

# Mental health, nutritional status, physical activity and healthy eating index among Malaysian university students

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**Abstract.** Lifestyle is a complex phenomenon that encompasses all aspects of daily life. University is a crucial period when students are more susceptible to engaging in unhealthy behaviours that can harm their health. This study aimed to assess the mental health, nutritional status, physical activity, and Health Eating Index (HEI) among university students at a university in Klang Valley, Malaysia. In this cross-sectional study, body composition (weight, height, body fat percentage and visceral fat), physical activity (IPAQ questionnaire), healthy eating index (HEI-Malaysia questionnaire) and mental health (GHQ-12 questionnaire) were collected from 383 university students aged 19-30 years using purposive sampling method. Approximately half proportionate of them (n=172; 45%) had unhealthy HEI scores, and 15% of them were overweight/ obese (n=57). However, a majority of them had high physical activity level (n=276; 72.5%). Physical activity was inversely associated with body fat percentage ( $r=-0.101$ ;  $p$ -value $<0.05$ ). Meanwhile, GHQ-12 scores were significantly associated with HEI scores ( $r=0.211$ ;  $p$ -value $<0.01$ ) and body mass index ( $r=-0.107$ ;  $p$ -value $=0.036$ ). The findings of the study indicate that university students are prone to unhealthy eating patterns. Those with good mental health tend to practice healthy eating and have a lower body mass index.

## 1. Introduction

### 1.1 Background

The transition to higher education presents numerous challenges for students, significantly impacting their overall well-being and academic success [1]. University students in full-time higher education typically range in age from 17 to 24 years, which is also a critical period for the onset of psychological issues. The transition from home to university can impact mood and overall mental health. This is a period of increased risk of onset of mental health problems. Studies from various countries have indicated that the well-being and mental health of students are under considerable pressure, this presents a serious health and societal issue [2]. Hence, the well-being of students in higher education is receiving increasing attention.

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The transition from home to university also appears to impact students' diet quality, as this period is often marked by the adoption of poor dietary habits [3]. Research indicates that poor dietary quality contributes to a greater risk of metabolic diseases. The issues of obesity and overweight among university students are alarming. Meta-analysis has revealed that university students tend to gain an average of 1.6 to 3.0kg during their four-year enrolment [4]. This increase in weight is five times higher than the average weight gain projected for the general population in one year. Obesity subsequently contributes to a higher mortality rate from a range of chronic diseases. Physical activity also plays a crucial role in determining the health status of a young adult, besides dietary intake. Given that a majority of the world's population is physically inactive, this issue is regarded as a public health concern rather than just an individual issue. Among the most significant external factors impacting physical activity in the student population is the lack of free time, attributed to faculty schedules and social and family responsibilities, adversely influencing students' well-being, strength, endurance and nutritional status [5]. It is widely recognized that physical activity has numerous positive effects on overall health, including both physical and mental well-being [6]. Thus, maintaining an active lifestyle is essential.

A growing number of studies have recently examined the potential impact of diet quality on the development of mental health issues across various nations and cultures [7]. Though not the only contributing factor, poor diet quality is recognized as a risk factor for mental health problems, with some arguing that mental health issues can also influence diet quality in young adult population [8]. Besides, high levels of physical activity are associated with mental well-being and social well-being, in addition to physical well-being [5]. As university students navigate the transitional phase in their lives, they often encounter changes in their living habits, moving from the structured setting of high school to a more flexible university environment. It involves challenging responsibilities, unfamiliar situations and more complex academic tasks; this suggests that university students are at risk and experience a high prevalence of mental health issues [9]. However, the associations between mental health, nutritional status, healthy eating index and physical activity level in Malaysian university students are not being studied. Considering all the above, it is important to investigate the mental health, nutritional status, healthy eating index and physical activity level among the university students in Malaysia.

## **2 Methodology**

### **2.1 Participants recruitment and study design**

A total of 383 healthy university students aged 19-30 years from a private university in Kuala Lumpur were recruited for this cross-sectional study through purposive sampling. This study was granted ethical approval by the Research Ethics Committee of Tunku Abdul Rahman University of Management and Technology, and was conducted in line with the guidelines laid down in the Declaration of Helsinki. Prior to data collection, written informed consent was obtained from all the participants. The sample size was calculated using the krejcie & Morgan [10] formulation. Given that the university has a total of 20,000 university students, with a relative precision of 5%, and predicted prevalence of 50% for a confidence interval of 95%. The estimated sample size needed for this study was 377 participants. We included an extra 10% to the sample size to account for the expected non-response rate, and the possibility of information loss resulting from incomplete data, the final required sample size for the present study was 415. The inclusion criteria were: (1) apparently healthy Malaysian university students aged 18 years and above; and (2) must be able to write, read and understand English language. Those who were absent on the data collection day or had

serious comorbidity requiring treatment were excluded from the study, as their presence could potentially affect the outcomes.

## **2.2 Anthropometric measurements and body composition**

Each participant's body weight was measured twice using a calibrated InBody 270 (InBody Co. Seoul, Korea) and recorded to the nearest 0.1kg. The participants were weighed while clothed, barefoot and without belts or items in their pockets. Participants were required to stand still, ensuring their body weight was evenly distributed on both feet. The angle of their heads had to be in the Frankfurt plane, with an upright posture, upper limbs at their sides and palms facing forward, feet flat and directed forward toward the researcher. Height measurement for each participant was conducted twice using a BSM170 Stadiometer (InBody Co. Seoul, Korea), recorded to the nearest 0.1cm. Participants were instructed to stand erect, barefoot, with their heels, buttocks, head and shoulder blades in alignment against the wall. Measurements were taken in the upright position, ensuring the top of the external auditory meatus was level with the inferior margin of the orbital bone. Body mass index was calculated in accordance with World Health Organization (WHO) guidelines.

## **2.3 Mental health assessment**

In the present study, the 12-item General Health Questionnaire (GHQ-12) was employed to assess the psychological health of university students. This self-administered screening tool aimed to identify psychological morbidity within the general population and those who may be at risk of psychiatric disorders. The GHQ-12 consists of 12 items scored using the original scoring method. 4-point Likert scale was adopted. Positively worded items have responses of "better than usual", "same as usual", "less than usual", and "much less than usual". Whereas, negatively worded items were scored with "not at all", "no more than usual", "rather more than usual" and "much more than usual". The total GHQ-12 scores ranged from 0 to 36, with higher scores indicating an increased risk of psychiatric comorbidity. In the Malaysian version of the GHQ-12, the optimal cut-off points for identifying individuals at risk of poor mental health is set at  $\geq 9$  [11].

## **2.4 Healthy eating index**

The Malaysian Healthy Eating Index (HEI) serves as one of many metrics for assessing the adherence of Malaysian citizens to the dietary recommendations set forth by the Malaysian Dietary Guidelines (MDG) [12]. The questionnaire comprises nine components: seven dietary categories and two nutritional groupings. These components yield various scores that contribute to an individual's overall dietary composition. Each nutrient's score ranged from 0 to 10, with whole number responses tallied proportionally. The overall healthy eating index score was calculated by summing the scores of each component. The composite score as a percentage was determined using the formula: (total score from food components/ maximum score) x 100%. A total score of 100% is possible, where a score of less than 46% indicates a poor diet and more than 46% indicated a good diet [12].

## **2.5 Physical activity assessment**

Physical activity level was assessed through the self-administered International Physical Activity Questionnaire (IPAQ). Participants were asked 27 questions related to their activities during the past week, including leisure, house chores and gardening, work-related

activities, and transport-related physical activities. The IPAQ employs a scoring method in which each activity is assigned a Metabolic Equivalent (MET) value to each activity. MET represents the ratio of the metabolic rate during an activity to the metabolic rate while at rest. The MET score for each activity is calculated as follows:

Walking MET score = 3.3 x walking minutes x days of walking  
 Moderate MET score = 4.0 x moderate activity minutes x days of moderate activities  
 Vigorous MET score = 8.0 x intense vigorous activity minutes x days of vigorous activities

The total MET score for physical activity was determined by adding the walking, moderate and vigorous MET scores. Subsequently, the scores were classified into low, moderate and vigorous physical activity levels according to below category:

Low physical activity level : < 600 MET minutes/ week  
 Moderate physical activity level : 600-2999 MET minutes/ week  
 High physical activity level : ≥ 3000 MET minutes/ week

### 2.6 Statistical analyses

SPSS (version 22.0) (IBM SPSS Statistics, 2014) was used for data analysis. Before analysis, the data was entered, cleaned and thoroughly checked. Descriptive statistics were computed for participants' demographic information, anthropometric profiles, GHQ scores, HEI category and physical activity level. The Kolmogorov-Smirnov test was used to assess the normal distribution of each variable. Group differences were tested using the Chi-Square test and the Mann-Whitney U test. The associations between mental health, nutritional status, HEI scores and physical activity were determined using Spearman's correlation coefficients. A two-sided *p*-value of <0.05 was considered as statistically significant.

## 3 Result

The demographic information, anthropometric profiles, GHQ scores, HEI scores and physical activity MET scores among participants are presented in Table 1. A total of 383 university students have been enrolled into the present study. A majority of them (65.3%; n=250) were normal weight, with normal body fat percentage (54.8%; n=210) and normal visceral fat (93.7%; n=359). 15% of them were overweight/ obese (n=57). Approximately half proportionate of them (n=172; 45%) had unhealthy HEI scores. However, a majority of them had high physical activity level (n=276; 72.5%). Male showed significantly higher physical activity MET score as compared to female (*p*-value<0.01).

**Table 1.** Demographic information, anthropometric profiles, GHQ scores, HEI category and physical activity level (n=383)

Variables	Male (n=174)	Female (n=209)
Age (years), median (IqR)	21 (1)	21 (2)
BMI (kg/m <sup>2</sup> ), median (IqR)	21.3 (4.4)	20.1 (3.8)
Body fat percentage (%), mean (SD)	19.2 (8.0)	30.3 (7.3)

<b>Visceral fat</b> , median (IqR)	4.0 (4.0)	5.0 (4.0)
<b>Healthy eating index score</b> , median (IqR)	47.4 (19.2)	48.8 (16.7)
<b>GHQ-12 score</b> , median (IqR)	13.0 (6.0)	14.0 (8.0)
<b>Physical activity MET score</b> , median (IqR)	5951.8 (13745.3)	3879 (9483) ††

IqR: Interquartile range; Mann-whitney U test was applied, ††*p*-value <0.01

Table 2 shows the associations between mental health, nutritional status, healthy eating index and physical activity among the university students. Physical activity was inversely associated with body mass index ( $r=-0.130$ ;  $p$ -value<0.05) and body fat percentage ( $r=-0.101$ ;  $p$ -value<0.05). Meanwhile, GHQ-12 scores were significantly associated with HEI scores ( $r=0.211$ ;  $p$ -value<0.01) and body mass index ( $r=-0.107$ ;  $p$ -value=0.036).

**Table 2.** Associations between mental health, nutritional status, healthy eating index and physical activity among the university students (n=383)

	<b>BMI</b>	<b>% BF</b>	<b>VF</b>	<b>HEI</b>	<b>MET</b>	<b>GHQ</b>
<b>BMI</b>		0.624 <sup>††</sup>	0.075 <sup>††</sup>	0.130	-0.130 <sup>†</sup>	-0.107 <sup>†</sup>
<b>% BF</b>	0.380 <sup>††</sup>		0.895 <sup>††</sup>	0.042	-0.101 <sup>†</sup>	0.013
<b>VF</b>	0.624 <sup>††</sup>	0.895 <sup>††</sup>		0.085	-0.020	-0.027
<b>HEI</b>	0.075	0.042	0.085		0.080	0.211 <sup>††</sup>
<b>MET</b>	-0.130 <sup>†</sup>	-0.101 <sup>†</sup>	-0.020	0.080		-0.040
<b>GHQ</b>	-0.107 <sup>†</sup>	0.013	-0.027	0.211 <sup>††</sup>	-0.040	

BMI: body mass index; % BF: percentage of body fat; VF: visceral fat; HEI: healthy eating index; MET: physical activity MET score; GHQ: general health questionnaire; ††*p*-value <0.01; †*p*-value <0.05.

## 4 Discussion

This is the first study to investigate the associations between mental health, nutritional status, healthy eating index and physical activity among Malaysian university students. Our study reveals the significant inverse associations between physical activity with body mass index and body fat percentage, as well as significant positive associations between healthy eating index and body mass index. In the present study, male demonstrated a significant higher physical activity MET score as compared to female. This gender disparity, favouring men, has been corroborated by previous study [13]. Recent research indicates that men demonstrate higher levels of motivation towards physical activity across various field, with the exception motivation and demotivation, possibly driven by competitive aspects and immediate rewards. This aligns with research indicating that competition can enhance motivation, particularly for men. On the other hand, women’s higher levels of external motivation and demotivation suggest that social factors or expectations might play a significant role in their engagement with physical activity. The preference for long-term goals could indeed contribute to a more sedentary lifestyle, especially if those goals are perceived as challenging to achieve in the short term [14].

Obesity is both a direct and indirect cause of serious chronic diseases. Many studies over the past few decades have sought solutions to the problem of obesity. Physical activity has been found to be inversely associated with body composition, it is in accordance with most longitudinal studies, and this observation has been interpreted as evidence supporting the protective role of physical activity in mitigating excess body fat accumulation among youth [15]. Besides, our study also found the inverse relationship between body mass index and mental health, it is in line with systematic review and meta-analysis, which demonstrated a bi-directional relationship between obesity and mental health [16]. While several studies examine the relationship between obesity and mental health, none have specifically investigated this issue among university students.

Recently, research has increasingly focused on the potential association between diet quality on the emergence of mental health issues across different cultures and countries. Many studies have found that eating a healthy diet can lower the risk of mental health issues [17]. Similarly, our study also demonstrates the same outcome among the university students. One study has associated the consumption of fruits with mental health, this relationship could be attributed to the various benefit nutrients found in fruits, including vitamins, folate, antioxidants, phytochemicals and minerals, which may play a protective role against psychiatric disorders. Additionally, the carbohydrate in fruit can influence insulin secretion. This process may enhance the production of neurotransmitters like serotonin by facilitating the transport of tryptophan to the brain. Increased serotonin levels are often associated with improved mood and emotional well-being. Overall, incorporating more fruits into the diet could be a simple yet effective strategy to support mental health [17].

On the whole, findings of the present study indicate that those with good mental health tend to practice healthy eating and have a lower body mass index. The university setting is ideal for implementing health promotion programs. Therefore, it is crucial to execute relevant initiatives that motivate students to take responsibility for their well-being and adopt healthy eating habits, along with other forms of wellness.

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