DETERMINANTS OF PHYSICAL ACTIVITY PARTICIPATION AMONG THE UNIVERSITI PUTRA MALAYSIA STUDENTS

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ABSTRACT

Background: The prevalence of non-communicable diseases in Malaysia are still rising, despite a slight increase in the prevalence of physical activity from 64.8% to 66.5% according to National Health and Morbidity Surveys 2011 and 2015. This rising trend is mostly related to environmental, socio-economic changes in relation to the development of a country. Determining the gap and improving the environmental health policy and strategy would be helpful for the community.

Materials and Methods: A cross-sectional study was conducted in the Universiti Putra Malaysia from September 2015 to May 2016. The sample size was calculated by using two-proportion formula and the proportionate stratified sampling method was used in this study. The short version of International Physical Activity Questionnaire (IPAQ) was used for physical activity measurement and the Physical and Social Environmental Scales (PASES) was used to measure the physical and social environmental factors.

Result: The prevalence of physical activity participation in this study was 72.2%. The majority of the respondents were below 24 years of age (61.4%), female (63.8%) and Malay (75.1%). The female respondents were less likely to participate in physical activity than male (p= 0.01) (OR= 0.558; CI: 0.358-0.869). The respondents who agreed to have poor neighbourhood safety (p=0.034) (OR=0.623; CI:0.403-0.965) and good social cohesion (p=0.005) (OR= 1.956; CI: 1.23 - 3.11) were more physically active.

Conclusion: The predictors of physical activity participation were female, the neighbourhood safety, and social cohesion.

Keywords: Physical activity participation, physical environmental factor, social environmental factor, UPM.
1.0 Introduction

The result of the imbalance between the amount of energy consumed in the diet and the amount of energy expended through exercise and bodily functions give rise to be in sedentary lifestyle for being inactive at workplace, and also in leisure time at home (Chaput et al., 2011). In 2010, the adolescent population of 81% of aged 11 to 17 years was insufficiently physically active. Adolescent girls were less active than adolescent boys: 84% and 78% respectively. Among adults of aged 18 years and over, 23% (men 20% and women 27%) were insufficiently physically active globally. Older adults were less active than younger adults (WHO, 2016).

According to the National Health and Morbidity Survey 2011, the prevalence of physical activity of 18 years and above Malaysian adults was 64.8% (95% CI: 63.1-65.5) (NHMS, 2011). The prevalence of physical activity among Malaysian adults was 66.5% according to National Health and Morbidity Survey 2015 (NHMS, 2015). From NHMS 2015, the prevalence of physical activity for 18 to 19 year of age was 61%, 20 to 24 year of age was 67.9%, 25 to 29 year of age was 68.1%, 30 to 34 year of age was 69.3%, 35 to 39 year was 70.8%, and 40 to 44 year of age was 73.4%. From the data, it was obvious that the youngest aged adult was less active in physical activity participation than the middle-aged adult (NHMS2015).

A student lifestyle is more on sitting hours with cognitive work in the classrooms and also after class. In addition, it might also be with irregular sleep pattern which affects the metabolism with increased eating habit of ready-made prepared food from the canteen or either fast food. Besides, the use of vehicles for transportation is also helping them to be in sedentary lifestyle with lack of physical activity which is required to use up the calorie that already gained from eating (Chaput, Klingenberg, Astrup, & Sjödin, 2011).

This study was on the physical activity participation in relation with the physical and social environmental factors among the young adult population in the Universiti Putra Malaysia students. This study, hopefully, can provide the baseline information upon the factors determining the participation of physical activity with available indoor and outdoor facilities whereby the interventions can be implemented in most of the universities and other institutions for better health outcome of Malaysian population in any institution.

2.0 Materials and Methods

A cross-sectional study was conducted in 14 faculties of the Universiti Putra Malaysia, located in Serdang, Selangor from September 2015 to May 2016. The sample size was calculated by using two-proportion formula and the proportionate stratified sampling method was used in this study. The short version of International Physical Activity Questionnaire (IPAQ) was used for physical activity measurement and the Physical and Social Environmental Scales (PASES) was used to measure the physical and social environmental factors.

Physical activity participation was measured by the IPAQ short form questionnaires which are a self-reported physical activity measure as it provided information on three types of...
activity: walking, moderated and vigorous intensity and also for sitting time. The physical activity was measured by metabolic energy expended, and the estimated MET for vigorous activity is 8, moderate activity is 4, and walking moderately is 3.3. The total MET was calculated on per week basic (Craig, C. L., A. L. Marshall, J. F. Sallis, 2003).

The socio-demographic variables (age, gender, level of education, ethnicity and income) of a university student were inquired in the form of open-ended and categorical questions. Physical activity and the availability of facilities in the respondents' community was assessed by residential density, the number of places for safe walking, pleasant environment for riding a bike or having separate lane for bike, availability of publicly owned recreational facilities for physical activity such as indoor or outdoor activities, any availability of specific area for doing physical activity, and safe environment for leisure time usage. Social environmental factors include the informational support from the neighbours to engage in physical activity such as information on physical activity, health benefits, encouraging to involve in daily physical activity for better health, and connected with an active network to link with other people.

All the five physical environmental infrastructures and the social environmental determinants were assessed by the PASES questionnaires. The PASES questionnaires were rated on a five-point scale (1- strongly disagree to 5- strongly agree) and each environmental factor has 3 to 6 questions to define the respondent's neighbourhood. The median score of the Likert scale has been taken as the score for each question. The median score of all questions for each environmental factor was calculated. By that means, the external context of the characteristics of the natural and built environment and the characteristics of the people in the neighbourhood were assessed for the participation of physical activity.

Forward to backward translation of the Physical and Social Environmental Scales Questionnaires (PASES) from English to Malay language and vice versa were done prior to the validity test. The content validity of the questionnaire was assessed by the supervisory committee. A full set of questionnaires were pretested among 50 university students in the Universiti Kebangsaan Malaysia and proper adjustments were done on the items highlighted in the comments by respondents. The internal consistency of the rating scales, the Cronbach's Alpha for International physical activity questionnaires (IPAQ-M) was 0.704. And, the Cronbach's Alpha for physical environment sub division was 0.622 and for the social environment, subdivision was 0.885 indicating a moderate and strong reliability. Besides, the Cronbach's Alpha for all social and physical environmental scales (PASES) was 0.8, confirming the ability of the PASES to generate reproducible results.

The physical activity scoring was coded into categorical variables, for those who have minimum 600 MET /min were put into a physically active group and those who have less than that would be a physically inactive group. Descriptive analysis was done. Binary logistic regression was performed to determine the association of the physical activity participation and independent variables, and estimating the risk through odds ratio. Multiple logistic regression analysis was conducted for predictors of physical activity participation. Results with p ≤ 0.05 were considered significant.
3.0 Result

3.1 Response Rate

Out of 555 respondents, there were 503 respondents from all 14 faculties. 39 students refused to take part in the study, 11 students provided only bio-data and 2 students were pregnant. So the overall response rate becomes 90.6%, approximately 91%.

3.2 Distribution of the Socio-demographic and Physical activity of the respondents

There were 309 (61.4%) students who were below 24 years of age; 321 (63.8) were female respondents; 348 (69.2%) were studying in a degree program; 378 (75.1%) were Malays and 172 (34.2%) respondents had the family income of (RM ≤ 2,500). The prevalence of physical activity participation in this study was 72.2%.

3.3 Predictors of Physical Activity Participation

All the variables which have more than two groups were collapsed into two groups. The age groups were reclassified into two groups: ≤ 24 and >24 year groups. The education was reclassified into undergraduate and postgraduate groups. In ethnicity variable, it was reclassified into Malay and Non-Malay groups and the family income was grouped into (RM ≤ 2,500) and (RM >2,500) groups.

Regarding with the Physical and Social Environmental Factors, the Likert scales of those factors were reclassified into two groups. The respondents who chose 'Agree to a certain extent' and 'Strongly agree' were grouped as good option of that particular environment, and the rest were put into the group of poor environment of each environmental factor, assuming the 'Neither agree nor disagree option' of Likert scale as not having awareness of that particular environment. Besides, the residential density was grouped as 'High density' to those who were staying in the building which has more than three stories and the rest, from detached single house to two or three storied houses, as 'Low density'. Regarding the land use, the distance which needed to reach any of the mentioned public places by walking, within 1 to 5 minutes and 6 to 10 minutes were put into the group of 'Low land use' and the rest as 'High land use'.

Binary logistic regression method of analysis was used to predict the prevalence of physical activity participation in relation to the physical and social environmental factors. The selected cases, in this study, were 503 cases (100%) with no missing data. Physical activity participation has been measured with metabolic equivalent and was encoded into '0' for physically inactive and '1' for physically active respondents. In this analysis, all of the variables have been analysed by using 'ENTER' method, 'FORWARD-LR' method and 'BACKWARD-LR' method. ‘ENTER’ method gave the most number of significant values and was selected as the best method. Each variable was analysed with binary logistic analysis. And the significant variables and the variables which have p-value <0.25 were further analysed by multiple logistic regression methods(Hosmer & Lemeshow, 2000). Those variables were gender, family income, the pleasantness of the neighbourhood environment, accessibility to the public places, neighbourhood safety and social cohesion (See Table 1).
**Table 1:** Factors associated with physical activity participation (Crude Odds Ratio)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E</th>
<th>Wald</th>
<th>Crude OR</th>
<th>95% CI Lower</th>
<th>Upper</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
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<tr>
<td>Male</td>
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<tr>
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<td>-0.568</td>
<td>0.218</td>
<td>6.777</td>
<td>0.567</td>
<td>0.369</td>
<td>0.869</td>
<td>0.009*</td>
</tr>
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<td>Family income (RM)</td>
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<tr>
<td>≤2500</td>
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</tr>
<tr>
<td>&gt;2500</td>
<td>-0.341</td>
<td>0.232</td>
<td>2.150</td>
<td>0.711</td>
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<td>Missing</td>
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<td>0.270</td>
<td>0.129</td>
<td>0.908</td>
<td>0.535</td>
<td>1.540</td>
<td>0.719</td>
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<td>Pleasant Environment</td>
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<tr>
<td>Good</td>
<td>0.240</td>
<td>0.203</td>
<td>1.401</td>
<td>1.271</td>
<td>0.854</td>
<td>1.892</td>
<td>0.236</td>
</tr>
<tr>
<td>Accessibility</td>
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<tr>
<td>Poor</td>
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<td>1</td>
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</tr>
<tr>
<td>Good</td>
<td>0.268</td>
<td>0.212</td>
<td>1.595</td>
<td>1.307</td>
<td>0.863</td>
<td>1.980</td>
<td>0.207</td>
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<td>Neighborhood safety</td>
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<tr>
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<td></td>
<td>1</td>
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<tr>
<td>Safety</td>
<td>0.259</td>
<td>0.201</td>
<td>1.69</td>
<td>0.772</td>
<td>0.521</td>
<td>1.1455</td>
<td>0.198</td>
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<td>Social Cohesion</td>
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<td></td>
</tr>
<tr>
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<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>0.467</td>
<td>0.213</td>
<td>4.828</td>
<td>1.595</td>
<td>1.052</td>
<td>2.420</td>
<td>0.028*</td>
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</tbody>
</table>

*significant at (p <0.05)

It was found that gender; the neighbourhood safety and social cohesion were significant predicting factors for physical activity participation after multiple logistic regression analysis. The model fits with the p-value of 0.726 Hosmer and Lemeshow test and the 6.1% variation in physical activity participation can be explained by those variables included in this study (Negelkerke R square is 0.061). The female gender were less likely to participate in physical activity participation (p=0.010)(OR=0.558; 95% CI=0.358-0.869). The respondents who agreed to have poor neighbourhood safety (p=0.034)(OR=0.623; 95% CI=0.403-1.965) and good social cohesion (p=0.005)(OR=1.956; 95% CI=1.230-3.110) were likely to participate more in physical activity (See Table 2).

**Table 2:** Predictors of physical activity participation (Adjusted Odds Ratio)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E</th>
<th>Wald</th>
<th>Adjusted OR</th>
<th>95% CI Lower</th>
<th>Upper</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
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<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>-0.584</td>
<td>0.226</td>
<td>6.658</td>
<td>0.558</td>
<td>0.358</td>
<td>0.869</td>
<td>0.010*</td>
</tr>
<tr>
<td>Neighborhood safety</td>
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</tr>
<tr>
<td>No safety</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Safety</td>
<td>-0.473</td>
<td>0.223</td>
<td>4.503</td>
<td>0.623</td>
<td>0.403</td>
<td>0.965</td>
<td>0.034*</td>
</tr>
<tr>
<td>Social Cohesion</td>
<td></td>
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<tr>
<td>Poor</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Good</td>
<td>0.671</td>
<td>0.237</td>
<td>8.038</td>
<td>1.956</td>
<td>1.230</td>
<td>3.110</td>
<td>0.005*</td>
</tr>
</tbody>
</table>

*significant at (p <0.05)
4.0 Discussion

The physical activity prevalence of 18 years and above age was 64.8% by National Health and Morbidity Survey, 2011. And, it was 66.5% in the age group of 16 years and above by National Health and Morbidity Survey, 2015. The prevalence of physical activity in this study was 72.2%. There was a similarity of age distribution between this study and National Morbidity Surveys done at 2011 and 2015, but the age above 48 years was very few in this study compared with the above-mentioned surveys. This might be the reason that the prevalence of physical activity participation in this study was higher than the above-mentioned surveys.

Gender was one of the significant socio-demographic factors in this study. Female among UPM students were less likely to participate in physical activity. It was because of the student lifestyle which could be with tight studying schedule during the day time and also occupied with self-study after the classes. In addition, the female was more sedentary than male. It was also in line with a study that >30% of female students were sedentary and 35% were insufficient in physical activity than being active (>13%) (Radu et al., 2015). The sedentary nature of female was a common cause of low physical activity participation in free time (Xu et al., 2010; Bolívar et al., 2010). And, the sedentary nature was more common among women, obese, poor health and in old age. It was also because of the educational level which could make them pay attention and to understand the disadvantage of sedentary behaviour. Besides, it was also because of the affordability for paid gym membership and playing sports in the free time (Bolívar et al., 2010). There were no significant socio-demographic factors in relation to physical activity participation apart from the gender in this study.

The physical activity participation was not significantly associated with residential density in this study. But, a study from the mainland China stated that students staying in low residential density were more active in physical activity and less sedentary (P<0.01) compared to the students staying in high residential density (Xu et al., 2010). And it was explained that persistent negative association of residential density and physical activity was because of rapid urbanisation in mainland China. Schulz et al., (2013) stated that there was a negative association of density (p<0.001) with physical activity in the urban community of Detroit (Schulz et al., 2013). It was because of the association of other physical environmental factors in a neighbourhood and also related with different types of physical activity domains. It can be explained further that the area with dense population would have nearer distance to commute to the public places in daily basic such as grocery shops, bus station and schools. (James F. Sallis et al., 2012).

It was stated that higher level of physical activity was associated with the sidewalk condition. Good or excellent condition reported higher physical activity participation, but it was not significantly associated with the street condition in an urban community of Detroit (Schulz et al., 2013). It was explained that the neighbourhood with a well-conditioned sidewalks was a strong indication for physical activity involvement compared to few well-conditioned sidewalks. James F. Sallis et al., (2012) also stated that more people enjoyed walking where there was more walkable neighbourhood (James F. Sallis et al., 2012). However, it was not significantly associated with physical activity participation in this study.
A study in Andalusia, Spain stated that the physical activity participations, (54.9%) \( (p < 0.001) \) for men, and (44.2%)\( (p < 0.001) \) for women, were higher in the neighbourhood with sufficient green spaces (Bolívar et al., 2010). It was explained that the perception of an individual had an influence on physical activity. That was further supported by the fact that 37% of men and 19% of women were more sedentary when they perceived no green spaces in their neighbourhood. Besides, it was also explained by social classes; people from higher social class thought of necessity to have green spaces in their neighbourhood for physical activity participation (Bolívar et al., 2010). It was explained that the physical environmental factors were related at multiple levels. The perception of having attractive and beautiful environment could be a factor to promote physical activity participation together with the available park and playground in neighbourhood area where it was safe (Rech et al., 2014).

The physical activity participation in relation to accessibility to the public places for recreation was positively associated with leisure time walking activity \( (OR = 1.35; \ 95\% \ CI: \ 1.02 \ to \ 1.80) \) (Rech et al., 2014). But, the community survey data from the urban community of Detroit showed that there was a marginal positive association of accessibility \( (p=0.058) \) with physical activity (Schulz et al., 2013). It was explained by the fact that perception of residing at an accessible place, and presence of having day to day walking to close-by shops, grocery, supermarket were the supportive factors for increased physical activity participation. And thus, it was also related to land use in the built-in environment.

The transportation domain of physical activity was significantly associated with vehicular traffic, which included the difficulty of walking or cycling due to traffic and due to the existence of exhausted fumes (Amorim et al., 2010). People who said the difficulty of walking or cycling due to traffic were more likely to walk in that neighbourhood. But, people who said about exhausted fumes were less likely to walk in that neighbourhood. It can be explained that the transportation domain of physical activity was higher in low socioeconomic status so that they noticed more on that type of environment. And, the short temper nature of drivers, lack continuous separate lanes for walking or cycling made unsafe for the people to engage in physical activity. In addition, air pollution hindered people to participate in physical activity. In contrast with above study, it was stated that the noise from outdoors, bad smells, polluted air or having an industry in the neighbourhood and the quality of the neighbourhood environment was not significantly associated with leisure time physical activity participation. (Bolívar et al., 2010). This is similar to above study (Amorim et al., 2010) where the vehicular traffic was not significantly associated with the leisure time physical activity domain.

There was a significant association between sufficient physical activity with the availability of facilities in Canadian study. It showed stronger association of people with university-level education than the people with low educational level. However, there was no significant association after multivariate analysis (Pan et al., 2009). It was because men with low educational level, involved in the occupational physical activity, could have higher PA compared to the recreational physical activity of the men with university level education. Schulz et al., (2013) stated that presence of parks or playgrounds in good condition were not significantly associated with physical activity (Schulz et al., 2013). But, the negative association was not directly associated with physical activity at that study. It was related to density, integrity and street conditions. Thus, it was also stated in the study that the relationship of built-in structures with physical activity varied because of the condition of the built-in environment.
Regarding with physical activity participation in relation with neighbourhood safety, it was noted that there was slightly higher physical activity participation in an unsafe environment compare with a safe environment. It can be explained that the walking physical activity scores were the highest among all students, and there were more female students in this study. Besides, the students needed to walk from classrooms to classrooms and to the hostels and also to the public places, including bus stops for those who were staying outside the UPM campus. In addition, the perception of the safety might be different among students, though it was not studied in this study. It was in line with the study in Brazil, where people in the low territoriality performed more physical activity than people from high territoriality (Schulz et al., 2013). But, the findings were contradicted by the studies (Rech et al., 2014; Amorim et al., 2010) as it was positively associated with physical activity participation. Rech et al., (2014) found out that the positive association was significant in the respondents with older age, thus the perception of safety might be different in different age group and can be with gender in this study. To sum up the possible fact of neighbourhood safety, the students who said to be in the unsafe neighbourhood were more likely to be the students who walked more than other students.

Regarding with the 'reach', which was similar with 'land use' in this study, it was stated that there was an association between land use and physical activity (p=0.033). The land use was positively associated with physical activity when the land protection was low and negatively associated with physical activity in high protection (Schulz et al., 2013). The protection was from the strangers so that the place was a highly guarded area for the safety purpose. It can be explained that people staying in low protective places were less defensive and less feeling of being watched for any activity, either leisure time walking or visit a day to day public places. It was obvious that the physical environment was linked at multiple levels in a built environment. Having nearby destinations in a resident, with good sidewalk gave rise to high connectivity. Accessibility with less polluted environment in a safe neighbourhood would promote transportation physical activity. From the studies, it can be seen that almost all of the physical environmental factors in this study were interconnected with each other in a neighbourhood environment which has some effect on physical activity participation of the residence in that neighbourhood.

The students who said to have good social cohesion were more likely to participate in physical activity compare to the students who said to have poor social cohesion. Cradock et al., (2009) stated that people living in the neighbourhoods with a higher level of social cohesion were more active in recreational physical activity than less socially cohesive environment (OR: 0.43, p<0.001). It was explained that this study was done in a community where people were bound together by strong relationships, common interest, trusts and sharing the values. That attitude favoured them to continue to participate in physical activity persistently. Besides, a study from Brazil stated that there were positive associations between leisure-time walking and social support from family (OR = 1.66; 95% CI: 1.26 to 2.21) and friends (OR = 1.93; 95% CI: 1.47 to 2.54) (Rech et al., 2014). Similarly, there was a positive association between leisure time physical activity with social support from family (OR = 2.77; 95% CI: 2.08 to 3.69) and friends (OR = 2.89; 95% CI: 2.18 to 3.85) (Rech et al., 2014). People tends to follow the family or close friends advice. The involvement of friends, the family were the techniques in health promotion, especially for physical activity participation. By acceptance of physical activity and involving family and friends, could achieve group activities. Thus, it was the favourable condition to promote physical activity participation on...
health enhancing activity among the students, especially the female students. In this study, the social cohesion among UPM students was significantly related to physical activity. It can be explained that young age students, studying tertiary education were the factors favouring the social cohesion to be significant.

5.0 Conclusion and recommendation

The prevalence of physical activity participation in this study was 72.2%. The predictors on factors determining physical activity participation were gender as a socio-demographic factor, the neighbourhood safety as a physical environmental factor, and social cohesion as a social environmental factor. There is a necessity to have more in-depth studies on physical and social environmental factors for physical activity participation in relation with different domains of physical activity such as transportation, recreational and work-related physical activity for an employee in the university or an institution.

As for the female gender, who were more selective on physical activity, it would be nice to have the maintained sidewalks, the pleasant and safe environment in the university compound for walking physical activity. In addition, having a gym service for girls, who didn't want to participate in vigorous exercises, would have positive benefits to get higher MET for the female gender. Besides, high-quality physical education courses should be included as a co-curricular activity and should be integrated as a contribution factor for the graduation of the undergraduate students. Encourage to have a fitness group among students, support training on nutritional information, healthy lifestyle and counselling skill to those who are active. Assign the active student as a leader in the fitness group for coordination among the member students to ensure the participation of the members. These programs should be supported and advocated as a public health policy, thereby the practice of physical activity can be integrated as a physical education, not only as a theory, but also as a practice since school age, in the university life and to the workplace thus it will be carried over as a day to day practice throughout the entire life.

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Declaration

Author(s) declare that there is no conflict of interest.

Author's contribution

Author1: Literature Review, Preparing Research Proposal and research activities.
Author2: Contributing in methodological aspects, planning research activities and data analysis.
Author3: Contributing in methodological aspects and planning research activities.

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