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ORIGINAL ARTICLE

The effect of the health belief model-based educational program on physical activity beliefs and behaviors of university students

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Abstract

Aim This study was conducted to determine the effect of the education program based on the Health Belief Model (HBM) on the physical activity beliefs and behaviors of university students.

Subject and methods This quasi-experimental study was carried out with one experiment and one control group where a pre-test and post-test were applied to the participant. The study included 129 participants (experimental group = 61, control group = 68) studying at two universities between March–September 2019. A 4-week HBM-based training program was applied to the students in the experimental group. Data were collected with the "Personal Information Form," "International Physical Activity Questionnaire (IPAQ)" and "Exercise Health Belief Model Scale (EHBMS)." Chi-square test, T-test for dependent and independent groups, Wilcoxon sign test, and Mann–Whitney U tests were used in the evaluation of the data.

Result The EHBMS ($p = 0.009$) and MET (p=0.000) total score averages of the experimental group were found to be statistically significantly higher than the control group in the post-test.

Conclusion We determined that the HBM-based education program implemented within the scope of this study positively affects the physical activity beliefs and behaviors of the students. Nurses studying with students can use this program as a guide.

Keywords Exercise Health Belief Model Scale · Physical activity · Nursing · Health Belief Model

Introduction

In today's world, people's habits of movement have decreased considerably with the development of technology. The use of automobiles has greatly reduced the need for walking; and machines doing hard work for us in daily life have begun to be used. At the same time, tools such as computers and televisions have caused us to be inactive for a long time. There is strong evidence to support the health benefits of physical activity and being physically active is a common message from health promotion authorities (Gledhill et al. 2016; Warburton and Bredin 2016). Physical activity is an important indicator of a healthy life. A remarkable amount of work has been done on this subject in recent years. It is seen that the most important factor contributing to healthy aging is physical activity considering its clinical, psychological, and social benefits (Bauman et al. 2016). Many developed countries have included encouraging participation in physical activity in line with its physiological and psychological benefits among the primary goals of public health (Cengiz et al. 2010).

Although the positive effects of physical activity and exercise on health are a well-known fact, the physical activity level of most people around the world is low. While studies were conducted on the benefits of physical activity in the past, why the level of physical activity has not been increased is currently being studied (Koçak 2002). According to the World Health Organization (WHO) data, "one in four adults (1.4 billion people) worldwide does not follow physical activity recommendations that reduce common chronic diseases and improve health and well-being" (Guthold et al. 2018).

Health-related beliefs and behaviors of individuals significantly affect their health. Health belief refers to the thoughts

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and behaviors of people about being healthy or being ill (Ünsal 2017). Health behaviors are all actions related to health protection and health promotion. Many theories and models about behavioral change have been developed (Alıcı and Sarıkaya 2009). Using these models has an important role in the nursing discipline in that these models guide health behaviors and initiatives that will occur both today and in the future (Bulduk et al. 2015; Ersin and Bahar 2012). Since the early 1950s, the Health Belief Model (HBM) has been one of the most widely used models in health-related behavioral research both to explain the change and maintenance of health-related behaviors and as a guiding framework for interventions toward health behaviors (Skinner et al. 2015).

It is stated that the university period is one of the most important periods in terms of either achieving a healthy lifestyle by doing physical activity regularly or abandoning this habit (Hildebrand and Johnson 2001; Irwin 2004). It becomes even more important for these individuals to acquire regular physical activity behaviors considering the responsibilities and positions of university students in society after graduation (Irwin 2004).

This study was conducted to determine the effect of the education program based on the Health Belief Model on the physical activity beliefs and behaviors of university students. It is thought that the results of the study will form the basis for the design and evaluation of the programs to be implemented to enable adults to exercise more in further studies.

Methods

Type of research

This quasi-experimental study was carried out with one experiment and one control group where a pre-test and post-test were applied to the participant.

Place and time of research

The research was carried out with nursing undergraduate students between March–September 2019 at two state universities in the Eastern Anatolia region of Turkey. In both universities, physical activity conditions are similar in terms of the availability of indoor gymnasiums, walking areas, and fitness centers.

Sample and universe

The number of people to be recruited into the experiment and control groups was calculated by power analysis. Power analysis was performed using the G Power 3.1.9.2 program (Faul et al. 2009). As a result of the calculations, as type I error 0.05, type II error 0.80, and effect size 0.5 (Cohen's medium effect size), it was determined that at least 27 and 51 people should be included in experiment and control groups to compare the two dependent groups and independent groups, respectively. Due to possible losses during the research, it was planned to include 65 people in the experimental group and 75 people in the control group. Since it was estimated that the losses in the control group could be higher during the research process, 10 more people were recruited in the control group. The study was completed with students in the experimental group (61) and the control group (68) due to the circumstances during the research process, such as students' transferring to another university, students' appointments, students leaving the study voluntarily, missing data, etc. The experimental and control groups were selected from different universities in order that the volunteers participating in the study cannot be affected by one another. This study was conducted using the non-randomized groups pre-test post-test control group design.

Inclusion and exclusion criteria

Inclusion criteria for the study was volunteering to participate in the study, having no language barrier in communication, having no disease or disorder that would prevent participation in the study, and receiving no structured training on physical activity. Data collection forms that were thought not to be reliable were not included in this study as for the exclusion criteria of the study.

Intervention protocol

Experimental group

The participants were informed about the study and their verbal and written consents were obtained. Data collection forms were given during the interviews with the students. After the researcher gave the related information about the research to the students by applying face-to-face and individual interview techniques, "Personal Information Form," "Exercise Health Belief Model Scale," "International Physical Activity Questionnaire (Short form)" were applied. The program was implemented after the exercise program based on the Health Belief Model (HBM) was introduced to the experimental group (Table 1).

During the 4 weeks, the following program applied to the experimental group: HBM-based exercise training was given in four sessions, and then the training booklet was distributed. Warm-up walking (45 min), which is one of the aerobic exercises, was performed three times in total.

After warm-up, stretching and posture exercises were done three times. After the exercises, it was recommended to watch exercise videos to practice at home. Text messages

Table 1 The content plan of the education program based on the health belief model

HBM-based aims	Content	Method/content	Instruments	Evaluation
1. The perception of sensitivity toward physical activity increases	Introduction – Meeting 1.1. Conceptual structure of physical activity 1.2. Factors affecting physical activity 1.3. The importance of physical activity 1.4. The necessity of physical activity	• Explanation • Expression • Discussion • Q&A	• Slide • Training booklet • Text messages by phone 3 times a week • Stretching and posture exercises • Walk	• EHBMS • IPAQ
2. The perception of the seriousness of health problems caused by not doing physical activity increases	1.5. Incidence of physical inactivity 1.6. Risk factors caused by inactivity	• Explanation • Expression • Discussion • Q&A	• Slide • Training booklet • Text messages by phone 3 times a week • Stretching and posture exercises • Walk	• EHBMS • IPAQ
3. The perception of benefit toward the benefits of doing physical activity increases	1.7. Benefits of physical activity 1.8. Adopting the benefits of physical activity	• Explanation • Expression • Discussion • Q&A	• Slide • Training booklet • Text messages by phone 3 times a week • Stretching and posture exercises • Walk	• EHBMS • IPAQ
4. The perception of barriers to physical activity decreases	1.9. Conditions preventing physical activity 1.10. Overcoming the situations that prevent physical activity	• Explanation • Expression • Discussion • Q&A	• Slide • Training booklet • Text messages by phone 3 times a week • Stretching and posture exercises • Walk	• EHBMS • IPAQ
5. The motivation for physical activity increases	1.11. Situations increasing physical activity motivation 1.12. Willingness to maintain and develop physical activity behavior	• Explanation • Expression • Discussion • Q&A	• Slide • Training booklet • Text messages by phone 3 times a week • Stretching and posture exercises • Walk	• EHBMS • IPAQ

about physical activity were sent three times a week. After the HBM-based exercise program was implemented, the Exercise Health Belief Model Scale and International Physical Activity Questionnaire Short Form was applied again.

Control group

Pre-test at the beginning of the study and post-test at the end were applied to the individuals in the control group without any intervention. After the post-test was applied, a training booklet was given to the students to enable them to learn about the exercise.

Data collection tools

Personal information form

This form created by the researcher consists of questions about the sociodemographic characteristics of the participants, such as age, gender, academic achievement, place of residence, educational status of parents, income status, etc.

International physical activity questionnaire (short form)

The International Physical Activity Questionnaire (IPAQ) was developed by Craig et al. (2003) to determine the physical activity levels of participants aged 15–65. The validity and reliability study of IQAP in Turkey was conducted by Öztürk (2005). In the evaluation of all activities, the criterion is that each activity is done for at least 10 min at a time. A score is obtained as "MET minute/week" by multiplying the minute, day, and MET value. Calculation of the total score of the short form includes the sum of the duration (minutes) and frequency (days) of walking, moderate-intensity activity, and vigorous activity. The energy required for activities is calculated with the MET-minute score. Standard MET values have been established for these activities. These are

Walking = 3.3 MET,
Moderate-intensity Physical Activity = 4.0 MET,
Vigorous Physical Activity = 8.0 MET,
Sitting = 1.5 MET.

The daily and weekly physical activity level is calculated using these values, e.g, The walking MET-min/week score of a person walking for 3 days and 30 min is calculated as 3.3 X 3 X 30 = 297 MET-min/week. Those with a weekly MET value below 600 are considered low, those between 601–3.00 0 are considered moderate, and those above 3000 are considered high.

Exercise health belief model scale

The Exercise Health Belief Model Scale was developed by Esparza-Del Villar et al. (2017). The scale consists of 32 items in 5-point Likert type. From question 1 to question 26, it is graded as never (1), little (2), somewhat (3), a great deal (4), much (5). From the 27th to the 32nd question, I don't think at all (1), I don't think (2), I think (3), I think often (4), I think all the time (5). The scale consists of 5 sub-dimensions and there is no reverse item. The highest score that can be obtained from the scale is 160, and the lowest score is 32. In the evaluation of the scale, an increase in the score means an increase in the exercise belief level. The Cronbach alpha coefficient of the original scale: general health values sub-dimension 0.84, perceived seriousness sub-dimension 0.67, perceived benefit sub-dimension 0.90, motivation sub-dimension 0.85 and sensitivity perception sub-dimension 0.75 (Esparza-Del Villar et al. 2017).

"The validity and reliability study of the Exercise Health Belief Model Scale has been established in Turkey" (Ciftci and Kadıoğlu 2020). The Cronbach alpha reliability coefficient of the exercise health belief model scale, which was adapted into Turkish, was found to be 0.87. The Crohnbach's alpha values of the sub-dimensions of the scale were 0.87 in the general health value sub-dimension, 0.76 in the perception of seriousness sub-dimension, 0.87 in the perception of benefit sub-dimension, 0.87 in the motivation sub-dimension, and 0.77 in the perception of sensitivity sub-dimension.

Data analysis

The data obtained from the research were analyzed using the SPSS 24.0 (SPSS Inc., Chicago, IL, USA) program. The distributions of the data were tested for normality with the Skewness–Kurtosis test. Data were analyzed using descriptive statistics, chi-square values, T-test for dependent and independent groups, Mann–Whitney U test, and Wilcoxon signed ranks test. Descriptive statistics were evaluated as number (n), percentage (%), mean ± standard deviation (mean ± SD). Statistical significance was accepted as $p < 0.05$.

Ethical dimension of research

Before starting the research, ethical permission from the Ethics Committee of a University (dated 23/11/2018-E.14750) and institutional permissions from the universities where the study was conducted (dated 14/02/2019-E.2361, 10/01/ 2019-665 dated and numbered) were received. Written informed consent was obtained from the students participating in the study with the Voluntary Consent Form.

Results

Of the students in the experimental group, 67.2% were women, 68.9% of them were between the ages of 20–22, 59% of the students were staying in dormitories, 41% of the students' mothers were illiterate, 29.5% of the students' fathers were primary school graduates, and 29.5% of the students' fathers have high school or higher education level. Of the students in the control group, 76.5% were women, 61.8% of them were between the ages of 20–22, 57.4% of the students were staying in dormitories, 38.2% of the students' mothers were illiterate, and 27.9% of the students' fathers were primary school graduates. As a result of the comparison of the descriptive properties of the experimental and control groups, it is seen that all variables are similar ($p > 0.05$) (Table 2).

It was determined that the experimental group students' post-test Exercise Health Belief Model Scale (EHBMS) total score averages were higher than the control group students' EHBMS total score averages. The difference between the post-test EHBMS ($t = –2.64$, $p = .009$) total score averages of the control and experimental group students was found to be statistically significant ($p < 0.05$) (Table 3). Nevertheless, it was determined that the difference between the pre-test and post-test in-group EHBMS ($t = –0.767$, $p = .448$) total score averages of the control group students was not statistically significant ($p > 0.05$) (Table 3). Moreover, the difference between the pre-test and post-test in-group EHBM ($t = –4.314$, $p = .000$) total score averages of the experimental group students was found to be statistically significant ($p < 0.05$) (Table 3).

The difference between the post-test MET ($U = –3.767$, $p = .000$) total mean scores between the control and experimental groups were found to be statistically significant ($p = 0.000$) (Table 4). However, it was determined that the difference between the pre-test and post-test MET total score averages of the control group students was not statistically significant ($p = 0.587$). Furthermore, the difference between the in-group pre-test and post-test MET total score averages of the experimental group students was found to be statistically significant ($p = 0.000$) (Table 4).

Table 2 Socio-demographic status of students

Variables	Experiment (61)		Control (68)		Test and değeri
	Number	%	Number	%	*p*-value
Gender					
Woman	41	67.2	52	76.5	χ^2= 1.370
Man	20	32.8	16	23.5	*p*= 0.242
Age					
17–19	12	19.7	16	23.5	χ^2= .723
20–22	42	68.9	42	61.8	*p*= .697
23 and above	7	11.4	10	14.7	
Place of residence					
Homestay	17	27.9	14	20.6	χ^2= 2.167
Rented accommodation	8	13.1	15	22.0	*p*= .338
Dormitory	36	59	39	57.4	
Education level of mother					
Illiterate	25	41.0	26	38.2	χ^2= .900
Literate	12	19.7	11	16.2	*p*= .925
Primary school graduate	13	21.3	20	29.4	
Secondary school graduate	5	8.2	5	7.4	
High school and above	6	9.8	6	8.8	
Education level of father					
Illiterate	5	8.2	7	10.3	χ^2= .515
Literate	7	11.5	7	10.3	*p*= .972
Primary school graduate	18	29.5	19	27.9	
Secondary school graduate	13	21.3	17	25.0	
High school and above	18	29.5	18	26.5	
Economic status					
Low	8	13.1	7	10.3	χ^2= .334
Medium	47	77.1	53	77.9	*p*= .846
High	6	9.8	8	11.8	
Are there areas suitable for doing sports in your area?					
Yes	29	47.5	23	33.8	χ^2= 2.515
No	32	52.5	45	66.2	*p*= .113
Is anyone in the family interested in sports?					
Yes	20	32.8	21	30.9	χ^2= .054
No	41	67.2	47	69.1	*p*= .817
Do you have any diseases?					
Yes	8	13.1	8	11.8	χ^2= .054
No	53	86.9	60	88.2	*p*= .816
Health situation					
Good	26	42.6	24	35.3	χ^2= .767
Moderate	30	49.2	37	54.4	*p*= .681
Bad	5	8.2	7	10.3	

$p < 0.05$ significance level. Fisher's exact chi-square test

Discussion

This study was conducted to determine the effect of the education program based on the Health Belief Model (HBM) on the physical activity beliefs and behaviors of university students.

The fact that the EHBMS total score averages of the experimental group were higher than that of the control group in the post-test shows that the applied training program improved the exercise health belief scores positively. Encouraging exercise in university students may be effective against a decrease in physical activity after graduation

Table 3 Distribution and Comparison of Students' Pre- and Post-Test EHBMS Total Mean Scores between and within groups

Scale	Min–Max	Control Group (n=68) Mean. ±SS.	Min–Max	Experimental Group (n = 61) Mean. ±SS.	Test and p value
Pre-test EHBMS total	106–150	124.33±9.14	103–160	123.62±10.98	t=.403* p = .688
Post-test EHBMS total	104–145	125.19±9.50	107–177	130.06±11.38	t=–2.648* p = .009
Test and p-value		t = –0.767** p = .448		t = –4.314** p = .000	

*T-test in independent groups, **T-test in dependent groups.

Table 4 Distribution and comparison of students' pre/post-test intra-group and inter-group MET total mean scores

Group	Pre-test	Post-test	Test and p value	
	Mean. ±SS.	Mean. ±SS.	Test	p-value
Control group (n = 68)	3717.22±2370.60	3824.35±2432.00	Zwc = 543**	p = .587
Experimental group (n = 61)	3805.22±2083.70	5407.80±2928.31	Zwc = 5.362**	**p**=.00
Test	U = –.856*	U= –3.767*		
p value	P = .392	**p= .000**		

*Mann–Whitney U test, ** Wilcoxon Signed Ranks test.

(Buckworth 2001). In the study conducted by Topçu Yalçın on students, similar to our result, it was found that the physical activity values of the experimental group increased significantly compared to the control group when the pre-test and post-test values of the experimental and control groups were examined after the training given to increase physical activity (Topçu Yalçın 2019). In the randomized controlled study of Nourian et al., 44 obese adolescents between the ages of 12–18 were included in the control group with no intervention, and 46 of them were included in the experimental group. A 12-week educational intervention program was applied using HBM in the experimental group. After the intervention, it was found that there were statistically significant increases in the knowledge, perceived sensitivity, self-efficacy, and health belief values of the experimental group participants compared to the control group (Nourian et al. 2017). In the study conducted by Leslie et al., students studying at two different universities were divided into control and experimental groups, and 8 weeks of physical activity training was applied to the experimental group. After the training, the physical activity values of the experimental group were found to be statistically significantly higher than the control group (Leslie et al. 2000). In the non-randomized controlled study of Holler et al., 31 of the physically inactive adults were included in the intervention group and 30 of them were included in the control group. No intervention was applied to the control group, but physical exercise training was given to the intervention group once a week for 15 weeks. While the physical activity behavior values of the intervention group were found to be statistically significant after the training, no change was found in the physical activity values of the control group (Holler et al. 2019). In Fischer and Bryant's study to examine the effect of certified personal trainer services on exercise behavior of female university students during the fall semester, there was a statistically significant improvement in the exercise behavior change scores of the experimental group who received personal trainer services; whereas there was a decrease in the exercise behavior change scores in the control group (Fischer and Bryant 2008).

In addition, in some other studies supporting the results of our study, it is shown that interventions increase physical activity levels (Boyle et al. 2011; Hsiao et al. 2005; Tully and Cupples 2011). In some studies, unlike our results, it was found that the difference in the scores of the experimental and control groups after the training was not statistically significant in terms of physical activity (Abu-Moghli et al. 2010; Buscemi et al. 2011; Werch et al. 2008).

McEwan et al. (2019) emphasize that theory-based interventions can lead to significant improvements on a more consistent basis in their meta-analysis study to compare the effects of theory-based and non-theory-based interventions on physical activity. The results of the current study overlap that of McEwan et al. in this respect.

This study shows that the applied training program increased the level of physical activity because the experimental group's MET score averages are higher than the control group in the post-test. Seasonal changes affect the physical activity levels of individuals (Pinelo Silva and Akleh 2018). The effects of seasonal changes experienced during the study on students' physical activity levels were ignored. This is the limitation of our study. In the literature, similar to our result, the increase in the total MET scores of the trained experimental group was found to be significantly higher in the intervention group than

in the control group (Sonkaya and Günay 2019). Sharp and Caperchione implemented a 12-week pedometer-based intervention program in their study with freshman university students in Canada. Unlike our result, the intervention participants are given a pedometer, monthly follow-up logs and follow-up e-mails are sent, and no intervention is made to the control participants. At the end of the study, all participants have a slight increase in physical activity compared to the beginning; however, there was no statistically significant difference between the intervention group and the control group (Sharp and Caperchione 2016). Choi et al. applied a physical activity program in their quasi-experimental study with a single-group pre-test/post-test design on 63 Korean university students. It is found that the program increased physical activity and the number of steps, while it decreased sedentary behavior levels (Choi et al. 2018). In the study conducted by Ardıç, the average number of steps per week during the intervention is examined by applying the health promotion program to adolescents. After all, it is found that the average number of steps in the experimental group increased significantly compared to the control group (Ardıç 2014). When the MET scores were recalculated after the health education in the study of Sonkaya and Günay, similar to our study, a statistically significant difference was found in the physical activity levels of the intervention group. Unlike our study, a statistically significant difference was found in the physical activity levels of the control group (Sonkaya and Günay 2019).

A statistically significant difference was found between pre-test and post-test MET total score averages after 12 weeks of training was given to 62 university students in the study conducted by İnce to evaluate the effectiveness of physical activity intervention for health promotion behaviors of university students as a single group of pre-test and post-test (Ince 2008). There is evidence that physical activity interventions in university settings can improve students' knowledge of well-being (Adams et al. 2006). Although there are few experimental studies in the literature, it has been determined that interventional studies increase the level of physical activity in individuals. This study supports the relevant literature in this sense.

Study limitations

The effect of seasonal changes experienced during the study on physical activity levels was ignored.

Conclusion

The HBM-based education program was determined to be effective in increasing the exercise health belief scores and MET values of university students.

In line with the results obtained from the study, HBM-based exercise development programs can be organized for university students to lead an active life by assigning school nurses on university campuses. Short messages can be sent through telephone operators to encourage participation in physical activity. In future studies, it is recommended that the HBM-based exercise training program be performed in a randomized controlled manner.

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Data collection: Çiftci Necmettin
Data analysis: Çiftci Necmettin, Kadıoğlu Hasibe.
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Declarations

Ethical approval Approval was obtained from Muş Alparslan University Scientific Research and Publication Ethics Committee for the research (date and number: 23/11/2018-E.14750). Verbal consent to participate in the research was obtained from the individuals by giving information about the purpose of the research, the method, the time they would spare for the research, and by declaring that participating in the research would not do any harm and that the participation was completely voluntary.

Consent to participate Written informed consent was obtained from the students participating in the study with the Voluntary Consent Form.

Consent for publication Publication permission was obtained from the participants.

Conflict of interest The authors declare that they have no conflict of interest.

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