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Body Image, Eating Behaviour, and Physical Activity among Students at National Defence University of Malaysia

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ABSTRACT

This study aimed to explore the relationship between body image, eating behaviour, and physical activity among students at the National Defence University of Malaysia (UPNM). A total of 114 students, aged between 19 to 31 years old, were requited from the National Defence University of Malaysia (UPNM). Data were collected using an online self-report questionnaire which consists of four sections; Sociodemographic Form, Body Image Avoidance Questionnaire (BIAQ), Eating Attitude Test (EAT-26), and the International Physical Activity Questionnaire (IPAQ). Almost half of the respondents have normal BMI, whereas 20.2% were underweight and 23.7% were overweight and obese. Mean body image avoidance scores for civilian students, Reserve Officer Training Unit (ROTU), and cadets were 38.88±12.39, 42.71±6.34, and 44.00±16.05, respectively. Furthermore, high physical activity level was seen the most among civilian students (72.3%) compared to (57.1%) and cadets (41.7%). Significant associations were found between body image and eating behaviour ($p<0.001$). No association was observed between body image with physical activity ($p>0.05$) and eating behaviour with physical activity ($p>0.05$). To conclude, the respondents with a risk of the eating disorder tend to have higher body image avoidance, and the physical activity level did not seem to be concerning body image and eating behaviour in this study.

Keywords: body Image, eating behaviour, military, physical activity

INTRODUCTION

Globally, about half of the adult population suffers from overweight and obesity which makes it one of the most widespread health issues in the world (WHO 2016). Among Malaysian adults, the prevalence of overweight and obesity increased by 1.0% and 4.6% respectively from the year 2011 to 2019 (NHMS 2019). Body image was observed to indirectly affect the body weight status of an individual due to its relationship with eating behaviour and physical activity. Negative body image or body dissatisfaction is a negative perception of a person toward their physical appearance (Heider *et al.* 2018). Body dissatisfaction was reported to be related to eating disorders such as restrictive eating and purging (Edlund *et al.* 2022). People with a high score on the Eating Attitude Test-26 (EAT-26) which indicates a high risk of eating disorders were stated to be prone to becoming obese (Rukavishnikov *et al.* 2021).

According to a recent study, half of the population of Malaysian adults were diagnosed with symptoms of unhealthy eating behaviour (Chua *et al.* 2022). Besides that, physical inactivity was also known to be related to body image dissatisfaction as the person with a negative

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body image perceived exercising as embarrassing and exhausting to themselves (More *et al.* 2019). Mortality and cardiovascular disease were also reported to be caused by insufficient physical activity worldwide (Katzmarzyk *et al.* 2022). These days, university students also experience low physical activity and nutritional consumption due to workload, excessive sleep deprivation, less physical activity, and social inactivity (Azli *et al.* 2023). It is renowned that the purpose of universities is for academic excellence and preparing the next generation of scholars as well as help students to build character physically and mentally to become future leaders of the nation (Jakiwa *et al.* 2022).

At the National Defence University of Malaysia (UPNM), the students were divided into three subcategories which are cadets, civilians and civilians that joined Reserve Officer Training Unit (ROTU). The cadets are the members of the military who are involved in military training and academics, meanwhile, the civilians were only engaging in academics study (Jakiwa *et al.* 2020). On the other hand, civilians in the Reserve Officer Training Unit (ROTU) are also involved in military drills. A study conducted at UPNM found that cadets were more actively engaging in physical activity compared to civilian students (Jakiwa *et al.* 2020). Although the cadets had a high level of physical activity, they were observed to have a negative body image and were on the verge of unhealthy eating behaviour (Smith *et al.* 2020). Not only cadets, but civilian students were also prone to the symptoms of eating disorders (Falvey *et al.* 2021).

There was limited study among UPNM students regarding their body image perception, eating behaviour and physical activity level as well as the relationship between them. Additionally, previous studies had reported negative body image and risk of eating disorders in both cadets and civilian students, therefore early identification of this harmful behaviour was important to prevent unhealthy lifestyle prolonged among the students. These unhealthy behaviours not only may affect their fitness performance in military training but also could give a negative impact on their academic studies. Hence, the purpose of this study was to determine the relationship between body image, eating behaviour, and physical activity among students at the national defence University of Malaysia

METHODS

Design, location, and time

This cross-sectional study was conducted from January to July 2023. Ethics Approval was obtained from the Faculty Ethics Reviews Committee, Faculty of Health Sciences, Universiti Teknologi MARA (UiTM). The participant information sheet was included along with the questionnaires to get consent from the respondents.

Sampling

The study used convenient sampling as the sampling method and the sample size was determined using Raosoft software with a sample size of 232 respondents. However, only 114 students were successfully surveyed in the study through an online survey (Google Form), with 73 males and 41 females. Out of these 114 respondents, 24 were cadets, 83 were civilians and the remaining 7 students were ROTU.

Data collection

The anthropometric measurements of body weight and height were self-reported by the respondents since this study was conducted through an online survey. Self-reported anthropometrics measurement can be used in this study since it is a valid measure (De Rubeis 2019). The Body Mass Index (BMI) of the respondents was then calculated using the formula, weight (kg) divided by height (m^2) to obtain their BMI status. The cut-off points of BMI were determined using the WHO Asian BMI classifications, which includes underweight (<18.5 kg/m^2), normal (18.5−22.9 kg/m^2), overweight (23−27.4 kg/m^2), and obesity (>27.5 kg/m^2).

The Body Image Avoidance Questionnaire (BIAQ) was used to assess the body avoidance behaviour among the participants. BIAQ was developed in 1991 by Rosen and his colleagues (Rosen *et al.* 1991). This questionnaire comprised 19 items which can be classified into four factors associated with the adopted behaviour such as clothing, social activity, eating restraint, and grooming and weighing. It is based on a 6-point scale, with each item having scores between 0 (never) to 5 (always). The higher the total BIAQ scores, the higher the risk of a person to body image avoidance (Zakaria 2022). The internal consistency reliability of BIAQ varies among

different studies, with Cronbach's g ranging from 0.64 to 0.89 whereas test-retest reliability is between 0.64 to 0.87 (Pellizzer *et al.* 2018).

The eating behaviour of participants was assessed using the Eating Attitude Test-26 (EAT-26). This questionnaire was developed by Garner, Olmstedt, Bohr and Garfinkel in 1982, which consists of 26 questions related to dieting, bulimia and food preoccupation, and oral control (Garner *et al.* 1982). Additional 5 questions were included to evaluate harmful behaviour like purging, binge eating, usage of diet pills, and laxatives. Using a 6-point scale, each item ranges from 'Never', 'Rarely', 'Sometimes', 'Often', 'Usually', to 'Always'. A score of 0 for 'Never', 'Rarely' and 'Sometimes', a score of 1 for 'Often', a score of 2 for 'Usually' and a score of 3 for 'Always'. Meanwhile, for item 25, the scoring system was different which is reversed. The scores may be totalled between 0 to 76. The participants' eating behaviour can be classified into two categories, 'no-risk' if the total scores are below 20, and 'at-risk' if more than 20.

The short International Physical Activity Questionnaire (IPAQ) was used to measure the physical activity level of participants. It was developed by International Consensus Group in 1998 which consists of 4 generic items regarding vigorous activity, moderate activity, walking and sitting concerning the total amount of time that was spent within the last seven days (Lavelle *et al.* 2020). The data obtained was then inserted in the IPAQ Microsoft Excel sheet to assess the physical activity level of the participants. The physical activity levels can be categorized into three categories low (<600 MET-min/week), moderate (600−2,999 MET-min/week), and high (>3,000 MET-min/week).

Data analysis

The Statistical Package for Social Sciences (SPSS) version 27 was used to analyse the data in this study. Descriptive statistics was used to describe the characteristics like age, gender, course, and Body Mass Index (BMI). An independent T-test was performed to examine the differences between the mean BIAQ scores of the two groups' variables such as gender and eating behaviours. Meanwhile, One-way ANOVA was used to observe the differences between mean BIAQ scores of more than two groups' variables like physical activity. Similarly, the Kruskal Wallis test was also used to compare the differences of the mean BIAQ score of more than two groups, however, it was applied for non-normal distributed data in this study which were BMI and course. Pearson Chi-Square test was performed to assess the association between these variables. The statistical significance was set at $p<0.05$ and $p<0.001$.

RESULTS AND DISCUSSION

Socio-demographic

Table 1 shows that 64.0% of the respondents were males and 36.0% were females. The age of all the respondents were ranging from 19 to 31 years old, and their mean age was 20.24±1.76 years. Most of the respondents were civilians (72.8%), cadets (21.1%) and the remaining are ROTU (6.1%). The male respondents had a mean BMI of 21.42±2.97 kg/m^2, whereas the female respondents had a mean BMI of 20.39±2.48 kg/m^2. The majority of respondents in both genders were observed to have a normal body weight status according to their BMI. About half of the study samples (56.1%) had a normal BMI category, 20.2% of them were underweight and 23.7% were overweight and obese. The males (28.8%) were more prevalent to overweight and obese than females (14.6%) in this study.

Body image avoidance

Table 2 presents the mean BIAQ scores of each characteristic as well as their associations. Overall, the average score of BIAQ among the students was 40.19±13.07. This can be considered higher compared to previous studies, in which the mean score of Spanish adolescents was 23.6±11.0 (Senín-Calderón *et al.* 2020). Meanwhile, Moroccan teenagers had an average score of 24.4±9.7 (Zakaria 2022). Based on these comparisons, the majority of UPNM students may have critical issues with their body image perception as they were prone to behavioural avoidance.

Although the females had a slightly higher mean BIAQ score than males, no significant differences were observed between these two genders ($p>0.05$). On the contrary, a previous study reported that females were more unsatisfied with their body image than males (Quittkat *et al.* 2019). In addition, a study conducted among university students found that females had greater

Table 1. Socio-demographic characteristics of UPNM students

Characteristics	Mean±SD or n (%)		
	Male n (%)	Female n (%)	Total n (%)
Gender	73 (64.0)	41 (36.0)	114 (100.0)
Age	20.44±1.99	19.88±1.21	20.24±1.76
Course			
Civilian	52 (71.2)	31 (75.6)	83 (72.8)
PALAPES	4 (5.5)	3 (7.3)	7 (6.1)
Cadet	17 (23.3)	7 (17.1)	24 (21.1)
BMI (kg/m^2)	21.42±2.97	20.39±2.48	21.05±2.84
BMI category			
Underweight	16 (21.9)	7 (17.1)	23 (20.2)
Normal	36 (49.3)	28 (68.3)	64 (56.1)
Overweight & Obesity	21 (28.8)	6 (14.6)	27 (23.7)

BMI: Body Mass Index; PALAPES: *Pasukan Latihan Pegawai Simpanan* ; SD: Standard Deviation
UPNM: National Defence University of Malaysia

Table 2. Mean scores of the BIAQ test according to gender, course, BMI category, physical activity and eating behaviour (n=114)

Characteristics	n	Mean±SD	*p*
Gender			
Male	73	39.96±14.85	0.774[a]
Female	41	40.61±9.21	
Course			
Civilian	83	38.88±12.39	0.348[c]
ROTU	7	42.71±6.34	
Cadet	24	44.00±16.05	
BMI category			
Underweight	23	41.65±14.42	0.604[c]
Normal	64	39.48±13.16	
Overweight & Obesity	27	40.63±11.97	
Physical activity level			
Low	14	41.93±9.90	0.141[b]
Moderate	26	44.15±15.08	
High	74	38.47±12.64	
Eating behaviour			
No risk	101	37.80±10.76	<0.001[a**]
At risk	13	58.77±14.86	

[a]Independent T-test; [b]One-way ANOVA; [c]Kruskal Walli's test; BIAQ: Body Image Avoidance Questionnaire; ROTU: Reserve Officer Training Unit; SD: Standard Deviation
[*]Significantly associated at p<0.05; [**]Significantly associated at p<0.001

body dissatisfaction than males (Radwan *et al.* 2019). It can be stated that females, especially among young adults were more prevalent to negative body image.

Between the three courses, no significant differences in BIAQ scores were found ($p>0.05$). However, all these three courses had high BIAQ mean scores, such that civilians (38.88), ROTU (42.71) and cadets (44.00). A study reported that Reserve Officer Training Corps (ROTC) cadets were unsatisfied with their body image (Smith *et al.* 2020). This is maybe due to cadets having to focus on both military training and their academics study (Smith *et al.* 2020). For civilians, it may be common because behavioural avoidance was prevalent even among university students (Radwan *et al.* 2019).

According to the weight status of respondents, there were no significant differences in BIAQ scores observed between these BMI categories ($p>0.05$). This finding contradicts another study which discovered that a person who is underweight and overweight was more likely to have body image dissatisfaction (Moehlecke 2020). However, other studies found that there was no correlation between body image and BMI (He *et al.* 2020). Based on these facts, body weight status may not affect all people's view of their body image because it depends on their perception towards their body (Radwan *et al.* 2019).

Among different levels of physical activity, no significant difference in BIAQ score was observed ($p>0.05$). Similarly, a study conducted among college students reported that there was no association between body image and physical activity (Han *et al.* 2023). But another study reported that high physical activity level was linked to positive body image (Sabiston *et al.* 2019). Therefore, as stated earlier body image perception depends on one own's view and it does not merely affect by another factor such as physical activity.

The current study found that there were significant differences in BIAQ scores between respondents with normal eating behaviour and those at risk of eating disorders ($p<0.001$). It was observed that respondents with a risk of eating disorders had mean BIAQ scores of 58.77, which is significantly higher than those with normal eating behaviour (37.80). Similarly, a study reported that emotional eating was related to high dissatisfaction with body image (Corno 2022). Moreover, university students who were engaging in unhealthy eating behaviour had negative perceptions towards their bodies (Santos *et al.* 2021). Thus, this clearly shows that body image had a strong relationship with eating behaviour.

Eating behaviour

Table 3 shows the distribution of eating behaviour according to gender, course, and BMI category. No significant association were found between eating behaviour and gender ($p>0.05$). This is consistent with findings from a study among students at the University of Malaysia, in which both genders were reported to have the same rate of eating disorders (Taib *et al.* 2021). However, another study found that female students in university were more prone to restrictive eating than males (Chin 2020). These contradicting findings indicate that eating behaviour may differ between genders, but it also depends on the location of the study, such that different universities had different environments and cultures.

The current study found that there was no significant association between eating behaviour and course ($p>0.05$). Correspondingly, no significant differences in eating disorders were observed between military-involved students and civilian students (Falvey *et al.* 2021). However, the current study observed that one in ten civilian students was at risk of eating disorder. It was stated that students in the Association of Southeast Asian Nations (ASEAN) countries were diagnosed with a risk of unhealthy eating habits, with Malaysia as one of the top countries (Pengpid 2018). Further, less than 20% of cadets in this study were at risk of eating disorders. Similarly, a study reported that 21.3% of military students were having the risk of unhealthy eating behaviour (Falvey *et al.* 2021). Besides that, due to small samples, all ROTU students were observed with normal eating behaviour. Nonetheless, a study found that ROTC cadets were prevalent in eating disorders, particularly females (Smith 2020). Thus, it is shown that only a few respondents in both the civilian and military-involved students were having the risk of eating disorders.

Further, there was a negative association between eating behaviour and BMI category ($p>0.05$). On the contrary, a study reported that

Table 3. Distribution of eating behaviour according to gender, course, and BMI category (n=114)

Characteristics	No risk n (%)	At risk n (%)	*p*
Gender			
Male	64 (87.7)	9 (12.3)	0.678
Female	37 (90.2)	4 (9.8)	
Course			
Civilian	74 (89.2)	9 (10.8)	0.453
ROTU	7 (100.0)	0 (0.0)	
Cadet	20 (83.3)	4 (16.7)	
BMI category			
Underweight	19 (82.6)	4 (17.4)	0.533
Normal	57 (89.1)	7 (10.9)	
Overweight & Obesity	25 (92.6)	2 (7.4)	

p-value obtained from Pearson Chi-Square Test; *Significantly associated at p<0.05; BMI; Body Mass Index
ROTU: Reserve Officer Training Unit

there was an association between BMI and eating disorders, where people with obesity had more risk of unhealthy eating habits (Ngan *et al.* 2017). In addition, underweight people were reported to be more prevalent in having eating restraints (Ralph-Nearman 2020). However, a study in a university setting found that students with normal BMI were more prone to eating disorders (Chan *et al.* 2020). Hence, this shows that the BMI of an individual does not precisely indicate the person's eating behaviour.

Physical activity

Table 4 presents the physical activity level among UPNM students by gender, course, BMI category, and eating behaviour. The current study found that there was no significant association between physical activity and gender (p>0.05). This contradicts other studies, a survey conducted among Malaysian adults observed that men had higher physical activity than women (NHMS 2019). In addition, male students were more actively engaging in physical activity than females (You *et al.* 2020; Emmy *et al.* 2023). Nevertheless, a study reported that there were no differences in strenuous physical activity among the gender (Craft *et al.* 2014). Thus, the level of physical activity among gender in this study was similar, maybe due to the fact that students in military universities were actively engaging in military training and sports.

There was a significant association between physical activity and course (p<0.05). The current study observed that civilians (72.3%) were the most active compared to ROTU (57.1%) and cadets (41.7%) under high physical activity level category. On the contrary, a study reported that cadets were more active than civilian students because they were regularly engaged in military training (Jakiwa *et al.* 2020). According to current findings, civilian students may be more active than cadets due to their frequent involvement in sports or exercise.

No significant association were found between physical activity and BMI category (p>0.05). Similarly, a study also reported a negative association between physical activity and BMI (Yousif *et al.* 2019). However, another study found that a person with a low BMI was more likely to engage in vigorous physical activity compared to an overweight person (Wu & He 2022). Thus, there were no differences in physical activity among the students in this study despite their body weight status, due to the environment or activity in the military university.

There was also no association between physical activity level and eating behaviour (p>0.05). However, current findings show that students with normal eating behaviour (68.3%) were more actively participating in the high physical activity level category than those with a risk of eating disorder (38.5%). A study

Table 4. Distribution of physical activity level according to gender, course, BMI category, and eating behaviour (n=114)

Characteristics	Low n (%)	Moderate n (%)	High n (%)	*p*
Gender				
Male	7 (9.6)	20 (27.4)	46 (63.0)	0.203
Female	7 (17.1)	6 (14.6)	28 (68.3)	
Course				
Civilian	7 (8.4)	16 (19.3)	60 (72.3)	0.042*
ROTU	1 (14.3)	2 (28.6)	4 (57.1)	
Cadet	6 (25.0)	8 (33.3)	10 (41.7)	
BMI category				
Underweight	6 (26.1)	4 (17.4)	13 (56.5)	0.153
Normal	4 (6.3)	15 (23.4)	45 (70.3)	
Overweight & Obesity	4 (14.8)	7 (25.9)	16 (59.3)	
Eating behaviour				
No risk	12 (11.9)	20 (19.8)	69 (68.3)	0.074
At risk	2 (15.4)	6 (46.2)	5 (38.5)	

P-value obtained from Pearson Chi-Square Test; *Significantly associated at $p<0.05$
BMI: Body Mass Index; ROTU: Reserve Officer Training Unit

reported that low physical activity level was linked to a higher appetite level (Shook *et al.* 2015). This implies that people who frequently engaged in physical activity were more likely to have normal eating habits due to their low appetite. Nevertheless, the physical activity level of UPNM students was the same regardless of their eating behaviour because it is a military university which involves regular engagement in military training.

CONCLUSION

In conclusion, this study suggests that body image was positively associated with eating behaviour. However, no association were found between physical activity with body image and eating behaviour. Future studies should recruit larger samples of military-involved students, particularly cadets and ROTU. Furthermore, it is recommended that future research conduct a non-virtual method to acquire more precise data. Strategies to promote healthier lifestyles in both civilian and military-involved students should include measures that prevent negative body image, unhealthy eating behaviour and physical inactivity. Thus, it is suggested that government and non-government agencies give more attention to military university students by carrying out programs to promote positive body image, healthy eating habits and high physical activity.

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DECLARATION OF CONFLICT OF INTERESTS

The author(s) declare no conflict of interest.

REFERENCES

Azli MS, Noordin I, Atan SA, Ikram EHK. 2023. Association of physical activity and dietary behaviour on sleep quality among students

of faculty of architecture, planning, and surveying in Universiti Teknologi MARA (UiTM) Selangor. Malays J Med Health Sci 19(6). https://doi.org/10.47836/mjmhs.19.6.23

Chan YL, Samy AL, Tong WT, Islam MA, Low WY. 2020. Eating disorder among Malaysian University students and its associated factors. Asia Pac J Public Health 32(6–7):334–339. https://doi.org/10.1177/1010539520947879

Chin YS, Appukutty M, Kagawa M, Gan WY, Wong JE, Poh BK, Mohd Shariff Z, Mohd Taib MN. 2020. Comparison of factors associated with disordered eating between male and female Malaysian University students. Nutrients 12(2):318. https://doi.org/10.3390/nu12020318

Chua SN, Fitzsimmons-Craft EE, Austin SB, Wilfley DE, Taylor CB. 2022. Estimated prevalence of eating disorders in Malaysia based on a diagnostic screen. Int J Eat Disorder 55(6):763–775. https://doi.org/10.1002/eat.23711

Corno G, Paquette A, Monthuy-Blanc J, Ouellet M, Bouchard S. 2022. The relationship between women's negative body image and disordered eating behaviors during the COVID-19 pandemic: A cross-sectional study. Front Psychol 13:856933. https://doi.org/10.3389/fpsyg.2022.856933

Craft BB, Carroll HA, Lustyk MKB. 2014. Gender differences in exercise habits and quality of life reports: Assessing the moderating effects of reasons for exercise. Int J Lib Arts Soc Sci 2(5):65–76.

De Rubeis V, Bayat S, Griffith LE, Smith BT, Anderson LN. 2019. Validity of self-reported recall of anthropometric measures in early life: A systematic review and meta-analysis. Obes Rev 20(10):1426–1440. https://doi.org/10.1111/obr.12881

Edlund K, Johansson F, Lindroth R, Bergman L, Sundberg T, Skillgate E. 2022. Body image and compulsive exercise: Are there associations with depression among university students? Eat Weight Disorders 27(7):2379–2405. https://doi.org/10.1007/s40519-022-01374-x

Emmy HKI, Md Jasnin SN, Mohd Syrinaz A, Syima N. 2023. Dietary habit, physical activity and perceived barriers during movement control order among undergraduate students in Puncak Alam, Selangor. Food Res 7(1):264–270. https://doi.org/10.26656/fr.2017.7(1).660

Falvey SE, Hahn SL, Anderson OS, Lipson SK, Sonneville KR. 2021. Diagnosis of eating disorders among college students: A comparison of military and civilian students. Mil Med 186(9-10):975−983 https://doi.org/10.1093/milmed/usab084

Garner DM, Olmsted MP, Bohr Y, Garfinkel PE.1982. The eating attitudes test: Psychometric features and clinical correlates. Psychol Med 12(4):871−878. https://doi.org/10.1017/S0033291700049163

Han B, Du G, Yang Y, Chen J, Sun G. 2023. Relationships between physical activity, body image, BMI, depression and anxiety in Chinese college students during the COVID-19 pandemic. BMC Public Health 23(1):1−11. https://doi.org/10.1186/s12889-022-14917-9

He J, Sun S, Lin Z, Fan X. 2020. The association between body appreciation and body mass index among males and females: A meta-analysis. Body Image 34:10−26. https://doi.org/10.1016/j.bodyim.2020.03.006

Heider N, Spruyt A, De Houwer J. 2018. Body dissatisfaction revisited: On the importance of implicit beliefs about actual and ideal body image. Psychol Belg 57(4). https://doi.org/10.5334/pb.362

Jakiwa J, Azli MS, Zainuddin AA, Atan SA. 2020. Time spent in physical activity and abdominal muscle endurance level between cadets and civilian students of national defense university of Malaysia. J Mil Med 22(8):93. https://doi.org/ 10.30491/JMM.22.8.873

Jakiwa J, Atan SA, Azli MS, Rustam S, Hamzah N, Zainuddin AA. 2022. The level of sports participation and academic success among Malaysian student-athletes. Int J Learn Teach Edu Res 21(6):122−137. https://doi.org/10.26803/ijlter.21.6.8

Katzmarzyk PT, Friedenreich C, Shiroma EJ, Lee IM. 2022. Physical inactivity and non-communicable disease burden in low-income, middle-income and high-income countries. British J Sports Med

56(2):101−106. https://doi.org/10.1136/bjsports-2020-103640

Lavelle G, Noorkoiv M, Theis N, Korff T, Kilbride C, Baltzopoulos V, Shortland A, Levin W, Ryan JM. 2020. Validity of the International Physical Activity Questionnaire Short Form (IPAQ-SF) as a measure of Physical Activity (PA) in young people with cerebral palsy: A cross-sectional study. Physiotherapy 107:209–215. https://doi.org/10.1016/j.physio.2019.08.013

Moehlecke M, Blume CA, Cureau FV, Kieling C, Schaan BD. 2020. Self-perceived body image, dissatisfaction with body weight and nutritional status of Brazilian adolescents: A nationwide study. J Pediat 96(1):76−83. https://doi.org/10.1016/j.jped.2018.07.006

More KR, Phillips LA, Colman MHE. 2019. Evaluating the potential roles of body dissatisfaction in exercise avoidance. Body Image 28:110−114. https://doi.org/10.1016/j.bodyim.2019.01.003

[NHMS] National Health Morbidity Survey. 2019. National Health Morbidity Survey (NHMS 2019). Malaysia (KL): National Institute of Health Malaysia.

Ngan SW, Chern BCK, Rajarathnam DD, Balan J, Hong TS, Tiang KP. 2017. The relationship between eating disorders and stress among medical undergraduate: A cross-sectional study. Open J Epid 7(02):85−95. https://doi.org/10.4236/ojepi.2017.72008

Pellizzer ML, Tiggemann M, Waller G, Wade TD. 2018. Measures of body image: Confirmatory factor analysis and association with disordered eating. Psychol Assessment 30(2):143. https://doi.org/10.1037/pas0000461

Pengpid S, Peltzer K. 2018. Risk of disordered eating attitudes and its relation to mental health among university students in ASEAN. Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity 23(3):349−355. https://doi.org/10.1007/s40519-018-0507-0

Quittkat HL, Hartmann AS, Düsing R, Buhlmann U, Vocks S. 2019. Body dissatisfaction, importance of appearance, and body appreciation in men and women over the lifespan. Front Psychol 10:864. https://doi.org/10.3389/fpsyt.2019.00864

Radwan H, Hasan HA, Ismat H, Hakim H, Khalid H, Al-Fityani L, Mohammed R, Ayman A. 2019. Body mass index perception, body image dissatisfaction and their relations with weight-related behaviors among university students. Int J Env Res Public Health 16(9):1541. https://doi.org/10.3390/ijerph16091541

Ralph-Nearman C, Yeh HW, Khalsa SS, Feusner JD, Filik R. 2020. What is the relationship between body mass index and eating disorder symptomatology in professional female fashion models?. Psychiat Res 293:113358. https://doi.org/10.1016/j.psychres.2020.113358

Rosen JC, Srebnik D, Saltzberg E, Wendt S. 1991. Development of a body image avoidance questionnaire. Psychological Assessment: A Journal of Consulting and Clinical Psycholog 3(1):32. https://doi.org/10.1037/1040-3590.3.1.32

Rukavishnikov GV, Verbitskaya EV, Vekovischeva OY, Bobrovsky AV, Kibitov AO, Mazo GE. 2021. The association of obesity with eating disorders risk: Online survey of a large cohort of Russian-speaking individuals seeking medical weight correction assistance. J Eat Disorders 9(1):1−7. https://doi.org/10.1186/s40337-021-00456-y

Sabiston CM, Pila E, Van M, Thogersen-Ntoumani C. 2019. Body image, physical activity, and sport: A scoping review. Psychol Sport Exerc 42:48−57. https://doi.org/10.1016/j.psychsport.2018.12.010

Santos MMD, Moura PSD, Flauzino PA, Alvarenga MDS, Arruda SPM, Carioca AAF. 2021. Eating behavior and body image in health sciences university students. J Bras Psiquiatria 70(2):126–133. https://doi.org/10.1590/0047-2085000000308

Senín-Calderón C, Santos-Morocho JL, Rodríguez-Testal JF. 2020. Factor structure and psychometric properties of the Spanish version of the Body Image Avoidance Questionnaire (BIAQ). Eat Weight Disorders 25(3):591−600. https://doi.org/10.1007/s40519-019-00650-7

Shook RP, Hand GA, Drenowatz C, Hebert JR, Paluch AE, Blundell JE, Hill JO, Katzmarzyk PT, Church TS, Blair SN. 2015. Low levels of physical activity are associated with dysregulation of energy

intake and fat mass gain over 1 year. Am J Clin Nutr 102(6):1332−1338. https://doi.org/ 10.3945/ajcn.115.115360

Smith A, Emerson D, Winkelmann Z, Potter D, Torres-Mcgehee T. 2020. Prevalence of eating disorder risk and body image dissatisfaction among ROTC cadets. Int J Env Res Public Health 17(21):8137. https://doi.org/10.3390/ijerph17218137

Taib NM, Khaiyom JHA, Fauzaman J. 2021. Psychometric properties of the adapted Malay Eating Disorder Examination-Questionnaire 6.0 (EDE-Q 6.0) among university students in Malaysia. Eat Behav 42:101533. https://doi.org/10.1016/j.eatbeh.2021.101533

[WHO] World Health Organization. 2016. Obesity and overweight: Fact sheet. WHO Media Centre. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight [Assessed 26th June 2023]

Wu J, He L. 2022. The relationship between body mass index and physical activity participation rate design based on fuzzy breakpoint regression design. J Sensors 2022. https://doi.org/10.1155/2022/3721659

You HW, Tan PL, Mat Ludin AF. 2020. The relationship between physical activity, body mass index and body composition among students at a pre-university centre in Malaysia. IIUM Med J Malays 19(2). https://doi.org/10.31436/imjm.v19i2.1567

Yousif MM, Kaddam LA, Humeda HS. 2019. Correlation between physical activity, eating behavior and obesity among Sudanese medical students Sudan. BMC Nutr 5(1):1−8. https://doi.org/10.1186/s40795-019-0271-1

Zakaria R, Amor H, Baali A. 2022. Body image perceptions and avoidance behaviours among a Moroccan group of adolescents. Ann Hum Bio 49(2):116−123. https://doi.org/10.1080/03014460.2022.2072524