

## Testing the Planned Behavior Model in Predicting the Physical Activity Behavior of Beginner Volleyball Adolescent Students

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### Abstract

**Background:** Identifying the factors that affect adolescents' participation in physical activity is considered as an important topic concerning public health.

**Objectives:** The purpose of the present study was to test the effects of the constructs of the planned behavior theory on the physical activity behaviors of beginner Volleyball adolescent students.

**Methods:** We used a descriptive-correlational approach in the present study. The participants comprised 112 middle school students from Urmia, Iran, 2020. The Research was conducted on the basis of the Theory of Planned Behavior, and the physical activity behaviors were objectively measured by the use of an accelerometer. To analyze the data, we used the structural equation method.

**Results:** Results showed that attitude and perceived behavioral control had significant impacts on the intention to physical activity (both  $T > 1.96$ ). However, no significant effect was observed for the subjective norm on intention to physical activity ( $T = 0.152$ ). Moreover, intention to physical activity significantly affected the moderate-to-vigorous physical activities ( $T > 1.96$ ). Finally, attitude and perceived behavioral control had significant effects on moderate-to-vigorous physical activities through a mediation by intention to physical activity (all  $P < 0.001$ ). The daily MVPA was 45.48 minutes, which is below the WHO-guideline.

**Conclusions:** Findings indicate that those participants with more positive attitudes and higher perceived behavioral control had greater intentions to engage in physical activities.

**Key Words:** Accelerometer, Attitude, behavioral control, Physical activity, Subjective norms.

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## 1- INTRODUCTION

Physical activity is defined as any movement of the body produced by skeletal muscles that leads to the energy expenditure and can be executed as part of sport activities, working activities, active transportation, household activities, and recreational activities (1-2). Regular physical activity can lead to prevention of chronic illnesses and premature deaths, improved mental health, reduced symptoms of depression and anxiety, improved quality of life and life satisfaction (1-4). It has been consistently shown that physical activity decreases significantly with age among children and adolescents, in line with the increase in obesity and overweight. Therefore, World Health Organization's guidelines recommended that children and adolescents aged 6-17 years should do at least an average of 60 minutes of moderate-to-vigorous-intensity (MVPA) physical activity per day, across the week (WHO, 2020). However, it has been shown that only 20 to 25 percent of girls and 35 to 40 percent of boys follow the WHO's guidelines for performing at least 60 minutes of MVPA per day (5-6). In Iran, some studies have shown that both boys and girls do not follow international guidelines on the amount of physical activity per day (7-15). Thus, physical activity became one of the most important research topics in the field of children and adolescents. Furthermore, different theories can be used to examine the effects of different components on the participation of children and adolescents in physical activity. One of them is the theory of planned behavior (16-18).

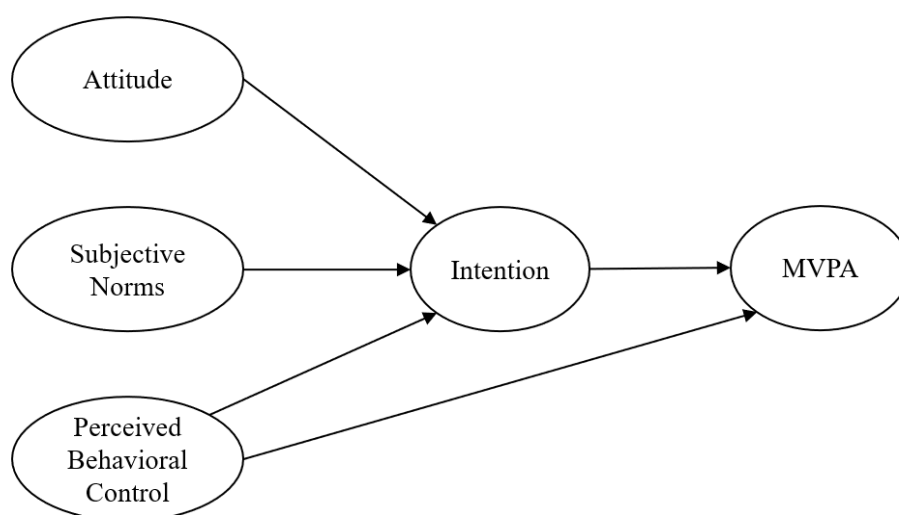
The theory of planned behavior (16-18) predicts the intention to perform a behavior through three factors including "attitude towards behavior", "subjective norms" and "perceived behavioral control". "Attitude towards behavior" refers to the extent to which the respective

behavior is desirable, pleasant, useful or enjoyable to the person; this depends on the individual's judgment about the effects and consequences of behavior. "Subjective norm" refers to the amount of social pressure perceived by the individual to perform the behavior (i.e., the reflection of social influence on the individual). "Perceived behavioral control" is the degree to which a person feels that he or she is in voluntary control over the performing or not-performing behavior (16-18).

Numerous studies have examined the application of the planned behavior theory in the context of physical activity and sport participation. For example, Tsorbatzoudis (19) reported that an intervention based on the theory of planned behavior improved attitudes towards physical activity, perceived behavioral control, intention, and self-reported actual behavior. Jackson, Smith, & Conner (20) examined this issue with additive factors such as descriptive norm, moral norm, anticipated affective reaction, self-identity and past behavior. Moral norm, self-identity and past behavior each explained additional variance in intentions, over and above the theory of planned behavior variables. Past behavior moderated the impact of descriptive norms on intentions. Intentions, self-identity and past behavior significantly predicted physical activity behaviors. Bae et al. (21) showed that attitude, subjective norm, and perceived behavioral control had a positive influence on participation intention, which further leads to participation behavior. In addition, prior knowledge had a positive influence on adolescents' attitudes and participation intention. Chatzisarantis and Hagger (22) showed that the participants who received persuasive messages targeting modal salient behavioral beliefs reported more positive attitudes and stronger intentions than the participants receiving messages targeting non-salient behavioral beliefs.

Although the above-mentioned studies have increased our knowledge on the application of the theory of planned behavior in the field of physical activity and sport participation, these studies are based on self-report questionnaires. However, due to the large differences in the time spent on moderate physical activity and vigorous physical activity measured by questionnaire and accelerometer in children and adolescents (23), the accuracy of this approach remains questionable, and, therefore, using of

accelerometers is necessary to objectively assess physical activity patterns in children and adolescents. Therefore, the purpose of this study was 1) to characterize the levels of objectively measured physical activity and sedentary behavior among beginner volleyball adolescent students, and 2) to test the effects of the theory of planned behavior on moderate-to-vigorous physical activities among beginner volleyball adolescent students. The conceptual model of the present study is shown in **Fig. 1**.



**Fig. 1:** The conceptual model of the present study

## 2- METHODS

### 2-1. Participants

The present study made use of a descriptive-correlational approach. The participants of this study included 112 male adolescent students from middle schools of Urmia city, Iran in 2020. We selected the students based on convenience sampling. Accordingly, we asked managers of schools in Urmia city to give us a list of students. Then, we contacted their parents asking permission for the participation of their children in this study. Finally, those who approved our request, in case they were healthy having no

physical and mental disabilities, were included in the study. Mean and standard deviation of the age of the participants were  $11.56 \pm 1.27$  years.

### 2-2. Measures

#### 2-2.1. Constructs of the theory of planned behavior

The constructs of the theory of planned behaviors including attitude, subjective norms, and perceived behavioral control were assessed using a questionnaire designed by Hagger, et al. (24). This questionnaire consisted of sixteen questions (seven questions for attitude, six questions for subjective norms, and three

questions for perceived behavioral control) scored based on a seven-point Likert scale from completely disagree (1) to completely agree (7). The designers of the scale corroborated its reliability with a Cronbach's alpha coefficient of 0.90 (24). In this study, nine experts confirmed the content validity of this questionnaire (CVI=0.90, CVR=0.82) and we measured Cronbach's alpha reliability as 0.89.

### **2-2.2. Intention**

The intention to physical activity was measured using 2 questions (24) which were scored based on a Likert scale from strongly disagree (1) to strongly agree (7). We averaged all items of this questionnaire to measure the total score. The designers of the questionnaire measured the reliability of its original form and reported a Cronbach's alpha coefficient of 0.87 (24). In this study, the standard method of translation and retranslation was utilized to convert the initial questionnaire into Persian. Then, nine experts expressed their opinions on the content of the questions via email and confirmed the validity of the Persian version of this questionnaire (CVI=1.00, CVR=1.00). In addition, we measured the reliability of this questionnaire and its Cronbach's alpha coefficient was 0.93.

### **2-2.3. Physical activity**

Physical activity was measured objectively using the accelerometer ActiGraph wGT3X-BT (ActiGraph LLC, Pensacola, FL, USA). Accelerometers are small, non-invasive, and easy-to-wear devices that measure overall physical activity, including frequency, intensity and duration of PA, and steps. In recent years, the ActiGraph accelerometer was most frequently used in research, showing good validity and reliability in many studies (25). Accelerometer data were downloaded, processed, and analyzed after the seven-day period by the use of the software ActiLife v6.13.4 (Actigraph Inc,

USA). Before starting the research protocol, the participants were informed, in separated sessions, about the study's aims, procedure, and wearing the accelerometer on the right hip for seven consecutive days all the time, whether they are awake or asleep and to remove it only for taking a shower and doing water-based activities (if any). In order to ensure the compliance with wearing the accelerometer, the experimenter contacted the participant visually in the WhatsApp mobile application every day to make sure the accelerometer was fastened properly at all times and in the right position. Based on the cutoff points given by Evenson, et al. (26), the total and daily time in which the participant spent in MVPA and/or was sedentary were calculated. Time spent not wearing the accelerometer was identified by the algorithm by Choi, et al (27).

### **2-3. Data analysis**

The data were analyzed through SPSS Statistics (version 26) and Lisrel. Means and standard deviations were calculated to describe the data. Kolmogorov-Smirnov test was used to measure the normality of data. Then, the Spearman correlation test was applied to assess bidirectional relationships between research variables. Finally, we used structural equation modeling (SEM) to investigate the relationships between the research variables. The significance level was considered at the alpha level of 0.05.

## **3- RESULTS**

### **3-1. Descriptive data**

As can be seen in **Table 1**, boys ranged from moderate to high in the attitude scores, perceived behavioral control, and intention to physical activity. The accelerometer data reveal that the participants spent 70.98% of their total time in sedentary behavior, 20.19% in light physical activity, and 8.83% in MVPA. In absolute numbers, the daily MVPA was 45.48 minutes. These values are below the

WHO-guideline of at least 60 minutes of MVPA per day. In fact, only 27% of the students (n=30) achieved the recommended MVPA, 58% of students

(n=65) had more than 30 minutes of MVPA per day, and only 15% of them engaged in less than 30 minutes of MVPA per day (n=17).

**Table-1:** Descriptive data of research variables

Students	Attitude	Subjective Norms	Behavioral Control	Intention	Sedentary Time%	Light PA%	MVPA %	MVPA (min per day)
Mean	11.01	4.67	4.72	3.67	70.98	20.19	8.83	45.48
SD	0.85	0.93	0.59	1.45	3.13	2.24	1.57	30.29

PA: MVPA: physical activity; Moderate-to-vigorous physical activity

### 3-2. Bidirectional relationship

The results of the Kolmogorov-Smirnov test showed that the data were not normally distributed (all  $P < 0.05$ ). The results of Spearman correlation tests showed that there were significant associations between: 1) attitude and intention to physical activity ( $r = 0.658$ ,  $P < 0.001$ ), 2) perceived behavioral control and intention to physical activity ( $r = 0.842$ ,  $P < 0.001$ ), and between 3) intention to physical activity and MVPA ( $r = 0.754$ ,  $P < 0.001$ ). However, we found no significant relationship between the subjective norms and intention to physical activity ( $r = 0.018$ ,  $P = 0.694$ ).

### 3-3. Structural equations modeling

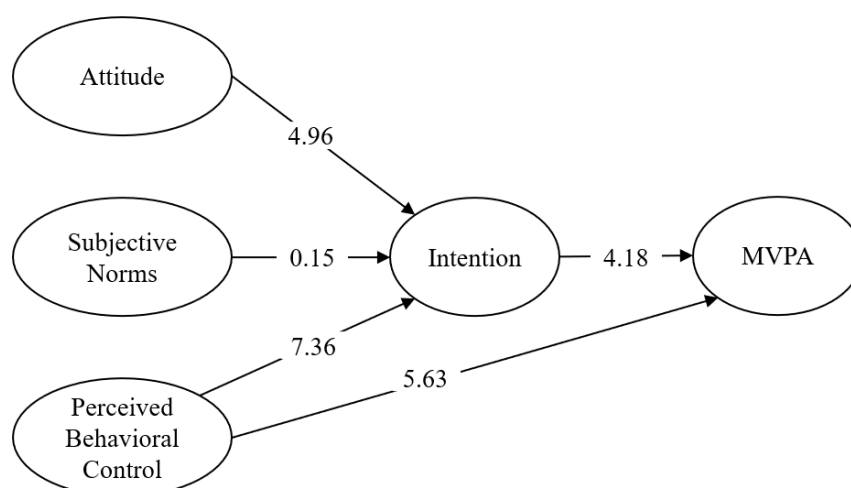
**Table 2** and **Fig. 2** represent the results of structural equations modeling. The results of path analysis showed that attitude and

perceived behavioral control had significant impacts on intention to physical activity (both  $T > 1.96$ ). However, subjective norms were not found to have a significant impact on intention to physical activity ( $T = 0.152$ ). Moreover, intention to physical activity significantly affected MVPA ( $T > 1.96$ ). In addition, attitude and perceived behavioral control had significant effects on MVPA through the mediation of intention to physical activity (all  $P < 0.001$ ). Again, subjective norms were not found to have a significant impact on MVPA through the mediation of intention to physical activity ( $P = 0.547$ ). Finally, perceived behavioral control significantly affected MVPA ( $T > 1.96$ ). Based on the results of the model fit (**Table 3**), we found a good fit for the research model.

**Table-2:** Results of path analysis

	Path	$\beta$	T-value
1	attitude => intention	0.26	4.96*
2	subjective norms => intention	0.01	0.15
3	perceived behavioral control => intention	0.36	7.36*
4	intention => MVPA	0.21	4.18*
5	perceived behavioral control => MVPA	0.24	5.63*
		Z	P-value
6	attitude => intention => MVPA	5.26	$P < 0.001^{**}$
7	subjective norms => intention => MVPA	0.15	$P = 0.547$
8	perceived behavioral control => intention => MVPA	3.96	$P < 0.001^{**}$

MVPA: Moderate-to-vigorous physical activity; \* $T > 1.96$ , \*\* $P < 0.001$



**Fig. 2:** Results of path analysis in the form of T-Values

**Table-3:** Results of model fit

Index	Optimal Range	Obtained Value	Conclusion
RMSEA	< 0.08	0.07	Good fit
X <sup>2</sup> / df	< 3	2.64	Good fit
RMR	Closer to 0	0.04	Good fit
NFI	> 0.9	0.96	Good fit
CFI	> 0.9	0.95	Good fit

#### 4- DISCUSSION

Physical activity is critically involved in the long-term well-being of students. Therefore, the present study aimed to test concepts of the theory of planned behavior in objective physical activity behavior of middle school volleyball students. Concerning physical activity behavior, the findings revealed that the participants spent 70.98% of their total time in sedentary behavior, 20.19% in light physical activity, and 8.83% in MVPA. In absolute numbers, the daily MVPA was 45.48 minutes. These values are below the WHO-guideline of at least 60 minutes of MVPA per day. In fact, only 27% of the students (n=30) achieved the recommended MVPA, 58% of students (n=65) had more than 30 minutes of MVPA per day, and 15% of them engaged in less than 30 minutes of MVPA per day (n=17). These results are in line with those

of previous studies showing that children and adolescents engage less in MVPA (7-15).

Regarding the impact of theory of planned behavior, the results of the present study show that attitudes and perceived behavioral control directly affect the intention to physical activity. These results indicate the importance of the constructs of the theory of planned behavior in this model as well as their direct effect on the intention to physical activity in adolescents. These results are consistent with the results of previous research (19-22, 28-29). The theory of planned behavior is a self-based cognitive-social theory that attempts to show the role of a person's beliefs in the behaviors he or she expects (16-18). This theory states that the occurrence of future behaviors in the individual is a function of the individual's desires. Intentions are considered as

motivational structures that reflect the extent to which individuals intend to participate in a behavior. As such, the students who have more positive attitudes toward physical activity are more likely to report intention to physical activity than those participants with less positive attitudes toward physical activity. Moreover, the students who felt confident could perform physical activity and the opportunity to perform physical activity is likely to lead to more intention to physical activity.

From the three determinants of intention predicted by the theory of planned behavior, attitude and perceived behavioral control were significantly effective, while the impact of subjective norms on intention was not significant. This finding is in accordance with previous studies in which attitude and perceived behavioral control were much stronger predictors of intention than subjective norms, with their influence on intention being small or insignificant. Similarly, Hagger et al. (30) found subjective norms to be a weaker predictor than attitudes and perceived behavioral control, while Brickell et al. (31) found that the relationship between subjective norms and intention to perform physical activity were not significant. Azjen (16) states that attitudes, perceived behavioral control and subjective norms may have variable effects on intention with regards to different behaviors and situations. Thus, although all three TPB constructs impact intentions in some situations one or more constructs may be found to have higher predictive values than others. So, although individuals may feel that their significant others would like them to perform a certain behavior, these individuals are under no obligation to comply with these wishes. Based on these findings it is likely that while more positive attitudes, confidence and opportunities drive students' physical activity behavior, social influence may not be a major deciding factor on students'

decisions to exercise. In this regard, the impact of other social factors, such as social support, on intention should be taken into account.

The strength of our study was that we used accelerometers to objectively determine the levels of physical activity and sedentary behavior of adolescent students which made it possible to prevent the self-reporting bias.

#### **4-1. Limitations of the study**

Among the limitations of the present study, we did not measure socioeconomic status of the students, so further research with emphasis on socioeconomic variables are needed to present a more comprehensive view of factors related to physical activity in adolescents. Furthermore, this research has a cross-sectional design, which creates limitations for examining the causal effects of social beliefs' processes on the participation of adolescents in sport and physical activities.

#### **5- CONCLUSION**

The aim of the present study was to investigate the application of the theory of planned behavior in the objectively measured physical activity behaviors of adolescent students. The important point in the results of the present study was that attitude and perceived behavioral control had positive effects on MVPA among the adolescent students, directly or by the mediation of intention to physical activity. However, the subjective norm was not a significant predictor of participating in physical activities. The findings, further, indicate that those participants with more positive attitudes and higher perceived behavioral control have greater intentions to engage in physical activities.

#### **6- ACKNOWLEDGMENTS**

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## 7- CONFLICTS OF INTEREST

None.

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