Clinical and Experimental Health Sciences

The Effect of Preventive Nursing Interventions on Reduction of Obesity Risk University Students: A Randomized Controlled Trial

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ABSTRACT

Objective: The aim of the study was to assess the effect of an obesity prevention program to decrease obesity risk on university students at risk.

Methods: This is a parallel-group randomized controlled trial that is suitable for the Consolidated Standards of Reporting Trials (CONSORT) statement. The study was carried out at a University in Turkey. The study participants were 70 students (experiments 35 and control 35). The obesity prevention program, which includes education and practices about eating habits and physical activity, and motivational messages, was implemented for 11 weeks. Nutrition training attitude score, exercise nutrition behavior score and exercise benefit/barrier score, body mass index, waist size ratio, and body fat percentage are the outcomes of the research.

Dependent samples t-test, independent t-test, and intention to treat (ITT) were used for data analysis.

Results: The difference between the experimental group and the control group was statistically significant in attitude and behavior of nutrition exercise ($p<.05$). The difference between the experimental and control groups was significant in terms of scores on the exercise benefit/barrier scale ($p<.05$) but not significant on anthropometric measures. In the experimental group, the pre-test and the post-test differed in body mass index (BMI) and it was found that BMI was reduced after the obesity prevention program ($p<0.05$).

Conclusions: This study is important to reduce obesity risk among university students.

Keywords: Nursing, Nutrition, Obesity, Exercise, Randomized Controlled Trials, University Students

1. INTRODUCTION

Obesity is defined as an abnormal or excessive accumulation of fat in the body, leading to poor health (1). It has been reported that globally, 1.9 billion adults aged 18 years and over are overweight; of these, over 60 million are obese. Among adults aged 18 years and over, 39% are overweight and 13% suffer from obesity. Globally, 41 million children under the age of 5, and 340 million children and adolescents aged 5-19 years are overweight or obese (2), and the prevalence of obesity in OECD countries is 22.6% (3). The prevalence of obesity in Turkey is similar to those reported in developed Western countries (4, 5). In a study conducted in 22 countries, it is stated that the prevalence of obesity or overweight in university students is 22% (24.7% male and 19.3% female) (6).

The sooner obesity begins, the higher the risk of disease will be. Overweight and obese children are more likely to become obese in adulthood and to develop non-communicable diseases at an earlier age (7). Obesity is a disease that should be treated, as it leads to many health problems (8). Studies conducted have shown that interventions made for obesity treatment are long-continued, and these interventions have a limited effect on the decrease in body weight (9-11). To prevent obesity-accompanying diseases and the attendant financial burden that incurs due to treatment costs, it is highly important to develop various protective measures for people at risk of obesity before the occurrence of obesity (12-14). Therefore, obesity which is an economic effect on health systems and the individual should be prevented first, and then if necessary, treatment should be provided (8). Obesity can be prevented through healthy dietary habits augmented by physical activity (15). Current studies conducted generally focus on therapeutic interventions for people with obesity (9-11). However, there is a need to carry out more studies that examine the effects of the interventions applied to risk groups for obesity and the effects of these interventions on reducing the risk of obesity. It is more important to focus on preventing obesity rather than on treating obesity. The risk of

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obesity can be reduced by providing education on effective and sustainable eating habits to be followed at every stage of life, encouraging adolescents to exercise, and explaining the importance of physical activity (8, 16).

In the studies, it is seen that physical activity and nutrition are generally considered separate interventions, and obese individuals are included in the studies (9, 10). For this reason, the fact that the study was conducted in a group at risk of obesity and that it included interventions related to nutrition and physical activity, as well as the inclusion of individual and group activities in the program, differ from other studies.

Study Hypotheses

H1: The nutrition-exercise attitude scores of the university students receiving the obesity prevention program increase positively compared to the control group.

H2: The exercise benefits scores, of the university students receiving the obesity prevention program increase positively compared to the control group.

H3: The exercise barrier scores, of the university students receiving the obesity prevention program, decrease positively compared to the control group.

H4: The BMI of the university students receiving the obesity prevention program, decrease compared to the control group.

H5: The waist/hip ratio of the university students receiving obesity prevention program, decrease compared to the control group.

H6: The body fat percentages, of the university students receiving the obesity prevention program, decrease compared to the control group.

2. METHODS

2.1. Study Design

This study is a randomized, controlled trial using two parallel-group as an experimental and a control group in a pretest-posttest design. Reporting adhered to the CONSORT extension for parallel-group randomized controlled trials (17). This study is registered at ClinicalTrials.gov (ref. no: NCT03115229).

2.2. Study Setting and Participants

The study was conducted on 152 university students who were at risk of obesity and were studying in the Health Management Department at a University, in the 2015-2016 academic year in Turkey. The researchers performed a risk screening, to determine the reference population. As a result of the survey conducted with 152 students, this study determined that 29 students did not fall under any of the obesity risk groups. The exclusion criteria were applied to 123 students who were determined to be at risk for obesity. From these exclusion criteria results, the population for the randomized controlled trial ended up being 103 students who were between the ages of 19 and 24 and at risk of obesity.

Inclusion criteria; This study considered three key criteria to determine the risk of obesity; Pre-obesity (BMI: 24.9-29.9) (18) or Unhealthy nutritional habits (Global Status Report on Noncommunicable Diseases/GSRN 2010), or Physical inactivity (19).

Exclusion criteria; BMI less than 18.5 and greater than 29.9, under 19 or over 24 years old, regular drug use, any pre-existing health condition, and being pregnant.

2.3. Sample Size

The sample size of this randomized controlled trial was determined through power analysis, conducted using GPower 3.1 software (20). The study of Yurt and Yıldız, found the Nutrition-exercise attitude scale mean score and standard deviation value of the pre-test: 45.96 ± 6.45; post-test: 51.75 ± 6.67. The calculation was made considering this means score, and the minimum sample size was found to be 35 students should be included in both groups with 95% power and 95% confidence interval, 0.05 α error probability, and 0.8 effect size.

This study selected 70 students, from among the determined 103 students to be in the at-risk group, to form the study group by using a simple random numbers table. A total of 70 students, randomly selected, were randomly assigned to the control and experimental groups so that each group would have 35 students.

2.4. Randomization

This study used random stratification (by sex) to ensure randomization. After stratification, block randomization was performed. To ensure equal distribution in terms of gender in each group, this study created two strata: male and female. In the randomization stage, randomization was performed by a statistician, not the researcher, to prevent subjectivity and to conceal randomization. Shortly before beginning interventions, the researchers were informed about the groups that had been randomized. The experimental and control groups had several characteristics in common (Figure 1).

2.5. Data Collection and Tools

Study data were collected in two different rooms of the fitness center. Students' body fat percentage and waist/hip circumference were measured, and their BMI values were calculated. The researchers performed pre-and post-test measurements on students in the morning hours when the students were hungry, and with them in minimal clothing. For body fat percentage measurements, this study used the Tanita BC 418 brand weighing instrument. Then students

were administered questionnaires and scales assessing cognitive and behavioral variables. All data were collected by two researchers (one was a doctoral student in community health nursing and the other, a trainer who graduated from the Faculty of Sport Sciences) other than the researcher who conducted this study. In the RCT, the researchers were not blind to the intervention group or the person performing the intervention; however, data collectors, statisticians, and reporters were blind to these matters.

The primary outcomes were: nutrition–exercise attitude, exercise-nutrition behavior, and exercise benefit/barriers score. The secondary outcomes were: body mass index, waist-to-hip ratio, and body fat percentage. Before starting the interventions, this study performed anthropometric measurements of the participants (BMI, waist/hip ratio, and body fat percentage) and administered the measurement instruments.

2.5.1. Information Form

This form included questions on the sociodemographic characteristics and health status of the participants.

2.5.2. Nutrition-Exercise Attitude Scale

This scale was developed by Yurt, Save (21) to determine attitudes about nutrition and exercise. It is a 5-point Likert-type and one-dimensional scale consisting of 13 items. The Cronbach's Alpha of the scale was found to be 0.74. The lowest score that can be obtained from the scale is 13 and the highest score is 65. A high total score from the scale indicates a positive attitude toward nutrition and exercise.

2.5.3. Nutrition-Exercise Behavior Scale

Yurt, Save (21) developed this scale to determine behaviors about nutrition. It is a 5-point Likert-type scale consisting of 45 items and its Cronbach's Alpha value is 0.85. Items 7, 8, 9, 10, 11, 12, 14, 15, 17, 18, 20, 22, 30, 31, 32, 34, 35, 36, 37, 38, 39, 42, 43 were scored in the opposite direction. The scale consists of 4 sub-dimensions; Psychological Dependent Eating Behavior (PDEA), Healthy Nutrition-Exercise Behavior (HNEB), Unhealthy Nutrition-Exercise Behavior (UNEB), and Meal Pattern (MP). PDEA, score distribution is between 11-55. A low score indicates the absence of PDEA. HNEB, score distribution is between 14-70. A high score indicates healthy nutrition-exercise behavior. UNEB score distribution is between 14-70. A low score indicates the absence of unhealthy nutrition-exercise behavior. MP, score distribution is between 6-30. A high score indicates a good meal pattern.

2.5.4. Exercise Benefits/barriers Scale:

The Turkish adaptation of the scale developed by Sechrist, Walker (22) was made by Ortabag, Ceylan (23). This scale has two sub-dimensions Exercise Benefits Scale (EBES) and the Exercise Barriers Scale (EBAS). The Cronbach Alpha value is 0.87. EBAS items 4, 6, 9, 12, 14, 16, 19, 21, 24, 28, 33, 37, 40, and 42, EBES items 1, 2, 3, 5, 7, 8, 10, 11, 13, 15, 17, 18, 20, 22, 23, 25, 26, 27, 29, 30, 31, 32, 34, 35, 36, 38, 39, 41 and 43. The lowest score that can be obtained from the scale is 43 and the highest score is 172. The higher the score, the more the individual believes in the benefits of exercise. When the EBES is used alone, the score range is 29-116. The higher the score, the more positive believes in the benefits of exercise. When the EBAS is used alone, the score range is 14-56. The higher the score, the greater the perception of barriers to exercise (23).

2.6. Overview of the Intervention

Experimental group: The interventions were performed for the experimental group for 11 weeks. The interventions performed for the experimental group were divided into three categories as follows; Interventions for nutritional habits; including group training, individual interventions, and group events. Group training; during the first three weeks, training which included four sessions of 45 minutes about causes of obesity, right and wrong eating habits, and healthy cooking techniques were provided to students in the experiment by the researcher. Individual interventions: Every week, the researchers asked each student in the experimental group about their food consumption, using the "24-hour Recall Method". Nutritional counseling was given individually. Group events; to increase fruit/vegetable consumption and to improve the motivation of students towards healthy nutrition salad competitions were organized within the kitchen competition in the faculty. Interventions for physical activity; group training, group exercises, individual interventions, and group events were applied for 8 weeks. Interventions were performed via social media; throughout 11 weeks, almost 100 WhatsApp and short text messages were sent to the students. See this study protocol for detailed information (24).

Control group: Since there is no health promotion program for students on campus, the students in this group continued their routine practices.

The following precautions were taken to avoid contamination in the study. Experimental and control group students were asked not to talk to each other about education. The training of the experimental group was given outside the lesson hours, without the knowledge of the control group. Students were informed about keeping the interventions related to exercise confidential.

2.7. Ethical Consideration

Permission was obtained from the Ethics Committee at a University (decision number: 2015/75). The participants were informed about the research purposes and benefits/risks of intervention and procedures. Written informed consent was obtained from all the participants.

2.8. Statistical Analyses

A dependent samples t-test was performed to evaluate the pre-and post-test results of the groups, and an independent samples t-test was used to evaluate the difference between the control and experimental groups. The similarity of control variables between the groups was analyzed with the Chi-square test. The obtained data were tested at the p<.05 significance level and bidirectionally. Intention to treat (ITT) analysis was performed in the evaluation of the data. In addition, effect size (d) and confidence interval were calculated. The collected study data were analyzed by computer using SPSS 20.0 statistical analysis software by a statistician.

3. RESULTS

There was no statistically significant difference between the experimental and control groups in terms of sociodemographic characteristics (p>.05) (Table 1).

In examining the post-test scores of the groups, as shown in Table 2, it was found that there was a statistical difference between the Nutrition-Exercise Attitude Scale (NEAS) post-test scores of the experimental and control groups, with the scores of the experimental group being positively higher compared to those of the control group (p<.05), and the effect size was at a high level.

It was determined that the PDEA score of the control group increased statistically significantly in the post-test compared to the pretest (p<.05). Psychological dependent eating habits of this control group caused their behavior to be adversely affected. The inter-group comparison showed that the Healthy Nutrition-Exercise Behavior (HNEB) scores of the experimental group after the application of the nursing interventions increased compared to those of the control group, which was an indication that the nursing interventions were effective (p<.05), and the effect size was at a high level. It was determined that the UNEB scores of the experimental group decreased significantly after the experiment compared to the pre-experiment, and the unhealthy nutrition and exercise behavior changed positively (p<.05), and the effect size was found to be high. This comparison also showed that the experimental group had higher scores on the post-test Meal Pattern (MP) than those of the control and that the meal pattern positively changed in the experimental group (p<.05). The effect size was also found to be high (Table 3).

The results indicated that the experimental group had higher scores on the Exercise Benefits/Barriers Scale's Total Score (EBBS) for the post-test than those of the control group and the attitudes of the experimental group participants towards the benefits of exercise were shown to have changed positively (p<.05), with the effect size being at a high level. The fact that the experimental group had higher scores on the EBES for the post-test than those of the control group indicates that the nursing interventions had a positive effect on the attitudes of the experimental group participants towards the benefits of exercise (p<.05), and the effect size was high. The inter-group comparison determined that the experimental group had lower scores on the post-test EBAS than those of the control group, which indicated that the nursing interventions reduced the barriers to exercise and had a positive effect (p<.05), with the effect size being at a high level (Table 4).

According to Table 5, no statistically significant difference was found between the experimental and control groups in terms of BMI, waist/hip measurements, and body fat percentage means (p>.05). However, there was a significant change in BMI in the experimental group pre-test and post-test (p<.05).

Interventions carried out within this study had no negative effects and no participants were harmed during the study.

Table 1. *Distribution of similarities in socio-demographic and health characteristics of students in the experimental and control groups*

Variable	Experimental (n: 35)		Control (n: 35)		X^2	p
	n	%	n	%		
Gender						
Female	26	74,3	26	74,3	0,000	1,000
Male	9	25,7	9	25,7		
Grade						
1. Grade	11	31,4	10	28,6	4,667	0.097
2. Grade	14	40	7	20,0		
3. Grade	10	28,6	18	51,4		
Perceived Economic Status						
Good	6	17,1	5	14,3	0,108	0.743
Moderate	29	82,9	30	85,7		
Presence of obesity in first-degree relatives						
Yes	8	22,9	11	31,4	0,650	0.420
No	27	77,1	24	68,6		

X^2: Chi-square test.

Table 2. *Means of pre-test and post-test of nutrition-exercise attitude scale (NEAS) scores measure for experimental and control groups*

Groups		Pre-Test	Post-Test	Comparison Pre-Test/Post-Test		Effect Size (%95 CI)
		Mean±SD	Mean±SD	t[a]	*p	d
Experimental (n:35)		39.86±1.35	51.80±0.89	-9.208	.000	0.982 (0.991 – 0.964)
Control (n:35)		41.11±1.14	42.86±0.89	-1.745	.090	
Comparison Groups	t[b]	-0.711	7.111			
	*p	0.479	0.000			
Effect Size (%95 CI)	d		0.980 (0.968 – 0.988)			

**p<0.001*

Notes: t[a] = dependent samples t-test, t[b]= independent sample t-test, SD = Standard Deviation.

Table 3. *Means of pre-test and post-test of nutrition-exercise behavior scale (nebs) scores measure for experimental and control groups*

Nutrition-Exercise Behavior Scale's (NEBS) sub-dimensions means		Pre-Test	Post-Test	Comparison Pre-Test/ Post-Test		Effect Size (%95 CI)
		Mean±SD	Mean±SD	t[a]	*p	d
Psychological Dependent Eating Behavior (PDEA)						
Experimental (n:35)		28.14±1.12	27.37±1.07	0.760	.43	0.331 (-0.003 – 0.598)
Control (n:35)		26.63±0.86	29.29±1.02	-2.558	.015	
Comparison Groups	t[b]	1.074	-1.296			
	p	0.287	0.199			
Effect Size (%95 CI)	d		0.675 (0.785 – – 0.523)			
Healthy Nutrition-Exercise Behavior (HNEB)						
Experimental (n:35)		40.09±1.47	52.51±1.15	-8.866	.0000	0.978 (0.989 – 0.956)
Control (n:35)		41.86±1.18	42.71±1.13	-0.683	.499	
Comparison Groups	t[b]	-0.937	6.078			
	*p	0.352	0.000			
Effect Size (%95 CI)	d		0.974(0.958 – 0.984)			
Unhealthy Nutrition-Exercise Behavior (UNEB)						
Experimental (n:35)		39.17±1.12	36.09±0.93	3.702	.001	0.831 (0.688 – 0.912)
Control (n:35)		36.97±1.16	37.29±1.09	-0.332	.742	
Comparison Groups	t[b]	1.360	-0.839			
	p	0.178	0.404			
Effect Size (%95 CI)	d		-0.510 (-0.665 – – 0.312)			
Meal Pattern (MP)						
Experimental (n:35)		19.83±0.56	22.83±0. 55	-5.074	.0000	0.938 (0.969 – 0.880)
Control (n:35)		21.03±0.73	20.29±0.87	1.552	.130	
Comparison Groups	t[b]	-1.310	2.471			
	p	0.194	0.016			
Effect Size (%95 CI)	d		0.867 (0.794 – 0.915)			

**p<0.001*

Notes: t[a] = dependent samples t-test, t[b]= independent sample t-test, SD = Standard Deviation.

Table 4. *Means of pre-test and post-test of exercise benefit /barriers scale total and subscale scores measure for experimental and control groups*

The exercise benefit /barriers scale		Pre-Test	Post-Test	Comparison Pre-Test/Post-Test		Effect Size (%95 CI)
Exercise Benefits/Bariers Scale's Total Score (EBBS)		**Mean±SD**	**Mean±SD**	**t[a]**	***p**	**d**
Experimental (n:35)		120.57±1.86	129.40±1.59	-3.615	.001	0.930 (0.964 – 0.865)
Control (n:35)		121.08±1.92	121.80±2.16	-0.339	.737	
Comparison Groups	**t[b]**	-0.192	2.824			
	p	0.848	0.006			
Effect Size (%95 CI)	**d**		0.894 (0.834 – 0.933)			
Exercise Benefits Scale (EBES)						
Experimental (n:35)		90.66±2.17	103.00±1.84	-4.655	.000	0.950 (0.975 – 0.902)
Control (n:35)		90.03±2.00	91.08±2.20	-0.563	.577	
Comparison Groups	**t[b]**	0.213	4.150			
	***p**	0.832	0.000			
Effect Size (%95 CI)	**d**		0.946 (0.914 – 0.966)			
Exercise Barriers Scale (EBAS)						
Experimental (n:35)		29.91±0.84	26.40±0.89	4.191	.000	0.896 (0.802 – 0.947)
Control (n:35)		31.05±0.84	30.71±0.92	0.493	.625	
Comparison Groups	**t[b]**	-0.961	-3.355			
	p	0.340	0.001			
Effect Size (%95 CI)	**d**		0.921 (0.950 – 0.875)			

**p<0.001*

Notes: t[a] = dependent samples t-test, t[b]= independent sample t-test SD = Standard Deviation.

Table 5. *Means of pre-test and post-test of some anthropometric measurements (BMI, waist/hip measurements, and body fat percentage) scores measure for experimental and control groups*

Anthropometric measurement		Pre-Test	Post-Test	Comparison Pre-Test/Post-Test		Effect Size (%95 CI)
		Mean±SD	**Mean±SD**	**t[a]**	**p**	**d**
BMI						
Experimental (n:35)		22.56±0.37	22.30±0.31	2.185	.036	0.352 (0.021 – 0.613)
Control (n:35)		22.54±0.48	22.67±0.47	-1.539	.133	
Comparison Groups	**t[b]**	0.038	-0.651			
	p	0.970	0.517			
Effect Size (%95 CI)	**d**		0.418 (0.595 – 0.203)			
Waist/hip measurements						
Experimental (n:35)		0.79±0.01	0.78±0.01	1.327	.193	0.465 (0.156 – 0.691)
Control (n:35)		0.79±0.01	0.79±0.01	0.601	.522	
Comparison Groups	**t[b]**	-0.333	0.698			
	p	0.741	0.487			
Effect Size (%95 CI)	**d**		-0.429 (-0.603 – – 0.216)			
Body fat percentage						
Experimental (n:35)		23.80±1.37	23.56±1.33	0.649	.520	0.091 (-0.250 – 0.412)
Control (n:35)		23.04±1.18	22.89 ±1.21	0.323	.729	
Comparison Groups	**t[b]**	0.420	0.370			
	p	0.676	0.713			
Effect Size (%95 CI)	**d**		– 0.253 (0.019 – 0.461)			

Notes: t[a] = dependent samples t-test, t[b]= independent sample t-test, SD = Standard Deviation.

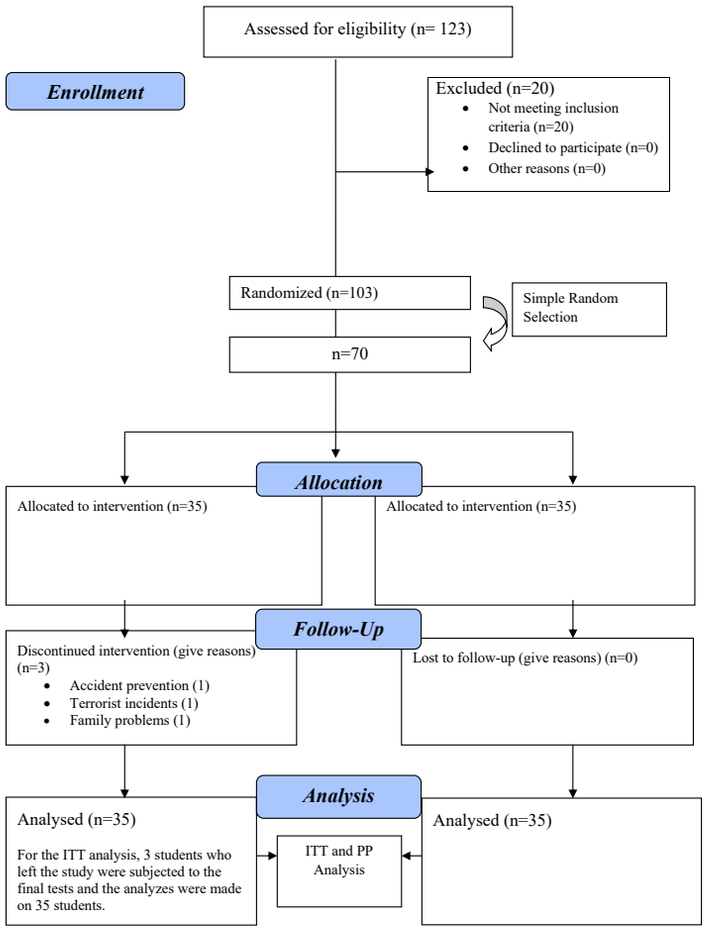

Figure 1. *CONSORT flow diagram of this study.*

4. DISCUSSION

Study results on the application of preventive nursing interventions, which included healthy nutrition and physical activity training, practices, and motivational messages sent via social media, showed that the students' attitudes towards nutrition and exercise had changed positively, as determined by the post-test scores, and that the effect size was at a high level, according to inter-group comparisons. Studies conducted have revealed that training programs and practices on nutrition attitude were effective in reducing obesity risk (25, 26).

According to the inter-group comparison, the experimental group had higher scores on healthy nutrition/exercise behavior and MP in the post-test than those of the control group, which shows that during the 11-week-intervention, the healthy nutrition behavior and meal pattern of the experimental group positively changed, with the effect size being high and confidence intervals being close. In addition, it was observed that unhealthy nutrition and exercise behavior in the experimental group decreased after the interventions and changed positively. It was further observed that the nursing interventions, which included the four basic nursing interventions of the Omaha System (Health education-counseling-guidance, Treatment, and procedure, Case management, Surveillance) (27) had positive effects on nutrition, exercise, and meal patterns of the students. From these results, it was demonstrated that providing training programs on nutrition and physical activity and culinary practices, conducting weekly personal counseling sessions, assessing nutritional status using the 24-hour recall method, and sending motivational messages via social media, all had positive effects on the nutrition-exercise behaviors of the students. It has been reported that promoting healthy lifestyles to prevent obesity is highly important in terms of public health (28). An intervention study conducted with female university students between the ages of 18 and 26 revealed that the interventions applied to the experimental group resulted in a considerable decrease in caloric intake and carbohydrate consumption, as well as an improvement in their nutrition behavior (29). A systematic review study conducted on training programs provided to address the nutritional habits of computer-based obesity determined that computer-based programs positively changed nutritional habits and physical activity (30). An intervention study designed to prevent obesity in adolescents through an Internet program found a significant difference in healthy nutrition behaviors and physical activity and reported

that school-based programs were suitable for adolescents in terms of preventing obesity and developing healthy behaviors (25). The results reported in another intervention study support the findings of the present study showing that the interventions made were effective in improving healthy nutrition-exercise attitude and behavior (31-36). The relevant literature shows that the training programs and practices developed on healthy nutrition and exercise had significant effects on forming healthy lifestyles and especially on developing healthy nutrition behaviors and attitudes. The present study results are in line with those presented in the literature. It is believed that nursing interventions performed to improve attitudes on nutrition and exercise and attendant behaviors lead to a decrease in the risks of nutrition and physical activity for students.

In the pretest-posttest comparison of the students in the control group, at the end of the 11-week period, it was determined that the psychological dependent eating behaviors of the students changed negatively and the effect size was high in the negative direction. Psychological dependent eating behavior has a characteristic that changes over time. This situation suggests that the eating behaviors of the students who did not receive intervention during these periods may be negatively affected since the post-test measurements are close to the final exam week of the students.

Compared to the control group, the attitudes of the experimental group on the benefits of exercise positively changed on the post-test; this change suggests that the interventions were highly effective in the experimental group, and the confidence interval was close. Post-test comparisons between groups showed that the nursing interventions made for the experimental group reduced the barriers to exercise and provided positive changes; the effect size was high, and the confidence intervals were close. In this context, it is believed that the training programs on physical activity, weekly physical activities, trekking, cycling events, and pedometer usage all had positive effects on the attitudes of students toward the benefits of exercise. An intervention study conducted with adolescents revealed that physical activity practices improved the educational skills of students and motivated them to continue school sports (37). According to another intervention study involving a control group and experimental group, the diet was shown to result in a decrease in body weight for the experimental group, while combined treatments (i.e. diet and physical activity) were found to have similar results for the experimental and control group in the short term, in the long-term, when diet and physical activity were combined, there was a greater sustained decrease in body weight. It was determined that programs which are based only on physical activity are less effective in obesity prevention than combined treatments, which include both nutrition and physical activity (11). The literature review showed that healthy nutrition and regular physical activity have significant effects on obesity prevention. To get a person to start exercising, the person must believe in the benefits of exercise and that perceived barriers to physical activity be reduced. Intervention studies have emphasized that the combined practices involving both physical activity and nutrition are more effective in obesity prevention (11, 38, 39). Furthermore, it is believed that interventions are effective in helping individuals to understand the benefits of exercise and to realize barriers to physical activity.

The present study found no statistical difference in the post-test between the experimental and control groups in terms of BMI, waist/hip ratio, and body fat percentage. Hebden, Chey (10) stated that interventions that last four or more months provide a greater decrease in body weight and that the effect of interventions carried out for less time and involving multiple lifestyle changes on the control of body weight had no definitive impacts on young adults. A study stated that BMI, a low-fat mass percent, and lower fat mass are associated with low dietary energy density. In future study may provide low dietary energy density for decrease BMI, waist/hip ratio, and body fat percentage (40). Additional experimental studies that carry out interventions for longer periods to decrease anthropometric measurements would be beneficial. Considering that the main purpose of the present study was to reduce the risks associated with obesity, it can be argued that the 11-week intervention study was successful in doing this; however, no change was found in the anthropometric measurements of the participants.

There were two main limitations to this study. First, the students in the experimental and control groups were taking courses in the same classroom at the university and living in the same dormitory, and therefore, it is possible that their daily interaction mutually impacted their behavior and attitudes. Moreover, this study was limited to 11 weeks due to the academic calendar of the students.

5. CONCLUSION

At the end of this study, it was concluded that the preventive nursing interventions involving multiple actions for obesity prevention that were applied to university students in a planned way, positively benefit the students' nutrition-exercise attitudes and behavior and improves their perceptions of the benefits of exercise, the results of which reduce the risk of obesity. The present study revealed the importance of nursing interventions in taking preventive measures for obesity in university students.

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Author Contributions:

Research idea: TO, BA
Design of the study: TO, BA
Acquisition of data for the study: TO
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