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Association between self-reported physical activity and indicators of body composition in Malaysian adolescents

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ABSTRACT

Background. Obesity and lack of physical activity are fast becoming a concern among Malaysian adolescents.

Objective. This study aims to assess physical activity levels among Malaysian adolescents and investigate the association between physical activity levels and body composition such as body mass index (BMI), waist circumference (WC) and percentage of body fat.

Subjects and methods. 1361 school-going 13 year old multi-ethnic adolescents from population representative samples in Malaysia were involved in our study. Self-reported physical activity levels were assessed using the validated Malay version of the Physical Activity Questionnaire for Older Children (PAQ-C). Height, weight, body fat composition and waist circumference (WC) were measured. Data collection period was from March to May 2012.

Results. 10.8% of the males and 7.4% of the females were obese according to the International Obesity Task Force standards. A majority of the adolescents (63.9%) were physically inactive. There is a weak but significant correlation between physical activity scores and the indicators of obesity. The adjusted coefficient for body fatness was relatively more closely correlated to physical activity scores followed by waist circumference and lastly BMI.

Conclusion. This study demonstrates that high physical activity scores were associated with the decreased precursor risk factors of obesity.

Introduction

The prevalence of cardiovascular disease (CVD) risk in the Malaysian population is alarmingly high and obesity is a known risk factor (Institute of Public Health, 2008). Physical activity has been shown to play an important role in preventing cardiovascular diseases among Malaysian adults (Dhanjal et al., 2001).

Childhood obesity is now becoming a growing concern in Malaysia (Bauman et al., 2011; Rampal et al., 2007). Previous studies have shown an increasing trend of overweight from 20.7% in 2002 to 26.5% in 2008 among 6–12 year-old children in Peninsular Malaysia (Ismail et al., 2009) and a higher prevalence (34.2%) of overweight and obese children in metropolitan Kuala Lumpur (Wee et al., 2011). Body fatness is linked to the increased prevalence of overweight and obesity in adolescents contributing to the risk of metabolic syndrome in childhood which may exacerbate and cause cardiovascular diseases in adulthood (Ali et al., 2014).

In addition, 21% of secondary school adolescents, aged 14 to 16 years, of the Petaling district in Selangor state were found to be physically inactive (Aniza and Fairuz, 2009). Easy access to the internet and use of digital gadgets at an early age have resulted in a sedentary lifestyle which in turn has decreased physical activity levels even further among adolescents (Lau et al., 2013). This information highlights the need to determine the prevalence of obesity and to explore the relationship between reported physical activity and body fatness among Malaysian adolescents.

Previous studies which have investigated the association between physical activity and obesity in Malaysia focused on one geographical area, either one school or district and used Body Mass Index (BMI) as a parameter of obesity (Dan et al., 2011; Rezali et al., 2012). However, recent studies showed that Waist Circumference (WC) (McCarthy et al., 2003) and percentage of body fat are more sensitive parameters of obesity compared to BMI (Deurenberg-Yap et al., 2000, 2002). Asian populations are more likely to have a higher percentage of abdominal

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fat for any given BMI compared to Caucasians (Boyko et al., 2000). Furthermore, Malaysian children and adolescents have also been shown to have the largest WC compared to their peers in the UK, Australia, Turkey and Hong Kong (Poh et al., 2011).

In order to fill the current knowledge gap, this study aims to assess self-reported physical activity levels among Malaysian adolescents and also investigate the possible association between self-reported physical activity levels and indicators of body composition such as BMI, WC, and percentage of body fat using data from a population representative sample.

Methods

Study design

Data used in this study was from the first wave of an adolescent cohort study conducted in Peninsular Malaysia. The cohort included 1361 adolescents and the study was supported by the University Malaya Research Grant. The detail of the study was reported previously (Abu Hanifah et al., 2013).

Study area and duration of the study

The study was conducted in two states and one metropolitan area of Peninsular Malaysia. The state of Perak from the northern region and Selangor state from the central region of Peninsular Malaysia were chosen purposively based on discussion with the Ministry of Education. The Federal territory of Kuala Lumpur was included as the metropolitan area. The data collection for the first wave cohort study was carried out between March and May 2012. Malaysia has an equatorial climate and temperature is more or less consistent throughout the year. The choice of data collection time does not affect the study findings.

Study population

The study population were school children, aged 13 years who were attending the first year of governments' Secondary school (Secondary One). The inclusion criteria were that students must be able to read and write in Malay (the national language of Malaysia).

Sampling procedure

A two stage cluster sampling method was applied. In the first stage, 15 schools were randomly selected from all government secondary schools belonging to two states and the federal territory of Kuala Lumpur. The sampling frame was constructed according to the list of secondary schools provided by the Ministry of Education. Schools were selected using a computer generated random number table and each school had the same probability of being selected. At the second stage, all students attending Secondary One from selected schools were invited to participate in the study. Out of 2694 students who received the invitation letter, 1361 of them participated in the study, an average response rate of 51%. There were no significant differences in terms of socio-demographic characteristics (age, gender and ethnicity) of respondents and non-respondents.

Measurements

Anthropometric measurement

Height was measured without socks and shoes using a calibrated vertical Seca Portable 217 Stadiometer, to the nearest millimetre. Weight was measured with light clothing using a Seca 813 digital electronic weighing scale, to the nearest decimal fraction of a kilogramme. BMI was calculated as weight in kilogrammes divided by the square of height in metres. Body fat composition was estimated with bioelectrical impedance using a Tanita portable scale (SC-240, Body Composition Analyser, Tanita Europe B.V., The Netherlands). The Body Composition Analyser SC-240 has acceptable accuracy compared to the dual-energy X-ray absorptiometry in white and African-American adolescents (Barreira et al., 2013). WC was measured with a non-elastic Seca measuring tape (Seca 201, Seca, UK), to the nearest millimetre. WC measurement was done at the natural waist which is the midway between the lowest rib margin (tenth rib) and highest point of the iliac crest with the tape around the body in horizontal position (World Health Organization, 2008). All measurements were done by trained research assistants.

Assessment of self-reported physical activity

Self-reported physical activity levels were assessed using the validated Malay version of the Physical Activity Questionnaire for Older Children (PAQ-C) which has good internal consistency and acceptable validity (Crocker et al., 1997; Dan et al., 2007; Dan et al., 2011). There were 10 items in the PAQ-C which captured the level of physical activity in the last 7 days. The first item included the type and frequency of sports or/and dance the adolescents did during the past 7 days. The 2nd to 8th items in the questionnaire assessed the activity of the adolescents during physical education (PE) classes, recess, lunch time, right after school, evenings, weekend and leisure time. The answers to items 2 to 8 used a five-point Likert scale [1 (lowest) to 5 (highest)]. Item 9 included the frequency of participating in daily physical activity in the previous week. Item 10 asked the adolescents to report any unusual activities during the previous week which have not already been recorded. The mean self-reported physical activity score was further categorised into low (score < 2.33), moderate (2.33–3.66) and high (score > 3.66). We followed the categorization of a previous study which used the PAQ-C (Crocker et al., 1997).

Ethical approval

This study was approved by the Ethics committee, University Malaya Medical Centre (Ref. no. 896.34). Participation in the study was voluntary and written informed consent was obtained from the parents or guardian as well as the participants.

Statistical analysis

All data were analysed using IBM SPSS Statistics version 21. Descriptive and bivariate analyses were done as preliminary data analysis. Continuous variables were presented as means with 95% confidence intervals. The associations between self-reported physical activity scores and gender, ethnicity and place of residence was analysed using ANOVA. The indicators of obesity such as BMI, WC and body fatness were also examined in terms of their association with gender, ethnicity and place of residence using ANOVA. Lastly, multiple linear regressions were applied to determine the association between self-reported physical activity scores and BMI, WC and body fatness. Crude and adjusted analyses (age, gender, ethnicity and place of residence) were carried out for each indicator of obesity and presented as standardized regression coefficients.

Results

Among 1361 respondents, 1327 adolescents were included in the final analysis. The socio-demographic characteristics of adolescents are presented in Table 1. Of the sample, 508 were males and 819 females with the mean age of 12.9 ± 0.3 years. Using IOTF standards to categorise adolescents according to BMI, results (Table 2) showed that in total, 8.7% of the adolescents were obese (10.8% of males and 7.4% of females) and a further 15.9% (16.1% of males and 15.8% of females) were overweight. 53% of males and 54.5% of females were within the normal BMI range.

Results showed that 17% of males and 15.6% of females have a WC greater than the 90th percentile.

Table 1
Socio-demographic characteristics of Malaysian adolescents (N = 1327).

Socio-demographic characteristics		Mean ± SD or N (%)
Age (years)		12.9 ± 0.3
Gender	Male	508 (38.3)
	Female	819 (61.7)
Ethnicity	Malay	1086 (81.8)
	Chinese	100 (7.5)
	Indians	100 (7.5)
	Others	41 (3.1)
Place of residence	Urban	702 (52.9)
	Rural	625 (47.1)