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Application of Theory of Planned Behavior to Improve Obesity-Preventive Lifestyle among Students: A School-based Interventional Study

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Abstract

Background: Obesity is regarded as the epidemic of diseases correlated with an unhealthy lifestyle. The avoidance of inactivity could prevent obesity and its relevant issues. The present study aimed to explore the effectiveness of the theory of planned behavior (TPB) to improve obesity-preventive lifestyle among Iranian students.

Materials and Methods: The current study was a quasi-experimental study. Using multistage sampling, 100 Junior High-school students in Khoy, Iran in 2016 were selected and assigned to two groups, namely intervention (n=50) and control (n=50). To collect the study data, researchers utilized a researcher-made questionnaire including items about demographic information and TPB constructs such as attitudes, subjective norms, perceived behavioral control (PBC), behavioral intention, and behaviors related to physical activities, television watching, and computer-game playing. The data were analyzed using SPSS software version 20.0.

Results: The mean age of the intervention group was 13.88 ± 0.79 and that of the control group was 14.12 ± 0.77 years. Prior to the intervention, there was no significant difference between the two groups in the mean of the scores of both the TPB constructs and their health performances. However, three months after the intervention, the mean score of attitudes, subjective norms, perceived behavioral control and behavior of students changed, and all these changes were statistically significant between two groups ($p<0.05$).

Conclusion: The results of the study showed that the TPB could be an appropriate theoretical basis for designing and evaluating interventions to encourage people to avoid a sedentary lifestyle and inactivity.

Key Words: Theory of Planned Behavior, Obesity Preventive Lifestyle, School-based Intervention.

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1- INTRODUCTION

The epidemic of diseases correlated with an unhealthy lifestyle, particularly obesity-related one, is the biggest problem confronting modern medicine (1). The prevalence of obesity and obesity-related metabolic diseases has increased progressively over the past two decades (2), so that it has reached pandemic proportions (3). As health issues, obesity and overweight are not limited to a particular age group, but their prevalence and incidence in children of developed and developing countries have reached alarming levels (4, 5). Approximately 35 million children with overweight live in developing countries and eight million children with this health problem live in developed countries. It is expected that the number will rise to 60 million children in the coming decade (6). The prevalence of childhood obesity ranges from 30% in America to 2% in some parts of Africa (7).

The prevalence of obesity among schoolchildren has been reported to be 20% in England and Australia, 15.8% in Saudi Arabia, 11.6% in Thailand, 10% in Japan, and 7.8% in Iran (8, 9). Childhood and adolescence obesity and overweight affect health so that adulthood obesity and overweight are predicated on them (10, 11). According to a study, the prevalence of obesity was 42.8% for men and 57% for women as indicating a warning rate for obesity in Iran (12). In fact, obesity results from a complex interplay between the environment, genetic factors, and human behavior. From among these, environmental factors are the most common causes of the obesity epidemic. In most people, the primary reason for obesity is an unhealthy lifestyle, including inactivity, sedentary habits, and increased calorie intake (13). Moreover, the prevalence of obesity increases by 2% for every extra hour of television watching (14). A large number of factors can predispose children to obesity, such as changing lifestyles, increasing urbanization and industrialization, which leading to increased access to modern technologies such as television, computers, video, DVDs, etc. These factors affect dietary habits and the level of physical activity, thereby affecting body composition and fat distribution (15). The significance of obesity is more due to its effects on the incidence of noncommunicable diseases such as cardiovascular disease, diabetes, high blood pressure, and even cancers (16). Psychologically speaking, childhood obesity is accompanied by problems such as depression, unsociability, low selfconfidence, and frustration (17). Despite recommendations by health organizations for moderate- to vigorous-intensity activities during the week, inactivity is common among young adults (18). Furthermore, these organizations recommend that this age group should not watch a display screen for more than two hours (19).

During adulthood, it is too difficult to change behaviors established in childhood. Hence, it would be more effective to prevent obesity and its complications during childhood (20). Given that a large number of children and adolescents spend most of their time at school and, moreover, schools are the only places where it is possible to maintain regular and constant contact with children and adolescents, we could therefore play a major role in national planning for preventing childhood obesity by training children and adolescents at schools to adopt appropriate behaviors (21). Researchers believe that training is the principal pillar of all preventive behaviors and the first step in planning a training program is the selection of an appropriate training model (22). Different trials in a variety of health fields show that most interventions which have used behavior-change models have been more successful in accomplishing

their objectives and, moreover, the efficacy of these models in changing behavior has been proven (23). In the Theory of Planned Behavior (TPB), it is assumed that behavioral intention determines behavior directly and indicates that three factors influence an individual's intention, namely attitudes toward a behavior, subjective norms, and perceived behavioral control (PBC) (24). Attitudes are evaluations of behaviors by an individual as negative or positive. In other words, when the individual wants to perform a behavior, he, first, evaluates the outcome and then forms an intention to perform it. Subjective norms are based on the fact that the individual is influenced by others in the society, including partners, parents, religious leaders, relatives, and health officials, and accordingly performs or avoids performing a behavior under their influence or pressure.

In fact, the individual builds his intention based on the demands of others. PBC refers to the degree to which an individual feels that the performance or nonperformance of any given behavior is under his volitional control. If the individual believes that there are no opportunities or resources to perform a particular behavior, he is likely not to form a strong intention to perform that behavior even though he might have positive attitudes toward it or believe that important others would approve of it (24, 25). The Theory of Planned Behavior has been one of the most influential and cited theories of intentional behavior in social psychology (26), and effectiveness of this theory is proven in various studies in the field of health (27-31). Considering that the TPB can help predict and understand environmental and individual factors affecting behavior, the present study used it to explore effects of a theory-based training intervention on overweight- and obesity-prevention behavioral intentions among junior high-school students in Khoy, North West of Iran, in 2016.

2- MATERIALS AND METHODS

2-1. Study design and population

The present research was a controlled quasi-experimental study, which was carried out among junior high-school students in Khoy city, North West of Iran, in 2016. The proposal of this research was approved by the Research Ethics.

Committee at Urmia University of Medical Sciences and necessary arrangements were made with schools. The sample size was determined according to results of a similar study (32). The sample size was based on achieving a 90% power with $\alpha = 0.05$, the mean difference before and after the intervention = 9.2, and standard deviation = 14.5. Using the Power SSC software, the minimum sample size was calculated at 44 in each group and 88 in total. Subsequent to 10% attrition, 100 students were assigned to two groups of 50, namely intervention and control.

The samples were selected using multistage sampling. First, from among junior high schools, two all-boys schools and two all-girls schools were selected using cluster random sampling. Next, one all-boys school and one all-girls school were assigned to the intervention group from among these schools. The other schools formed the control group. Finally, using quota sampling, from among different grades of the two groups, in proportion to the number of students in each grade, 50 students were selected for each group and included in the study.

2-2. Measuring tools: validity and reliability

The data-collection tool was a questionnaire translated and adapted from a study entitled Predictors of behaviors related to obesity using the theory of planned behavior in seventh and eighth grade students by Melinda J. Ickes (33).

The validity of the questionnaire was assessed by exploring the clarity, simplicity, relevance (content validity), and necessity of questions by surveying attitudes of a panel of experts including specialists in health education, pediatrics, midwifery, and nutrition (n = 10 in total).

The questionnaire consisted of two sections. The first section was demographic information about age, Gender, body mass index (BMI), educational level, and the second section was about items concerning the TPB constructs. The section of attitudes toward physical activities included five questions and that of attitudes toward television watching had four questions. The section of subjective norms in the questionnaire comprised four questions on physical activities and four questions on television watching. The perceived behavioral control was measured using eight questions, four of those were about physical activities and the others were about television watching and ComputerGame Playing (CGP).

The behavioral intention of physical activities, television watching, and CGP was assessed through one question. The level of physical activity was evaluated with two questions and the level of television watching and CGP was assessed with two questions. Each question was based on a five-point Likert scale, from "Totally agree" to "Totally disagree", and the score range was from one to five. Altogether, every student's total score for each section was calculated on the basis of 100 points. The reliability of the questionnaire was evaluated using the Cronbach's alpha test on 30 students who were similar to the studied population in terms of demographic characteristics. The reliability coefficient for attitudes toward physical activities was 0.73 and for attitudes toward television watching and CGP was 0.81. The reliability coefficient of subjective norms for physical activities was 0.85 and for television watching was 0.83. The reliability coefficient of behavioral control for physical activities was 0.91 and for television watching and CGP was 0.78.

2-3. Intervention

The process of performing the training intervention was as follows: the first session used lectures and group discussions to introduce factors affecting obesity and overweight and available procedures for minimizing this health problem. In the second session, benefits of physical activities and their positive effects on reducing obesity both physically and mentally were highlighted; moreover, benefits of reducing inactivity resulting from television watching and CGP were taken into account. Generally, the second session aimed to foster new attitudes by making a distinction between what the subjects did and what they were ideally expected to do. The third session dealt with standard models for performing physical activities and with good planning for reducing the time devoted to television watching and CGP.

In order to improve subjective norms, the fourth session was held for the students and their parents and teachers. This session underscored the role of teachers and parents as health guides for performing physical activities, gave them a high priority, highlighted their role in monitoring sedentary activities such as television watching and CGP, and stressed the need for planning to replace these activities with healthy ones. Benefits of group games and activities such as swimming and mountaineering were also discussed in this session. In the fifth session of the training, self-efficacy enhancement strategies and overcoming the deterrent factors associated with physical activity and planning to reduce the time spent watching television and gaming were discussed. Each session lasted 60 minutes and training methods

included lecture, brainstorming, group discussion, question and answer, and PowerPoint presentation. Educational sessions were held on by experts of health education and social medicine. In order to evaluate effects of training intervention, three months after the last session, the initial questionnaire was recompleted by the participants in the intervention and control groups.

2-4. Inclusion and exclusion criteria

According to the inclusion criteria, the students had to provide written informed consent from their parents and school principals for participating in the study and they were expected not to have metabolic disease or other health problems leading to obesity. The students who intended to drop out before finishing the study and those who failed to attend training sessions were to be excluded from the study.

2-5. Data Analyses

Data were analyzed using the SPSS software version 22.0 program. In order to examine the difference between the groups, first, presumptions of each test were controlled. Moreover, in order to analyze data, first, the KolmogorovSmirnov test (KS-test) was used to confirm that research variables had a normal distribution. In order to compare the intervention group with the control group, at each evaluation stage, the independent ttest and the paired t-test were used for quantitative variables and the chi-square test was used for qualitative variables.

2.6-Ethical consideration

The research was presented to the Ethics Committee at Urmia University of Medical Sciences and received the ethics code IR.UMSU.rec.1394.281. Written informed consent was gained from all the participants. Indeed, the research adhered to all principles indicated in the Declaration of Helsinki.

3- RESULTS

In this controlled quasi-experimental research, 100 students were assigned to the intervention group (n = 50), and the control group (n = 50). The mean age of the intervention group was 13.88 ± 0.79 years and that of the control group was 14.12 ± 0.77 years. **Table.1** shows that, before the study, the two groups were not significantly different from each other in terms of demographic variables ($P > 0.05$). The results also showed that there was no significant difference between the two groups in the mean of the scores of physical activities, television watching, and CGP and the mean of the scores of the TPB constructs (i.e. attitudes, subjective norms, PBC, and behavioral intention) related to these activities before the intervention ($P > 0.05$).

As **Tables 2 and 3** showed that there was a significant difference in all the TPB variables between the two groups (after intervention, $P < 0.001$). The results highlighted a significant difference in the mean of the scores of the variables in the intervention group before and three months after the intervention. However, no significant difference was observed in the control group ($P > 0.05$). According to **Table.4**, before the training intervention, the average of television watching was 194.40 minutes and that of CGP was 54.90 minutes in the intervention group. After the intervention, the averages were 148.80 and 45 minutes, respectively.

Furthermore, before the training intervention, the average of television watching was 179.00 minutes and that of CGP was 49.10 minutes in the control group; however, three months after the intervention, the averages were 177.60 and 45.10 minutes, respectively. In the intervention group, the average daily participation in light-intensity activities and vigorous-intensity activities before the intervention was 9.90 and 2.80 minutes, respectively. Nevertheless, after the

intervention, the averages were 20.00 and 7.80 minutes, respectively. However, before the intervention, they were 9.70 and 2.70 minutes, respectively, in the control group but, three months after the intervention, they were 8.90 and 2.90 minutes, respectively.

Table-1: Demographic characteristics of the students in the two groups

Variables	Sub-group	Intervention (n= 50)		Control (n = 50)		P-value*
Age		Mean or No.	SD or %	Mean or No.	SD or %	
Gender	Female	26	52%	19	38%	0.130
	Male	24	48%	31	62%	0.317
Grade	First	22	44%	12	24%	0.468
	Second	18	36%	20	40%	
	Third	10	20	18	36%	
BMI		22.54	3.69	21.64	3.19	0.194

* The quantitative variables were tested using the independent t-test and the qualitative variabiles were tested using Chi-square; SD: standard deviation; BMI: body mass index.

Table-2: A comparison of the means and standard deviations of the TPB constructs in the two groups before and three months after intervention with regard to television watching and computer-game playing

Variables	Time	Intervention		Control		Independent t-test α
		Mean	SD	Mean	SD	
Attitudes	Before	57.28	6.63	56.80	7.62	0.738
	After	77.68	5.48	57.60	6.04	0.001
Paired t-test α		0.001		0.192		
Subjective norms	Before	53.90	6.33	54.70	6.90	0521
	After	69.80	7.75	54.20	5.37	0.001
Paired t-test α		0.001		0.358		
PBC	Before	51.20	9.34	50.60	9.18	0.747
	After	67.90	6.63	50.10	7.45	0.001
Paired t-test α		0.001		0.528		
Intention	Before	54.40	10.72	53.20	14.90	0.645
	After	74.00	11.60	56.00	15.11	0.001
Paired t-test α		0.001		0.07		

TPB: Theory of Planned Behavior; SD: standard deviation.

Table-3: A comparison of the means and standard deviations of the TPB constructs in the two groups before and three months after intervention with regard to physical activities

Variables	Time	Intervention		Control		Independent t-test α
		Mean	SD	Mean	SD	
Attitudes	Before	55.92	5.45	*57.52*	5.70	0.155
	After	73.60	5.36	58.64	4.16	0.001
Paired t-test α		0.001		0.095		
Subjective norms	Before	59.40	6.35	58.60	6.14	0.524
	After	76.10	6.56	59.80	6.77	0.001
Paired t-test α		0.001		0.032		
Perceived behavioral control	Before	56.90	9.89	53.16	10.83	0.115
	After	73.10	8.32	54.50	9.38	0.001
Paired t-test α		0.001		0.182		
Intention	Before	56.00	12.77	55.20	12.49	0.752
	After	73.60	12.12	50.60	9.18	0.001
Paired t-test α		0.001		0.533		

SD: standard deviation; TPB: Theory of Planned Behavior.

Table-4: A comparison of the means and standard deviations of television watching, computer-game playing (CGP), and physical activities in the two groups before and three months after intervention

Variables	Time	Intervention		Control		Independent t-test α
		Mean	SD	Mean	SD	
Light activity*	Before	9.90	14.44	9.70	11.26	0.939
	After	20.00	14.74	8.90	8.64	0.001
Paired t-test α		0.001		0.467		
Vigorous activity*	Before	2.80	6.48	2.70	7.01	0.941
	After	7.80	10.88	2.90	7.07	0.009
Paired t-test α		0.001		0.322		
Television watching*	Before	194.40	51.15	179.00	49.12	0.128
	After	148.80	35.08	177.60	47.44	0.001
Paired t-test α		0.001		0.090		
CGP*	Before	54.90	20.44	49.10	21.68	0.172
	After	45.00	13.85	45.10	19.49	0.976
Paired t-test α		0.001		0.069		

* (min); during 24 hours. Examples of light-intensity, or sedentary, activities are sitting using a computer and walking slowly. These activities do not speed up your respiration and heart rate. Examples of moderate-intensity activities are vacuuming and washing windows. Vigorous-intensity activities refer to basketball, soccer, swimming, running, tennis, and other forms of aerobic exercise which speed up your respiration and heart rate.

4- DISCUSSION

A sedentary lifestyle has been regarded as a risk factor for different diseases. Considering an increase in sedentary habits and inactivity due to the prevalence of behaviors such as low physical activity, and too much time television watching and CGP, which lead to health issues such as obesity, the present study aimed to explore effects of a theory-based training intervention on forming health-promotion behaviors to prevent obesity. Based on the results, three months after the intervention, in the two groups, the mean of the scores of intention and obesity-prevention behaviors such as performing physical activity and reducing television-watching and CGP time showed a significant difference.

This shows that the implementation of a TPB-based health training program had been influential in following and adopting health-promotion behaviors related to the topic of the present research. According to the TPB, attitude toward a particular behavior is the first construct which affects intention. In fact, attitudes are based on outcomes of the personal experience of behaviors or outcomes of experiences which are instead learnt through observing others. Owing to this, after the direct experience of a behavior, positive beliefs about its outcomes are reinforced and, as incentives, influence the way it is adopted and followed (34).

In the present study, attitudes of the students in the two groups toward physical activities, television watching, and CGP were not at the optimum level before the intervention. However, after the training intervention, in the intervention group, the mean score of the students' attitudes toward a reduction in television-watching time increased approximately by 20% and the mean score of their attitudes toward physical activities increased by 18%. Nevertheless, in the control group, no significant change was observed. Results of a TPB-based educational intervention study by Solhi et al. on physical activity of students were consistent with the results of the present study (35). Furthermore, in a study by Delshad Noghabi et al. on the impact of education on reducing students' television-watching time, the mean score of their attitudes increased by 13.5%, which was in line with the results of the present study (36). According to study of Hazavehei et al., it has been stated that attitudes alone cannot guarantee performance, and it is necessary to consider different factors such as intention, subjective norms, and PBC (37). After the intervention, subjective norms of performing physical activities improved, and television-watching time significantly decreased in the intervention group, compared to what had happened before the intervention.

However, in the control group, there was no significant relationship. Hence, together with parents and teachers who have sufficient leverage to influence children and adolescents, the training method used in the present study could amplify effects the present research aimed at.

Unfortunately, most parents are unaware of negative aspects of television and regard it as something good for children's leisure time (38). However, parents should consider and regain their role as guide and often spend time playing with their children. They should also encourage their children to do physical exercise, engage in outdoor recreational activities, and go on excursion, for example (36). Parrott et al. in a study confirmed the effectiveness of subjective norms in adopting physical activities, too (39).

The present study results showed there exists a statistically significant association between the groups in views of the mean score of PBC after the intervention. In fact, improved PBC after intervention led that students feel a more control towards behaviors in any circumstance. In the other

words, they could perform the behavior without needing resources or specific skills. Results of studies by Solhi et al. (35), Tsorbatzoudis (40), and Armitage (41), regarding physical activity, were consistent with the results of the present study. It seems that providing an educational program to promote perceived behavioral control towards physical activity and to reduce the time spent watching TV and games will be beneficial. The following educational program adolescents could take part in physical activities, minimize television-watching and CGP time, and finally replace these unhealthy activities with calorie-burning ones. Noghabi and Moshki in their study found that the absence of a proper procedure for filling children's leisure time, and parents' inclination to entertain their children with television were the most important barriers to PBC (36). In the present study, the improvement of attitudes, subjective norms, and PBC led to increase behavioral intention towards healthy lifestyles in the intervention group. It means that TPB had a main role in these improvements.

4-1. Limitations of the study

The data were collected through a selfreport instrument, which is likely not to show the students' real performance with regard to the topic of the study. The other limitation was that there was no free time for holding training sessions, which was removed by coordination made with the training and Education Department and schools managers. A small number of samples were also a limitation of this study.

5- CONCLUSION

Results of the present study showed positive effects of TPB-based training through attitudes, subjective norms, PBC, and behavioral intention on obesity-prevention behaviors, thereby maximizing physical-activity time and minimizing sedentary-activity time in the intervention group. Hence, it is necessary to design and evaluate theory-based training programs related to health-promotion behaviors with the aim of reducing obesity through teachers and health officials.

6- CONFLICT OF INTEREST: None.

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