

## Understanding the Physical Activity Behavior of Iranian Female Students: Two Approaches to Analyzing the Theory of Planned Behavior

Mansoure Alipour-anbarani<sup>1</sup>, Saeed Mohammad-pour<sup>2</sup>, Hossein Akhavan<sup>3</sup>, Maryam Habibnezhad<sup>4</sup>, \*Tayebe Marashi<sup>5</sup>

<sup>1</sup>Ph.D Candidate in Health Education & Health Promotion, Student Research Committee, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran. <sup>2</sup> Ph.D. Candidate, Department of Health Economics, School of Management and Medical Information, Iran University of Medical Sciences, Tehran, Iran. <sup>3</sup>Pediatric Intensivist, Pediatric & Congenital Cardiology Division, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran. <sup>4</sup> Pediatrician, Department of Pediatrics, Faculty of Medicine, Mashhad University of Medical sciences, Mashhad, Iran. <sup>5</sup>School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

### Abstract

#### Background

Living without sufficient amount of physical activity is known as a contributing factor to countless diseases. This research study aimed to determine the relationships between the constructs of the theory of planned behavior and female students' physical activity with a path analysis approach.

#### Materials and Methods

The present research is a descriptive-analytic study conducted through cross-sectional data collection procedure. 185 female students were selected via multi-phase random sampling in elementary schools in Mashhad, Iran, from February to November 2018. Path analysis was performed by AMOOS version 22.0 and SmartPLS 2.0 to test the causal relationship among physical activity and constructs of the theory of planned behavior.

#### Results

The age range of female students was between 10 and 13, with mean and standard deviation of 11.51 ±0.76, respectively. The results showed that the constructs of attitude ( $r=0.177$ ,  $p=0.018$ ), and perceived behavioral control ( $r=0.234$ ,  $p=0.001$ ) had a direct and significant relationship with physical activity intention. However, the direct relationship between the constructs of subjective norms and physical activity intention was not significant ( $P>0.05$ ). Also the direct relationship between the constructs of physical activity intention and physical activity behavior was not significant ( $P>0.05$ ).

#### Conclusion

Based on the results, the constructs of attitude, and perceived behavioral control had a direct and significant relationship with physical activity intention in female students.

**Key Words:** Physical Activity, Path Analysis, Theory of Planned Behavior, Student.

\*Please cite this article as: Alipour-anbarani M, Mohammad-pour S, Akhavan H, Habibnezhad M, Marashi T. Understanding the Physical Activity Behavior of Iranian Female Students: Two Approaches to Analyzing the Theory of Planned Behavior. *Int J Pediatr* 2021; 9(6): 13753-763. DOI: **10.22038/IJP.2021.57084.4475**

#### \*Corresponding Author:

Dr. Taebe Marashi, <sup>5</sup>School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Email: Marashi142002@yahoo.com

Received date: Dec.17, 2020; Accepted date: Mar.22, 2021

## 1- INTRODUCTION

The advancement of technology has minimized people's mobility and physical activity and this is turning to be a major issue in world's public health (1). Lack of physical activity is recognized to be the world's fourth major cause of death (2). Physical activity is defined as any kind of daily activity that is done using the body's muscles along with the burning of calories for various purposes (3). More than 80 percent of the adolescents throughout the world are physically inactive (4), which poses a real threat to the future health of young people (5). Although teenagers seem to be healthy, research indicates that their unhealthy lifestyle in the form of lack of physical activity, unhealthy diet, and smoking may contribute to future development of chronic diseases. Therefore, adolescence must be regarded as a criterion for future health (6-8). Physical activity can not only positively influence and help to prevent cardiovascular problems as well as emotional fatigue/trauma (9), but it also improves people's quality of life (10).

As a result, in order to secure a healthy life, teenagers should be physically active at least for 60 minutes a day (11). Doing physical activities during adolescence can help teenagers sustain this habit in the later stages of life (12-14). Unfortunately, due to social mores and cultural limitations girls are far less active than boys in outdoor activities (15). Concerning research on physical activities, the crux of the matter is to identify the effective factors leading to physical activity. This matter can encourage teenagers to seriously take up physical activities. Thus it is crucial to identify the most effective constructs with their direct or indirect effects so as to design the most appropriate educational interventions. The theory of planned behavior is a socio-cognitive theory designed to understand and predict humans' action and inaction. This theory,

planned behavior, was developed by Ajzen and Fishbin. This theory consists of constructs such as individual attitude, subjective norms, Perceived behavioral control, and behavioral intention. According to the theory of planned behavior, the initial behavior is determined by behavioral intention, which provokes an individual to adopt a particular behavior. Accordingly, behavioral intention encompasses an individual's attitude toward behavior, an individual's perception of others' norms and the environment, an individual's perception of the control over his/her action or inaction (16). With respect to the significance of the theory of planned behavior in the current study, this point should be stressed that research on physical activities supports the predictability potential of the theory of planned behavior on behavior. In order to understand the psychological determiners of physical-activity behavior, it is important to identify an individual's beliefs which are strongly connected with attitude, subjective norms, and Perceived behavioral control (17-19).

In addition, this theory is capable of accounting for, on average, 40 percent of the connection between intention and hygienic behavior. Consequently, it is claimed that this model has a potential capacity to develop interventions aimed at changing behavior (20). The theory of planned behavior is effective in understanding and explaining physical activity behavior and demonstrates that attitude toward physical activity, subjective norms about physical activity, and Perceived behavioral control regarding physical activity correlate with physical activity intention (18). With regard to the significance of the physical activity in guaranteeing health, this study aimed to determine the relationships between the constructs of the theory of planned behavior and female students' physical activity with a path analysis approach.

## 2- MATERIALS AND METHODS

### 2-1. Study design and population

The present research is a descriptive-analytic study conducted through cross-sectional data collection procedure from February 2018 to November 2018. The participants were female students from elementary school in Mashhad, Iran. This city has a population of just more than 3 million, making it the second most populated city in Iran (after Tehran), and the ninety fifth most populated city in the world. A total of 185 female students met the criteria and participated in the study. Suhr (2012) suggested that a 10:1 ratio for number of participants to number of parameters was a sufficient sample size for path analysis (21). The sampling technique was random and cross-sectional (multiphase), according to the 7 regions of education. Then, three schools were randomly selected from one region. Eventually, the research data was randomly collected from 6 classes within the age range of 10 to 13.

### 2-2. Inclusion criteria

Fifth and sixth grade primary girl students with no physical disability and with willingness to participate in the research. The age ranged of student were between 10 and 13 years old.

### 2-3. Data Collection Procedure

The data collection form was a questionnaire with three parts (demographic questions, questions associated with the constructs of the theory of planned behavior, and physical activity questions) which was completed by the participants through self-report. Demographic section included 6 questions: age, parents' job, parents' education, and family's income. The questions associated with the constructs of the theory of planned behavior were consistent with Solhi et al. (22). The International Physical Activity Questionnaire (IPAQ) was

employed to assess physical activity. The questionnaire was thoroughly checked by 13 experts in this area for content validation. The tools of data collection were evaluated through 3 criteria: simplicity, association, and specificity, followed by the necessary changes and revisions. Content validation index (CVI) for the construct of attitude was 0.92, for subjective norms 0.94, for Perceived behavioral control 0.93, and for behavioral intention 0.93. Content validation ratio (CVR) for the construct of attitude was 0.71, for subjective norms 0.48, for Perceived behavioral control 0.75, and for behavioral intention 0.84. The reliability of the questionnaire was checked through internal consistency (Cronbach's alpha) with a preliminary pilot study on 20 students.

Cronbach's alpha coefficients for attitude questions were found to be 0.70, for subjective norms 0.73, for Perceived behavioral control questions 0.75, and for behavioral intention questions were 0.72. The questions of the constructs of the theory of planned behavior consisted of 9 attitude questions (45 scores), 6 questions of subjective norms (30 scores), 4 questions of Perceived behavioral control (20 scores), and 4 questions of behavioral intention (20 scores). All these questions were of a 5-point Likert scale type from strongly agree to strongly disagree. For all the constructs, the approach for scoring was as follows: strongly disagree= 1 point, disagree= 2 points, I have no idea= 3 points, I agree = 4 points, strongly agree= 5 points. However, for the first two questions in the construct of Perceived behavioral control, scoring was applied in reverse. The three section in this questionnaire was, in fact, the International Physical Activity Questionnaire (the short form), which contained a number of questions about intense and moderate physical activities within the past week. In this questionnaire, some questions are

asked from the subjects about vigorous and moderate physical activity as well as walking in the past week (the total physical activity of the person in the past week; Metabolic Equivalent of Task (MET)-minutes per week). MET is a unit which is used to estimate the energy consumed by physical activity (23). It is almost equivalent to the extent of the resting state energy of the person. All physical activities can be categorized as factors of the extent of energy consumption in the resting state. Following the guidelines, based on an individual's average physical activity and the number of calories burnt during the past 7 days, physical activity is categorized into three groups: weak, average, and strong.

On the one hand, if the physical activity was less than 10 minutes, it did not count as physical activity. On the other hand, if the combination of average and strong physical activity as well as walking reached the minimum of 600 Met-min/week during the past 5 days, it would fit into the category of average physical activity. Furthermore, if the sum of energy to do strenuous physical activity in at least 3 days of the past 7 days reaches 1500 Met-min/week, or during the past 7 days the sum of energy to do a combination of average and strong physical activity as well as walking reaches at least 3000 Met-min/week, the physical activity is categorized as strong. If the questionnaire reports no physical activity and does not meet the above-mentioned requirements, the physical activity is regarded as weak (3). The reliability and validity of this questionnaire have been confirmed to evaluate the extent of the physical activity (24).

#### **2-4. Analysis of the Data**

Spearman's correlation coefficient was employed to analyze the unadjusted relationships among Theory of Planned Behavior (TPB) constructs. To test the direct and indirect relations of the three

TPB constructs (i.e., attitude, subjective norm, and PBC) to physical activity intention and behavior in participants, path analysis was conducted by two methods. A covariance based model using maximum likelihood was estimated in AMOS 23.0. For further path analysis, Box-Cox transformation was conducted. The Box-Cox transformation offers a more formal and highly flexible method of transformation to optimally improve the likelihood of the data given specific distribution model. Indirect effects in the model were tested using the bootstrap. Bias-corrected confidence intervals were generated based on 1000 bootstrapped samples from the data.

A significant indirect effect was indicated by the absence of zero in the 95% confidence interval. Model fit was assessed using multiple indexes, including comparative fit index (CFI), normed fit index (NFI), Chi-square to the degree of freedom ratio ( $\chi^2/df$ ) and the root mean square error of approximation (RMSEA). The value of CFI and NFI ranges from 0 to 1, with a score exceeding 0.90 indicating a good fit and above 0.95 meaning an excellent fit.  $\chi^2/df$  which minimizes the effect of sample size on the Chi-square index. The strictest criteria for this index are presented by Tapachnik and Fidel, who consider the value between 1 and 2 to be the best value for this index (25).

Hu and Bentler also suggested a value of 0.06 as the cutoff criteria for RMSEA, with less than 0.06 indicating a well-fit model (26). On the other hand, a path analysis was performed with Partial Least Squares (PLS) structural equation model. The Smart PLS 2.0 software was used for analysis. Untransformed variable was used in this model. Also reliable results can be obtained with PLS analysis for small samples in comparison with the covariance-based model. An alpha level of 0.05 was used as statistically significant for all statistical analyses.

### 3-RESULTS

The participants were between the ages of 10 and 13, with the mean and standard deviation of  $11.5 \pm 0.76$  respectively. 34.1 percent of students' fathers and 39.5 percent of their mothers had high school diploma. Also, 85.4 percent of their mothers were housewives and 45.9 percent of their fathers had their own business. Almost 40 percent of these families were far below the poverty line, with a monthly salary of between 5 million and 10 million Rials. Following the IPAQ

questionnaire, the participants' physical activity was as follows: none of the participants fit into the category of strong/strenuous physical activity; 24.3 (45 participants) were categorized as average; and 75.7 (140 participants) were classified as weak in physical activity. For this study, the sample size was estimated by the number of parameters (23 in the theory of planned behavior), and response rate was 80% (21). The diagram below (**Figure.1**) shows the distribution of participants' physical activity based on their age group.



**Fig.1:** distribution of female students' physical activity based on their age group.

**Table.1** demonstrates a matrix of correlation coefficients between the constructs of the theory of planned behavior. Based on the findings, the construct of Perceived behavioral control

is strongly correlated with participants' physical activity. However, the construct of attitude had the least amount of correlation with physical activity and it was not statistically significant.

| <b>Table-1:</b> Spearman's correlation coefficients between study variables. |        |        |        |       |       |
|--|--------|--------|--------|-------|-------|
| Structures   | 1      | 2      | 3      | 4     | 5     |
| Attitude   | 1.000  |        |        |       |       |
| Subjective Norm  | .357** | 1.000  |        |       |       |
| PBC  | .151*  | .247** | 1.000  |       |       |
| Intention  | .214** | .177*  | .256** | 1.000 |       |
| Physical activity  | .054   | .093   | .266** | .067  | 1.000 |

\*\* . Correlation is significant at the 0.01 level (2-tailed).  
 \* . Correlation is significant at the 0.05 level (2-tailed).

Regarding the fact that normal distribution is a fundamental hypothesis in covariance models and the fact that the results of the statistical tests – Kolmogorov-Smirnov and Shapiro-Wilk – rejected the hypothesis of the research at 0.05 level of

significance, in order to estimate the regression coefficients of the path analysis based on maximum likelihood estimation, the Box-Cox transformation was employed to normalize the variables. **Table.2** illustrates the transformation of variables.

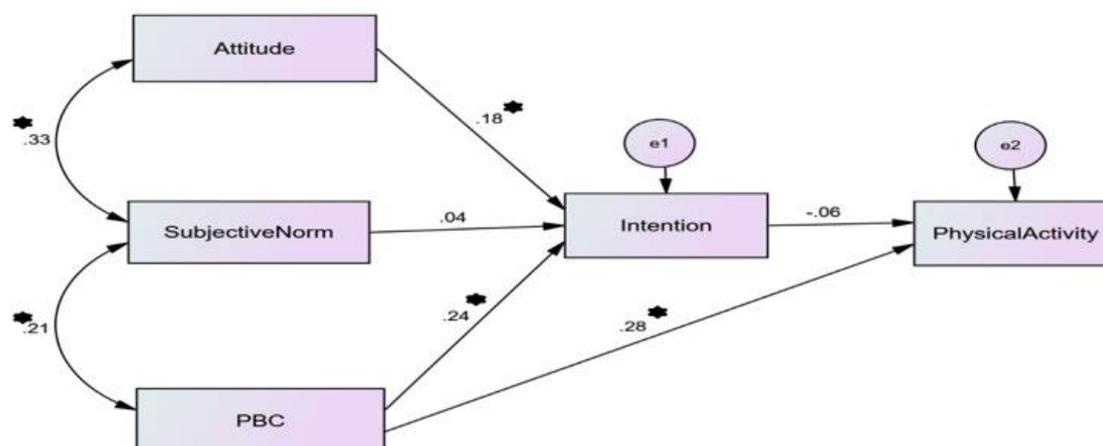
**Table-2:** Description of study variables (Transformed and Not Transformed).

| Statistic          |                 | Attitude | Subjective Norm | PBC    | Intention | Physical activity |
|--------------------|-----------------|----------|-----------------|--------|-----------|-------------------|
| Mean               | Not Transformed | 36.6     | 21.96           | 15.09  | 15.51     | 800.125           |
|                    | Transformed     | 0        | 0               | 0      | 0         | 0                 |
| Standard Deviation | Not Transformed | 3.144    | 4.531           | 2.477  | 2         | 1109.331          |
|                    | Transformed     | 1        | 1               | 1      | 1         | 1                 |
| Skewness           | Not Transformed | -0.086   | -0.553          | -0.176 | 0.159     | 10.375            |
|                    | Transformed     | 0.086    | -0.151          | -0.151 | 0.177     | 0.176             |
| Kurtosis           | Not Transformed | -0.604   | -0.346          | -0.308 | -0.07     | 127.631           |
|                    | Transformed     | -0.604   | -0.904          | -0.385 | -0.115    | -0.507            |

PBC: Perceived behavioral control.

Path analysis was used to investigate the predictive factors of physical activity behavior. In addition, the normalized variables were utilized to perform path analysis based on covariance model.  $\chi^2/df=1.336$ ; RMSEA=0.43; CFI = 0.984; NFI = 0.945; For participants (**Figure.2**), attitude and PBC were significantly associated with intention ( $p<0.01$ ). Attitude was indirectly related to physical activity behavior through intention ( $\beta = -0.007$ ;  $p=0.334$ ), whereas PBC had a significant direct relation to physical activity behavior ( $\beta = 0.277$ ,  $p< 0.01$ ), unlike to its indirect relation through intention. In this study Partial Least Squares (PLS) was also used to estimate the path coefficients. **Table.3** compares the estimated correlation coefficients through the methods of maximum likelihood estimation and Partial Least Squares (PLS). As can be seen, the significance of the estimated correlation coefficients in both methods is clear. However, the coefficients are different in size. According to the covariance model, Perceived behavioral control had the highest explanatory power for behavioral intention. However, with respect to

variance model, attitude had the highest explanatory power for behavioral intention. Another finding of the study reveals that although the direct effect of the Perceived behavioral control on participants' physical activity has been significant in both methods, the extent of the effect in covariance model (0.277) was larger than the variance model (0.180). Average variance extracted (AVE) values are expected to be greater than 0.500 for each latent variable. According to the results, all values were higher than the threshold value. Stone-Geisser's Q2 value is determined by using PLS and provides knowledge to the researchers on the extent to which the collected data predicts the endogenous variables. Q2 values should be different from zero. The model of this study provided the necessary criteria in this regard. The effect size of  $f^2$  values were given to interpret to what extent the exogenous variable predicts the endogenous variables. According to the results, the most effective variable in the model was Attitude ( $f^2 = 0.193696$ ).  $F^2$  for subjective norm was 0.000 and for PBC was 0.020.  $f^2 = (R^2_{\text{included}} - R^2_{\text{excluded}}) / (1 - R^2_{\text{included}})$



**Fig.2:** Model of path analysis of factors related to physical activity based on the theory of planned behavior in female students.

| Effect                               | Covariance Based Model(maximum likelihood) |       |          |       |         |       | Variance Based Model (partial least square) |       |          |       |        |       |
|--------------------------------------|--|-------|----------|-------|---------|-------|---|-------|----------|-------|--------|-------|
|                                      | Direct                                     |       | Indirect |       | Total   |       | Direct                                      |       | Indirect |       | Total  |       |
|                                      | $\beta$                                    | (SE)  | B        | (SE)  | $\beta$ | (SE)  | $\beta$                                     | (SE)  | $\beta$  | (SE)  | B      | (SE)  |
| Attitude to Intention                | 0.177*                                     | 0.075 |          |       | 0.177*  | 0.075 | 0.443*                                      | 0.101 |          |       | 0.443* | 0.101 |
| Subjective Norm to Intention         | 0.038                                      | 0.076 |          |       | 0.038   | 0.076 | -0.016                                      | 0.108 |          |       | -0.016 | 0.108 |
| PBC to Intention                     | 0.234*                                     | 0.072 |          |       | 0.234*  | 0.072 | 0.140*                                      | 0.114 |          |       | 0.140* | 0.114 |
| Attitude to Physical Activity        |  |       | -0.007   | 7.417 | -0.007  | 7.417 |   |       | 0.005    | 0.058 | 0.005  | 0.058 |
| Subjective Norm to Physical Activity |  |       | -0.001   | 3.456 | -0.001  | 3.456 |   |       | -0.000   | 0.017 | -0.000 | 0.017 |
| PBC to Physical Activity             | 0.277*                                     | 0.074 | -0.009   | 9.652 | 0.268*  | 28.16 | 0.180*                                      | 0.076 | 0.001    | 0.067 | 0.182* | 0.071 |
| Intention to Physical Activity       | -0.039                                     | 0.074 |          |       | -0.039  | 0.074 | 0.013                                       | 0.130 |          |       | 0.0130 | 0.130 |

SE: Standard error, \*.  $\beta$  coefficient is significant at the 0.05 level.

#### 4- DISCUSSION

This study aimed to determine the relationship between the constructs of the theory of planned behavior and female students' physical activity. We attempted to calculate the coefficients of the direct and indirect effects based on variance and covariance. In order to estimate the

correlation coefficients in path analysis, maximum likelihood estimation (MLE) is usually used when data is normally distributed. However, because the variables under this study do not meet the requirements of normal distribution, Box-Cox transformation enabled us to estimate the correlation coefficients of the model based on maximum likelihood estimation.

In addition, the estimated coefficients of the model were calculated through Partial Least Squares (PLS) when the data were not normally distributed. The estimated correlation coefficients as well as the significance of the coefficients were similar using those two methods. It is possible to confirm this hypothesis that the predictive variables of the model are not sensitive to normality; therefore, normality of the variables has no effect on estimating the correlation coefficients of the model. The findings of the research show that the correlation between the construct of Perceived behavioral control and physical behavior was stronger and more meaningful compared to other constructs of the theory of planned behavior, which was consistent with the findings of Xiaoxia Zhang et al. (26).

This might be associated with children's games which do not rely on specific sports equipment. Furthermore, attitude was discovered to be the most effective construct of the theory of planned behavior in predicting physical activity. Also, the relationship between the construct of attitude and physical activity intention was direct and significant, which was also congruent with the findings of Xiaoxia Zhang et al. (26), and Karvinen et al. (27).

When people's evaluation of their behavior is positive, they are likely to repeat that behavior. Accordingly, in this study participants believed that they derived great pleasure from physical activity. Therefore, in order to implant a positive attitude in students and more enjoyment as a result, it is imperative to present lectures and conduct group discussions with a view to improving students' attitude towards physical activity and their health. Other findings of the study reveal that the direct relationship between the construct of subjective norm and physical activity intention was not significant, concurring with the findings of Karvinen et al. (27). However, this finding

was not compatible with what Xiaoxia Zhang et al. (26), Ulvick et al. (28), and Yasunaga et al. (29) found out in their research, where they discovered a strong correlation between social support and participation in physical activity. The discrepancies from other research findings might stem from parents' overemphasis on students' academic success, school's lack of attention to physical attention, and fear of injury while playing sports. These might contribute to parents not taking any step towards encouraging their kids to play sports. In order to create a better connection between subjective norms and physical activity intention, participants' family members need to be supported so as to improve their attitude towards their daughters' physical activity.

The results indicate that the construct of Perceived behavioral control had a direct and significant relationship with physical activity intention. In addition, the direct relationship of the construct of Perceived behavioral control and physical activity was significant, which was consistent with Xiaoxia Zhang et al. (26), and Rhodes et al. (30). The ease with which girls played games with friends made them very active even with the fewest pieces of equipment. In order to sustain girls' physical activity, it is advisable to include training sessions as well as motivational texts to encourage students to keep being physically active. What's more, opportunities, resources, and supportive climate should be created to improve girls' physical activity.

Also, activities and teamwork games and matches should be designed so as to promote group dynamics and coherence and prevent students' withdrawal and aloofness. The direct relationship between the construct of physical activity intention and the construct of physical activity behavior was found to be insignificant. In addition, the indirect relationship between the three constructs of attitude, subjective

norms, and perceived behavioral control through intention and physical activity behavior was not significant, which was consistent with the findings of Xiaoxia Zhang et al. (26), as well as Xinli et al. (31), but in conflict with the results of Karvinen et al. (27). There might be a few reasons why participants' intentions did not turn into behavior and practice, the most important of which are as follows: not being able to afford sports equipment, not including sport as an extracurricular activity, lacking sufficient space to do exercise in apartments, not sending girls to gyms on account of inappropriate schedules, parents' concern over girls' security, and lacking proper sports equipment in schools. Another reason for conflicts in research findings might be due to participants' age and gender.

Culture and social mores concerning girls' dress code while playing sports outdoors can affect participants' physical activity in terms of quality and quantity. The limitations imposed on girls not to play specific outdoor sports have greatly reduced participants' physical activity. However, women's health being at the top of the agenda has resulted in opening certain women-only sports centers so that women can play sports and do exercise uninhibitedly. However, due to the participants' low age in this study, participants are less physically active if and when parents do not support them when it comes to commuting to and from gym and other sports centers. Therefore, in order to have a healthy population of participants, parents' continuous support is needed to put physical activity policies into action.

#### 4-1. Study Limitations

This study has focused on female students; therefore, it is not appropriate to generalize the findings to all age groups or male students. Data collection was through self-report. As a result, it is possible that the data regarding physical activity behavior is

not accurately stated. Due to their age, students might not be able to answer the questions with precision. Further studies with a mixed-method design (qualitative and quantitative) are recommended to throw light on students' reluctance to do physical activities.

## 5- CONCLUSION

The following recommendations need to be taken seriously: hiring professional PE (physical education) teachers, involving parents in students' physical activities (e.g., their presence in students' matches and competitions), and sports talent shows for students, requesting student athletes to encourage and train other students, and promoting a non-competitive and friendly atmosphere. Other measures to take are to provide a variety of sports equipment and to establish standard sports centers for all students. Finally, it is crucial to arrange cooperation and coordination among Department of Education, Ministry of Sport and Youth, and Ministry of Health so as to design and implement interventions to improve people's health, in general, and students' health, in particular.

## 6- ABBREVIATIONS

**BMI:** Body mass index.

**TPB:** Theory of Planned Behavior.

**PBC:** Perceived behavioral control.

**IPAQ:** International Physical Activity Questionnaire.

**MET:** Metabolic Equivalent of Task.

**PLS:** Partial Least Squares.

**MLE:** Maximum likelihood estimation.

## 7- ACKNOWLEDGEMENT

This study is related to the project NO.1398/10168 from Student Research Committee, Shahid Beheshti University of Medical Sciences, Tehran, Iran. We also appreciate the "Student Research

Committee "and "Research & Technology Chancellor" in Shahid Beheshti University of Medical Sciences for their financial support of this study.

**8- CONFLICT OF INTEREST:** None.

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