

**RECOMMENDED PHYSICAL ACTIVITY AND INTENSITY LEVELS TO REDUCE
EXCESS OF BODY FAT AMONGST MALAY FEMALE UNIVERSITY STUDENTS
IN MALAYSIA**

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ABSTRACT

This study aims to determine the type of physical activity that best predicts risk of adiposity amongst Malay female university students residing in Klang Valley, Malaysia. A total of 316 female youth aged 18 to 25 years old were recruited for this study. Their physical activities were assessed using Short Questionnaire to Assess Health-Enhancing Physical Activity (SQUASH). Body fat percentage was measured via InBody 270 Body Impedance analyzer machine. Bivariate logistic regression was used to assess the association between physical activities and body fat percentage. Result from this study highlighted that total time per week of commuting (OR = 2.92, 95% CI: 1.18-7.31, $p < 0.05$) and the activity score of leisure time activities (OR = 2.47, 95% CI: 1.37-5.34, $p < 0.05$) are able to predict the risk of adiposity amongst Malay female youth.

Keywords: youth; physical activity; adiposity; fat percentage; SQUASH.

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1. INTRODUCTION

Obesity is one of the alarming health problems in the world. It is estimated that around 13% of the world's adult population (11% of men and 15% of women) were obese in 2014. Recent report highlights that Malaysia is now the leading nation in South East Asia for obesity [1]. Specifically, in Malaysia, 33.4% and 17.7% adults were overweight and obese respectively [2]. Moreover, the prevalence of obesity was significantly higher among females [20.6% (95% CI: 19.5-21.8)] as compared to males [15.0% (95% CI: 13.9-16.1)] [2].

Despite genetic predisposition, poor physical activity and dietary lifestyles bring more consequences such as early onset of obesity and non-communicable disease. Therefore, one of the best solution to combat obesity is to include daily regular physical activity [3]. Based on Institute of Public Health (2015) male adults were reported to be more active than females [61.7 (95% CI: 60.3-63.2)]. Hence, this marks the needs for female adults to improve their lifestyle to achieve healthier body mass index (BMI).

BMI is the most commonly used variable for diagnosing obesity at population level due to its simplicity and association with disease [4]. However, the inconsistency relationship between BMI and body fat percentage (BF%) across populations has always been criticized [5-7]. A study in Australia reported that a group of subject with similar BMI range is found to have a significant variation of BF% [8].

Theoretically, adiposity has long been suggested to have an inverse relationship with physical activity. The relationship of these two variables is clearly derived from equal balance of energy intake and energy expenditure [9]. Adiposity occurs when the balance disrupted [10]. Therefore, low physical activity may results in adiposity even for those with normal BMI. Thus, this study aims to determine the types of physical activity that best predicts adiposity amongst Malay female university students.

2. EXPERIMENTAL

2.1. Study Design and Subjects

A total of 316 female youth (Malay) aged 18 to 25 years old were recruited during health screening programme at multiple designated venues in Klang Valley. Subjects were recruited

through convenient sampling method. Information on the health screening programme were provided through flyers. Data collection was carried out between October 2016 to January 2017. Ethical approval was obtained from institutional ethical board (USIM/REC/0416-3) and informed consent were obtained from all participants' prior data collection. Inclusion criteria are female aged 18-25 years old based on United Nation classification for youth [24]. The exclusion criteria includes pregnant youth, lactating, mental health disorder, non-communicable disease, cancers, eating disorders and any injuries or disabilities that effect their body movement to perform physical activity. Standardized pre-tested questionnaire was used by trained interviewers to obtain demographic data. Physical activity (SQUASH) is used to assess subjects' physical activity.

2.2. Identification of Anthropometric Measurement

Anthropometric measurements taken include height measurement using BSM 170 stadiometer (Inbody Co. Ltd, Korea). Body composition that were measured using InBody 270 Body Impedance analyzer machine (Inbody Co. Ltd, Korea). Those instruments were calibrated every measurement sessions. Body fat percentage for female youth is classified using based on [25]. Ranges are 21-32% for healthy, 33-39% for overfat and > 39% for obese.

2.3. Identification of Physical Activity

Subjects' physical activity was measured using Short Questionnaire to Assess Health-Enhancement Activities (SQUASH) [26]. Four domains of activities are included in SQUASH such as commuting (walking or cycling), physical activity at work or at school, household activities and leisure time activities (sports, walking, gardening). Subjects were interviewed for the number of days a week they engaged in the activities and also the average time they spent each session on each activities (hours and minutes). Hence, the intensity score is calculated based on classification of the MET levels (low, moderate, high). Results from the SQUASH is presented in total times per week and activity score [26].

2.4. Statistical Analysis

All analyses were performed using Statistical Analysis for Social Sciences (SPSS) software version 23.0 and Medcalc software. Descriptive analysis was carried out on demography, anthropometry and physical activity. Mann Whitney test was used to compare means of

related factors to adiposity. ROC analysis test was performed to identify the cut-off point for level of physical activity of each domains. Bivariate logistic regression analysis was employed to determine the relative predictors of adiposity at $p < 0.05$.

3. RESULTS AND DISCUSSION

A total of 316 Malay female participants aged 18 to 22 years old were involved in this study. Mean for BMI and fat percentage are 22.6 kg/m^2 and 35.1% respectively. The prevalence of overweight and obesity in this study 17.1% and 8.5%. Based on fat percentage cut-off value of $\geq 32\%$, 113 (35.8%) subjects are identified as having high adiposity. As reported in Table 1, subjects with normal BMI has significantly lower fat percentage (med: 28.1 ± 4.6 , $p < 0.05$) than those who are overweight and obese (med: 38.3 ± 8.8 , $p < 0.001$). Level of physical activity (minutes/week) for all domains are found to be significantly higher ($p < 0.001$) in subjects with normal adiposity level. Parallel to that, the activity score for participants with normal adiposity level is also significantly higher ($p < 0.001$) than in subjects with high adiposity.

Table 1. Median difference of body composition and physical activities between normal group and group with high adiposity. Result is presented as median (interquartile range)

Items	Normal (n = 113)	Adiposity $\geq 32\%$ (n = 203)	p ^a Value
Body composition			
BMI (kg/m^2)	28.1(4.6)	21.2(4.4)	0.008*
Fat percentage (%)	22.5(6.7)	38.3(8.8)	< 0.001*
Physical activities (minutes/week)			
Commuting	100(25)	70(50)	< 0.001*
Leisure time activities	180(265)	30(120)	< 0.001*
Household activities	225(353)	150(230)	< 0.001*
Activities at work/school	600(1438)	225(450)	0.002*
Total item	1519(2090)	578(890)	< 0.001*
Physical activities (activity score)			

Commuting	200(50)	140(100)	< 0.001*
Leisure time activities	320(695)	60(330)	< 0.001*
Household activities	570(850)	420(570)	< 0.001*
Activities at work/school	1200(2850)	450(700)	< 0.001*
Total item	3290(4458)	1220(1870)	< 0.001*

^aMann-whitney test; *significant mean difference at level $p < 0.05$

BMI = Body mass index

Receiver Operating Characteristics (ROC) analysis was used to establish the cut-off points for all physical activity domains. Data were examined for all domains. The best cut-off points from each domains were chosen based on the optimal levels of sensitivity and specificity (Table 2). All of these cut-off points obtained were then used to investigate the predictors of various independent variables and the incidence of higher adiposity (i.e. fat percentage $\geq 32\%$). However, for leisure time activity, the cut-off points of 150 minutes/week (WHO recommendation) was used.

Table 2. Cut-off points for physical activity domains based on Receiver Operating Characteristics (ROC) value

Items	ROC Value	Specificity	Sensitivity
Physical activities (minutes/week)			
Commuting	90	67.8	74.6
Household activities	135	49.0	73.7
Activities at work/school	1020	85.6	43.9
Total item	1145	74.3	55.3
Physical activities (activity score)			
Commuting	180	67.3	73.7
Household activities	780	80.2	40.4
Activities at work/school	1920	86.1	45.6
Leisure time activities	120	64.4	68.4
Total item	2600	75.2	57.0

As shown in Table 3, results from binary logistic regression reveals that total time for

commuting (OR = 2.92, 95% CI: 1.18-7.31, $p < 0.05$) and leisure time score (OR = 2.47, 95% CI: 1.37-5.34, $p < 0.05$) are found to have positive effects towards reducing adiposity.

Table 3. Binary logistic regression of physical activity domains

Items	Crude OR	95% CI	p Value
Physical activities (minutes/week)			
Commuting	2.92	1.18-7.31	0.02*
90 <			
90 ≥			
Leisure Time activities	0.94	0.49-1.92	0.94
150 ≥			
150 <			
Household activities	1.60	0.85-0.63	0.15
135 ≥			
135 <			
Activities at work/school	1.48	0.31-5.99	0.25
1020 ≥			
1020 <			
Total item	0.45	0.12-1.72	0.68
1145 ≥			
1145 <			
Physical activities (activity score)			
Commuting	1.65	0.67-4.05	0.27
180 <			
180 ≥			
Leisure time activities	2.70	1.37-5.34	0.004*
120 ≥			
120 <			
Household activities	1.89	0.94-3.83	0.76
780 ≥			

780 <			
Activities at work/school	1.99	0.44-8.98	0.37
1920 ≥			
1920 <			
Total item	1.38	0.36-5.28	0.64
2600 ≥			
2600 <			

*significant at $p < 0.05$ level

OR = odds ratio

CI = confidence interval

In this study, the mean BMI of 21.95 kg/m² and 16.98% are found to be higher than the previous study done among female students in East Malaysia. [11]. The prevalence of high adiposity in our study (35.8%) is also higher than a recent study in Taiwan (2016) among young female adults which is reported at 27.3% [12]. This indicates that about one third of this population which are all young adults are at high risk for non-communicable and cancer diseases [13-14].

Many studies have shown that BMI is a reasonable index of adiposity [15-16] given that body weight and height are simple, inexpensive, safe and practical measurements to acquire, particularly for groups with limited access to health care. However, in our findings BMI did not reflect adiposity in which participants with normal BMI were found to have higher adiposity. According to previous studies, BMI gives limited information about body composition because it does not discriminate between fat and lean mass [17-18]. Thus, the determination of body fat percentage is crucial for early screening of overweight and obesity among young adults.

This present study revealed that female university students with normal fat percentage are physically active. In agreement to that, in [19] also reported that most youth spent most of their time being active during leisure time or when at school and/or work. Specifically, the “leisure time activity” domain is found to be higher (180 MET/minute) than the recommended physical activity level of 150 MET/minutes by WHO. Being university students the likelihood

of leisure time physical activity is positively associated with the strength of beliefs in the health benefits [20].

This study clearly indicate that physical activity is part of important predictors for adiposity level among female university students. Ideally, positive changes in lifestyle must include the component of physical activity. Hence, the lifestyle changes will persist to adult years and further create a healthy future generation [21]. Recent study in the Northeast also reported that despite multiple awareness programmes highlight the benefits of exercise, only 35% of university students had a regular schedule of physical activity. Furthermore, there better adherence to exercise by males (40%) than females (32%) students [22]. Another study showed that most students had light physical activity levels, particularly women [23]. Light physical activity such as walking may not provide desirable protection against disease as metabolism of fat also depends on the intensity of activity. Based on the young adult population in this study, total time of physical activity alone is found not to be a strong predictor for adiposity. However, the integration of total time and the intensity of physical activity exert significant effect on the adiposity level. Besides that, the cut-off point for total time in commuting of 90 min/week should also be included as part of the recommendation to reduce adiposity.

4. CONCLUSION

Body fat percentage provides better understanding than BMI on the relationship between body composition and individual physical activity. Female university students that are generally young adults reflect their inactivity with higher body fat percentage rather than BMI. Multiple domains of physical activity showed significant difference between different adiposity statuses of the selected population. Two strong predictors of excess body fat identified are the total time taken for commuting and the activity score of leisure time activity. Thus, combination of this two predictors will provide promising result in lowering adiposity.

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6. REFERENCES

- [1] Ng M, Fleming T, Robinson M, Thomson B, Graetz N. Global, regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. *Lancet*, 2014, 384(9945):766-781
- [2] Institute for Public Health. National health and morbidity survey 2015. Putrajaya: Ministry of Health, 2015
- [3] Hills A P, Byrne N M, Lindstrom R, Hill J O. 'Small changes' to diet and physical activity behaviors for weight management. *Obesity Facts*, 2013, 6(3):228-238
- [4] World Health Organization (WHO). Obesity: Preventing and managing the global epidemic. Geneva: WHO, 2000
- [5] Deurenberg-Yap M, Schmidt G, van Staveren W A, Deurenberg P. The paradox of low body mass index and high body fat percentage among Chinese, Malays and Indians in Singapore. *International Journal of Obesity*, 2000, 24(8):1011-1017
- [6] Rush E C, Goedecke J H, Jennings C, Micklesfield L, Dugas L, Lambert E V, Plank L D. BMI, fat and muscle differences in urban women of five ethnicities from two countries. *International Journal of Obesity*, 2007, 31(8):1232-1239
- [7] Fernández J R, Heo M, Heymsfield S B, Pierson R N, Pi-Sunyer F X, Wang Z M, Wang J, Hayes M, Allison D B, Gallagher D. Is percentage body fat differentially related to body mass index in Hispanic Americans, African Americans, and European Americans? *American Journal of Clinical Nutrition*, 2003, 77(1):71-75
- [8] Piers L S, Rowley K G, Soares M J, O'Dea K. Relation of adiposity and body fat distribution to body mass index in Australians of Aboriginal and European ancestry. *European Journal of Clinical Nutrition*, 2003, 57(8):956-963
- [9] Tiruneh G. The relation between physical activity and body mass index: Issues in model specification. *International Journal on Disability and Human Development*, 2009,

8(3):267-276

- [10] Esparza J, Fox C, Harper I T, Bennett P H, Schulz L O, Valencia M E, Ravussin E. Daily energy expenditure in Mexican and USA Pima Indians: Low physical activity as a possible cause of obesity. *International Journal of Obesity*, 2000, 24(1):55-59
- [11] Zin T, Yusuff A S, Myint T, Naing D K, Htay K, Wynn A A. Body fat percentage, BMI and skinfold thickness among medical students in Sabah, Malaysia. *South East Asia Journal of Public Health*, 2015, 4(1):35-40
- [12] Hung S P, Chen C Y, Guo F R, Chang C I, Jan C F. Combine body mass index and body fat percentage measures to improve the accuracy of obesity screening in young adults. *Obesity Research and Clinical Practice*, 2017, 11(1):11-18
- [13] Juliana N, Shahar S, Sahar M A, Ghazali A R, Manaf Z A, Noah R M. 'Her shape' intervention programme for obese women with high breast adiposity. *Asia Pacific Journal of Clinical Nutrition*, 2017, 26(2):278-286
- [14] Temple V A, Walkley J W, Greenway K. Body mass index as an indicator of adiposity among adults with intellectual disability. *Journal of Intellectual and Developmental Disability*, 2010, 35(2):116-120
- [15] Bedogni G, Pietrobelli A, Heymsfield S B, Borghi A, Manzieri A M, Morini P, Battistini N, Salvioli G. Is body mass index a measure of adiposity in elderly women? *Obesity*, 2001, 9(1):17-20
- [16] Shah N R, Braverman E R. Measuring adiposity in patients: The utility of body mass index (BMI), percent body fat, and leptin. *Plos One*, 2012, 7(4):1-8
- [17] Flegal K M, Shepherd J A, Looker A C, Graubard B I, Borrud L G, Ogden C L, Harris T B, Everhart J E, Schenker N. Comparisons of percentage body fat, body mass index, waist circumference, and waist-stature ratio in adults. *American Journal of Clinical Nutrition*, 2009, 89(2):500-508
- [18] Romero-Corral A, Somers V K, Sierra-Johnson J, Thomas R J, Bailey K R, Collazo-Clavell M L, Allison T G, Korinek J, Batsis J A, Lopez-Jimenez F. Accuracy of body mass index to diagnose obesity in the US adult population. *International Journal of Obesity*, 2008, 32(6):959-966

- [19] Campbell N, Gaston A, Gray C, Rush E, Maddison R, Prapavessis H. The Short QUestionnaire to ASsess Health-enhancing (SQUASH) physical activity in adolescents: A validation using doubly labeled water. *Journal of Physical Activity and Health*, 2016, 13(2):154-158
- [20] Haase A, Steptoe A, Sallis J F, Wardle J. Leisure-time physical activity in university students from 23 countries: Associations with health beliefs, risk awareness, and national economic development. *Preventive Medicine*, 2004, 39(1):182-190
- [21] Fabián C, Pagán I, Ríos J L, Betancourt J, Cruz S Y, González A M, Palacios C, González M J, Rivera-Soto W T. Dietary patterns and their association with sociodemographic characteristics and perceived academic stress of college students in Puerto Rico. *Puerto Rico Health Sciences Journal*, 2013, 32(1):36-43
- [22] Pinto B M, Cherico N P, Szymanski L, Marcus B H. Longitudinal changes in college students' exercise participation. *Journal of American College Health*, 1998, 47(1):23-27
- [23] Abdel-Megeid F Y, Abdelkarem H M, El-Fetouh A M. Unhealthy nutritional habits in university students are a risk factor for cardiovascular diseases. *Saudi Medical Journal*, 2011, 32(6):621-627
- [24] Petry N M. A Comparison of young, middle-aged, and older adult treatment-seeking pathological gamblers. *Gerontologist*, 2002, 42(1):92-99
- [12] Gallagher D, Heymsfield S B, Heo M, Jebb S A, Murgatroyd P R, Sakamoto Y. Healthy percentage body fat ranges: An approach for developing guidelines based on body mass index. *American Journal of Clinical Nutrition*, 2000, 72(3):694-701
- [26] Wendel-Vos G C W, Schuit A J, Saris W H M, Kromhout D. Reproducibility and relative validity of the short questionnaire to assess health-enhancing physical activity. *Journal of Clinical Epidemiology*, 2003, 56(12):1163-1169.

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