Brief Report

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Physical activity and associated factors among young adults in Malaysia: An online exploratory survey

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Summary **The burden of non-communicable diseases is increasing in Malaysia. Insufficient Physical Activity, which is an important risk factor for non-communicable diseases, is less researched in Malaysia. We aimed to assess the level of physical activity and identify its correlates. An online survey was carried out during October, 2011 in the University Tunku Abdul Rahman by the opinion poll research committee. Young adults answered the Short International Physical Activity Questionnaire and a questionnaire about factors according to a socio-ecological model which was adapted from published studies. Metabolic equivalent (MET)-hours and MET-minutes were calculated. Physical activity was classified as sufficient when MET-minutes were > 840. The mean age of the 474 participants was 22.4 years (S.D. = 4.7), and 253 (53.4%) were females. Their mean and median of MET-hours of PA done during the previous seven days were 31.36 (S.D., 52.19) and 14.7 (IQR, 5.77-32.07), respectively. Physical activity done was sufficient among 242 (51.1%) participants. Using univariate analysis, being male, good self-rated health, positive intention, self-efficacy, perceived benefits, social support, and availability of facilities were associated with sufficient physical activity. Using multivariate analysis sufficient physical activity was associated with participants' intention (OR 0.75, 95% CIs 0.64, 0.88), self-efficacy (OR 0.91, 95% CIs 0.85, 0.97) and facility availability (OR 0.81, 95% CIs 0.73, 0.91). The proportion of participants with sufficient physical activity was low. Positive intention and self-efficacy associated with sufficient physical activity should be supported by availability of facilities and a safely-built environment. A nationwide survey about physical and associated social-ecological factors is needed to design rational health promotion strategies.**

Keywords: Physical Activity, metabolic equivalent, non-communicable diseases

1. Introduction

Physical inactivity is the fourth leading risk factor for global mortality which accounts for 6% of all deaths (*1*). Physical inactivity is an important risk factor for non-communicable diseases (NCDs) which is estimated to cause nearly 21-25% of breast and colon cancers, 27% of diabetes, and approximately 30% of ischemic heart disease (*2,3*). Recent data indicates that 60% of the world's population fails to meet the World Health Organization (WHO) recommendation that adults should participate in a minimum of 30 minutes of moderate or vigorous Physical Activity (PA) every day (*1*). Insufficient PA is associated with urbanization and technological advancement (*4*). Sustained economic growth and rapid urbanization may have resulted in a decreased level of PA among Malaysians. Moreover there is increasing concern about the growing burden of NCDs in Malaysia (*5,6*). A national survey about metabolic syndrome has reported that prevalence was

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30.1% according to the IDF (International Diabetes Federation) definition (*7*). Surveys about PA using self-reported questionnaires have reported that children aged 7-12 years have a preference for sedentary pursuits, rather than sports or active games during their leisure time (*8,9*). However, there is very little information about factors associated with PA among young adults in Malaysia. With rapid urbanization more young adults may be spending less time in PA due to increased use of motorized transportation rather than walking. Studies from developed countries have studied various patterns of PA and factors associated with PA (*10-13*). Such information may be useful for formulating strategies and testing interventions to improve PA level. There is a paucity of such studies in developing countries like Malaysia. The objectives of our survey were: to estimate the level of PA among young adults in a sub urban population and identify the factors associated with PA according to a social-ecological model.

2. Methods

2.1. *Design*

The current study was a cross-sectional online survey.

2.2. *Setting*

The survey was carried out by University Tunku Abdul Rahman (UTAR). The UTAR opinion poll survey is an initiative undertaken by a committee which has representatives from all faculties of the university. Each month, the committee plans and executes opinion poll surveys which are varied topics of general interest about youth in Malaysia (*http://poll.utar.edu.my*).

2.3. *Participants*

Young adults from the general population who had registered for UTAR opinion poll survey.

2.4. *Sampling and sample size*

No sampling method was adopted and sample size estimation was not done because this was an exploratory survey.

2.5. *Instrument*

The instrument for this survey was developed based on the framework used in previous studies reported from Canada and Malaysia (*8,12*). The survey used a social-ecological model to assess demographic, individual, social and physical environmental factors (*14*). The questionnaire and framework for our survey was adapted from a Canadian study with the author's permission (*12*). To measure physical activity, we used an English version of a short self-administered International Physical Activity Questionnaire (IPAQ) which is available at *http://www.ipaq.ki.se/scoring.pdf*. This version of IPAQ is meant for use among young and middle-aged adults and has an acceptable test-retest reliability and criterion validity (*15*). The participants were asked to report the number of days on which they did 1) vigorous PA, 2) moderate PA, and 3) walking during previous seven days from the day of survey. In addition, they were also asked to report number of hours and minutes they carried out these three types of activities on each day. In IPAQ, the questions about PA included activities they do at the work place, as part of household and yard work, getting from place to place, and during spare time for recreation, exercise or sports. However, no information was asked about frequency and duration for these separate domains of PA. In addition to IPAQ, we collected information about socio-demographic variables (age, marital status, employment status, education, household income, and gender), questions about self-rated health, self-efficacy for PA and intention to be physically active, perceived health benefits of PA and barriers to PA (individual-level variables), social support for PA, and availability of facilities for PA were also included according to a social-ecological model. All the questions were rated in a Likert scale as described below.

2.6. *Outcome variable*

To obtain a dichotomous outcome variable, we calculated metabolic equivalent (MET)-hours according to the IPAQ scoring guidelines (*http://www.ipaq.ki.se/scoring.pdf*) (*16*). Outcome variable MET-hours were derived by multiplying total hours of vigorous PA, moderate PA, and walking with their respective MET. The values are as follows: vigorous PA (MET = 8.0), moderate PA (MET = 4.0), and walking (MET = 3.3). Thus MET-hours were calculated by the following method: MET-hours = (weekly total hours of vigorous PA × 8.0) + (total hours of moderate PA × 4.0) + (weekly total hours of walking × 3.3). As an index for PA, sufficient PA was defined as achieving a minimum of 840 MET minutes/week from any combination of walking, moderate-intensity or vigorous intensity activities. We used this definition to compare with a similar survey done in Malaysia (*8*).

2.7. *Description of explanatory variables*

2.7.1. *Individual level variables*

Intention to be physically active was assessed as extent to which the participants intended to be physically active during the next six months. Participants were asked to rate their intention on a seven point Likert scale where '1' was no intention at all and '7' was

fully intended to be physically active. Similarly, self-efficacy was assessed by asking how confident they felt about doing 30 minutes of moderate PA (3-4 days in a week) and 60 minutes of light PA each day. They were asked to rate this on a seven point Likert scale where '1' was not at all confident and '7' was very confident. Perceived health benefits were assessed by six items (*e.g.* improved physical attractiveness, prevention of heart disease, obesity, cancer, stress, diabetes, *etc.*). The participants were asked to rate their agreement with the statements on a seven point Likert scale where '1' was I do not agree and '7' was I agree very strongly. Barriers to PA were assessed by providing a list of eight items in which participants were asked "What prevents you from participating in regular PA?" (*e.g.* lack of time, energy, skills, motivation, *etc.*) The participants were asked to rate from '1' not at all important to '7' very important on a seven point Likert scale.

2.7.2. *Social and physical environment variables*

Participants were asked to rate a list of six factors that influence people to engage in PA (example: information about health and well being, planning daily schedule, professional advice and coaching, *etc.*). The rating was done on a seven point Likert scale from '1' as not important at all to '7' as very important. Availability of physical structures and types of infrastructure (*i.e.*, facilities for PA) surrounding their neighborhood was assessed by classifying them into four groups (*e.g.* jogging tracks, bicycle lanes, swimming pools, gymnasium, *etc.*). The participants were asked to report about availability of facilities for PA in their local communities as 'none at all', 'some', and 'many' which were scored as '1', '2', and '3', respectively.

2.8. *Data collection*

During the month of October 2011, e-mail invitations to participate were sent out to all the registered participants for the monthly UTAR opinion poll survey. E-mail provided a link to the survey with all the instructions included. The survey also provided an option for participants to invite their friends to participate in the survey. Consent was taken from the participants of the survey at the time of registration. Confidentiality and anonymity about the survey responses was assured for all the participants. All surveys were approved by the Research Ethics Committee of UTAR.

2.9. *Data analysis*

The data was extracted from the UTAR opinion poll survey web pages into Microsoft excel. The data set was converted into SPSS for labeling variables, recoding, and analysis. MET-hours were computed as explained above. MET-hours were re-coded to create sufficient PA and explanatory variables were also re-coded to combine some categorical variables. For individual, physical and social environmental factors (except self-rated health), we developed a total score by summing up individual responses given by each respondent on Likert scales explained above. Descriptive statistics were calculated for scores generated for individual, physical and social environmental factors and other continuous variables according to socio-demographic variables. Statistical tests of significance namely ANOVA, and independent samples *t*-test were used for continuous variables and chi square tests for categorical variables. By univariate analysis, unadjusted OR and their 95% CIs were calculated. To identify the factors associated with sufficient PA, explanatory variables with p-value < 0.05 were included in multivariate analysis to calculate adjusted OR and their 95% CIs. For all statistical tests a p-value of < 0.05 was considered as significant.

3. Results and Discussion

A total of 475 participants completed the survey. One participant's responses were incomplete and were excluded from analysis. Of these 253 (53.4%) were females while 221 (46.6%) were males. The mean age was 22.4 years (S.D. = 4.7) and median age was 21 years (inter-quartile range, 20-23). Most of the participants were studying full time (341, 72.4%), single (360, 75.9%) and had studied up to a bachelors degree (306, 64.6%) (Table 1).

Mean MET-hours was 31.36 (S.D., 52.19) and mean MET-minutes was 1881.91 (S.D., 3,131.96). The data was highly skewed (skewness, 3.8). Median MET-hours was 14.7 (IQR, 5.77-32.07) and median MET-minutes was 883.0 (IQR, 346.50-1924.25). Based on our operational definition, 242 (51.1%) of participants had done a sufficient amount of PA during the previous seven days. Mean MET-hours for those who had carried out sufficient and insufficient PA were 55.83 (S.D., 64.05) and 5.84 (S.D., 4.22), respectively, while median MET-hours were 31.42 (IQR, 21.83-60.70) and 5.65 (IQR, 2.2-9.48), respectively.

Men and participants who reported to have good/very good health had done more PA when measured in terms of MET-hours and as a proportion of sufficient PA both of which was statistically significant (Table 1). On univariate analysis, being male, self-perception of health as very good or good, positive intention, self-efficacy, perceived benefits of PA, social support, and availability of facilities for PA were associated with sufficient PA (Table 2). However, on multivariate analysis after adjustment for possible interactions between explanatory variables, participants who intended to be physically active (OR 0.75, 95% CIs 0.64, 0.88), and having higher confidence of doing PA (OR 0.91, 95% CIs 0.85, 0.97) were likely to have done sufficient PA during the last seven days. Participants

Table 1. Physical activity (MET-hours) by demographic variables of the study population

Variable	Mean (S.D.)	Number of participants	Mean level of PA (MET-hours)[†]	Sufficient PA (*n* (%)[€])
Age (years)	22.35 (4.7)			
≤ 20 years		181	31.6 (52.3)	89 (49.2)
21-24 years		203	33.8 (58.3)	109 (53.7)
≥ 25 years		46	25.4 (34.7)	44 (95.7)
Sex*				
Male		221	39.9 (63.3)	125 (56.6)
Female		253	23.9 (38.8)	96 (37.9)
Monthly household income				
< 2,001		324	31.1 (52.9)	160 (49.4)
2,001-4,000		108	34.8 (54.6)	61 (56.5)
> 4,000		42	25.8 (38.8)	21 (50.0)
Educational attainment				
Up to secondary		150	31.5 (46.6)	75 (50.0)
Bachelors		306	31.9 (56.0)	157 (51.3)
Masters and above		18	20.8 (19.3)	10 (55.6)
Occupation				
Studying full time		341	32.9 (54.5)	178 (52.2)
Working full time		113	28.9 (47.8)	55 (48.7)
Unemployed/part time work		20	22.9 (31.4)	9 (45.0)
Marital status				
Single		360	32.3 (53.5)	188 (52.2)
Into a relationship/married		114	28.5 (47.8)	54 (47.4)
Self-rated health				
Good/very good		168	38.6 (56.8)*	101 (60.1)*
Fair		241	28.9 (52.1)	117 (48.5)
Poor/very poor		65	21.6 (35.5)	24 (36.9)
Individual, Physical and social environmental factors				
Intention to do PA	4.43 (1.5)			
Self-efficacy for PA	8.42 (3.6)			
Perceived health benefits of PA	30.6 (8.9)			
Perceived barriers to PA	31.2 (9.2)			
Social support for PA	28.1 (8.3)			
Availability of facilities for PA	6.86 (1.8)			

* $p < 0.05$; † Non-parametric tests for comparison of means was used; € Chi square test was used.

who reported that many facilities were available for PA (OR 0.81, 95% CIs 0.73, 0.91) were more likely to have done sufficient PA (Table 3).

This pilot survey among young Malaysian adults showed that nearly half of them had done sufficient PA and nearly a quarter of them had done very minimal PA. Our results show that socio-demographic variables were not associated with PA, though being male, self-rated health as good, perceived benefits of PA, and social support for PA were associated with sufficient PA on univariate analysis but not associated with PA on multivariate analyses. On multivariate analysis, intention, self-efficacy, and availability of facilities were the strongest correlates of PA.

Results of our survey should be interpreted with caution against the limitations we had in our survey design and sample we surveyed. A purposive, non-representative sample used for the survey limits external validity of our results. Participant recruitment by online survey may have lead to selection bias. The correlates of PA from our cross-sectional survey lack temporal sequence thus limiting causal inference. Self-reported PA measures may have been over-reported about time spent doing PA. Moreover, we did not assess total PA without including time spent in separate domains like exercise or sport, recreational, occupational and transportation activities. Despite these limitations our survey may serve as a benchmark for further studies to assess interactions among individual, social and physical environmental factors.

The PA level reported in our survey is much lower than those reported from high income nations like Canada, USA, Belgium, and Sweden (*10-13,17*). However, such comparisons are limited because all these studies used varied instruments, and surveys were done among different age groups (*10-13,17*). There is a relative lack of literature about PA from the southeast Asia region except a few from Thailand and a report from five Asian countries (India, Bangladesh, Vietnam, Indonesia, and Thailand) which assessed PA using the Global Physical Activity Questionnaire version 2 (GPAQ-2) and another survey from six Asia-Pacific countries (*18-20*). A national survey on metabolic syndrome collected data about PA but not using IPAQ (*7*). One survey among school children in Selangor state, Malaysia used a short version of IPAQ to assess PA and reported that 20.8% had < 600 MET-minutes/week (*8*). Thus level of PA measured was

Table 2. Univariate analysis of demographic, individual, social and physical environmental factors with sufficient PA

Variable	Unadjusted odds ratio	95% Confidence intervals (CIs)	*p*-value
Age (years)			
≤ 20 years	1		
21-24 years	0.83	0.56, 1.25	0.376
≥ 25 years	1.01	0.61, 1.68	0.965
Sex			
Male	1		
Female	1.51	1.05, 2.18	0.025
Monthly household income			
< 2,001	1		
2,001-4,000	0.75	0.48, 1.17	0.20
> 4,000	0.98	0.51, 1.86	0.94
Educational attainment			
Up to secondary	1		
Bachelors	0.95	0.64, 1.40	0.79
Masters and above	0.80	0.29, 2.14	0.66
Occupation			
Studying full time	1		
Working full time	1.15	0.75, 1.76	0.52
Unemployed/part time work	1.34	0.54, 3.30	0.53
Marital status			
Single	1		0.37
Into a relationship/married	0.82	0.54, 1.26	0.57
Self-rated health			
Good/very good	1		
Fair	1.61	1.07, 2.38	0.021
Poor/very poor	2.56	1.43, 4.65	0.002
Individual, Physical and social environmental factors			
Intention to do PA	0.64	0.56, 0.74	< 0.001
Self-efficacy for PA	0.82	0.78, 0.87	< 0.001
Perceived health benefits of PA	0.95	0.93, 0.97	0.000
Perceived barriers to PA	1.19	0.94, 1.52	0.16
Social support for PA	0.96	0.94, 0.98	0.001
Availability of facilities for PA	0.79	0.71, 0.88	< 0.001

Table 3. Multivariate analysis of demographics, individual, social and physical environmental factors for sufficient PA

Variable	Unadjusted odds ratio	95% Confidence intervals (CIs)	*p*-value
Sex			
Male	1		
Female	1.330	0.89, 1.99	0.17
Self-rated health			
Good/very good	1		
Fair	1.139	0.73, 1.77	0.565
Poor/very poor	1.600	0.82, 3.12	0.167
Individual, Physical and social environmental factors			
Intention to do PA	0.75	0.64, 0.88	< 0.001
Self-efficacy for PA	0.91	0.85, 0.97	0.007
Perceived health benefits of PA	0.98	0.96, 1.01	0.204
Social support for PA	0.98	0.96, 1.02	0.330
Availability of facilities for PA	0.81	0.73, 0.91	0.001

not comparable across various studies. Thus there is a need for use of a standardized instrument and uniform criteria to measure PA (*21*).

Correlates of PA we identified according to the social-ecological model assume importance to design interventions to improve PA among young adults. From our study males were physically more active than females; which is similar to previous studies (*19,20*). Perceived poor health has been associated with lower PA in some studies (*22-24*). However, our study and a study from 15 member states of the European Union have reported that better self-rated health was associated with a higher level of PA (*13,24,25*). Self-efficacy, intention, and facilities for PA were strongly associated with higher PA in our study. These factors were consistently associated with higher PA in many studies done in different populations (*4,11,12,17,26-33*). Though countries and socio-ecological milieu where the participants reside may vary widely, we infer from our results that these three factors are very important to

carry out PA. For instance, intention to do PA may have a proximal goal which would provide self incentives and act as a guide to healthy habits (*34*). Perceived self-efficacy is another vital influencing factor on PA as it measures confidence level in one's own ability which is necessary for persistence of healthy behavior (*34*). Health promotion interventions aimed at increasing PA level should target self-efficiency and intention for PA. These alone are not sufficient without the availability of physical structures for PA. Our study provides evidence for this as people who perceived that availability of physical facilities for PA as 'some' or 'many' were likely to have done sufficient PA. A meta-analysis has also reported that a perceived physical environment was associated with PA (*28*). However, availability alone cannot predict indulgence in PA but general condition of the neighborhood is also important for a decision to indulge in PA (*26*). Factors such as traffic conditions, pavements for pedestrians, street lights, weather conditions (temperature, rain), street dogs, and street crime also determine suitability of the neighborhood for indulgence in PA (*4,25,35*). Social support, perceived health benefits of PA and perceived barriers to PA were not significant in our survey on a small sample due to lack of power to detect these differences or non-representativeness of the sample we surveyed. However, these were shown to be important factors determining PA and varied across socio-demographic variables according to a study from Canada and Malaysia (*8,9,12*).

In conclusion, results of our exploratory survey suggest that level of PA may not be sufficient among young adults. Factors such as intention, self-efficacy, and facilities for PA which were significant may be considered while planning health promotional strategies. Larger surveys at the national level using standardized instruments and inclusion of factors according to the socio-ecological model would provide better understanding about correlates of PA.

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