. In order to collect data more efficiently, questionnaires were distributed to gyms or fitness centres available around Johor too through email or any other online medium available to contact them. The respondents that fit in inclusion criteria would complete the questionnaire upon giving consent. The involvement of the respondents is based on their consent, without any pressure. Data from respondents were saved in the form of excel and later were analysed by using SPSS 20.0.

Measurement scale for each data was identified to determine the best statistical analysis to be applied in order to analyse data for each research question. Chi square was applied for all the research questions in this study as all of the data is categorical data.

3. RESULTS

There was a total of N=176 respondents, with N = 61 (34.7%) belonging to male and N = 115 (65.3%) belonging to females. The age of respondents was divided into five ranges which includes 20 to 24 years old with N = 126 (71.6%), 25 to 29 years old with N = 30 (17%), 30 to 34 years old with N = 13 (7.4%), 35 to 39 years old with N = 5 (2.8%) and lastly 40 to 44 years old with N = 2 (1.1%). Most importantly, all of the respondents is Muslim, N = 176 (100%) as required in inclusion criteria of this study.

Table 1: Frequency and percentage of respondent's age

Variable	Frequency (N)	Percent (%)
Age Range		
20-24 years old	126	71.6
25-29 years old	30	17
30-34 years old	13	7.4
35-39 years old	5	2.8
40-44 years old	2	1.1
Total	176	100.0

The respondents most often will do nighttime exercise in approximately 15 to 30 minutes per exercise session with n=89 (50.6%) followed by 35 (19.9%) of respondents will do exercise during the night between 46 to 60 min per daily basis. There are 33 (18.8%) respondents that will do nighttime exercise in less than 15 minutes per day. Other than that, 13 (7.4%) of the respondents will perform nighttime exercise for more than 60 minutes on average in an

exercise session followed by 6 (3.4%) respondents who do nighttime exercise for 31 to 45 minutes per session.

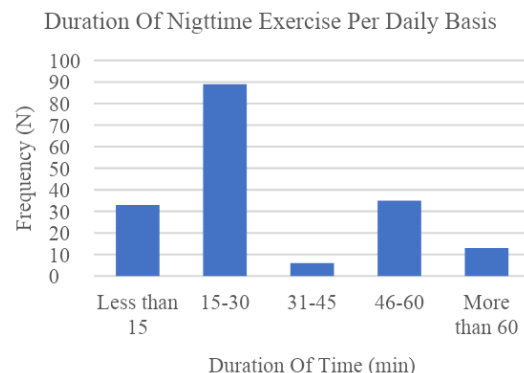


Figure 1: Duration of nighttime exercise done by respondent per daily basis

Type of intensity of nighttime exercise done by respondents on average was determined by the highest frequency type of intensity of the individual exercise. About 72 (26.1%) respondents did strenuous exercise while 40 (14.5%) and 64 (23.2%) respondents did moderate and light exercise weekly.

Table 2: Type of night exercise intensity

Types of Exercise Intensity	Frequency N (%)
Strenuous Exercise	72 (41.0%)
Moderate Exercise	40 (23.0%)
Mid/ Light Exercise	64 (36.0%)

Meanwhile, out of 176 respondents who do nighttime exercise regularly, 78 (44.3%) of them have good sleep quality while 98 (55.7%) of the respondents have poor sleep quality. Ability of respondents to wake up for fajar following nighttime exercise was also asked in the questionnaire. From the 176 responses, it was found that 36 (20.5%) of the respondents were unable to wake up for fajar following nighttime exercise. On the contrary, 140 (79.5%) respondents were able to do so.

Following the ability to wake up for fajar after doing nighttime exercise, an important part of the prayer or salah which is concentration was taken into consideration. From the assessment, it was found that respondents agree on the first item in the Salah Concentration Questionnaire 'During Salah, I often have to repeat a Sura or Tahiyat because I feel I recited it mechanically' marked by 40 (22.7%) and 12 (6.8%)

respondents that agree and strongly agree with the first statement given. For the second item which is ‘After Salah, I am sometimes not sure about the actual number of steps I made.’ about 59 (33.5%) respondents neither agree nor disagree that sometimes they are not sure about the actual number of steps that they made. About 59 (33.5%) respondents do agree that sometimes they feel guilty due to their performance in Salah following nighttime exercise supported by 28 (15.9%) respondents who strongly agree with the statement. For the third to fifth item, most respondents prefer to stay neutral indicating that they did not agree or disagree with the statements.

Table 3: Salah concentration following nighttime exercise

Salah Concentration Questionnaire	Responses, N (%)					Mean (Standard Deviation) M(SD)
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
Item 1	12 (6.8)	40 (22.7)	58 (33.0)	43 (24.4)	23 (13.1)	2.858 (1.120)
Item 2	14 (8.0)	43 (24.4)	59 (33.5)	41 (23.3)	19 (10.8)	2.955 (1.110)
Item 3	28 (15.9)	59 (33.5)	55 (31.3)	22 (12.5)	12 (6.8)	3.392 (1.106)
Item 4	10 (5.7)	27 (15.3)	66 (37.5)	49 (27.8)	24 (13.6)	2.716 (1.063)
Item 5	8 (4.5)	30 (17.0)	77 (43.8)	45 (25.6)	16 (9.1)	2.824 (0.973)

Level of agreement in Salah Concentration Questionnaire was input as ‘5’ for strongly agree, ‘4’ for agree, ‘3’ for neutral, ‘2’ for disagree and ‘1’ for strongly disagree in SPSS software. Based on Table 3, all items are above average in mean score ($M > 2.500$) indicates that respondents’ salah concentration was affected. Item 3 has the highest mean score ($M = 3.392$, $SD = 1.106$) indicating that most respondents almost agree that sometimes they felt guilty due to their performance in prayer (fajr) following nighttime exercise. On the other hand, the item with the lowest mean score from the questionnaire is item 4 which is ‘I have to repeat a Salah after performing it because I feel it was not performed adequately.’ with ($M = 2.716$, $SD = 1.063$) where least respondents felt that they have to repeat the Salah after performing it.

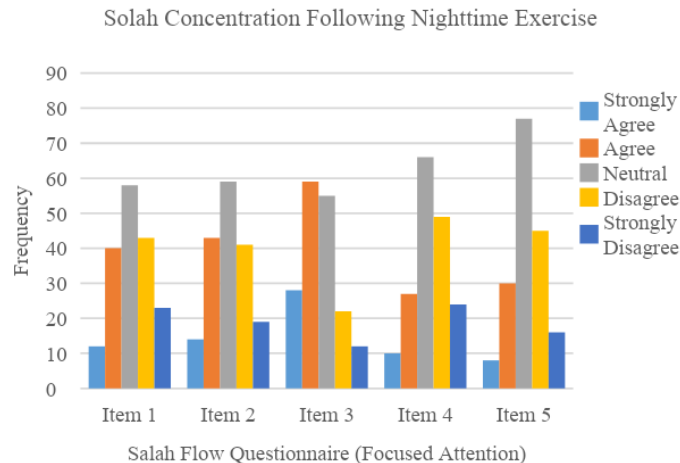


Figure 2: Salah concentration following nighttime exercise

3.1. Sleep Quality and Age Interval

The relationship between each variable as in objectives of this study was done by using chi square test. For the first objective, which is to identify differences in sleep quality of individuals who do nighttime exercise at different age intervals, it was found that there was no significant association between sleep quality and different age intervals with p-value of 0.156 ($p > 0.05$).

Table 4: Association between sleep quality and age interval

Age (Years old)	Sleep Quality N (%)		X ² statistic (df)	P-value
	Good	Poor		
20-24	51 (65.4)	75 (76.5)	6.641 (4)	0.156
25-29	14 (17.9)	16 (16.3)		
30-34	9 (11.5)	4 (4.1)		
35-39	2 (2.6)	3 (3.1)		
40-44	2 (2.6)	0 (0.0)		

3.2. Frequency and Duration of Night Exercise and Sleep Quality

For the second objective, it was found that there is no significant association between duration and frequency of night exercise and sleep quality with p-value of 0.131

($p > 0.05$) hence, from the data analysis we can conclude that duration and average frequency of night exercise does not affect sleep quality.

Table 5: Association between duration and frequency of night exercise and sleep quality

Sleep Quality	Duration of exercise (min)	Average Frequency of Exercise (day)							X ² (df)	P-value
		1	2	3	4	5	6	7		
Good	Less than 15	8 (4.5)	5 (2.8)	3 (1.7)	1 (0.6)	0 (0)	0 (0)	0 (0)	31.860 (24)	0.131
	15-30	13 (7.4)	21 (11.9)	8 (4.5)	10 (5.7)	2 (1.1)	1 (0.6)	0 (0)		
	31-45	0 (0)	3 (1.7)	1 (0.6)	0 (0)	0 (0)	0 (0)	0 (0)		
	46-60	2 (1.1)	9 (5.1)	3 (1.7)	2 (1.1)	0 (0)	0 (0)	0 (0)		
	More than 60	0 (0)	1 (0.6)	1 (0.6)	2 (1.1)	1 (0.6)	1 (0.6)	0 (0)		
Poor	Less than 15	4 (2.3)	9 (5.1)	3 (1.7)	0 (0)	0 (0)	0 (0)	0 (0)		
	15-30	9 (5.1)	10 (5.7)	9 (5.1)	4 (2.3)	2 (1.1)	0 (0)	0 (0)		
	31-45	1 (0.6)	0 (0)	1 (0.6)	0 (0)	0 (0)	0 (0)	0 (0)		
	46-60	2 (1.1)	9 (5.1)	5 (0)	0 (0)	0 (0)	2 (1.1)	1 (0.6)		
	More than 60	1 (0.6)	4 (2.3)	0 (0)	2 (1.1)	0 (0)	0 (0)	0 (0)		

3.3. Types of Night Exercise Intensity and Sleep Quality

No significant association between type of intensity of night exercise and sleep quality with p-value of 0.097 ($p > 0.05$) although 34 (19.3%) respondents have poor sleep quality following strenuous exercise whereas most respondents who have poor sleep quality are individuals who do light exercise, N=42 (23.9%). Therefore, as the type of intensity of night exercise that does not affect sleep quality, the type of intensity of nighttime exercise that gives more impact on sleep quality was unable to be determined.

Table 6: Association between type of intensity of night exercise and sleep quality

Types of Intensity of Exercise	Sleep Quality N (%)		X ² statistic (df)	P-value
	Good	Poor		
Strenuous	38 (21.6)	34 (19.3)	4.660 (2)	0.097
Moderate	18 (10.2)	22 (12.5)		
Light	22 (12.5)	42 (23.9)		
Total	78 (44.3)	98 (55.7)		

3.4. Ability to Wake Up Early for Fajr Following Nighttime Exercise

For the fourth objective of this study, it was revealed that there is significant association between engagement in nighttime exercise and ability to wake up early for fajr with a p-value of 0.001 ($p < 0.05$). Strenuous type of night exercise was found to be the type of night exercise intensity that affects 20 (11.4%) respondents' ability to wake up early for fajr with p-value of 0.005 ($p < 0.05$). Meanwhile, sleep quality was found to have no association with ability to wake up early ($p = 0.462$). Hence, we can conclude that doing nighttime exercise does affect Muslims ability to wake up early for fajr.

Table 7: Association between engagement in nighttime exercise and ability to wake up early for fajr

Engagement In Nighttime Exercise	Ability To Wake Up For Fajr N (%)		X ² statistic (df)	P-value
	Yes	No		
Yes	140 (79.5)	36 (20.5)	61.455 (1)	0.001
No	0 (0)	0 (0)		

Table 8: Association between ability to wake up for fajr with type of intensity of night exercise

Type Of Exercise Intensity	Ability To Wake Up For Fajr N (%)		X ² statistic (df)	P-value
	Yes	No		
	Strenuous	52 (29.5)		
Moderate	39 (22.2)	1 (0.6)		
Light	49 (27.8)	15 (8.5)		

Table 9: Association between sleep quality and ability to wake up early for fajr

Sleep Quality	Ability to wake up for fajr N (%)		X ² statistic (df)	P-value
	Yes	No		
	Good	64 (36.4)		
Poor	76 (43.2)	14 (8.0)		

3.5. Salah Concentration Following Nighttime Exercise

The last objective in this study is to identify the relationship between concentration in prayer (fajr) and nighttime exercise. As Salah Concentration Questionnaire has no specific scoring, each item in the questionnaire was correlated with sleep quality of respondents who do nighttime exercise. It was found that there is significant association between both variables with a p-value of 0.029, 0.014 and 0.026 (p<0.05) for item 1, 2 and 3 respectively. However, there was no significant association found between the types of intensity of night exercise in relation with Salah concentration. Hence, we can conclude that nighttime exercise does not give an impact to concentration in prayer (fajr) although there is significant association between salah concentration and sleep quality. This is due to frequency, duration and type of intensity of night exercise does not impact sleep quality of respondents who engage in nighttime exercise.

Table 10: Association between Salah concentration and sleep quality of respondents who engage in nighttime exercise

Item	Salah Concentration	Sleep Quality N (%)		X ² statistic (df)	P-value
		Good	Poor		
		Item 1	Strongly Agree		
	Agree	10 (5.7)	30 (17.0)		
	Neutral	27 (15.3)	31 (17.6)		
	Disagree	23 (13.1)	20 (11.4)		
	Strongly Disagree	14 (8.0)	9 (5.1)		
Item 2	Strongly Agree	4 (2.3)	10 (5.7)	12.524 (4)	0.014
	Agree	13 (7.4)	30 (17.0)		
	Neutral	24 (13.6)	35 (19.9)		
	Disagree	25 (14.2)	16 (9.1)		
	Strongly Disagree	12 (6.8)	7 (4.0)		
Item 3	Strongly Agree	6 (3.4)	22 (12.5)	11.056 (4)	0.026
	Agree	28 (15.9)	31 (17.6)		
	Neutral	26 (14.8)	29 (16.5)		
	Disagree	9 (5.1)	13 (7.4)		
	Strongly Disagree	9 (5.1)	3 (1.7)		
Item 4	Strongly Agree	2 (1.1)	8 (4.5)	5.929 (4)	0.204
	Agree	12 (6.8)	15 (8.5)		
	Neutral	27 (15.3)	39 (22.2)		

	Disagree	22 (12.5)	27 (15.3)			Strongly Disagree	7 (4.0)	4 (2.3)	8 (4.5)		
	Strongly Disagree	15 (8.5)	9 (5.1)			Item 3 Strongly Agree	9 (5.1)	7 (4.0)	12 (6.8)	4.097 (8)	0.848
Item 5	Strongly Agree	1 (0.6)	7 (4.0)	7.045 (4)	0.134	Agree	26 (14.8)	15 (8.5)	18 (10.2)		
	Agree	11 (6.3)	19 (10.8)			Neutral	22 (12.5)	10 (5.7)	23 (13.1)		
	Neutral	33 (18.8)	44 (25)			Disagree	10 (5.7)	4 (2.3)	8 (4.5)		
	Disagree	23 (13.1)	22 (12.5)			Strongly Disagree	5 (2.8)	4 (2.3)	3 (0.6)		
	Strongly Disagree	10 (5.7)	6 (3.4)			Item 4 Strongly Agree	6 (3.4)	0 (0)	4 (2.3)	5.402 (8)	0.714

Table 11: Association between type of night exercise intensity and Salah concentration

Salah Concentration		Type of Exercise Intensity N (%)			X ² statistic (df)	P-value
		Strenuous	Moderate	Light		
Item 1	Strongly Agree	8 (4.5)	3 (1.7)	1 (0.6)	9.240 (8)	0.322
	Agree	17 (9.7)	11 (6.3)	12 (6.8)		
	Neutral	20 (11.4)	12 (6.8)	26 (14.8)		
	Disagree	15 (8.5)	10 (5.7)	18 (10.2)		
	Strongly Disagree	12 (6.80)	4 (2.3)	7 (4.0)		
Item 2	Strongly Agree	7 (4.0)	4 (2.3)	3 (0.6)	5.229 (8)	0.733
	Agree	21 (11.9)	11 (6.3)	11 (6.3)		
	Neutral	22 (12.5)	12 (6.8)	25 (14.2)		
	Disagree	15 (8.5)	9 (5.1)	17 (9.7)		

	Agree	11 (6.3)	8 (4.5)	8 (4.5)		
	Neutral	28 (15.9)	15 (8.5)	23 (13.1)		
	Disagree	19	10 (5.7)	20 (11.4)		
	Strongly Disagree	8 (4.5)	7 (4.0)	9 (5.1)		
Item 5	Strongly Agree	6 (3.4)	1 (0.6)	1 (0.6)	6.991 (8)	0.538
	Agree	11 (6.3)	10 (5.7)	9 (5.1)		
	Neutral	31 (17.6)	15 (8.5)	31 (17.6)		
	Disagree	17 (9.7)	10 (5.7)	18 (10.2)		
	Strongly Disagree	7 (4.0)	4 (2.3)	5 (2.8)		

Result shows that there is no significant association between age interval, frequency and duration of exercise, other than type of exercise intensity when compared to sleep quality with p-value of 0.156, 0.131 and 0.097 respectively. There is a significant association between engagement in nighttime exercise and the ability to wake up early for fajr (p=0.001) besides association between types of intensity of night exercise and the ability to wake up early for fajr (p=0.005). However, no significant association was found between sleep quality and ability of respondents to wake up

early for fajr ($p=0.462$). Significant association was found between salah concentration with sleep quality of respondents who do nighttime exercise with p values of 0.029, 0.014 and 0.026 ($p<0.05$) for item 1, 2 and 3 respectively. However, the type of intensity of night exercise was found to have no significant association with salah concentration. Therefore, we can conclude that nighttime exercise does not influence concentration in salah (fajr) as frequency, duration and type of intensity of night exercise does not impact sleep quality of respondents who engage in nighttime exercise. Nevertheless, sleep quality was proven to influence concentration in prayer.

3.5. Discussion

Madrid-Valero et al. (2017) mentioned that there is a direct relationship between age and deterioration in the quality of sleep. In contrast, this study revealed that the age interval of individuals who do nighttime exercise does not have an impact on sleep quality. Veqar and Hussein (2012) also mentioned that exercise is a positive behavioral modification tool for all age groups to bring an improvement in sleep quality. Although sleep quality declines with age, only a very small fraction of the adults in the long follow-up consistently slept poorly while the majority of people sleep well or fairly well (Hublin et al., 2017).

There are several factors, including physiological changes, underlying physical conditions, and psychosocial factors that may contribute to a decrease in sleep quality with age (Kim et al., 2021). Among 176 responses received for this study, 63 of it describes other reasons that contribute to their trouble sleeping. Some of the reasons include stress or mental breakdown, unmanageable workload, fatigue, presence of headache or migraine during the night besides environmental factors such as hot room temperature and disturbing surrounding noise. In addition, overthinking, screen time or social media use before bed, caffeine intake, hunger and food intake before going to sleep were also contributing to their sleep problem.

The findings in this study discovered that both frequency and duration of exercises are not associated with sleep quality. This is supported by a cross-sectional study done by Kakinami et al. (2017) that showed that intensity and duration of physical activity were not associated with sleep quality or quantity. Meanwhile fitness levels and athleticism should be considered as one of the factors that influence the sleep quality of individuals who do nighttime exercise. This is because when comparatively fit populations were studied, longer exercise durations were needed in order to stimulate a sleep response (Sherill et al., 1998). Apart from that, athletic individuals tend to have longer duration of sleep and elevated slow wave sleep or deep sleep thus their sleep quality is most likely not be affected regardless of type of exercise intensity performed (Driver & Taylor, 2000).

However, Youngstedt et al. (1997) found that the duration of exercise was a more consistent moderator variable than other factors considered including fitness and time of day. This is due to the most reliable effects which includes increased total sleep time and REM latency, and decreased REM sleep were only observed for exercise lasting more than

1 hour possibly because these were more clearly described in experimental protocols when compared to other conditions such as fitness and time of day. Above all, regular exercise is said to be associated with lesser incidence of disturbed sleep (Sherill et al., 1998) and generally exercise done before bedtime was deemed to have a negative impact on sleep (Veqar & Hussein, 2012).

Kredlow et al. (2015) stated that it is reasonable to assume that physical intensity may be related to sleep quality. This is supported by a study done by Glavin et al. (2020) that mentioned the type of exercise completed may impact the relationship between exercise timing and sleep. A recent study found that high physical load at work and excessively frequent intensive physical activity are associated with difficulties initiating sleep and may represent a risk factor for insomnia (Dubina et al., 2021).

In contrast, Horne and Moore (1985) stated that exercise does give a thermogenic effect on sleep by promoting the increase of slow wave sleep or deep sleep of an individual. The body temperature increases are proportional to the workload in which exercising at 70% of maximal oxygen utilization (VO_2max) would raise the temperature by approximately $2^{\circ}C$ after 15–20 min of continuous work at a constant workload during a 60 min work period and hence, temperature effects could play a greater role in poor sleepers (Driver & Taylor, 2000). Moreover, increased energy expenditure was proven to improve quality of sleep in terms of duration of sleep and slow wave sleep by applying both energy conservation and restorative theories (Adam & Oswald, 1983; Berger & Philips, 1988 in Driver & Taylor, 2000). Meanwhile, engagement in acute or light exercises was found to be not very effective in improvement in quality of sleep. (Veqar & Hussein, 2012).

Engagement in nighttime exercise, especially strenuous exercise, gives an impact on Muslims ability to wake up early for fajr. From the Islamic perspectives, there are some Muslim sleep traditions in accordance with the practice of the Prophet Muhammad peace be upon him (pbuh) (Sunnah) that Muslims are encouraged to follow which one of them includes having early bedtime and early wake up time (Bahammam, 2011). In one Hadith narrated by Imam al-Bukhari and Muslim discussed on the superiority of the Fajr (early morning) prayer in Sahih Al-Bukhari (SB) and Sahih Muslim (SM) mentioned that Abu Bakr bin Abi Musa stated, "Allah's Messenger (ﷺ) said, 'Whoever prays the two cool prayers (ʿAsr and Fajr) will go to Paradise.'" [SB 574; SM 635]. Allah (God)'s messenger is referring to Prophet Muhammad (pbuh). This hadith emphasizes the importance of salah, especially the performance of prayer in two cool (not hot) times including a prayer before sunrise (fajr) and a prayer before sunset (asr) and there are rewards for those who observe these two prayers properly of which they will be blessed with paradise (Muhammad Mushfique Ahmad Ayoup, 2020). Prophet Muhammad (pbuh) encouraged his companions not to be involved in any activity after Isha prayer (which also known darkness prayer that usually done around 1.5 to 2 hours after sunset. The Prophet (pbuh) said, "One should not sleep before the night prayer, nor have discussions after it" [SB 574]. Additionally, Muslims are required to wake up for Fajr prayer, which is about one hour before sunrise.

Besides that, it was said that the Prophet (pbuh) usually did not sleep after Fajr prayer and always told his companions that early morning work is blessed by Allah (Bahammam, 2011).

Sleep deficit was known to be associated with lack of concentration and attention. A study done by McCoy and Strecker (2011) mentioned that evidence of deficits in attention, learning & memory, emotional reactivity, and higher-order cognitive processes including executive function and decision making are presented following sleep disruption. Meanwhile, Niu et al. (2011) mentioned that disturbed circadian rhythm may negatively influence performance and productivity. This may happen due to the lack of sleep that reduces the quality of the information stored in memory, which might occur along with the degenerative process of attention (Ratcliff & Van Dongen, 2018). In short, with poor sleep quality, individuals tend to have deficits in attention. Thus, in terms of prayer they may have difficulties concentrating on what they read during prayer besides having trouble remembering the actual number of steps during prayer.

3.6. Limitations of The Study

There were a few limitations in this study. First of all, Salah Concentration Questionnaire is a subjective measure of concentration in prayer thus the accuracy of concentration in prayer is unable to be obtained. This is because no objective measurement on concentration in prayer was available. Next, inadequate sample size may affect reliable findings in this study as some respondents were excluded from the study. Furthermore, the study was conducted with respondents in uncontrolled environmental conditions hence it is difficult to bring out results in accordance with the previous study in relating effects of night exercise and sleep quality. Other than that, this study was conducted only in Johor thus the results may not be applicable to all populations of Muslims young adults who perform nighttime exercise.

3.7. Future Recommendations

Future research should focus on awareness of sleep hygiene among Muslims as poor sleep quality was proven to give an impact on concentration in prayer (fajr). This is due to the presence of other reasons that contribute to their trouble sleeping despite doing nighttime exercise. Hence, able to contribute as part of sleep promotion strategies. Longitudinal research relating to nighttime exercise, sleep quality and its relation to religious practice as in concentration in prayer (fajr) using control groups is suggested to gain more reliable findings. Further research on how religious the respondents are, was suggested as this research has not considered those as one the variables that may affect both abilities to wake up early for fajr and concentration in salah (fajr) following nighttime exercise. In addition, future study using objective measurement was recommended if there are suitable tools or methods that help measure attention and concentration in salah accurately. Above all, make sure to use larger sample sizes to obtain precise results.

4. CONCLUSION

Overall, there was no significant association between sleep quality and different age intervals. Besides that, duration, average frequency of night exercise also does not affect sleep quality which is in contrast with most of the previous study. As the type of intensity of night exercise that does not have significant association with sleep quality, the type of intensity of nighttime exercise that gives more impact on sleep quality was unable to be determined. Respondents who engage in nighttime strenuous exercise tend to have difficulty waking up early when compared to those who did moderate and light exercise. While the ability to wake up is often associated with sleep deprivation, this study shows contrary results where sleep quality does not affect the ability to wake up early for fajr as most respondents who are unable to wake up early for fajr have good quality of sleep. Other than that, we can conclude that nighttime exercise does not give an impact to concentration in prayer (fajr) although there is significant association between salah concentration and sleep quality. This is due to frequency, duration and type of intensity of night exercise does not impact sleep quality of respondents who engage in nighttime exercise. To sum up, perform strenuous night exercise is not recommended for Muslim as it can affect their ability to wake up early for fajr despite of having good sleep quality.

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