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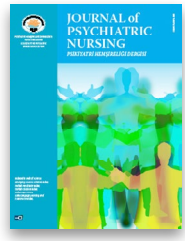

Original Article

The effects of physical exercise on the depressive symptoms and quality of life of individuals diagnosed with depression

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Abstract

Objectives: This study examines the effects of physical exercise on the depressive symptoms and quality of life of individuals diagnosed with depression.

Methods: This study used a pretest and a posttest with experimental and control groups. It was conducted in the Nevşehir province of Turkey. The study included 50 patients in the experimental group and 50 patients in the control group who met the inclusion criteria. The experimental group was administered a 14-week exercise program that included 30–45 minutes a day of mild-to-moderate step aerobics three times a week. Maximum heart rate (MHR) was used to keep the exercises at mild-to-moderate level and to select the groups for the exercise program. The Beck Depression Inventory (BDI) and the WHO Quality of Life-Bref (WHOQOL-Bref) scale were used to evaluate the participants' depressive symptoms and quality of life at the beginning of the exercise program and the 4th, 8th, 12th and 14th weeks.

Results: The experimental group's median depression scores before the exercise program and in the subsequent measurements fell more than those of the control group ($p<.05$). The experimental group's median scores in the physical, social, and environmental domains of the WHOQOL-BREF scale were higher than those of the control group ($p<.05$).

Conclusion: The physical exercise program reduced the patients' depressive symptoms and increased their quality of life. Nurses who care for patients diagnosed with depression should encourage them to exercise regularly.

Keywords: Depression; exercise; treatment of depression; quality of life.

Depression is one of the most common problems that threatens public health.[1] The World Health Organization report, Depression and Other Common Mental Disorders: Global Health Estimates, says that, in 2015, 322 million individuals were affected by depression in the world, and that it is one of the most common psychological disorders. The report also says that a 18.4% increase in depressive disorder was recorded between the years 2005 and 2015 and caused more than 50 years lost to disability.[2] It is estimated that major depressive disorders will be the world's second leading cause of disability and death after coronary heart diseases by 2020.[3]

In addition to pharmacotherapy and psychotherapy used for the treatment of depression,[4] the increase in the prevalence of major depressive disorder has made it necessary[8] to investigate new supportive methods such as physical exercise, herbal therapies, art and music therapy.[5–7] Recently, the use of physical exercise has drawn attention among the non-pharmacological methods because of its effects on depression symptoms.[9]

Studies have shown that physical exercise is as effective as antidepressants and psychotherapy in the treatment of mild and moderate depression.[10–12] The effect of exercise on depression is not only explained as a biochemical mech-

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What is presently known on this subject?

- The increased prevalence of depressive disorder has shown that it is necessary to investigate new supportive methods such as physical exercise, herbal therapies, art and music therapy that can make treatment more efficient.

What does this article add to the existing knowledge?

- In this study, patients diagnosed with depression completed a 14-week exercise program that included 30-45 minutes a day of mild-to-moderate level step aerobics three times a week. This program effectively reduced their depressive symptoms and increased their quality of life.

What are the implications for practice?

- This study offers evidence that psychiatric nurses should encourage depression patients to do physical exercise, and educate and counsel them about physical exercise in clinics.

anism,[13] but also as psychosocial mechanism that affects self-efficacy, self-esteem and social interaction due to its distraction effect.[14–23] Physical exercise is known to help patients with depression to recover, and to increase their quality of life and functionality.[24–27] Previous studies have suggested that physical exercise is as effective as antidepressants and psychotherapy in the treatment of mild and moderate depression,[28–30] and that it is a supportive method for treatment because it is easily applicable, cost-effective and has minimal side effects.[10,14,31,32] The fact that exercise does not cause concerns about stigmatization is also important for adaptation to treatment.[33]

Exercising can serve as a bridge for participating in treatment and taking responsibility, especially for inpatients.[34] Therefore, it is important that the exercise programs that are led by psychiatric nurses for patients in clinical environments contribute to treatment, help them to adapt to the treatment and get motivated.[35] Psychiatric nurses are healthcare professionals who should encourage patients to perform physical exercise in clinics and help them to continue to exercise regularly after discharge.[36]

In Turkey, there is not a sufficient number of studies that investigate the effects of physical exercise on mental health. Therefore, the evidence of the studies in this field will contribute to the inclusion of physical exercise in the care plans of psychiatric nurses. This study sought answers to these questions:

1. Is there a significant difference between the depression levels of the experimental and control groups?
2. Are there significant differences between the WHO Quality of Life-Bref (WHOQOL-Bref) physical, psychological, social and environment subscale scores of the experimental and control groups?

Materials and Method

This controlled, experimental study was planned and carried out from December 2, 2011 to June 13, 2014.

Sample

The study sample included 50 participants in the experimental group and 50 participants in the control group, with 80% power and a 5% margin of error based on the study by Mather et al.,[37] "The Effects of Exercise on Depressive Symptoms in Older Adults with Poorly Responsive Depressive Disorder: A Randomized Controlled Trial." Three psychiatrists at the I. Şevki Atasagun Public Hospital provided information about the study to the patients and helped the researcher contact them. The patients were diagnosed with mild to moderate depression for the first time, had no psychological disorders other than depression, agreed to use SSRI-antidepressants, had no physical illnesses that would prevent them from exercising regularly and were 18–45 years old. The patients were thoroughly informed about the exercise program and the data collection tools in person by the researcher.

Of the patients who agreed to participate in the study, 84 were selected for the experimental group, and 62 were selected for the control group. Of the 146 participants who were included in the study, 12 patients left the control group because of change of address or because they could not be at home at the time of the administration of questionnaires, and 34 patients left the experimental group because they did not follow the exercise program regularly or reported that the program did not suit their daily program. The number of male patients was already low during the selection, and some of them did not agree to participate in the study because the exercise program conflicted with their work hours. Therefore, no male patients were included in the control group.

Data Collection Tools

The data were collected in person from the participating patients using a personal information form, the Beck Depression Inventory (BDI) and the WHO Quality of Life-Bref (WHOQOL-Bref).

The Personal Information Form: This form was developed by the researchers. It includes eight questions about sociodemographic characteristics.

The Beck Depression Inventory (BDI): This scale was used to measure the level and severity of depressive symptoms. Its validity and reliability study was carried out by Hisli[38] in 1988. It has 21 questions. The participants choose the statement that best explains how they have been feeling for the last 15 days. The questions are evaluated by adding the scores from 0 to 3 for each response. Scores of 1 to 10 are evaluated as normal, scores of 11 to 16 indicate moderate emotional disorder, scores of 17 to 20 indicate clinical depression, scores of 21 to 30 indicate moderate depression, scores of 31 to 40 indicate serious depression, and scores from 41 to 63 indicate severe

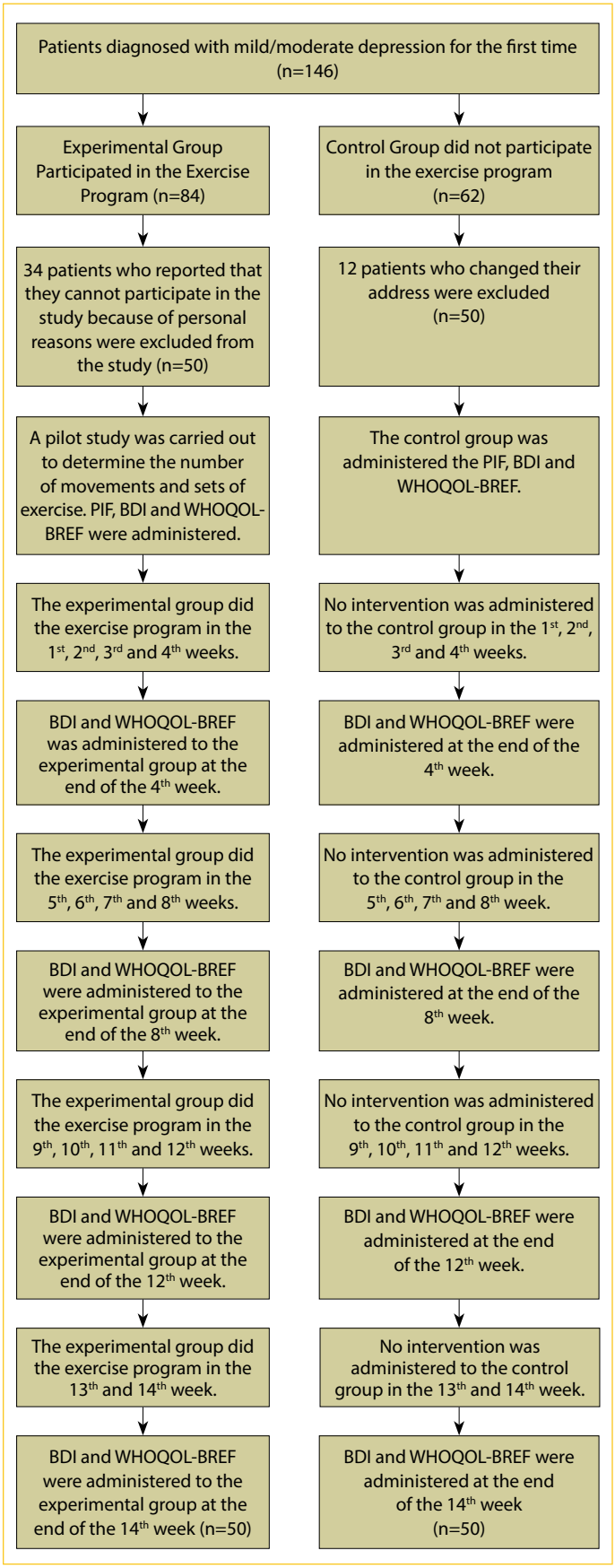

Figure 1. Flow chart

depression.[38] In this study, the Cronbach's alpha reliability coefficient of this scale was 0.840 for the experimental group and 0.710 for the control group.

The WHO Quality of Life-Bref (WHOQOL-Bref): This scale was used to measure quality of life. Its Turkish validity and reliability study was carried out by Fidaner et al.[39] in 1999. This scale includes 26 questions, the first 2 of which are general questions about perceived quality of life and perceived health state. The Turkish validity and reliability study added a question to the scale's Turkish version. The participants are asked to provide responses considering their last 15 days. The physical, psychological, social and environment scores are calculated using all the questions except for the first two general questions. The subscales are scored from 0 to 20. Higher scores indicate higher quality of life. Questions 3, 4, 26 and 27 are scored in reverse. Therefore, raw scores are calculated by subtracting the scores for these questions from 6. The score for the 7 environment questions is divided by 7. The physical health subscale includes questions 3, 4, 10, 15, 16, 17 and 18. The psychological health subscale includes questions 5, 6, 7, 11, 19 and 26. The social relationships subscale includes questions 20, 21 and 22, and the environment subscale includes questions 8, 9, 12, 13, 14, 23, 24 and 25.[39]

The Cronbach's alpha value for the WHOQOL-BREF physical health subscale was 0.720 for the experimental group and 0.752 for the control group. The Cronbach's alpha value for the WHOQOL-BREF psychological health subscale was 0.550 for the experimental group and 0.472 for the control group. The Cronbach's alpha value for the WHOQOL-BREF social relationships subscale was 0.762 for the experimental group and 0.700 for the control group. The Cronbach's alpha value for the WHOQOL-BREF environment subscale was 0.549 for the experimental group and 0.729 for the control group.

The Physical Exercise Program

The physical exercise program was planned based on interviews with physical training and sports specialists from the University of Nevşehir and on the literature.[20,40–43] It was taken into account that the patients should be able to do the exercises easily in their daily lives on their own (without exercise equipment). The facilities of the university gym and possible dizziness due to the side effects of antidepressants were also considered. Based on these evaluations, the researcher administered a 14-week exercise program to the experimental group that involved mild-to-moderate step aerobics 30–45 minutes a day three times a week. The researcher attended a course provided by the Turkish Sports for All Federation and obtained a Wellness First Stage Assistant Coaching certificate as preparation for the exercise program.

The exercise program used in the study included a warm-up (5–10 minutes), step aerobic exercises (30–45 minutes) and a cool down (5 minutes) steps. All the exercises were performed while listening to upbeat music. The music was selected based on the choices of the participants and a review of the literature.[44] For the warm-up exercises, 4 treadmills and 2 stationary bicycles from the gym were used, and step boards were used for the aerobic exercises.

Maximum heart rate (MHR) was used to select the groups for the exercise program and keep the exercises at a mild/moderate level. The MHR=220-age formula was used to determine the level of exercise, and age is an important factor in it. Therefore, four exercise groups were created with patients in the 18–24, 25–31, 32–38 and 39–45 age ranges. To keep the exercise at a mild to moderate level, the pulse range was calculated using the MHR=220-age formula within the 55–74% target pulse range. A pilot study was carried out to determine the appropriate number of movements and sets for each exercise group. Before the pilot study, the patients were taught to use their radial artery to measure their pulse. In the pilot study, the patients were asked to measure their pulse for 15 seconds before, during and after the exercise. Their pulse rates were multiplied with 4 to determine their pulse rate per minute. The target pulse ranges, number of movements and sets appropriate for the participants' age group were calculated weekly for each exercise group (Table 1). The pulse ranges for the age groups were:

18–24 age group (10 patients): 111–146 bpm

25–31 age group (12 patients): 107–140 bpm

32–38 age group (11 patients): 103–135 bpm

39–45 age group (17 patients): 100–130 bpm

Ethical Considerations

Ethical approval 6.5.2012 (decision number 2012/332) for the study was obtained from the University of Erciyes Medical Faculty Ethics Committee. Permission (5.23.2012, number 215) was obtained from University of Nevşehir Semra and Vefa Küçük Health College. Permissions from the Nevşehir Provincial Directorate of Health (05.07.2012, number 3698) and the University of Nevşehir Physical Education and Sport Education Department (05.23.2012, number 061) were also obtained. The participating women were informed about the aim of the study, and their written consent was obtained using an informed consent form.

Data Analysis

The data were evaluated using SPSS 22.0. The normality of the data distribution was evaluated using the Shapiro-Wilk normality test and Q-Q graphics. The descriptive statistics are shown as medians, and 25th and 75th percentiles [M(Q1-Q3)] values. Since the data were not normally distributed, inter-group comparisons were done using the Mann-Whitney U test. The Student-Newman-Keuls test was used for multiple comparison when differences were found in intra-group comparisons using Friedman analysis. Friedman analysis is a non-parametric test that analyzes differences in the rankings between measurements. There was a difference in the rankings between the measurements in both groups. Since the rankings, which should normally be provided, would not be understood by the target readers, they are presented like this in the literature. Median values, which are also ranking values, are provided in order to make it more understandable for the target readers. The measurements were evaluated as median values. The difference values shown in the study are not the first and last median value differences in the tables. Rather, they are the median values of the difference between the first and last values. The relationships between categorical variables were evaluated using the chi-squared test exact method. The threshold for statistical significance was $p<0.05$.

Table 1. Weekly target heart rate ranges, movements and sets for each exercise group

Week	18–24 age group (Number of movements x number of sets)	25–31 age group (Number of movements x number of sets)	32–38 age group (Number of movements x number of sets)	39–45 age group (Number of movements x number of sets)
1st and 2nd weeks	8 x 8 sets	8 x 8 sets	8 x 8 sets	8 x 8 sets
3rd and 4th weeks	8 x 8 sets	8 x 8 sets	8 x 8 sets	8 x 8 sets
5th and 6th weeks	8 x 9 sets	8 x 9 sets	8 x 9 sets	8 x 9 sets
8th and 9th weeks	9 x 11 sets	9 x 10 sets	8 x 9 sets	8 x 9 sets
10th and 11th weeks	10 x 12 sets	10 x 11 sets	9 x 10 sets	9 x 9 sets
12th and 14th weeks	10 x 12 sets	10 x 11 sets	9 x 10 sets	9 x 9 sets

Table 2. Distribution of patients diagnosed with depression by introductory characteristics (n=100)

Introductory characteristics	Experimental		Control		p
	n	%	n	%	
Age group					0.81
18–24	10	20	7	14	
25–31	12	24	11	22	
32–38	11	22	14	28	
39–45	17	34	18	36	
Marital status					0.95
Married	33	66	35	70	
Single	8	16	7	15	
Widowed or divorced	9	18	7	15	
Education level					0.78
Primary school	14	28	15	30	
Middle school	7	14	10	20	
High school	18	36	17	34	
Undergraduate	11	22	8	16	
Total	50	100	50	100	

Results

It was determined that 34% of the experimental and 36% of the control group were in the 39–45 age group. It was also determined that 66% of the experimental group and 72% of the control group were married. Of all the participants in both groups, 34% had completed high school. The experimental group and the control groups had similar introductory characteristics (p>0.05, Table 2).

The patients' depression score medians fell both in the experimental group and control group. Before the exercise program and at the other measurements, the difference between depression score medians was statistically significant in both groups. The experimental group's median depression scores before the exercise program and in the subsequent measurements fell more than those of the control group (p<0.05, Table 3).

Both groups' score medians on the WHOQOL-BREF physical health, social relationships and environment subscales increased with the measurements. The differences in both groups' score medians on the WHOQOL-BREF physical health, social relationships and environment subscales were statistically significant before the exercise program and in the other measurements. The increase in the score of experimental group was statistically (Friedman test) higher than that of the control group (p<0.05, Tables 4–6).

The intra-group and inter-group differences in the WHOQOL-BREF psychological health subscale score medians was not statistically significant (p>0.05).

Discussion

Here, the results of this study are discussed along with the relevant studies in the literature.

Both the experimental and control groups' depressive symptom levels fell in the measurements carried out before and after the exercises (Table 3). This is to be expected with the use of antidepressants; however, the main point of this study is the group that did the physical exercise program had lower depressive symptom levels than the group that only took antidepressants (Table 3).

Studies of the supportive effects of regular exercise on depression treatment indicate that depression levels of pa-

Table 3. Distribution of the patients' depression score medians before and after the exercise program by measurement (n=100)

Measurement	Depression score median $M(Q_1\text{-}Q_3)^{***}$		p
	Experimental Group $M(Q_1\text{-}Q_3)^{***}$	Control Group $M(Q_1\text{-}Q_3)^{***}$	
Before the exercise program	21.5 (20.0–26.0)^{a**}	21.0 (20.0–24.0)^{a**}	0.592
4th week	18.0 (16.0–20.3)^{b**}	18.0 (17.0–19.3)^{b**}	0.805
8th week	17.0 (9.5–19.0)^{c**}	17.0 (14.8–18.3)^{c**}	0.640
12th week	17.0 (5.0–17.3)^{c**}	17.0 (12.0–17.0)^{c**}	0.595
14th week	17.0 (5.0–17.0)^{c**}	17.0 (12.0–17.0)^{c**}	0.419
p*	<0.001	<0.001	
Difference (0 week–14th week)	9.0 (3.8–14.0)	7.0 (3.0–11.0)	0.034

**p Friedman test. **a, b, c: There is a difference between measurements with different letters. ***M: Median; ***Q1: First quarter; ***Q3: Third quarter.

Table 4. Distribution of the patients' WHOQOL-BREF physical health medians before and after the exercise program by measurement (n=100)

WHOQOL-BREF Physical health subscale measurement	WHOQOL BRIEF Physical Health Subscale Score Median *M(Q1-Q3)****		p
	Experimental Group *M(Q1-Q3)****	Control Group *M(Q1-Q3)****	
Before the exercise program	9.7 (9.1–11.4)[a**]	10.3 (9.1–12.0)[a**]	0.223
4th week	13.1 (12.6–13.7)[b**]	12.6 (11.4–13.7)[b**]	0.123
8th week	13.1 (12.6–13.7)[b**]	13.1 (12.6–13.7)[b**]	0.520
12th week	13.1 (13.0–13.7)[b**]	13.1 (12.6–13.7)[b**]	0.562
14th week	13.1 (13.0–13.7)[b**]	13.1 (12.6–13.7)[b**]	0.676
p*	<0.001	<0.001	
Difference (14th week–0 week)	3.4 (2.3–4.0)	2.3 (1.7–3.4)	0.016

*Friedman analysis was carried out. **a, b: There is a difference between measurements with different letters. ***M: Median; ***Q1: First quarter; ***Q3: Third quarter.

Table 5. Distribution of the patients' WHOQOL-BREF social relationship medians before and after the exercise program by measurement (n=100)

WHOQOL-BREF Social relationship subscale measurement	WHOQOL BRIEF Social relationship subscale score median *M(Q1-Q3)****		p
	Experimental Group *M(Q1-Q3)****	Control Group *M(Q1-Q3)****	
Before the exercise program	10.7 (8.0–10.7)[a**]	10.7 (8.0–13.3)[a**]	0.251
4th week	10.7 (10.7–10.7)[ac**]	10.7 (8.0–13.3)[ab**]	0.257
8th week	10.7 (10.7–10.7)[ad**]	10.7 (8.0–13.3)[ab**]	0.356
12th week	10.7 (10.7–10.7)[bcd**]	10.7 (8.0–13.3)[b**]	0.976
14th week	10.7 (10.7–12.0)[bd**]	10.7 (8.0–13.3)[b**]	0.890
p*	<0.001	<0.001	
Difference (14th week–0 week)	1.0 (0.0–2.7)	0.7 (0.0–2.7)	0.013

*Friedman analysis was carried out. **a, b, c: There is a difference between measurements with different letters. ***M: Median; ***Q1: First quarter; ***Q3: Third quarter.

tients who participate in exercise programs fall. This has been shown by Yeh et al.[45] (12-week mild-to-moderate aerobic exercise program with music for 50 minutes, three times a week), by Blumenthal et al.[29] (16-week moderate-high level aerobic exercise program for 45 minutes, one time a week), by Atlantis et al.[46] (24-week moderate-high level aerobic exercise program for 20 minutes, three times a week), by Olson et al.[47] (8-week moderate-high level aerobic exercise program for 30–45 minutes, three times a week). This study's results support those in the literature. The fall in the depression scores of the experimental group after the exercise program was associated with the supportive effect of exercise as a biological and psychosocial mechanism. According to the literature, there is not enough information about therapeutic effect of exercise on depressive symptoms; however, it suggests that the therapeutic effect can be explained by biological and psychosocial mechanisms.[15,29] The change in the hypothalamic-pituitary-adrenocortical (HPA) axis, increased norepinephrine neurotransmission and serotonin metabolism and reduced cortisol levels are biological mechanisms which indicate that the effects of exercise can be similar to those of antidepressants.[48–51] It has been suggested that if patients regularly perform activities such as physical exercise, it can lead to perceptions of achieving success and showing determination, which increase their self-efficacy and self-esteem.[15] The psychosocial aspect of exercise is also considered to have a distraction effect that prevents focusing on negative thoughts.[11]

Table 6. Distribution of the patients' WHOQOL-BREF environment medians before and after the exercise program by measurement (n=100)

WHOQOL-BREF Environment subscale measurement time	WHOQOL BRIEF Environment subscale score median *M(Q1-Q3)****		p
	Experimental Group *M(Q1-Q3)****	Control Group *M(Q1-Q3)****	
Before the exercise program	11.6 (11.1–12.9)[a**]	12.0 (11.6–12.9)[a**]	0.045
4th week	12.4 (11.6–13.3)[b**]	12.2 (11.6–12.9)[b**]	0.909
8th week	12.4 (11.6–13.3)[b**]	12.2 (11.6–12.9)[b**]	0.674
12th week	12.4 (11.6–13.3)[b**]	12.2 (11.6–12.9)[b**]	0.651
14th week	12.4 (11.6–13.3)[b**]	12.2 (11.6–12.9)[b**]	0.611
p*	<0.001	<0.001	
Difference (14th week–0 week)	0.9 (0.4–0.9)	0.2 (0.0–0.4)	<0.001

*Friedman analysis was carried out. **a, b: There is a difference between measurements with different letters. ***M: Median; ***Q1: First quarter; ***Q3: Third quarter.

The increase in the WHOQOL-BREF physical health, social relationships and environment subscale scores of experimental group was statistically higher than the increase in the scores of the control group before the exercise program and in other measurements (Table 4–6).

A randomized, controlled study by Carta et al.[25] found an increase in the WHOQOL-BREF physical health subscale scores after a 32-week exercise program that was performed for one hour twice a week. The WHOQOL-BREF physical health subscale includes pain, need for medical treatment, energy to continue daily life, physical activity, sleep, the ability to carry out daily routines and work capacity. Studies have determined that exercise has a positive effect on mood and quality of life because it relieves fatigue and increases physical vitality and energy.[52,53] Sleep disorders are among the most common clinical problems in depression.[54] Epidemiological studies[35,55,56] support the idea that exercise has a positive effect on sleep. Somatic symptoms are commonly observed in depression, and the common ones include pain, fatigue, dizziness, headache, difficulty breathing, tachycardia and gastrointestinal complaints. The most common complaint is pain.[57] Previous studies have reported that exercise has a positive effect on somatic symptoms such as pain.[58,59] The increase in the experimental group's WHOQOL-BREF physical health subscale score was statistically higher than that of the control group before the exercise program and in other measurements. This is due to the effect of exercise on sleep quality, pain, fatigue and physical vitality.

Mota-Pereira et al.[60] reported that a 30–45-minute exercise program that was performed five times a week for 12 weeks reduced depressive symptoms and increased mean scores on the WHOQOL-BREF social relationships subscale. De la Cerda et al.[61] reported that the depression scores of a group that participated in an 8-week aerobic and dance exercise program for 45 minutes three times a week decreased, and that their mean scores on the WHOQOL-BREF social relationships subscale increased. This study's results support those of the studies in the literature.

Patients are reluctant to establish and maintain social relationships because of anhedonia, which is one of the main symptoms of depression. This leads to social isolation and reduced social interaction.[62] Exercise groups have an important role in developing social interaction. Exercise groups that bring people with similar problems together provide appropriate environments for sharing feelings and thoughts, and increase emotional and social support.[63] In exercise groups, trainers can also provide social support to the group members using therapeutic approaches.[64] In this study, performing the exercises in groups increased the social interaction among the patients, and increased their motivation both individually and as groups, which increased their WHOQOL-BREF social relationships subscale score.

Conclusion

This study's depression patients participated in a 14-week exercise program that included mild-to-moderate step aerobics for 30–45 minutes a day three times a week. This exercise program reduced their depressive symptoms and increased their WHOQOL-BREF physical health, social relationships and environment subscale scores. Physical exercise is a supportive method of treating depression. Based on these results, psychiatric nurses should include regular and planned aerobic exercise programs in their therapeutic practices, and nurses who work in public mental health centers and monitor patients

with depression in their homes should plan exercises to help them acquire the habit of physical exercise at home.

Limitations

The study sample was planned to be patients diagnosed with depression regardless of gender. However, since the number of male patients diagnosed with depression was insufficient, and they did not agree to participate in the study during sample selection, the study was carried out with only female patients. This restricts the generalizability of its results.

Conflict of interest: There are no relevant conflicts of interest to disclose.

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Authorship contributions: Concept – S.A., N.K.; Design – S.A., N.K.; Supervision – S.A., N.K.; Fundings - S.A., N.K.; Data collection &/or processing – S.A.; Analysis and/or interpretation – S.A.; Literature search – S.A.; Writing – S.A., N.K.; Critical review – S.A., N.K.

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