ORIGINAL ARTICLE

Evaluation of Fitness Levels and Associated Factors among Public Health Pharmacy Staff in Perlis.

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Submitted: 07/04/2025. Revised edition: 17/06/2025. Accepted: 18/09/2025. Published online: 01/11/2025.

Abstract

Background: Maintaining good fitness levels is vital for healthcare workers due to the physical and mental demands of their roles. This study assessed the fitness levels of pharmacy staff at public health clinics in Perlis and explored associated factors. **Methods:** A cross-sectional study was conducted from April to June 2024 among pharmacy staff in 13 public health facilities in Perlis. Data on sociodemographic characteristics, fitness levels (cardiovascular endurance, muscle strength, and muscle endurance), and mental health symptoms were collected using an English-language questionnaire and analysed with SPSS version 25.0. **Results:** Of the 72 participants (mean age 36.3 years, SD=7.04), most were Malay (95.8%), female (77.8%), and married (70.8%). Obesity (BMI ≥30 kg/m²) was present in 11 participants (15.3%). Cardiovascular endurance was rated average or above in 87.5% of participants, muscle strength in 55.6%, and muscle endurance in 73.6%. Overall, 37.5% were classified as physically fit. Exercising four to five times per week significantly increased the likelihood of being physically fit compared to those who did not exercise (AOR=17.29, p=0.030). **Conclusion:** A considerable proportion of pharmacy staff were not classified as physically fit, highlighting the need for targeted interventions. Regular exercise, particularly four to five times per week, was strongly associated with improved fitness levels.

Keywords: *Cardiovascular endurance, healthcare workers, muscle endurance, muscle strength, physical fitness.*

Introduction

The World Health Organization (WHO) defines physical activity as any energy-driven movement initiated by skeletal muscles, encompassing a wide range of daily activities such as commuting, working, and leisure activities like walking, cycling, sports, and active recreation [1]. Regular physical activity is vital for maintaining health, significantly reducing the risk of noncommunicable diseases like diabetes, heart disease, stroke, and certain cancers. It aids in managing blood pressure, maintaining a healthy body weight, and preventing obesity-related conditions [1]. Beyond its physical benefits, physical activity also enhances mental health by reducing anxiety and depression, contributing to an overall sense of well-being [2].

Fitness levels, which are directly linked to consistent physical activity, encompass improvements in cardiovascular endurance, muscular strength, muscle endurance, and body composition [3]. Activities such as walking, running, and cycling boost cardiovascular health and stamina, while strength training builds muscle and supports joint stability. Muscle endurance exercises are essential for maintaining performance during prolonged activities, and flexibility exercises help preserve a full range of motion, reducing the risk of injury [4]. Higher fitness levels also correlate with improved cognitive function, greater focus, and increased productivity, making physical activity a key contributor to both physical and mental resilience [5].

The importance of maintaining good fitness levels is particularly evident in healthcare workers, whose roles require physical endurance, strength, and mental resilience. High fitness levels enable healthcare workers to perform physically demanding tasks, such as moving patients or standing for long hours, while also reducing fatigue and preventing work-related injuries [6]. Evaluating fitness levels through assessment of cardiovascular endurance, muscle strength, and muscle endurance provides a comprehensive understanding of healthcare workers' physical capabilities, helping to identify areas for improvement [7]. Moreover, healthcare workers with better fitness often report improved mental clarity, focus, and stress management, which are critical qualities for delivering high-quality care in demanding environments [8].

A lack of physical fitness has been associated with several occupational concerns, including reduced work productivity, increased rates of absenteeism, and a higher incidence of medication errors in healthcare settings [9]. Physically inactive workers are more likely to experience musculoskeletal problems, fatigue, and chronic diseases, all of which contribute to workplace inefficiencies and safety concerns. In pharmacy practice specifically, where precision and sustained concentration are essential, these negative outcomes can impact on both staff well-being and patient safety.

Despite the well-documented benefits of physical activity, a significant portion of the global population, including healthcare workers, fails to engage in sufficient physical activity. According to the WHO, 1.4 billion adults, which is over 25% of the global adult population, fail to meet the recommended activity levels, with one in three women and one in four men affected [1]. This inactivity is also prevalent in the healthcare sector, where many employees lead sedentary lifestyles. A study conducted in Perak revealed that 45.6% of primary healthcare personnel were physically inactive, averaging five hours of sedentary behavior per day [10]. Additionally, the same study found that 51% of healthcare workers were at risk of abdominal obesity, 49.9% were overweight or obese, and 79.6% had excessive body fat percentages [11]. Further research by Kunyahamu et al. showed that only 43% of healthcare workers had a normal BMI, while 33.1% were classified as overweight and 21.1% as obese [12].

Pharmacists and pharmacy assistants play crucial roles in healthcare delivery, ensuring that patients receive accurate medication management and counseling. Despite the evident importance of assessing healthcare workers' fitness status, the literature on the fitness levels of pharmacists and

pharmacy assistants in Malaysia remains relatively scarce [13]. Understanding and evaluating their fitness levels is essential as it can significantly promote their health and well-being, potentially leading to reduced absenteeism and enhanced job satisfaction [9]. A healthy workforce is vital for maintaining high standards of care, reducing the risk of errors, and improving overall productivity [14]. Moreover, encouraging physical fitness among these healthcare professionals not only benefits their personal health but also sets a positive example for patients, reinforcing the importance of a healthy lifestyle [15].

This study focused specifically on pharmacy staff at public health clinics in Perlis rather than including those from hospitals. The rationale for this decision lies in the distinct work environments and service demands between the two settings. Public health clinic pharmacy staff often handle high outpatient volumes, provide community health outreach, and work in smaller teams, potentially placing them at greater risk of sedentary behavior and physical inactivity. In contrast, hospital pharmacy staff may operate within larger teams with more role division and a different workflow. Furthermore, the public health setting in Perlis offered consistent access across facilities, making data collection more feasible and representative of primary care services.

Given these concerns, this study aims to evaluate the fitness levels of pharmacy staff at public health clinics in Perlis, focusing on key components of physical fitness, including cardiovascular endurance, muscle strength, and muscle endurance. By assessing these parameters, the study will provide a comprehensive understanding of the overall fitness levels of pharmacy staff, highlighting their physical health in relation to their ability to perform tasks that require sustained energy, strength, and stamina. In addition to evaluating these fitness components, the study will explore factors influencing physical activity among this group. Identifying these factors will help pinpoint barriers to physical activity and offer insights into potential strategies for promoting a healthier, more active lifestyle among pharmacy staff.

Methods

This was a cross-sectional study that targeted all pharmacy staff (including pharmacists and pharmacy assistants) from all 13 public health facilities in Perlis from April to June 2024. The study population included those who were on duty (not on long-term or extended leave) and performing their usual work roles during the study period. Staff members on extended leave (e.g., maternity, study, or unpaid leave exceeding two weeks) were excluded.

A universal sampling method was employed to invite all eligible pharmacy staff to participate. Although the study aimed to include all staff members, the estimated minimum required sample size was calculated using the single proportion formula. Using a 95% confidence interval ($Z = 1.96$), an estimated prevalence (P) of physical inactivity at 0.456 based on previous findings [10], and a margin of error (d) of 0.10, the calculated minimum sample size was 95 participants. The universal approach ensured that the entire accessible population was approached to minimize sampling bias.

This study was registered with the National Medical Research Register (NMRR ID-24-00117-07L) with ethical approval. Before data collection, permission to conduct this study was obtained from the Kangar District Health Officer. Investigators recruited participants for the study by scheduling appointments at each facility for data collection. During each visit, all eligible participants received detailed information about the study and had the opportunity to ask questions for clarification. Only individuals who provided consent received a paper-based questionnaire. The questionnaire, available in English, consists of two parts.

Sociodemographic and lifestyle information

The first part collected sociodemographic information, including weight, height, BMI, age, gender, race, marital status, number of children, education level, and number of shifts per month. Number of shifts per month, defined in this study as any work assignment outside regular weekday hours (8 am–5 pm), including on-call duty, night shifts, weekend duties, or extended overtime hours. It also gathered data related to exercise routines, and dietary plans (e.g., Keto diet, fasting, intermittent fasting).

Medical history and symptoms of mental health

Medical history (asthma, diabetes mellitus, hypertension, and dyslipidemia) and symptoms of mental health (depression, stress, and anxiety) were also recorded. The questionnaire utilized the Depression, Anxiety, and Stress Scale (DASS-21), which is a shorter version of the DASS-42 survey [16]. Each of the three components contains seven items rated on a 4-point Likert scale from 0 ("Did not apply to me at all") to 3 ("Applied to me very much or most of the time"). The following conventional cut-off scores were used to interpret the severity levels of depression, anxiety, and stress in the DASS-21: for depression, scores of 0–9 were considered normal, 10–13 mild, 14–20 moderate, 21–27 severe, and 28 or above extremely severe; for anxiety, scores of 0–7 were normal, 8–9 mild, 10–14 moderate, 15–19 severe, and 20 or above extremely severe; and for stress, scores of 0–14 were normal, 15–18 mild, 19–25 moderate, 26–33 severe, and 34 or above extremely severe [16].

Fitness assessment

Three fitness components were measured:

- Cardiovascular Endurance was assessed by using the YMCA 3-Minute Step Test. Participants stepped up and down on a 12-inch bench at a consistent pace for 3 minutes. Heart rate was recorded immediately after the post-test. Fitness classification was based on heart rate recovery benchmarks by age and gender following the YMCA norms [17].
- Muscle strength was assessed using the Five-Level Sit-Up Test. Participants were required to perform sit-ups with increasing levels of difficulty, and the highest level successfully completed was recorded. Those who were unable to perform even the easiest movement were classified as 'Very Weak', while participants who could place both hands behind the head and perform a sit-up until the chest touched the thighs were classified as 'Excellent' [18].
- Muscle Endurance was measured by the Push-Up Test (standard push-ups for men; modified/knee push-ups for women). The number of correct repetitions performed in one minute was used. Classification of fitness level was based on established ACSM normative data [19].

Participants who scored “below average” or “poor” in any fitness categories were classified as “unfit,” while those who scored “average” or higher in all categories were classified as “fit.”

Data analysis

The data were analyzed using SPSS version 25.0 [20]. Descriptive statistics were employed to measure the sociodemographic characteristics of participants. The Chi-square test or Fisher’s Exact Test was used for associations between categorical variables and fitness classification. The Independent t-test was used for continuous variables after checking assumptions of normality (Shapiro-Wilk test) and homogeneity of variance (Levene’s test).

Variables with p-values < 0.25 in univariate analysis were entered into multiple logistic regression to identify predictors of fitness level. Multicollinearity was assessed using Variance Inflation Factor (VIF), with values <5 indicating no concern. Model fit was evaluated using the Hosmer-Lemeshow goodness-of-fit test, and the Nagelkerke R^2 was reported to indicate the proportion of variance explained [21].

Results

Participants' characteristics and lifestyle behaviours

The questionnaire was distributed to 97 eligible participants at public health clinics, and 72 pharmacy staff responded, resulting in a response rate of 74.2%. The sociodemographic characteristics and lifestyle behaviors of the respondents are shown in Table 1. Overall, participants were predominantly Malay (n=69, 95.8%), female (n=56, 77.8%), and married (n=51, 70.8%). The average age was 36.3 years (SD = 7.04). Nearly two-thirds of respondents were pharmacists, while the remainder were pharmacy assistants. More than half (58.3%) reported having one to three shifts per week.

Notably, eleven participants (15.3%) were classified as obese, with a body mass index (BMI) of 30 kg/m² or higher. Only 26.4% reported following a specific diet plan, such as the Keto diet or intermittent fasting. Physical activity levels were generally low, with nearly 40% reporting no regular exercise. Another quarter of the participants (n=18) engaged in physical exercise two to three times per week. Only a small minority (5.6%, n=4) reported exercising four to five times per week.

Medical history and symptoms of mental health

Table 2 summarises the self-reported medical history of participants. The majority reported no chronic health conditions. Hypertension (8.3%) and diabetes mellitus (5.6%) were the most commonly reported conditions, followed by dyslipidemia (4.2%) and asthma (2.8%). Table 3 summarises the prevalence of depression, anxiety, and stress symptoms among participants. Most participants reported normal levels across all three domains. However, symptoms of anxiety were more commonly reported (22.2%) compared to depression (13.9%) and stress (9.7%). Severe or extremely severe symptoms were rare across all categories.

Assessment of fitness level

Table 4 presents the assessment of participants' physical fitness across multiple domains. In terms of cardiovascular endurance, most participants rated within the "good" to "excellent" range, accounting for over half of the respondents. Muscle strength assessments revealed a broader distribution, with a notable proportion falling in the "poor" to "very poor" categories (44.4%). Muscle endurance was generally better, with the majority achieving "average" or "good" levels. Despite some positive indicators in individual components, overall fitness classification showed that 62.5% of participants were considered unfit, while only 37.5% were categorised as fit.

Factors associated with fitness level

Univariate analysis indicated that only one factor, frequency of exercise, was significantly associated with overall fitness level (Table 5). After adjusting for confounding variables in the multiple logistic regression (Table 6), it was found that individuals who engaged in frequent physical exercise showed higher fitness levels. Specifically, those who exercised two to three times per week had 4.49 times the odds of being fit compared to non-exercisers (p=0.030). Furthermore, individuals who exercised four to five times per week had 17 times the odds of achieving fitness compared to those who did not exercise (p=0.030).

Discussion

Similar to a previous study, the current study found that less than half of the participants were categorized as physically fit, highlighting a concerning trend of suboptimal fitness levels among pharmacy staff [10]. This finding suggests that a significant portion of the participants may not be meeting the recommended levels of physical activity and fitness. Studies have attributed low fitness levels in similar populations to sedentary work, long or irregular hours, and limited opportunities for physical activity during the workday [22]. The occupational implications

are noteworthy, as poor physical fitness among healthcare professionals can lead to increased fatigue, decreased productivity, and higher rates of absenteeism [22]. Addressing this issue requires workplace-level strategies, such as integrating wellness programs, providing access to on-site or subsidised fitness facilities, scheduling protected time for exercise, and promoting active commuting.

The present study found that none of the demographic factors, including age, gender, and BMI, were significantly associated with overall fitness level, even in the univariate analysis. This suggests that demographic characteristics alone may not adequately predict physical fitness among pharmacy staff. One possible explanation is that the homogeneity of the study population, in terms of occupation, work setting, and potentially shared health awareness which may reduce variability in fitness determinants typically observed in more heterogeneous populations. Additionally, the lack of association might reflect the overriding influence of modifiable lifestyle behaviours, particularly physical activity levels, which showed a strong and statistically significant relationship with fitness. These findings align with some previous research that highlights behaviour over background as a key determinant of fitness [23]. Individuals who engage in regular exercise and lead active lifestyles tend to exhibit higher fitness levels through improvements in cardiovascular health, muscular strength, and overall physical performance [24].

The frequency of exercise plays a significant role in determining an individual's fitness level, serving as a cornerstone for maintaining and enhancing overall health. Regular physical activity is essential for cardiovascular health and muscle strength [25]. The current study has shown that individuals who exercise four to five times per week exhibit significantly higher fitness levels compared to those who do not exercise, suggesting that regular physical activity has a strong and measurable impact on fitness outcomes. This finding is consistent with prior studies among healthcare professionals, where higher physical activity levels were positively associated with better health indicators [26]. However, among pharmacy staff, engaging in regular exercise may be particularly challenging due to job-related barriers such as prolonged standing, fixed schedules, or limited time for physical activity during or after work hours. Compared to other healthcare professions, pharmacists may have fewer structured wellness initiatives integrated into their workplace settings. This highlights the need for targeted interventions such as incorporating short activity breaks during shifts, promoting active commuting, or providing incentives for gym memberships to support regular exercise among pharmacy personnel. Addressing these occupational barriers can help improve physical fitness and contribute to long-term health and productivity in this essential workforce.

While previous literature supports a positive relationship between physical activity and mental health, particularly in reducing symptoms of depression, anxiety, and stress, the current study found no significant association between mental health status as measured using the DASS-21 and fitness levels among participants. This finding aligns with other studies that have also reported mixed or non-significant results in healthcare populations, suggesting that the relationship may be more complex than direct cause and effect [27]. Several factors may explain this, including the potential influence of occupational stressors, coping mechanisms unrelated to physical activity, or the presence of latent confounding variables such as sleep quality, workload, or social support [28]. Additionally, pharmacy staff may experience stress that is not alleviated solely by physical activity, especially if time constraints or job demands prevent consistent exercise. These findings underscore the need for more nuanced, multifactorial approaches to promoting mental well-being in healthcare workers, rather than relying solely on physical fitness interventions.

One of the primary limitations of the study was its small sample size, which may have reduced the statistical power to detect significant associations, increased the risk of type II errors, and affected the stability and generalizability of the multivariate models. Additionally, the study's regional focus on pharmacy staff in Perlis limits the applicability of the findings to other populations or healthcare settings. Future research efforts could benefit from conducting larger-scale, multicenter studies across Malaysia to improve representativeness and provide a more comprehensive national picture.

Further studies should also consider collecting additional data on factors that may influence fitness, such as physical activity measurements using wearable devices, occupational workload, sleep patterns, dietary habits, and organisational factors like access to wellness programmes or time allocated for physical activity. Including these parameters would allow for a more nuanced analysis of contributors to fitness and enable the development of tailored, evidence-based interventions.

Conclusion

The study revealed a significant portion of participants were not categorized as fit, indicating a concerning trend among pharmacy staff. The frequency of exercise significantly impacts fitness, with those exercising four to five times per week demonstrating higher levels of physical fitness. Given the sedentary nature of pharmacy work and long working hours, tailored interventions such as workplace wellness programs, flexible exercise opportunities, and community-based fitness initiatives are essential to support active lifestyles among pharmacy personnel. Promoting regular physical activity and healthy behaviours within the occupational context can improve overall health and work performance. Future research should explore specific occupational barriers to physical activity and inform the design of targeted strategies to enhance fitness outcomes in this professional group.

Funding

No funding was involved in the publication of this research.

Acknowledgement

We would like to thank the Director General of Health for permission to publish this study.

Conflict of interest

All authors declared that no conflict of interest may arise from this research.

Ethics clearance

The Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia (MOH) has provided ethical approval for this study (NMRR ID-24-00117-07L (IIR)).

Authors' contributions

SPP, MHFSH and SM came out with the study design. SPP, MHFSH, SM and NM performed the literature search and data collection SPP and NYH were involved in the statistical analysis and manuscript preparation. All authors agreed and approved the manuscript for publication.

Table 1. Participants' sociodemographic data and lifestyle behaviors, n=72

Variable	Category	n (%)	Mean (SD)
Age (years)			36.30 (7.04)
Gender	Male	16 (22.2)	
	Female	56 (77.8)	
Ethnicity	Malay	69 (95.8)	
	Chinese	1 (1.4)	
	Indian	1 (1.4)	
	Others	1 (1.4)	
Marital status	Single	19 (26.4)	
	Married	51 (70.8)	
	Divorced	2 (2.8)	
Number of children	None	26 (36.1)	
	1-3	35 (48.6)	
	>3	11 (15.3)	
Education level	Diploma	26 (36.1)	
	Degree	46 (63.9)	
Occupation	Pharmacist	46 (63.9)	
	Pharmacist assistant	26 (36.1)	
Number of shifts per week	None	16 (22.2)	
	1-3/week	42 (58.3)	
	>3/week	14 (19.4)	
BMI (kg/m^2)	Non-obese	61 (84.7)	
	Obese (≥ 30 kg/m^2)	11 (15.3)	
Diet plan	Yes	19 (26.4)	
	No	53 (73.6)	
Exercise	None	28 (38.9)	
	1/week	22 (30.6)	
	2-3/week	18 (25.0)	
	4-5/week	4 (5.6)	

SD=Standard deviation

Table 2. Medical history, n=72

Variable	Category	n (%)
Asthma	Yes	2 (2.8)
	No	70 (97.2)
Diabetes mellitus	Yes	4 (5.6)
	No	68 (94.4)
Hypertension	Yes	6 (8.3)
	No	66 (91.7)
Dyslipidemia	Yes	3 (4.2)
	No	69 (95.8)

Table 3. Prevalence of depression, anxiety and stress symptoms among pharmacists and pharmacist assistants in Perlis, n=72

Variable	Category	n (%)
Depression	Normal	62 (86.1)
	Mild	3 (4.2)
	Moderate	6 (8.3)
	Severe	1 (1.4)
	Extremely severe	0
Anxiety	Normal	56 (77.8)
	Mild	6 (8.3)
	Moderate	7 (9.7)
	Severe	1 (1.4)
	Extremely severe	2 (2.8)
Stress	Normal	65 (90.3)
	Mild	4 (5.6)
	Moderate	2 (2.8)
	Severe	1 (1.4)
	Extremely severe	0

Table 4. Assessment on fitness level, n=72

Variable	Category	n (%)
Cardiovascular endurance	Very poor	1 (1.4)
	Poor	8 (11.1)
	Average	12 (16.7)
	Above average	14 (19.4)
	Good	17 (23.6)
	Excellent	20 (27.8)
Muscle strength	Very poor	15 (20.8)
	Poor	17 (23.6)
	Average	8 (11.1)
	Above average	9 (12.5)
	Good	10 (13.9)
	Excellent	13 (18.1)
Muscle endurance	Very poor	9 (12.5)
	Poor	10 (13.9)
	Average	27 (37.5)
	Good	20 (27.8)
	Excellent	6 (8.3)
Overall fitness level	Fit	27 (37.5)
	Unfit	45 (62.5)

Table 5. Univariable analysis on factors associated with fitness level, n=72

Variable	Category	Fit n=27	Unfit n=45	Test-statistics	*p*-value
Demographic data					
Age		35.3 (5.50)	36.9 (7.81)	t (70) = -0.93	0.356
Gender	Male	6 (37.5)	10 (62.5)	X^2 (1) = 0.00	1.000 [a]
	Female	21 (37.5)	35 (62.5)		
Ethnicity	Malay	27 (39.1)	42 (60.9)		
	Chinese	0 (0)	1 (100)	X^2 (3) =3.56	0.313 [b]
	Indian	0 (0)	1 (100)		
	Others	0 (0)	1 (100)		
Marital status	Married	17 (33.3)	34 (66.7)	X^2 (1) =1.30	0.255 [a]
	Unmarried	10 (47.6)	11 (52.4)		
Number of children	None	12 (46.2)	14 (53.8)	X^2 (2) =1.48	0.478 [a]
	1-3	12 (34.3)	23 (65.7)		
	>3	3 (27.3)	8 (72.7)		
Education level	Secondary school	0 (0)	3 (100)	X^2 (3) =-3.87	0.276 [b]
	Diploma				
	Degree	9 (39.1)	14 (60.9)		
		18 (39.1)	28 (60.9)		
Occupation	Pharmacist	18 (39.1)	28 (60.9)	X^2 (1) =0.14	0.704 [a]
	Pharmacist assistant	9 (34.6)	17 (65.4)		
		31 (39.2)	48 (60.8)		
Number of shifts per month	None	8 (50.0)	8(50.0)	X^2 (2) =1.40	0.497 [a]
	1-3/week	14 (33.3)	28 (66.7)		
	>3/week	5 (35.7)	9 (64.3)		
BMI (kg/m^2)		24.7 (5.74)	26.5 (5.92)	t (70) = -1.26	0.211
Diet plan	Yes	7 (36.8)	12 (63.2)	X^2 (1) =0.005	0.945 [a]
	No	20 (37.7)	33 (62.3)		
Exercise	None	5 (17.9)	23 (82.1)	X^2 (3) =8.80	0.032 [b]
	1/week	10 (45.5)	12 (54.5)		
	2-3/week	9 (50.0)	9 (50.0)		
	4-5/week	3 (75.0)	1 (25.0)		
Emotional states					
Depression	Without symptom	23 (37.1)	39 (62.9)	X^2 (1) =0.03	0.860 [a]
	With symptom[#]	4 (40.0)	6 (60.0)		
Anxiety	Without symptom	22 (39.3)	34 (60.7)	X^2 (1) =0.34	0.558 [a]
	With symptom[#]	5 (31.3)	11 (68.8)		
Stress	Without symptom	23 (35.4)	42 (64.6)	X^2 (1) =1.28	0.413 [b]
	With symptom[#]	4 (57.1)	3 (42.9)		

SD=standard deviation; t=t-statistic; X^2= X^2 statistic; a = chi-square; b = fisher exact; *=statistically significant at $p<0.05$; All variables of $p<0.25$ were included for multivariable analysis; #the cut-off score for depression, anxiety, and stress were ≥10, ≥8, and ≥15, respectively.

Table 6. Multiple logistic regression on factors associated with fitness level, n=72

Variable	Category	Adjusted OR (95% CI)	*p*-value
BMI		0.94 (0.85, 1.04)	0.227
Exercise	None (R)		0.128
	1/week	3.43 (0.94, 12.53)	0.062
	2-3/week	4.49 (1.16, 17.41)	0.030*
	4-5/week	17.29 (1.31, 227.98)	0.030*

OR=odds ratio; 95% CI=95% confidence interval; (R)=reference group; *=$p<0.05$, $R^2 = 0.19$

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