Research Paper: The Effect of Yoga on Musculoskeletal Pain in Elderly Females: A Clinical Trial

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ABSTRACT

Objectives: Chronic musculoskeletal pain is a common problem in the elderly. Yoga exercise can be considered a non-pharmacological and complementary method for pain control. The present study was conducted to investigate the effect of yoga on chronic musculoskeletal pain in elderly females referring to selected health centers in Rafsanjan, Iran.

Methods: In this clinical trial, 60 females over 60 years of age with musculoskeletal pain were randomly divided into two intervention and control groups. The intervention group received three one-hour training sessions weekly for eight weeks, and they did yoga for 1 hour in each session. The pain was measured in both groups before the intervention and at weeks four and eight using the McGill Pain Questionnaire. The control group did not receive any special intervention.

Results: The mean musculoskeletal pain decreased at the end of the 4th and 8th weeks after performing yoga in the intervention group compared to the control group (P<0.005). The subscales of sensory dimension and severity of pain showed no decrease after four weeks compared to the control group (P>0.005). However, at the end of the eighth week, all the pain subscales decreased in the intervention group (P<0.005).

Discussion: The obtained results revealed that practicing yoga continuously could reduce musculoskeletal pain in elderly females; thus, it is suggested that such yoga exercises be included in the treatment of musculoskeletal pain in this group.

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Highlights

● Both four weeks and eight weeks of yoga practice reduced the mean musculoskeletal pain in elderly females.

● Four weeks of yoga practice did not reduce the subscales of sensory dimension and severity of pain in elderly females.

● Eight weeks of yoga practice reduced all the subscales of pain in old females.

Plain Language Summary

Old age is a critical period of human life, and chronic musculoskeletal pain in the elderly is highly prevalent. Yoga is a popular complementary or alternative therapy for musculoskeletal pain. Limited studies have evaluated the effects of yoga for the treatment of chronic pain and they have been conducted over a limited period of time or their results are not entirely consistent in elderly patients. This study examined the effect of yoga on chronic musculoskeletal pain in elderly females. The results suggested that continuous yoga exercise can reduce chronic musculoskeletal pain in elderly females.

1. Introduction

Aging is a natural phenomenon associated with changes in the old person's physical, mental, and social aspects of life [1]. Health advances, industrialization, changes in lifestyle, and environmental factors have contributed to increased longevity and life expectancy in the last few decades [1]. In the following decades, the elderly population in the world will be increased and show a different perspective [1]. In this regard, Iran also is a country that moves from a young to a middle-aged population and will soon join the number of old-population nations [1].

By increasing the age, the risk of one or more chronic diseases increases as well [2]. Chronic pain is a serious threat to the health of the elderly [3]. Approximately one-third of the elderly suffer from chronic pain, which is mainly caused by arthritis, osteoporosis, and vascular disorders [2]. The presence of chronic pain among the elderly leads to increased costs for society and low quality of life [2].

Taghipour et al., in their study on the elderly in Amir Kola, reported a prevalence of 82.4% for musculoskeletal pain over the past six months, with a prevalence of 76.2% in men and 89.9% in females [4]. It was also reported that one-third of the old people living in the elderly houses and at the community level suffer from the pain [3]. Chronic musculoskeletal pain is more common in females than in men, which can be due to differences in the level of sex hormones [5]. Taghipour et al. also indicated that the prevalence of pain in old females in all upper and lower organs and head and neck areas are higher than that in men [4].

Chronic musculoskeletal pain is recurrent and is caused by problems in bones, joints, muscles, and soft tissues [6]. Pharmaceutical treatment is often considered a selective treatment for chronic pain [7]. Considering the multiple complications of medications and pharmacokinetic and pharmacodynamics changes and the presence of underlying illnesses in the elderly, non-pharmacological pain control should be considered in this age group [7]. Studies have been conducted on non-pharmacological interventions to control chronic pain in old people, including Pilates [8] and massage therapy, yoga, and tai chi [9].

Researchers believe that Pilates exercises can positively affect depression and happiness in the elderly [8]. It has been proven that the elderly can adapt to fitness exercises and develop their physical capacity [10]. Old people are not able to perform conventional exercises due to muscle atrophy and weakness in the musculoskeletal system, and the probability of their injury following these exercises is high. Hence, yoga is preferable to other sports for these people [10]. Recently, the effectiveness of yoga exercises in the elderly was taken into account by the researchers. These exercises are a combination of physical and mental exercises concentrating on movement control, body position, and respiration [9].

Studies have recently focused on the effects of yoga exercise. For instance, the effects of yoga on pain relief and increasing the range of motion in females with lumbar disc herniation [11] and pain, back flexibility, depression, also its effects on serum serotonin levels and neurotroph-

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ic factors in females with a chronic backache have been reported [12]. Also, some review studies have shown the effectiveness of yoga as a treatment for musculoskeletal disorders [13, 14]. However, in some studies, the effect of yoga on backache in old females over 65 years old was not reported [15]. Moreover, yoga was effective on knee pain caused by osteoarthritis in the elderly [16].

The results of studies on the effectiveness of yoga on elderly patients are not completely consistent. Although some studies have indicated the effectiveness of yoga [11, 12], some others have shown that yoga exercises have no positive effect on the relief of elderly patients' pain [15]. Numerous studies have been conducted on a particularly painful position, such as pain in the waist, knee, neck, or other areas of the body [12, 16]. However, many elderlies experience pain in different areas of their body, including knees, hands, feet, neck, and waist. Furthermore, considering the different lifestyles of the elderly in Iran [17] and the possibility that different areas of the old people's bodies may be affected by the chronic pain, further studies are definitely needed in this area. Hence, the research team decided to evaluate the effect of Yoga on musculoskeletal pain in elderly females.

2. Materials and Methods

Participants

The present study was a randomized clinical trial (IRCT20150519022320N11) performed on 75 elderly females referring to Health Services Center No. 1 and health centers under the control of this center, in Rafsanjan City, from 22 April 2017 to 20 December 2017. Inclusion criteria were female gender, age over 60 years, the ability to perform yoga exercises without the inability to exercise, and having a minimum literacy. People with musculoskeletal pain less than three months, pain intensity less than three based on Visual Analogue Scale (VAS) criteria, Parkinson's disease, Alzheimer's disease, recent fracture, drug addiction, the history of mental illness or the use of psychosocial drugs, admission to the psychiatric ward, other sports and exercise prohibitions, were not included in the study. Exclusion criteria were the use of other pain relief treatments, unwillingness to continue the program, fracture occurrence, start of taking narcotic drugs, absence in 25% of yoga trainings. Based on the exclusion criteria, eight individuals were excluded from the intervention group: two due to unwillingness (in the fourth week), three due to the absence of excessive permission, one due to the start of surgical treatment, and
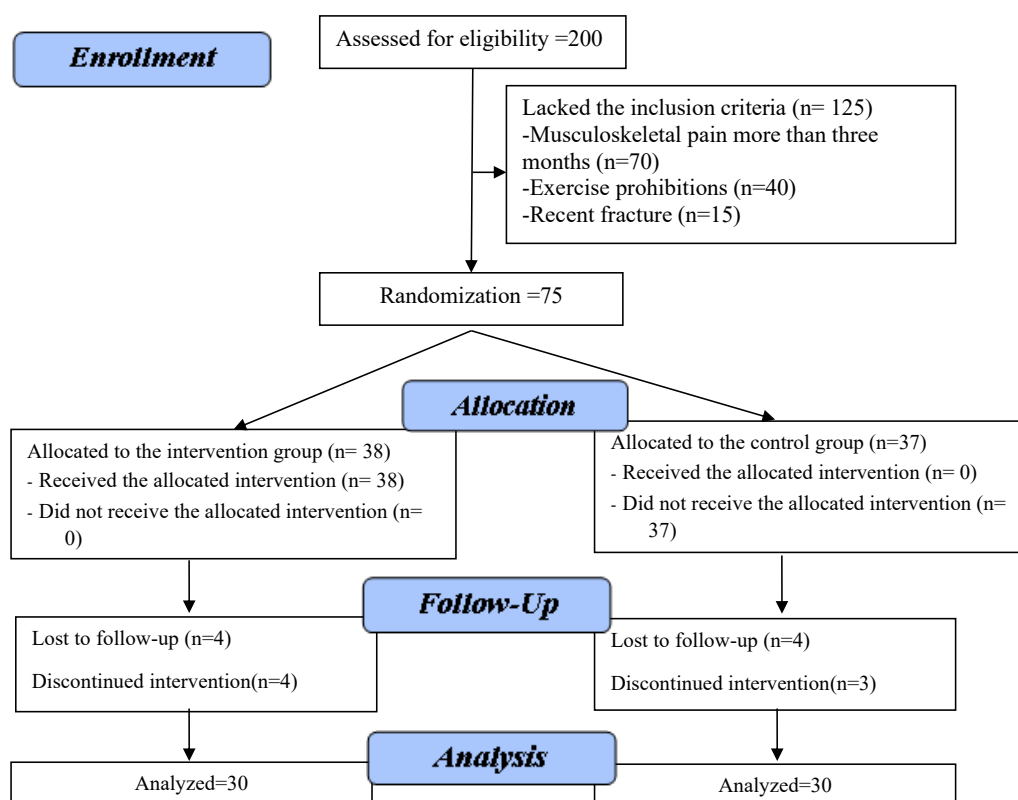

Figure 1. Flow diagram of the study protocol

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two due to traveling (in the eighth week). Also, seven patients were excluded from the control group: two cases due to reluctance to continue to cooperate (in the fourth week), three due to the start of the new treatment, and two due to bone fracture (in the eighth week) (Figure 1). It is noteworthy that the trained person evaluated the participants based on the inclusion and exclusion criteria.

Intervention

The research procedure and the fundamental objectives were fully explained to the subjects, and written informed consent was obtained from the participants. The sample size was determined to be 28.6 people in each group using the statistical formula and considering the standard deviation of 1.4, the significance level of 0.05, the power of 90%, and the effect size of 1.2, and 30 cases were considered for each group for more confidence [11] (Equation 1).

$$1. \ n = \frac{2(z^{1}\text{-}a/2 + z_{1\text{-}\beta})^2 \delta^2}{d^2} = 28.6$$

There were 700 records of elderly females in these centers, of which 200 were selected by the simple random sampling and were contacted, 125 lacked the inclusion criteria (70 having musculoskeletal pain for more than three months, 40 having exercise prohibitions, and 15 having a recent fracture). The remaining 75 patients with self-declaration of musculoskeletal pain [18] were selected. Then, they were randomly assigned to the intervention (38 people) and control (37 people) groups (Figure 1).

Data collection

The pain questionnaire was answered by the elderly who were educated and completed for the illiterate ones by the club's secretary. First, demographic information, including the level of education, occupation, economic status, and other information of the questionnaire, including the history of fracture, history of hospitalization for other causes, and taking drugs to control the pain, were questioned and recorded, and the height and weight were measured.

The intervention group was then supervised by a trainer experienced with the elderly with a valid degree (the document was observed, and its copy was kept at the gym). Yoga was done within three 1-hour sessions weekly for eight weeks. The exercises were done in the morning after a brief breakfast. After attending the gym and wearing bright clothes (according to the trainer's instructions), the mats were put with the supervision of the researcher and coach such that everyone could see the coach and hear her voice. Moreover, there was sufficient space for exercising not to hit each other. After putting their hands on their knees, the subjects listened to the coach with their eyes closed. Positive thinking was implemented as follows: Take away all the negative thoughts, focus on strengths, belongings, and abilities, discover what you encounter with, such as the person, the object, and the situation, and focus and pay attention to the positive aspects of it and breathe deeply while sitting for the first 10 min and thank the creator. It was followed by the intellectual release of all mental affiliations.

The proper movements were performed for 40 min considering the elderly constraints, with the supervision of the coach and researcher. Standing, sitting, and lying movements were performed. The conditioning, focusing, and relaxation were performed for 10 min. The control group did not participate in yoga classes. During the study course, they were contacted by the researcher. The subjects were referred to the service center for a doctor's appointment, and they were examined in terms of the exclusion criteria. The researcher guided participants in the control group to receive routine interventions for old people (such as controlling blood pressure and blood sugar).

The short form of the McGill pain questionnaire has three parts. The first part consists of 15 words, of which 11 words were for sensory examination, and four words were for emotional examination of pain. Each row was marked as painless, mild, moderate, and severe pain, respectively, and scored 0 to 3 (0=painless, 1=mild, 2=moderate, and 3=severe). The scores were summed. The second part included VAS, which is a horizontal line with "no pain" at one end to "worst possible pain" at the other end [5]. The third part is a 6-point verbal scale, in which the patient was asked to choose from six words, being scored from none=0 to overwhelming=5. Finally, the total score of these three items was considered.

The McGill Pain Questionnaire, as a self-report questionnaire, is the most reliable instrument for measuring pain, especially resistant chronic pain. Several studies have used this questionnaire to measure elderly pain. For example, Dicorros et al. used this instrument to measure the pain in elderly females [19]. Dos Santos et al. also showed that the McGill Pain Questionnaire could effectively assess chronic pain in the elderly [20]. It has been one of the most applicable tools for more than 30 years, designed to evaluate the sensory, emotional, and pain assessment aspects. Adel Manesh et al. recommended the Persian version of McGill as a reliable, valid, and sensitive multidimensional tool to assess musculoskeletal pain [21].

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The scientific validity of the McGill Pain Questionnaire has been evaluated in several studies in Iran. Shirazi et al. used the McGill Pain Questionnaire to assess the pain of 205 elderly patients referring to Ahwaz health centers for six months. In this study, Cronbach's alpha coefficient was 0.94, and its reliability coefficient was 0.88 [3]. Khosrawi investigated the validity and reliability of the questionnaire in patients with cancer in 2012 and reported the Cronbach's alpha coefficient of 0.85, and the reliability coefficient of over 0.8 in all aspects (sensory, emotional, and evaluation aspects) [22].

Statistical analysis

All statistical tests were performed using SPSS software v. 18. Quantitative data were presented as Mean±SD, while qualitative data were demonstrated as frequency and percentage (%). Kolmogorov-Smirnov test was used to evaluate the normality of the data. An independent t-test was used to compare the intervention and control groups if the data were normal, and the Mann-Whitney U test was used if the data had no normal distribution. To compare the changes of the two groups in the first and second months compared to before the study, if the data were not normal, Friedman test and, if normal, analysis of variance with repeated measures were used. Bonferroni post hoc test was used to compare the trend of changes in the study groups. A p-value of <0.05 was considered statistically significant.

Data availability

The data associated with the paper are not publicly available but are available from the corresponding author on reasonable request.

3. Results

The Mean±SD of the age was 63.5±3.67 and 63.26±3.52 years in the intervention and the control group, respectively; however, there was no significant difference between the two groups (P=0.80). Moreover,

Table 1. Demographic characteristics of the intervention and control groups

Variables		No.(%) / Mean±SD		P
		Intervention Group (n=30)	Control Group (n=30)	
Marital status	Married	26(86.6)	24(80.0)	0.48
	Widow	2(6.7)	3(10.0)	
	Divorced	2(6.7)	3(10.0)	
Job	Housekeeper	26(86.7)	25(83.4)	2.29
	Employee	4(13.3)	5(16.7)	
Education	Minimum literacy	6(20.0)	10(33.3)	1.36
	Elementary	18(60.0)	15(50.0)	
	Secondary	6(20.0)	5(16.7)	
Economic level	Good	14(46.7)	18(60.0)	6.03
	Moderate	6(20.0)	7(23.3)	
	Poor	9(30.0)	2(6.7)	
	Depended	1(3.30)	3(10.0)	
Age (y)		63.5±3.67	63.26±3.52	0.80
Body Mass Index (kg/m^2)		30.71±3.84	30.38±3.97	0.74
Number of children		4.63±1.86	4.1±1.90	0.27
Duration of pain (y)		5.06±4.04	5.71±4.32	0.91

A P-value less than 0.05 was considered to be statistically significant.   **I**ranian **R**ehabilitation **J**ournal

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Table 2. Comparing pain-related characteristics between the intervention and control groups

Variables		No.(%)		P-Value
		Intervention Group(n=30)	Control Group(n=30)	
Hospitalization	Yes	21(70.0)	19(63.3)	0.30
	No	9(30.0)	11(36.7)	
History of fractures	Yes	7(23.3)	8(26.7)	0.08
	No	23(76.7)	22(73.3)	
Location of fractures	neck	6(20.0)	6(20.0)	1.59
	Hand	3(10.0)	3(10.0)	
	Shoulder	4(13.3)	5(16.7)	
	Waist	2(6.7)	2(6.7)	
	Knee	11(36.7)	10(33.3)	
	leg	4(13.3)	4(13.3)	
Pain relief factors	movement	20(66.7)	23(76.7)	0.82
	sleeping	5(16.7)	4(13.3)	
	sitting	5(16.7)	3(10.0)	

A P-value less than 0.05 was considered to be statistically significant.

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elementary education level was reported as the highest level of education in both intervention and control groups (60% in the intervention group and 50% in the control group). The Mean±SD duration of pain was 5.06±4.04 in the intervention group and 5.71±4.32 in the control group. Also, the Mean±SD of Body Mass Index (BMI) was 30.71±3.84 kg/m² in the intervention group and 30.38±3.97 kg/m² in the control group. Nonetheless, there was no statistically significant difference between the two groups regarding demographic factors, duration of pain, and BMI (Table 1). Pain-related characteristics included hospitalization and location and history of fractures, and pain relief factors between intervention and control groups. Based on the findings, there was no statis-
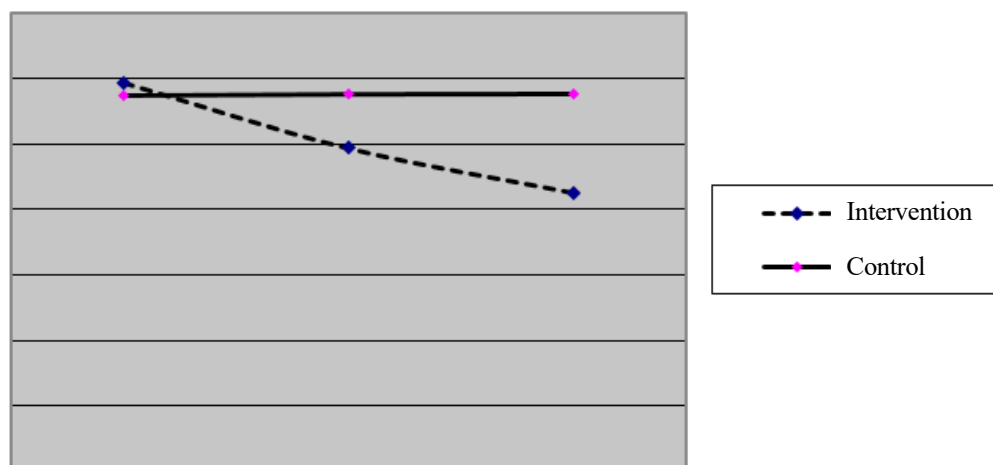

Figure 2. Comparison of the mean total pain in the intervention and control groups before and after four and eight weeks of the studyl

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Table 3. Mean total pain and its subscales scores before and at the end of the 4th and 8th weeks between the groups

Variables	Groups	Mean±SD			P (Within-Group)
		Before	Fourth Week	Eighth Week	
Sensory pain	Intervention	17.16±4.92	15.06±4.75	13.53±4.73	0.0001
	control	17.00±4.54	17.13±4.47	17.23±4.5	0.283
P-value (Between-group)		0.89**	0.053*	0.001*	-
Emotional pain	Intervention	4.80±1.93	3.43±1.79	2.53±1.54	0.0001***
	control	4.36±1.27	4.37±1.27	4.40±1.33	0. 891***
P-value (Between-group)		0.45*	0.026*	0.0001*	-
VAS	Intervention	5.35±1.13	4.50±1.14	3.92±1.30	0.0001
	control	5.02±1.14	5.05±1.16	5.06±1.15	0.267
P-value (Between-group)		0.17*	0.069**	0.001**	-
Current pain	Intervention	2.40±0.77	1.70±0.70	1.30±0.59	0.0001***
	control	2.26±0.73	2.26±0.73	2.16±0.69	0.065
P-value (Between-group)		0.60*	0.005*	0.0001*	-
Total pain	Intervention	29.72±7.19	24.70±7.00	21.29±6.91	0.0001
	control	28.65±6.37	28.82±6.27	28.87±6.25	0.46
P-value (Between-group)		0.54**	0.019**	0.0001**	-

A P-value less than 0.05 was considered to be statistically significant.

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*Mann Whitney U test, **Independent t-test, ***Friedman test

tically significant difference between the two groups in terms of hospitalization (P=0.30) and location (P=1.59) and history of fractures (P=0.80), and pain relief factors (P=0.82). According to the findings, 70 % in the intervention group and 63.30% in the control group had a history of hospitalization for various reasons. Also, the findings of the study indicated that 23 patients in the intervention group (76.7%) and 22 in the control group (73.3%) did not mention the history of fractures. Moreover, the knee was reported as the most common pain area of location in both intervention and control groups (36.70% in the intervention group and 33.30% in the control group). The most pain-intensifying agent was movement in both intervention and control groups (66.7% in the intervention group and 76.7% in the control group) (Table 2).

The findings related to the pain and its subscales indicated that before the intervention, the average pain in the intervention group was 29.72±7.19 and in the control group was 28.65±6.37, and there was no significant difference between the two groups (P=0.54). The average

of the pain subscales before the intervention was similar between the two groups. The statistical test did not show any significant difference between the two groups before the intervention in this regard (P>0.05). At the end of the fourth week after the intervention, the Mean±SD pain score of the intervention group was 24.7±7.00, and in the control group, it was 28.82±6.27. Furthermore, the emotional and current pain subscales were further reduced in the intervention group compared to the control group, indicating pain relief in this group. The statistical test showed a significant difference between the two groups before and at the end of the fourth week in terms of mean total pain (P=0.019) and subscales of emotional (P=0.026) and current pain aspects (P=0.005). According to the independent t-test and Mann-Whitney test, the subscales of sensory pain aspect (P=0.053) and pain severity (P=0.069) in the two groups before and at the end of the fourth week did not differ significantly. At the end of the eighth week after the intervention, the Mean±SD pain score of the intervention group was 21.29±6.91 and in the control group was 28.87±6.25. At the end of

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Table 4. Comparison of the difference between the mean total pain scores in the fourth and eighth weeks

Pairwise Comparisons							
Groups	Pain (I)	Pain (J)	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
						Lower Bound	Upper Bound
Intervention	Before	Fourth week	5.023[*]	0.358	0.0001	4.141	5.906
		Eighth week	8.430[*]	0.570	0.0001	7.025	9.835
Fourth week		Eighth week	3.407[*]	0.302	0.0001	2.662	4.151
Control	Before	Fourth week	-0.170	0.358	1.000	-1.053	0.713
		Eighth week	-0.213	0.570	1.000	-1.618	1.191
Fourth week		Eighth week	-0.043	0.302	1.000	-0.788	0.701

the eighth week, all pain subscales in the intervention group decreased compared to the control group. The independent t-test and Mann-Whitney test showed a significant difference between the overall score of the pain (P=0.0001) and its subscales, including emotional and current pain (P=0.0001), sensory pain (P=0.001), and pain severity (P=0.001) (Table 3). The total mean pain score in intervention and control groups at the end of the fourth and eighth weeks of the study compared to the baseline. As shown in Figure 2, a descending pain trend was observed in the intervention group indicating the decreased pain in the intervention group. The findings related to the intra-group comparison between the intervention and control groups showed that the mean of pain and its subscales in the intervention group at the end of the fourth and eighth weeks decreased compared to the pre-intervention condition indicating the pain relief compared to the baseline (P=0.0001) (Table 3). Friedman and ANOVA with repeated measures showed a significant difference between the fourth and eighth weeks compared to the baseline (P=0.0001). However, in the control group, the mean total pain and its subscales did not change at the end of the fourth and eighth weeks compared to the baseline (Table 4).

4. Discussion

In this study, all types of musculoskeletal pain in healthy elderly were considered. In many studies, the effect of yoga was considered only on a painful region. For example, Akbari et al. [11] assessed the effect of yoga and common exercises on depression, pain, functional disability, and lumbar motion domain in females aged 28 to 60 years with a lumbar disc herniation. The findings of this study showed that yoga effectively reduced the backache

caused by lumbar disc herniation. Despite the differences between this study and the present study, in terms of the type of pain, sample size, number of yoga sessions, and pain evaluation tools, the findings of the two studies are consistently indicating the effect of yoga on acute pain and in younger people in a certain position similar to chronic musculoskeletal pain in old people. However, Teut et al. [15] compared the effects of yoga and traditional Qigong medicine on chronic back pain in elderly aged 65 years and older and reported that yoga did not relieve back pain. This finding is not consistent with the findings of the current study. In the mentioned study, participants were complaining of back pain for 18 to 20 years, and 60% of the subjects took medication. In the present study, the mean duration of pain was five years. The reason for this difference in the results of this study can be due to the area of the pain in these two studies and the long duration of lower back pain in Theo Michelle et al.'s study.

The current research results suggested that the eight weeks of yoga practicing reduced all dimensions of pain based on the McGill Pain Scale decreased further during eight weeks compared to the four weeks in elderly females. In the study by Park et al. in 2017, the severity of pain decreased further during three months compared to the eight weeks [16]. This result suggests that more time is required to indicate the effects of yoga on all aspects of pain. Yoga exercises do not improve all aspects of pain in the short term, and yoga exercises for a long time are required in this regard.

The findings of this study showed that the most painful zone was in the knee area, and the average BMI of the elderly was above 30. In a study conducted by Shirazi et al. on the prevalence of musculoskeletal pain in the elderly, it was also reported that the knee was the most frequent region

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of pain, followed by the neck, shoulder, waist, and hands [3]. Considering the culture of traditional Iranian society, in many activities, such as sitting on the ground and using the Iranian toilet, the knee bends more than 90 degrees. In this situation, a huge deal of stress is applied to the knee. These stresses will be associated with damage to the knee structures related to tibiofemoral and patellofemoral joints and will eventually lead to pain and disability [4]. Also, in the study by Alipour et al., elderly with a BMI of more than 30 had significantly more pain than other elderly. Knee pain resulted in reduced movement and increased weight. Again, weight gain leads to more pressure on the knee [23].

One of the limitations of this study is the lack of long-term follow-up. Future studies with consistent follow-up for a longer duration could be planned to explore the substantial and constraint effect of yoga. Although several studies have reported similar findings, the type and time of yoga practice varied between studies, and hence, the effect might also vary according to the design of the study.

5. Conclusion

According to this study, yoga exercise may significantly reduce musculoskeletal pain and some subscales of the McGill Pain Scale, including sensory dimension and severity of pain in older females after eight weeks. Thus, yoga exercise for eight weeks may be recommended as a non-pharmacological treatment option to improve musculoskeletal pain in older females.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of the Rafsanjan University of Medical Science (Code: IR.RUMS.REC.1396.216).

Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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