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RESEARCH ARTICLE

The Effect of a Workplace Health Promotion Program in Nurses: A Repeated Measures Design

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ABSTRACT

There is evidence that workplace health promotion programs that support healthy living conditions protect and improve employees' health. Nevertheless, studies on the holistic evaluation of health behaviors and cardiovascular risk management in nurses are limited. Reflecting on this, we designed a workplace health promotion program based on the components of the Health Promotion Model and evaluated its effect on healthy behaviors and cardiovascular risk in female nurses. A repeated measures design with a pretest-posttest control group framework was used. The study included 72 female nurses, 32 in the experimental and 40 in the control group. A six-month-long intervention consisting of group training, moderate-intensity AeroPilates exercise, and individual counseling was carried out within the scope of the workplace health development program. In data analysis, 2 (group) × 3 (measurement time) repeated measures analysis of variance was employed to examine the effect of the intervention on the dependent variables. Following the nursing interventions implemented within the scope of the workplace health promotion program, the healthy lifestyle behaviors and the mean physical activity and nutrition scores of the nurses in the experimental group increased significantly, and the program was found to be effective in reducing nurses' cardiovascular risk, with a significant decrease in systolic and diastolic blood pressure.Implementing and sustaining workplace health promotion programs designed based on the health promotion model is recommended to improve the health behaviors and cardiovascular risk management of nurses working in hospitals with intensive working hours in a shift system.

INTRODUCTION

Cardiovascular diseases (CVDs) are the leading causes of death worldwide. It is estimated that approximately 17.9 million people die due to CVDs every year (World Health Organization [WHO], 2023). Turkey is among the high-risk countries in CVD mortality rates (European Society of Cardiology [ESC], 2021), and 33.2% of all deaths in Turkey in 2021 were due to CVDs, with mortality rates being higher in women (Republic of Türkiye Ministry of Health [MoH], 2021). Many risk scores, such as INTERHEART, PROCAM, Framingham Risk Score, Reynolds, WHO/ISH, and SCORE, have been created to identify risky individuals, predict the risk of the disease, and develop approaches for risky individuals in the fight against CVDs (Civek and Akman, 2022). These scoring systems focus on risk factors in the fight against CVDs. Many risk factors play a role in the development of CVDs (ESC, 2021). The main causal and modifiable risk factors are lipoproteins containing apolipoprotein-B, high blood pressure (BP), smoking, diabetes mellitus, and adiposity, and other modifiable risk factors are mostly related to behavior patterns, such as psychosocial stress, low socio-economic status, unhealthy diet, and sedentary lifestyle (ESC, 2021). Fortunately, CVDs can be largely prevented by interventions on modifiable factors (MoH, 2015).

In the context of the total risk approach, it is estimated that the incidence of CVDs can be halved by controlling BP, obesity, cholesterol, and smoking, which are modifiable risk factors (MoH, 2015). Effective tools in cardiovascular risk (CVR) management for risk factors include raising individuals' awareness about healthy lifestyle behaviors (HLBs) and carrying out interventions to help them acquire these behaviors (Civek and Akman, 2022). According to Pender's Health Promotion Model (HPM), HLBs, which increase the level of well-being throughout life as well as protecting against diseases, involve health responsibility, physical activity (PA), nutrition, interpersonal relationships, spiritual development, and stress management (Pender, Murdaugh and Parsons, 2006). M. A. Workplaces are appropriate environments to reach the adult population to implement health promotion interventions and assess the health-related issues they face in their work environments, which will increase HLBs and reduce CVR.

Hospitals that provide uninterrupted healthcare services are among the workplaces where employees face many health-related risks. Nurses, who constitute a large group of healthcare professionals, are among the risk group in terms of factors that increase the development of CVD, as well as the adverse effects of working in shifts/on-call systems at changing hours (Johnson et al., 2020). It has been reported that workplace health promotion programs (WHPP) are effective in areas, such as the promotion of breastfeeding for female employees from different professions, preventing a sedentary lifestyle, improving body composition, reducing CVR, and alleviating premenstrual symptoms (Jiménez-Mérida et al., 2020). WHPP topics in nurses are mostly on improving mental health (Akyurek, Avci, and Ekici, 2022; Schaller et al, 2022), nutrition, and PA (Brogan et al., 2022). No comprehensive WHPP study developed for HLB and CVR management in nurses was found. To address this gap, we designed a WHPP based on the components of the health promotion model and evaluated the effect of the WHPP on HLB and CVR in nurses The research question was "*What is the effect of the workplace health promotion program designed according to the health promotion model on healthy lifestyle behaviors and cardiovascular risk in female nurses*?"

MATERIALS AND METHODS

Study design and participants

A repeated measures design with a pretest-posttest control group framework was employed. The research was conducted between March 2017 and March 2018. The population of the research included nurses working in medium-sized public hospitals in the central district of Ankara province in Türkiye. The experimental and control groups of the study were selected from two different hospitals to exclude the possible effect of social interaction between nurses in the workplace environment on the interventions to be carried out within the scope of the study. The population included 174 nurses from the hospital that was specified as the experimental group and 246 nurses from the hospital that was specified as the control group. Criteria for inclusion in the sample were (a) working as a nurse in the hospitals where the research was conducted, volunteering to participate in the research, being aged ≥40 years, and being in the low or medium risk group according to the SCORE score. Exclusion criteria were having a history of CVD, using cholesterol-lowering medication, using antihypertensive medication, planning a pregnancy, being pregnant, giving birth in the past 12 months, having an extremity injury with continuing complaints, having orthopedic problems, exercising and/or dieting regularly in the past six months, reluctance to deliver written consent, and having plans for a diet and/or regular exercise within six months from the onset date of the study. Criteria for dismissal from the sample were quitting the study voluntarily, starting a different exercise/diet/treatment program, becoming pregnant, and being transferred to another hospital during the research.

Dependent variables of the research were HLB (mean scores on the total HLB Scale-II and PA and nutrition sub-dimensions), the level of knowledge about CVR factors (mean CARRF-KL scale score), general self-efficacy (mean General Self-Efficacy Scale (GSE) score), and the level of CVR (SCORE risk score, total Cholesterol, HDL cholesterol, LDL cholesterol, fasting triglyceride, total cholesterol/HDL cholesterol ratio, systolic and diastolic BP, body mass index (BMI), waist circumference, and waist-hip ratio). The independent variable of the research was participation in the WHPP.

A power analysis was performed for the planned sample size of the study. In this analysis, type I error is often taken as 0.05, and type II error is taken as 0.20. The value of the type II error is what makes the statistical power of the study 0.80 (Howell, 2013). These values were also utilized in this study. The pre-test (0th month), post-test (3rd month), and follow-up (6th month) measurements of the experimental and control groups were taken. Analysis of variance for repeated measures that involves one intra-group and one inter-group variable is suitable for analyzing this type of data (Howell, 2013). The power analysis was conducted on the G*Power version 3.1 software in line with this statistical test (Faul et al., 2009). The correlation coefficient between the measurement results was taken as 0.8, and the effect size value, Cohen's (1992) f statistic, was taken as 0.35. According to the G*Power output, the sample size of the study was calculated as 29 for each group. Nurses were visited in their clinics. Invitations were prepared for the nurses who would form the experimental group to introduce the research and the WHPP program and they were pinned on the boards in nurse rooms. Nurses in the control group were visited in their clinics and invited to the study. An introductory presentation lasting half an hour was held in the meeting room of the hospital. The study started with 35 individuals in the experimental group and 48 in the control group. The research was completed with 32 participants in the experimental group and 40 in the control group (Figure 1).

INSERT FIGURE 1 HERE

Pender designed the HPM by making use of social cognitive models to explain the multidimensional health-promoting lifestyle pattern in the context of nursing and behavioral sciences (Pender et al., 2006). Pender's model has been widely used as a framework and guide in health promotion research (Al-Kandari and Vidal, 2007; Callaghan, 2006; Lee and Loke, 2005). The behaviors that will ensure this promotion play a key role in health promotion practices (Palank, 1991). Health behavior is an important concept because, as in CVD, a portion of the mortality caused by leading causes of death depends on behaviors and these behaviors can be modified (Türkeri, 2006). Workplaces are the most suitable places to reach the adult population to teach these behaviors, evaluate the health-related issues they face in their workplaces, and implement health promotion interventions in order to create a healthy work environment (Blix, 1999). In this context, the theoretical framework of the research was based on Pender's HPM.

Assessments

In this study, the pre-test (0th month), post-test (3rd month), and follow-up (6th month) data of the experimental and control groups were collected. The data collection tools that were used in the study and were based on the components in Pender's Model were as follows:

Systematic Coronary Risk Evaluation (SCORE) Chart: This is one of the CVR estimation systems, and unlike other systems, it aims to predict not only the risk of coronary heart disease but also the 10-year risk of death due to CVDs (Conroy et al., 2003). Variables used in SCORE risk estimation are age, gender, TC, HDL cholesterol, systolic BP, and smoking. Separate charts have been created for low- and high-risk countries in the European region and they have been recalibrated for many European countries. The electronic version of SCORE is accessible from HeartScore (European Association of Preventive Cardiology [EAPC], 2018) for Türkiye. ESC and the Turkish Society of Cardiology recommend the use of the SCORE system in Turkish samples for CVR assessment. Therefore, the SCORE risk chart was employed in this study to estimate the participants' CVR and calculate the SCORE score. SCORE risk categories are classified as very high, high, moderate, and low risk. Lifestyle changes are recommended to individuals according to these risk categories, and they become guiding in determining treatment targets. Individuals in very high and high-risk groups should be given recommendations about lifestyle changes, and the physician should make treatment-oriented plans for them based on team collaboration (Piepoli et al., 2016). Since nursing interventions for lifestyle changes were planned in this study, one of the inclusion criteria for the sample was determined as being in the low or medium-risk group according to the SCORE score.

Personal Information Form (PIF) was prepared by the researchers. It consists of questions about participants' characteristics, such as age, gender, working hours, and the presence of CVD in the family.

Previous Behaviors Information Form (PBIF) was prepared by the researchers. It includes questions about the participants' meal patterns, consumption of water/sugary beverages, eating patterns at work and home, dieting status, characteristics of the diet, weight and targeted weight, nutritional supplement intake, and PA status.

Eating Monitoring Form (EMF) was created by the researchers to monitor the participants' three-day eating/drinking behavior. It was used to collect information about when participants ate and drank in a day, where and with whom they ate/drank, the amount of the food they ate, what was felt or thought during eating, and how this eating behavior was interpreted.

Cardiovascular Risk Diagnosis Form (CVRDF) was prepared by the researchers to collect data about laboratory results of the participants' biochemistry parameters (total cholesterol, HDL cholesterol, total cholesterol/HDL ratio, LDL cholesterol, and triglyceride), anthropometric measurements (waist and hip circumference, waist-hip ratio, and systolic and diastolic blood pressure, height and weight, BMI), presence of CVD in the family, smoking status, and SCORE score.

The Healthy Lifestyle Behavior Scale-II (HLBS-II) was developed by Walker and Hill-Polerecky (1996) and adapted into Turkish by Bahar et al. (2008). It is used to measure health promotion behaviors about an individual's healthy lifestyle. Both the scores of the dimensions and the total scale score of this six-dimensional scale are used. The sub-dimensions are health responsibility, PA, nutrition, spiritual development, interpersonal relationships, and stress management. The scale has a four-point Likert format and 52 items. All items are positive. Scores on the scale range between 52 and 208. High scores on the scale indicate that the individual applies HLBs at a high level. Cronbach's α coefficients in the adaptation study ranged between 0.64 and 0.80 for dimension scores and 0.92 for the total score (Bahar et al., 2008). In this study, the scores on the PA and nutrition sub-dimensions and the total scale were taken into account and Cronbach's α coefficients for these scores were found as follows: total scale score: 0.91 in the pre-test, 0.94 in the post-test, and 0.91 in the follow-up; the PA sub-dimension: 0.78 in the pre-test, 0.81 in the post-test, and 0.82 in the follow-up; the nutrition sub-dimension: 0.60 in the pre-test, 0.61 in the post-test, and 0.61 in the follow-up.

The Cardiovascular Disease Risk Factors Knowledge Level Scale (CARRF-KL)

This scale was developed by Arıkan et al. (2009) to measure the level of knowledge about CVD risk factors in adults. The first four of the 28 items on the scale are about CVD characteristics, 15 items are about risk factors, and nine items are about the result of change in risk behaviors. Each correct answer is assigned one point, and scores on the scale range between 0 and 28. Higher scores on the scale indicate that the individual's level of knowledge about CVD risk factors is high. Cronbach's α coefficient calculated in the scale development study was 0.77, and the test-retest reliability coefficient was 0.85. In this study, Cronbach's α coefficient was calculated as 0.83 in the pre-test, 0.97 in the post-test, and 0.97 in the follow-up.

The General Self-Efficacy Scale (GSE)

This scale was developed by Schwarzer and Jerusalem (1995) to measure the self-efficacy of individuals aged 12 and over. It was adapted into Turkish by Yeşilay et al. (1996). The scale was first developed with 20 items and was later reduced to ten items. Scores on this latest version vary from 10 to 40. Higher scores on the scale indicate that the individual has a high level of self-efficacy belief. Cronbach's α coefficient in studies conducted in 23 countries with this scale was found to be between 0.76 and 0.90. In this study, Cronbach's α coefficient was calculated as 0.87 in the pre-test, 0.85 in the post-test, and 0.90 in the follow-up.

The intervention procedure

The SCORE score of the nurses who volunteered to participate in the study was determined using the HeartScore application (EAPC, 2018). Nurses whose SCORE score was classified as low (<1%) and medium (1-5%) risk levels and who met the sampling criteria were included in the study. Pre-test data of the experimental group were collected using the PIF and the PBIF, EMF, CVRDF, HLBS-II, CARRF-KL, and GSE scales. Posttest and follow-up data were collected using the CVRDF, the HLBS-II, the CARRF-KL, and the GSE scales. The pretest data of the control group were collected using the PIF, CVRDF, HLBS-II, CARRF-KL, and GSE scales. Posttest and follow-up data of this group were collected using the CVRDF, HLBS-II, CARRF-KL, and GSE scale.

Participants' BP, anthropometric, and laboratory measurements were taken at the time when pretest, posttest, and follow-up data were collected. The systolic and diastolic BP of the participants was measured according to the recommendations of the Turkish Society of Cardiology (2000). The classification of the American Heart Association (2011) was taken as a reference for the measurement results. Venous blood was taken to determine the participants' TC, LDL-C, HDL-C, and TG values. Since 12 hours of fasting is required only for TG measurement (Perk et al., 2012), participants were told to fast after 10 p.m. A code was determined for each participant, age and gender information was added to the code, and this code was written on a label, which was stuck on the biochemistry tube. Blood samples taken in the morning hours of the day shift were kept at room temperature for 30 minutes and then transferred to a refrigerated container, not more than two hours before centrifugation. Blood samples taken from the participants were measured in a private medical laboratory. The list containing the code, age, and gender information of the participants was delivered to the laboratory along with the blood taken. Cholesterol values were evaluated according to the recommendations of the ESC (Perk et al., 2012). The body weight and height of the participants were measured to calculate BMI, and the measurements were made according to the WHO (1995) recommendations. The BMI classification of the WHO (2012) was taken as a reference for the measurement results. Participants' waist and hip circumferences were measured and evaluated according to the WHO (2008) recommendations. The waist-hip ratio was calculated by dividing the waist circumference by the hip circumference and was evaluated according to the recommendations of the International Diabetes Federation (2006). Post-test and follow-up data were collected using the CVRDF, HLBS-II, CARRF-KL, and GSE scales. Pre-test data of the control group were collected using the PIF, CVRDF, HLBS-II, CARRF-KL, and GSE scales. Posttest and follow-up data were collected using the CVRDF, HLBS-II, CARRF-KL, and GSE.

Intervention: The WHPP

All phases of the intervention were carried out by the primary researcher. The intervention was carried out in three stages: group training, moderate-intensity AeroPilates exercise, and individual counseling within the scope of the WHPP. The content of the group training consisted of three parts: (a) the impact of working life on the CV (cardiovascular) health of nurses (workplace risks and lifestyle-related risks); (b) CVD (characteristics, prevalence, risk factors, and disease prevention); and (c) nurses' protection from CVDs (maintaining a healthy weight, healthy eating, and PA). The content of the group training was finalized according to the opinions and suggestions of experts. The training was carried out in the training hall of the hospital in two-hour sessions at noon for a month. An average of three to seven people attended each session. The content of the training program was prepared as a training guide and shared with the participants.

A medium-intensity AeroPilates exercise, which was developed by an exercise physiologist (Akgün, 2016), could be applied at home or work, and did not require any sports equipment, was applied. This exercise consists of 15 movements, takes approximately 10 minutes to perform, and is recommended to be done every day and three times a day. Its daily frequency varies by the individual's weight. After the training program was implemented, a 10-minute video showing the implementation of the exercise was sent to participants' mobile phones via the WhatsApp application. Information about exercise movements, their features, and points to consider during

their implementation was included in the training guide given to the participants at the end of the training program.

Participants were given individual counseling. The individual health file created for each participant after the group training included their PIF, PBIF, EMF, and CVRDF. Before individual counseling was given, all of these forms were examined, and participants' HLB patterns and CVR status were evaluated. Following this evaluation, the first face-to-face interviews, which lasted approximately half an hour, were held with each participant. In this first meeting, (1) cholesterol, BP, waist circumference, waist-hip ratio, and weight measurement results were shared with the participants from the individual health file, (2) positive health-related behaviors were reinforced, (3) they were reminded of how to improve negative nutrition and inadequate PA behaviors through the training guide, (4) healthy living goals were determined, (5) realistic goals were clarified by discussing the feasibility of healthy life goals, (6) healthy weight goals were determined, and (7) the number of moderate-intensity AeroPilates exercise sessions was determined according to the healthy weight goals. Following the individual counseling, the training guide was shared with the participants. Subsequent individual interviews were held face-to-face once a month for approximately ten minutes and five times. In these meetings, how much the goals were achieved was monitored, and those that could not be achieved were discussed. The last interview was held six months after the training, and the individual results of the program were evaluated with each participant.

Data analysis

Of the statistical techniques employed in the study, a priori power analysis was conducted on the G*Power 3.1 software, and other analyses were performed on the IBM SPSS 23 software. A priori power analysis was used to calculate the sample size, observed power was employed to calculate the power obtained from the study findings, and means, standard deviations, numbers, and percentages were used to describe the sample. Other statistical procedures were as follows: $\chi 2$ for cross tables to compare experimental and control groups in terms of categorical variables; Cronbach's α to determine the reliability of the total and dimension scores of the scales; means and standard deviations to describe the distribution of pre-test, post-test, and follow-up scores of the groups; 2 (group)×3 (measurement time) repeated measures variance analysis to examine the effect of the intervention on the dependent variables; percentage-percentage graphs to examine normality, one of the assumptions of variance analysis; Levene tests to examine homogeneity of variances; Mauchly tests to examine sphericity.

Ethical consideration

The approval of the Dokuz Eylül University Clinical Research Ethics Committee (date: 05.04.2014, protocol number: 209SBKAEK) and the institutional permission of the hospital administrations were obtained. Verbal and written informed consent was obtained from the participants, and a copy of the form was given to them. Since repeated measurements were made in the research, participants' names and surnames were collected on the data collection tools. Also, mobile phone numbers were obtained to contact them and follow the intervention process. Participants were informed that their personal information would be kept confidential.

RESULTS

Descriptive findings

The mean age of the experimental group was 42.3±2.6 years and the mean work experience was 22.5±3.5 years. The mean age of the control group was 43.7±2.9 and the mean work experience was 23.1±4.3 years. The rate of single people in the experimental group was 16%, 84% were married, and 25% had an associate degree/high school education. The rate of single people in the control group was 20%, 80% were married, and 48% had an associate degree/high school education. In the experimental group, 28% of the participants worked in specialized units, and 63% worked in a rotating shift system, while 38% of the control group worked in specialized units and 43% followed

a rotating shift system. The rate of smokers in the experimental group was 34%, 16% used alcohol, and 48% had a chronic disease. The rate of smokers was 40% in the control group, 8% used alcohol, and 48% had a chronic disease. The rate of those who responded "always" to the question of whether they were physically active was 34% in the experimental group and 30% in the control group. The SCORE scores of all participants were calculated as ≤1%. In addition to the demographic characteristics of the experimental and control group participants in the sample, the groups were compared through variables, and no statistically significant difference was found ($p > 0.05$; (Table 1).

INSERT TABLE 1 HERE

The SCORE score remained the same across all three measurements in both groups. The mean waist circumference of the experimental group decreased in the post-test and maintained this in the follow-up. Although the mean waist circumference of the control group decreased in the post-test measurements compared to the pre-test, it trended upward again in the follow-up. The mean hip circumference of the experimental and control groups decreased in the post-test compared to the pre-test measurements. While the experimental group maintained this value until the follow-up time, an increase approaching the previous level was observed in the control group. The waist/hip ratio of the experimental group showed a slight decrease after the pretest measurement and was maintained during the follow-up. The waist/hip ratio of the control group remained the same. The experimental and control groups lost weight before the post-test measurements, but their weight tended to increase afterward. Overall, both groups showed lower BMI in the post-test measurements than in the pre-test measurements, and it increased to the previous levels in the follow-up measurement. While the systolic BP values of the experimental group decreased on average, they increased regularly in the control group over time. A parallel decrease was seen in the mean HDL-K values of the groups from the follow-up and pre-test measurements. In addition, while fasting TG measurements were lower in the post-test than in the pre-test values, an increase was observed in both groups later in the follow-up (Table 2).

The mean scores of the control group on the total HLB scale from all measurements remained relatively constant, but the scores of the experimental group were higher in the post-test than in the pre-test and increased further in the follow-up. The mean score of the control group from the PA dimension of the HLB scale decreased, but the scores of the experimental group increased. The mean post-test and follow-up scores of the experimental group from the nutrition dimension of the HLB scale were higher than their pre-test scores, but they were lower in the control group. The mean CARRF-KL scores decreased in the control group, and they decreased in the post-test and increased in the follow-up in the experimental group. The mean GSE scores showed a similar trend in the experimental group and control group, increasing in the post-test and decreasing in the follow-up (Table 2).

INSERT TABLE 2 HERE

Findings of the intervention

A 2 (group)×3 (measurement time) repeated measures analysis of variance was used to examine the effect of the intervention applied to the experimental group on the dependent variables. Normality, one of the assumptions of variance analysis, was examined with percentage-percentage graphs, homogeneity of variances with Levene tests, and sphericity with Mauchly tests. It has been reported that when the number of people in the groups is greater than 30, deviations from normality will not distort test statistics (Howell, 2013). The F statistic was subjected to Huynh-Feldt correction in cases where sphericity assumptions were not met. Partial eta squared (p2) values were reported as effect size. p2 values of 0.01, 0.06, and 0.14 indicated small, medium, and high effect sizes, respectively (Table 3).

INSERT TABLE 3 HERE

In the repeated measures analysis of variance, the effect of the intervention on the dependent variable was examined using the significance of the F value in the "Group×Time" lines. Changes in systolic and diastolic BP, HLB II total score, and the PA and nutrition dimensions of the HLB II were attributed to the intervention, and the F values calculated for the interaction of group and measurement time were found to be statistically significant ($p<0.05$). The F values calculated for group-measurement time interaction for other variables were not statistically significant ($p>0.05$; Table 3).

The group×time interaction was found to be statistically significant for the systolic BP variable ($F(1.4, 95.9) = 11.35$, $p<0.01$, $\eta_p^2=0.14$). The effect size value indicates a large effect. This interaction indicated that both post-test and follow-up scores differed statistically significantly from the pre-test results ($F(1, 69) =4.8$, $p=0.03$, $\eta_p^2=0.07$ and $F(1, 69) =20.03$, $p<0.01$, $\eta_p^2=0.23$, respectively). Since the interaction was statistically significant, a repeated measures analysis of variance was performed for the experimental group. The results of this analysis and subsequent paired comparisons performed with Bonferroni correction showed that the follow-up results of systolic BP measurements in the experimental group were statistically significantly lower than the post-test results ($p=0.025$). The difference between the post-test and pre-test results in the experimental group was very close to statistical significance ($p=0.052$). On average, the systolic BP values of the experimental group decreased by approximately three points from the pre-test to the post-test, and by approximately 1.9 points from the post-test to the follow-up. On the other hand, the systolic BP values of the control group increased regularly over time. This finding showed that the intervention applied to the experimental group reduced the systolic BP variable by approximately five points (Table 3).

The group×time interaction was statistically significant for diastolic BP ($F(1.3, 91.6) =19.66$, $p<0.001$, $\eta_p^2=0.22$). A η_p^2 value of 0.22 indicates a large effect. The interaction yielded a statistically significant difference between the pre-test and both post-test and follow-up values ($F(1, 69) =9.27$, $p=0.03$, $\eta_p^2=0.11$ and $F(1, 69) = 32.8$, $p<0.001$, $\eta_p^2=0.32$, respectively). The repeated measures analysis of variance results of the experimental group and subsequent paired comparisons performed with Bonferroni correction showed that the follow-up results of systolic BP measurements in the experimental group were statistically significantly lower than both the pre-test and post-test results ($p=0.009$ and $p=0.006$, respectively). While the BP values of the experimental group decreased throughout the measurements, the values of the control group increased. This difference was attributed to the effect of the intervention, showing that it reduced the blood pressure of the participants in the experimental group by approximately six points (Table 3).

The analysis of the HLB variable indicated that both the main effect of the time variable and the interaction were found to be statistically significant ($F(2, 134) =5.29$, $p=0.006$, $\eta_p^2=0.07$ and $F(2, 134) =5.98$, $p=0.003$, $\eta_p^2=0.08$, respectively). Post-test and follow-up scores were found to be statistically significantly higher than pre-test scores in the overall group ($F(1, 67) =7.36$, $p=0.008$, $\eta_p^2=0.10$ and $F(1, 67) =8.1$, $p=0.006$, $\eta_p^2=0.11$, respectively). While the mean score of the control group on the total HLB scale remained relatively constant, the score of the experimental group was higher in the post-test than in the pre-test and increased further in the follow-up. The effect of the intervention continued to show itself after the post-test. The repeated measures analysis of variance performed for the experimental group and subsequent paired comparisons showed that both the post-test and follow-up results were statistically significantly higher than the mean pre-test score ($p=0.017$ and $p=0.001$, respectively). However, the difference between the post-test and follow-up scores was not statistically significant ($p=0.173$; Table 3).

The scores obtained from the PA dimension of the HLB scale showed that the group × time interaction was statistically significant ($F(2, 134) =8.54$, $p<0.001$, $\eta_p^2=0.11$). This interaction showed that the post-test and follow-up scores differed statistically significantly from the pre-test scores ($F(1, 67) =7.39$, $p<0.008$, $\eta_p^2=0.10$ and $F(1, 67) =13.94$, $p<0.001$, $\eta_p^2=0.17$, respectively). The repeated measures analysis of variance and paired comparisons performed with the values of the experimental group showed that the follow-up scores were statistically significantly higher than the pre-test measurements ($p=0.007$). A two-point difference between follow-up and pre-test

measurements is greater than half a standard deviation in terms of effect size (practical significance). This indicated that the intervention had a moderate practical impact. The increase in the scores of the experimental group and the decrease in the scores of the control group showed that the interaction was statistically significant (Table 3).

The examination of the scores on the nutrition dimension of the HLB scale indicated that the group×time interaction was statistically significant ($F(2, 134) = 6.08$, $p<0.003$, $\eta_p^2=0.08$). This interaction indicated that the post-test and follow-up scores differed statistically significantly from the pre-test scores ($F(1, 67) = 6.22$, $p<0.015$, $\eta_p^2=0.09$ and $F(1, 67) = 9.49$, $p=0.003$, $\eta_p^2=0.12$, respectively). The repeated measures analysis of variance performed in the experimental group showed that the post-test and follow-up scores were statistically significantly higher than the pre-test measurements ($F(1, 31) = 5.12$, $p<0.03$, $\eta_p^2=0.14$ and $F(1, 31) = 5.67$, $p=0.002$, $\eta_p^2=0.16$, respectively). The post-test and follow-up scores were higher than the pre-test scores in the experimental group, and the opposite was true in the control group. The intervention provided an increase of 1.36 points in the mean nutrition dimension scores of the participants in the experimental group. This increase corresponded to a standard deviation of approximately 0.35, indicating a small to medium effect size (Table 3).

DISCUSSION

Evaluation of the Workplace Health Promotion Program

The WHPP that was applied to nurses working in the hospital included group training, moderate-intensity AeroPilates exercise, and individual counseling. Some multiple CVD risk factors were evaluated in this program. Findings obtained showed that the WHPP significantly reduced systolic and diastolic BP, which are CVD risk factors, and increased nurses' mean HLB, PA, and nutrition scores. No effect of the intervention was found on SCORE score, waist circumference, waist/hip ratio, body weight, BMI, TC, HDL-C, LDL-C, TC/HDL-C ratio, fasting TG, CARRF-KL, and GL.

The use of the HPM in the WHPP designed for nurses allowed a holistic evaluation of the direct/indirect factors related to the nutrition and PA behaviors that the participants had experienced in the past and their self-perception. This evaluation was based on cooperation with the participants and their participation in the decisions. According to the model, the barriers perceived by individuals were critical in maintaining HLBs directly and indirectly, and 79% of the behavior change was explained by perceived barriers (Pender et al., 2006). As perceived barriers may limit the transformation of health-promoting behaviors into action, the effect of the WHPP in reducing participants' CV risk in this study may have been limited. One of the motivational mechanisms that directly affect the maintenance of health-promoting behaviors is perceived self-efficacy (Pender et al., 2006). In this study, the participants had a high level of self-efficacy perception. Depending on the effect of the intervention, an increase may have been observed in the mean HLB, nutrition, and PA scores of the experimental group with a high self-efficacy perception.

According to the HPM, the environment in which an individual lives affects the formation of behaviors. Situation-specific influences occurring in the external environment may increase or decrease the likelihood of an HLB turning into action. Situational effects have been shown as the determinant of HLB in 56% of studies conducted using the HPM (Pender et al., 2006). During the planning phase of this study, it was considered to establish an exercise hall in the hospital where the participants in the experimental group could perform moderate-intensity AeroPilates exercises and place an adequate number of sports mats in this hall. This was discussed with the hospital management and a positive approach was taken. However, as the pretest data collection phase of the study began, new units were added to the hospital, and the potential spaces that would be suitable for an exercise room were allocated to these new units. For this reason, an exercise room could not be established. Although the WHPP that was applied in this study took into account participants' motivation, the effect of the program in reducing CV risk may have been limited due to the failure to implement this environmental aspect of the intervention.

Evaluation of Study Findings

According to the findings, 97% of the experimental group and 88% of the control group were at low risk levels, and the SCORE score did not change in both groups in the pre-test, post-test, and follow-up measurements. There were no interventional studies aiming to determine CVR and reduce them by using the SCORE risk calculation system. In a study, it was determined that the mean age of those with a high-risk SCORE score was statistically significantly higher than the mean age of those with low and medium risk, and the mean age of those with medium risk was statistically significantly higher than the mean age of those with low risk (Yılmaz, 2017). Age is a good indicator of the duration of exposure to known and unknown CVD risk factors, and exposure to risk factors increases with age (Perk et al., 2012). This finding of the current study may have been due to the participants' age, which was around 40, and their low risk levels.

The analysis of the waist circumference, waist/hip ratio, body weight, and BMI of the experimental and control groups indicated that the intervention did not affect these variables. This finding was parallel to the results of a meta-analysis (Torlak, 2014) involving studies in which nutritional recommendations and PA intervention were applied against the risk factors of CVD and Type 2 diabetes. Unlike this study finding, in a study by Adıbelli (2014) on the examination of the effect of training given to women according to the HPM on CVD risk factors, a significant decrease was found in the waist circumference measurements and BMI values of the participants in the experimental group. In a randomized controlled study conducted by Gerçeklioğlu (2010), PA was applied to the experimental and control groups two days a week for a total of six weeks. Consistent with the current study finding, it was determined that the intervention had no effect on body weight and BMI variables, but unlike the findings of this study, there was a significant change in waist and hip circumference variables. In studies conducted by Lin et al. (2017) and Lin et al. (2018) with a quasi-experimental design on the examination of the effects of a workplace intervention including physical activities on cardiometabolic health and work productivity in employees, a significant decrease in waist circumference measurements was detected. This finding of the study can be attributed to the participants' inability to follow the nutritional recommendations offered within the scope of the WHPP and do the moderate-intensity AeroPilates exercises in the recommended sessions. On the other hand, this finding of the study may have been due to the fact that the majority of the participants had normal or close to normal mean values in terms of waist circumference, waist/hip ratio, and BMI.

The analysis of the systolic and diastolic BP measurements of both groups showed that the intervention applied to the experimental group reduced the systolic BP by approximately five points and the diastolic BP by approximately six points. While the BP values of the experimental group decreased throughout the measurements, the values of the control group increased regularly over time. This differentiation was attributed to the intervention, and the group x time interaction was found to be statistically significant. The effect size indicated a large effect (a η_p^2 value of 0.14 for systolic BP and 0.22 for diastolic BP). This finding was consistent with interventional studies aiming to reduce systolic and diastolic BP (Adıbelli, 2014; Ham and Kim, 2011; Marquez-Celedonio et al., 2009). Achieving BP control is a critical factor in reducing the incidence of CVDs (MoH, 2015). The BP target for primary prevention of CVD is <140/90 mmHg. While it is aimed to preserve the lifestyle for individuals under these limits, lifestyle changes are enough for individuals with slightly high BP values. Lifestyle interventions include weight reduction in overweight individuals, reducing sodium chloride use to <5 g/day, increasing regular PA, fruit and vegetable consumption in sedentary individuals, reducing saturated fat intake, and quitting smoking (Perk et al., 2012). All interventions, except smoking cessation, were evaluated in this study. Unlike this finding of the study, there were studies in the literature that had found no effect of interventions on BP (Gerçekçioğlu, 2010).

No effect of the intervention was observed on the changes in the TC, LDL-C, TC/HDL-C TC, LDL-C, TC/HDL-C, HDL-C, and fasting TG values of the experimental and control groups. An experimental study was conducted by Ham and Kim (2011) for six weeks on the effectiveness of the CV health promotion program. The scope of the study included two hours of lecture-based health education covering hypertension, CVD, smoking, alcohol consumption, diet, exercise, stress management, and following medication instructions, one hour of small group discussion every week, and telephone

counseling. Unlike the findings of this study, findings obtained in the study indicated that the intervention significantly improved the TC and TC/HDL-C ratio of the experimental group, and similar to the present study, it did not provide a significant effect on HDL-C, LDL-C, and TG values. Unlike the finding of this study, Adıbelli (2014) found a significant decrease in TC and LDL-C and a significant increase in HDL-C in the study on the examination of the effect of education given to women according to the HPM on CVD risk factors. The decrease in TC, LDL-C, TC/HDL-C ratio, and fasting TG values and the increase in HDL-C value are associated with a decrease in CVD risk (Perk et al., 2012). In this study, the SCORE risk calculation system was employed to select the participants, and those with low and medium risk levels were included in the study. The majority of participants were at low risk, and the remaining few were at medium risk. The fact that no significant change was observed in the cholesterol values in this study can be attributed to this characteristic of the participants. On the other hand, age is a good indicator of the duration of exposure to known and unknown CVD risk factors, and exposure to risk factors increases with age (Perk et al., 2012). The finding of this study may have been due to participants' ages, which were around 40.

The examination of the total HLB scores indicated that the mean scores of the control group on the HLB scale remained relatively constant, but that the post-test scores and follow-up scores of the experimental group were found to be statistically significantly higher than their pre-test scores. While the scores of the control group on the PA dimension of the HLB scale decreased, the scores of the experimental group increased, and the group×time interaction was found to be statistically significant. This interaction showed that post-test and follow-up scores differed from pre-test scores. The post-test and follow-up scores of the experimental group on the nutrition dimension of the HLB scale were higher than their pre-test scores, while the opposite was observed in the control group, and the group × time interaction was statistically significant. This interaction indicated that post-test and follow-up scores differed from pre-test scores. Adıbelli (2014) examined the effect of training given to women according to the HPM on CVD risk factors and provided health promotion training structured to reduce CVD risk factors for three months and performed a six-month follow-up after the training. The findings obtained pointed out that the intervention significantly increased the total HLB scale and PA and nutrition dimension scores of the women in the experimental group, which was consistent with the findings of this study. In a study on the evaluation of the effectiveness of group training, individual counseling, and behavioral skill-building programs in working adults' knowledge, attitudes, and beliefs regarding CVD and the adoption of a healthy lifestyle, it was determined that the participants' mean scores on the total HLB Scale and nutrition dimension increased, which was consistent with this study finding. In the same study, it was found that, unlike the findings of this study, participants' mean scores on the PA dimension of the HLB scale did not change significantly (Eshah, Bond and Froelicher, 2010). The finding of the present study that the intervention increased the nutritional behavior of the experimental group was in line with the findings of studies conducted by Aldana et al. (2005), Brogan et al. (2022), Torquati et al. (2018), and Wiesemann et al. (2004). The current study finding that the intervention increased the PA behaviors of the experimental group was consistent with the findings of studies conducted by Hardcastle et al. (2008) and Nisbeth et al. (2000), but inconsistent with studies by Bragon et al. (2022) and Torquati et al. (2018). This difference between study findings may have been due to the differences in the challenges employees face in their work environments and the fact that the applicability of the WHPP is affected by many factors.

Limitations

Since we planned the assignment of nurses to the experimental and control groups according to the training schedule of the hospitals' administrations, we could not conduct this research as an experimental study. Another limitation of the study was the inclusion of nurses with low and medium SCORE risk categories in the study. During the planning phase of the research, it was planned to establish a hall where the experimental group participants could exercise in the hospital and to place sports mats in the hall. When this plan was discussed with the hospital management, a positive approach was displayed. However, during the pretest data collection phase of the study, new units were added to the hospital, and spaces that would be suitable for an exercise room were allocated to

these new units. For this reason, the exercise hall planned as a facilitating intervention in terms of the environment could not be established.

CONCLUSIONS

As a result of the nursing interventions carried out within the scope of the WHPP, it was determined that the systolic and diastolic BP, which are among the CVD risk factors, decreased significantly in the experimental group nurses compared to those in the control group, and the mean scores on the total HLB scale and the PA and nutrition dimensions increased significantly. However, no effect of the intervention was found on SCORE scores, waist circumference, waist/hip ratio, body weight, BMI, TC, HDL-C, LDL-C, TC/HDL-C ratio, fasting TG, CARRF-KL, and GSE.

It is recommended that interventions to increase HLBs and protect against CVD should be designed under the leadership of occupational health nurses, taking into account nurses' right to health. Environmental interventions should be added to the WHPP specific to nurses, and reward and incentive mechanisms should be developed to increase participation and ensure continuity.

Workplace risks are frequently investigated, but studies on the evaluation of nurses' lifestyle-related risks and CVD risks remain limited. Interventional studies on CV risk management in which CVD risk factors such as smoking and stress management are evaluated together, as well as nutrition and PA factors, should be conducted. Studies to reduce CV risks should be planned by using the SCORE risk calculation system in samples representing low, medium, high, and very high-risk categories according to SCORE scores.

Authors Contrubitions

SA: Conceptualization, Methodology, Investigation, Resources, Writing-Original draft preparation, Writing- Reviewing and Editing. **AŞ**: Conceptualization, Methodology, Formal analysis, Resources, Writing- Original draft preparation, Writing- Reviewing and Editing.

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Conflict of interests:

The authors declare that there is no conflict of interest.

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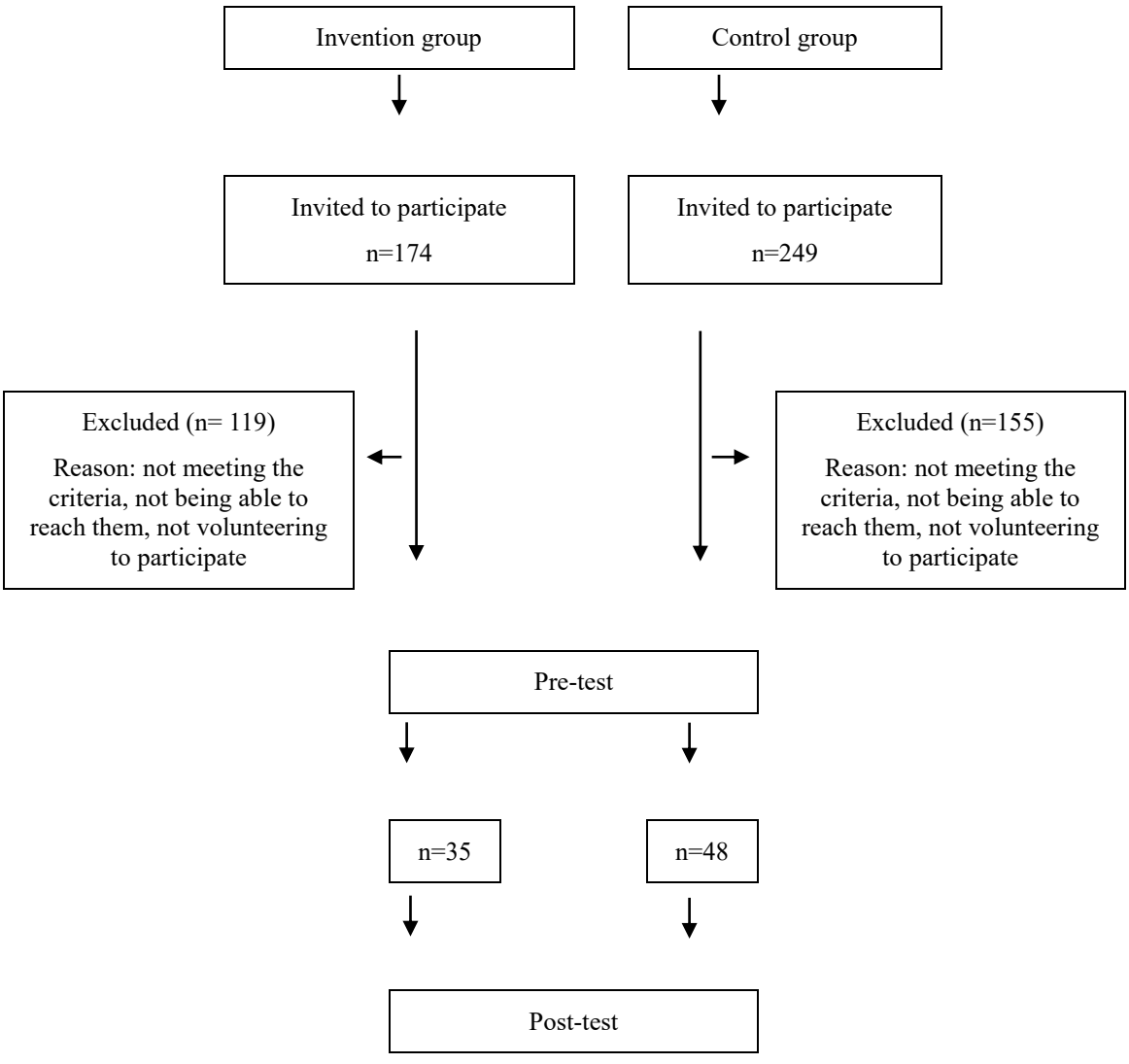

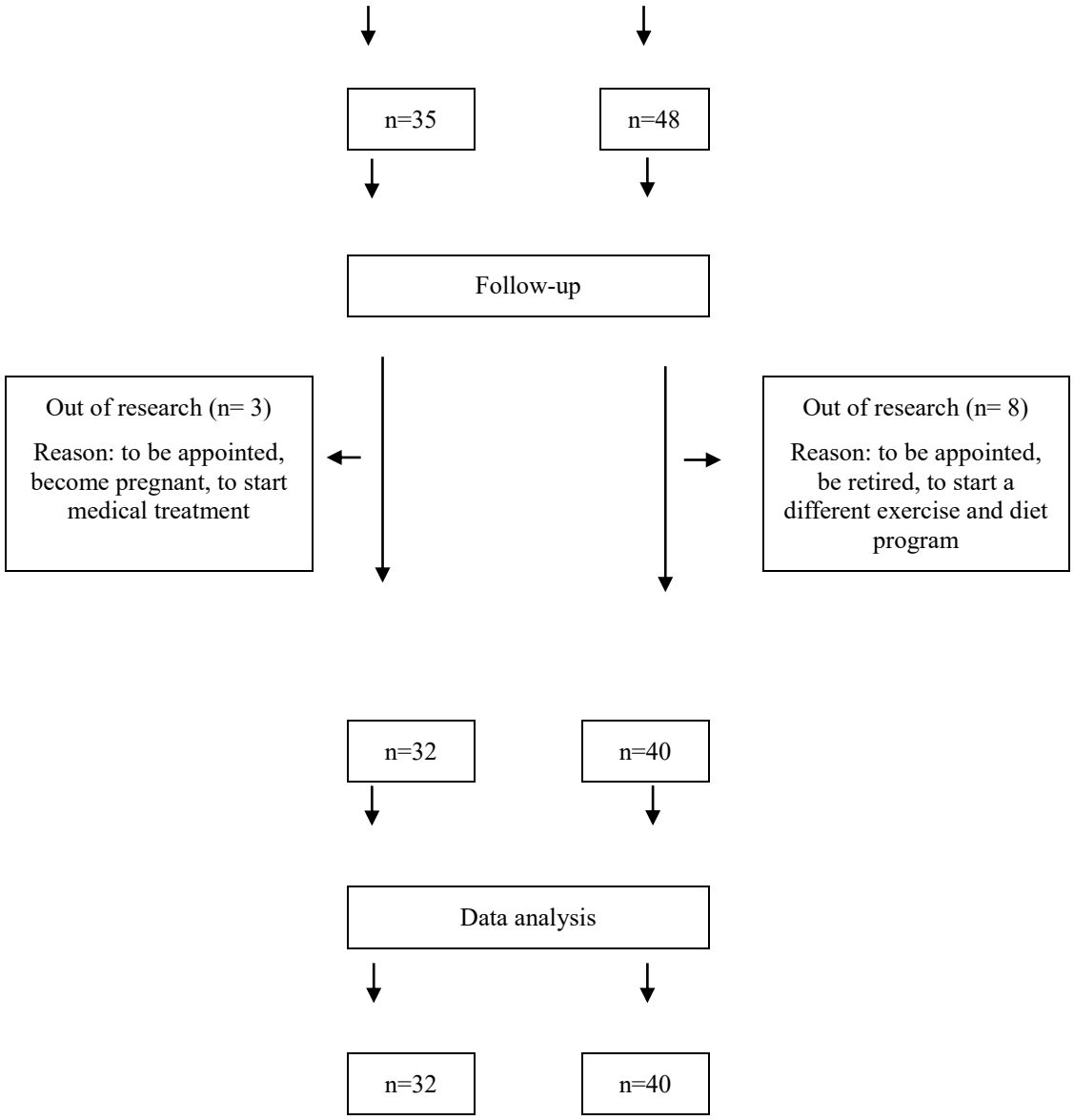

Figure 1. Participant's flow

Table 1. Comparison of demographic characteristics of experimental and control groups

Variable	Experimental	Control	*t*	Df	*p*
	Mean± Sd	Ort. ± SS			
Age	42.3 ± 2.6	43.7 ± 2.9	2.04	70	0.045*
Work experience (Year)	22.5 ± 3.5	23.1 ± 4.3	0.62	69	0.541

Variable	Experimental	Control	χ^2	Df	*p*

	n	*%*	*n*	*%*			
Marital status							
Single	5	16	8	20	0.23	1	0.632
Married	27	84	32	80			
Education status							
Associate degree/high school	8	25	19	48	3.84	1	0.050
Undergraduate/graduate	24	75	21	42			
Department							
Specialized units**	9	28	15	38	2.27	2	0.032
Inpatient services	16	50	13	33			
Management/training	3	9	3	8			
Policlinic	4	13	9	23			
Shift							
08-16 hours	11	34	23	58	2.85	1	0.092
16-08 hours	1	3	0	0			
Rotating	20	63	17	43			

Table 1. Comparison of demographic characteristics of experimental and control groups (Countined)

Variable	**Experimental**		**Control**		χ^2	**Df**	***p***
	n	***%***	***n***	***%***			
Smoking							
Smoker	21	66	24	60	2.4	1	0.624
Non-smoker	11	34	16	40			
Alcohol use							
Not user	27	84	37	93	1.19	1	0.276

User	5	16	3	8			
Chronic disease							
No	20	63	21	53	0.73	1	0.394
Yes	12	38	19	48			
Physical activity							
Rarely	7	22	8	20	0.28	2	0.868
Generaly	14	44	20	50			
Always	11	34	12	30			
SCORE scores							
% 1	1	3	5	13			0.217[F]
% 0	31	97	35	88			
Total	**32**	**100**	**40**	**100**			

*: p < 0.05, **: Operating room, intensive care, emergency room, Df: Degrees of freedom, Sd: Standard deviation, F: Fischer's exact test

Table 2. Descriptive findings regarding dependent variables

Variables	Group	Pre-test	Post-test	Follow-up
Waist circumference (cm)	E	81.66±8.10	80.45±8.45	80.45±7.68
	C	82.10±8.27	81.54±8.70	81.70±8.33
Hip circumference (cm)	E	102.54±6.34	101.70±6.78	101.73±6.74
	C	104.84±8.36	104.05±8.83	104.62±8.33
Waist-hip ratio	E	0.80±0.06	0.79±0.06	0.79±0.06
	C	0.78±0.04	0.78±0.05	0.78±0.04
Body weight (kg)	E	66.34±10.19	65.33±10.97	65.93±11.01
	C	66.77±12.25	66.36±12.58	66.53±12.70
Body Mass Index	E	25.25±3.28	24.85±3.57	25.09±3.67
	C	25.83±4.04	25.62±4.12	25.75±4.29
Sistolic blood pressure (mmHg)	E	107.03±9.06	104.06±9.54	102.19±9.41
	C	104.88±9.16	108.50±12.36	111.15±10.42
Diastolic blood pressure (mmHg)	E	74.22±8.04	70.47±7.87	67.66±7.29
	C	66.25±7.74	71.25±9.72	73.85±6.83

Total cholesterol (mg/dl)	E	191.59±34.80	185.35±32.15	192.18±31.15
	C	188.20±34.82	187.50±32.63	186.75±37.38
HDL cholesterol (mg/dl)	E	56.13±8.60	53.16±10.00	53.89±9.26
	C	52.83±12.22	52.68±14.16	50.51±12.13

Table 2. Descriptive findings regarding dependent variables (Countined)

Total cholesterol/HDL cholesterol ratio	E	3.49±0.85	3.59±0.92	3.67±0.92
	C	3.73±1.03	3.83±1.39	3.89±1.14
LDL cholesterol (mg/dl)	E	114.77±28.53	114.09±26.02	116.76±26.20
	C	114.97±30.36	115.60±29.40	116.22±33.68
Fasting triglyceride (mg/dl)	E	103.46±43.38	90.35±38.49	107.63±49.94
	C	106.77±67.42	99.65±64.76	103.99±58.12
HLB Scale-II	E	114.22±14.24	120.59±16.96	124.78±18.21
	C	121.05±19.03	125.21±19.21	120.46±16.03
Psyhical activity	E	12.69±3.79	14.38±4.00	14.91±4.27
	C	14.85±3.84	14.46±3.90	13.92±3.66
Nutrition	E	19.84±3.73	21.22±3.47	21.34±3.30
	C	20.59±3.90	20.09±3.49	19.59±3.45
CARRF-KL Scale	E	24.41±1.98	23.91±2.84	24.84±2.17
	C	23.35±2.20	22.69±2.69	22.63±3.67
General Self-Efficacy Scale	E	29.84±5.17	30.29±5.30	29.84±6.74
	C	31.56±6.34	31.85±5.65	30.63±6.08

E: Experimental group, C: Control group

Table 3. Repeated measurements variance analysis findings of independent variables

Variables	Effect	*F*	η_p^2	Observed power
Waist circumference (cm)	Time	6.83*	0.09	0.92
	Group × Time	2.15	0.03	0.43
Hip circumference (cm)	Time	4.44*	0.06	0.70
	Group × Time	1.85	0.17	0.34
Waist-hip ratio	Time	1.025	0.02	0.23
	Group × Time	< 1	< 0.01	0.13
Body Mass Index	Time	14.92*	0.06	0.69
	Group × Time	1.85	0.03	0.34
Sistolic blood pressure (mmHg)	Time	< 1	< 0.01	0.08
	Group × Time	11.35*	0.14	0.97

Diastolic blood pressure (mmHg)	Time	< 1	< 0.01	0.07
	Group × Time	19.66*	0.22	0.998
Body weight (kg)	Time	8.52*	0.11	0.93
	Group × Time	< 1	< 0.01	0.06
Total cholesterol (mg/dl)	Time	1.33	0.02	0.28
	Group × Time	1.39	0.02	0.30

Table 3. Repeated measurements variance analysis findings of independent variables (Countined)

Variables	Effect	*F*	η_p^2	Observed power
HDL cholesterol (mg/dl)	Time	4.23*	0.06	0.73
	Group × Time	1.98	0.03	0.40
LDL cholesterol (mg/dl)	Time	< 1	< 0.01	0.12
	Group × Time	< 1	< 0.01	0.07
Fasting triglyceride (mg/dl)	Time	4.96*	0.07	0.80
	Group × Time	1.47	0.02	0.31
HLB Scale-II	Time	5.29*	0.08	0.83
	Group × Time	5.98*	0.08	0.87
Psyhical activity	Time	1.27	0.02	0.27
	Group × Time	8.54*	0.11	0.96
Nutrition	Time	< 1	< 0.01	0.11
	Group × Time	6.08*	0.08	0.88
CARRF-KL Scale	Time	< 1	0.01	0.20
	Group × Time	1.71	0.03	0.33
General Self-Efficacy Scale	Time	< 1	0.01	0.16
	Group × Time	3.96	< 0.01	0.08