# Effects of resistance training with theraband on pain and quality of life in patients with knee osteoarthritis

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## Abstract

**Introduction:** Joint pain, especially pain in the knee joint, is one of the most important problems that people with osteoarthritis report.The aim of this study was to determine the effects of resistance training with theraband on pain and quality of life in patients with knee osteoarthritis.
**Materials and methods:** Twenty five patients with knee osteoarthritis with age range of 38 to 65 years old who had no history of any exercise during the past six months, and had no chronic conditions affecting on study outcomes were selected as study sample and randomly divided into two groups including experimental (n = 13) and control (n = 12) groups. The experimental group performed 8 weeks of resistance training, and the control group did not receive any intervention. SF-36 and Numeric pain rating scale were used to assess quality of life and pain, respectively. Finally, data were analyzed using SPSS software and independent t-test analysis. The level of significance was considered to be equal or less than 0.05.
**Results:** The results of this study showed that after using intervention in the experimental group pain had a significant decrease compared to the control group (p=0.012). Also, eight weeks of intervention indicated a significant difference in the quality of life of patients with knee osteoarthritis between the control and experimental groups as it was increased in the experimental group compared to the control group(p=0.001).
**Conclusion:** The findings of this study indicated that resistance training with theraband can reduce pain and enhance quality of life in patients with knee osteoarthritis.

**Keywords:** Resistance Training, Knee osteoarthritis, Pain, Quality of Life, Theraband

## Introduction

Osteoarthritis as one of the most common musculoskeletal disorders, can cause pain, disability, and reduce quality of life (1). The most important pathological aspects of osteoarthritis are the progressive deformity of articular cartilage, the formation of marginal osteophytes, and changes in secondary synovitis. The first clinical sign of disease is the mechanical pain that is, exacerbated by activity and work and is reduced by rest. Joint stiffness and limited range of motion are the secondary symptoms that appear after a few years of disease progression (2). In the severe cases, the deformity of articular cartilage, subchondral bone, and all intravascular synovial tissue is observed (1, 3). Osteoarthritis can affect any joint in the body, but this is significantly higher in weight-

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bearing joints, especially the knee joint (4). The pathophysiological defects of the disease are weakness and atrophy of the muscles around the knee, especially the quadriceps, which disorder the biomechanics of the joint (5). These mechanical stresses and malalignment affect the structure or function of joint tissues, including articular cartilage, subcondular bone, joint capsule, and synovial membrane (6).

Previous studies have shown that symptoms of knee osteoarthritis are seen in 40% of people aged 65 and over; however, this rate is significantly increasing (7, 8). Knee osteoarthritis is associated with an increased prevalence of obesity and a decreased life expectancy in the elderly (9). Although the close relationship between obesity and the prevalence of knee osteoarthritis has been reported in several studies, the only independent risk factor for this complication is age (7, 10). The severity of knee osteoarthritis is rated from zero (no radiographic signs) to five (destruction or loss of more than 10 mm of bone, often accompanied by inflammation or partial dislocation of the joint) according to radiographic signs of Ahlback (11). The progressive nature of the disease and the resulting pain and disability significantly affect the ability of the sufferersto perform daily activities (12). These conditions reduce the mobility of patients, which will lead to a decrease in their quality of life (13). Most people with osteoarthritis suffer from pain, joint stiffness, and muscle weakness, which reduces patients' quality of life due to its chronic, painful, and disabling nature (14). Patients face challenges in managing their illness, such as maintaining performance, managing pain, and preventing disability. Given that pain is one of the factors that slows down the walking speed of patients with osteoarthritis, reducing pain may also improve movement and increase the walking speed of these patients (15). Untreated pain is related to issues such as depression, anger, sleep disturbance, malnutrition, and mental disorder (16). The ultimate goal of treatment for osteoarthritis is to reduce pain, improve function, and maintain joint mobility, which in turn will improve the quality of life in these people (17).

Unfortunately, the prevalence of knee osteoarthritis is increasing in Iran due to the aging of the society (about 20%), which imposes many economic and social costs on the individual and society. Common treatments for this complication in Iran include surgery, medication, and rehabilitation (18, 19). Surgical procedures include complete replacement of the knee joint or injection of gel into the joint, which is very expensive and painful, so difficult for the patient to accept. Although medication is more economical for these patients, due to the digestive problems of these patients due to aging, the use of drugs by these people has also its own complication. Therefore, it seems that the least expensive treatment possible is to use the non-invasive method of therapeutic exercise in the form of a rehabilitation program.

In recent decade, non-pharmaceutical methods, including exercise, have received much attention. Exercise therapy is the use of exercise or sports training with therapeutic purposes to relieve the effects of a disease or disorder (7, 8, 10). Although high-intensity exercise increases the risk of injury, exercise in moderate can be beneficial, so that regular physical activity today is known as a multifaceted and safe treatment for the symptoms of knee osteoarthritis (20, 21). Exercise therapy for osteoarthritis may be performed on land or in an aquatic environment (2). Each of these types of exercise therapy has its advantages and disadvantages, for example, resistance training is due to being unsafe and water training is due to fear of water for some people. In recent years, the use of resistance



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training theraband has received much attention due to its low cost, and high safety. (22)

Studies show that exercises that emphasize increased strength of the rectus femur's muscle, can reduce pain and functional disorders in patients with knee osteoarthritis (23-25). Katz et al. studied 548 patients with rheumatoid arthritis and showed that disability was very common in people with arthritis. Fatigue and pain were associated with disability and other symptoms. Disability played a significant role in patients' psychological condition (26). According to Diettelm and et al, pain levels are the most important qualitative variable in the lives of patients with arthritis. Pain is also significantly affects daily living activities (27). However, some studies have shown that exercise does not affect pain levels. For example, Analia reported no changes in pain levels from exercise (50 minutes a day, 3 sessions a week for 6 weeks). In this study, depression decreased by 31% after 8 weeks of exercise and increased by 19% in the control group (11). Glamis et al. examined the effect of a 12-week combined exercise program on the quality of life in female patients with osteoarthritis of the knee. They recruited 34 participants aged 50-69 years during 12 weeks of exercise. They had two groups including control (no exercise) and experimental group (aerobic, strength and flexibility combination program). In this study, the exercise group showed a significant difference in all areas of SF-36. In addition, the physical performance score, mental health, and general health scores increased after 12 weeks of exercise (28).

Improving the quality of life of patients with knee osteoarthritis due to the chronic nature of the disease and the lack of definitive treatment for it is necessary (29). Many factors affect the quality of life of these patients, which is mostly related to the nature and severity of the clinical symptoms. Therefore, the goal of clinical care is to reduce the severity of symptoms including pain in this group of patients (30). Although many medications have been taken to reduce pain and clinical symptoms and improve the quality of life of these patients, it makes sense to use non-pharmacological methods as complementary therapies that can reduce the problems and improve the quality of life in patients with knee osteoarthritis without having side effects. Exercise with theraband in MS patients has been shown to improve muscle strength and quality of life (31), but the effect of this type of exercise has not yet been studied in patients with osteoarthritis of the knee. It can be portable, affordable and inexpensive So it can be as Complementary therapies can reduce the progression of the disease and improve a person's capacity and physical performance. Therefore, the aim of this study was to evaluate 8 weeks of resistance training with theraband on pain and quality of life in patients with knee osteoarthritis.

## Material and methods

This is a semi-experimental study with pre-test and post-test design and control group. In this study, female patients with knee osteoarthritis (grades 1 and 2) who were treated and had no drug changes during their treatment were examined. Those who had no specific exercise activity over the past six months or had a history of other acute or chronic physical or mental disorders (such as disabling heart disease, respiratory, liver, or kidney), mental or psychological conditions such as severe depression (Using a Beck Depression Assessment Questionnaire as well as a physician's opinion) speech or hearing impairmentwere recruited as study sample. Thirty patients with knee osteoarthritis who referred to the clinic were selected based on the entry criteria and were randomly divided into two groups including control and experimental groups each with 15



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participants. Before to start the study 5 people dropped out due to the some personality problems. So, the final number of participants was 25, 12 people in experimental group and 13 people in the control group.

Consent form was obtained and signed by all participants. Participants attend in 2 practice sessions to be familiar with the study procedures and for experimental group with intervention program as well. Prior to the intervention, patients were assured that their information would be confidential and anonymous.

In the present study, patients performed pedaling to warm up and did resistance exercises with theraband that included knee extension (strengthening the quadriceps muscles), pelvic abduction to strengthen the femoral abductor or the muscles on the outside of the knee, and hip adductor to strengthen the muscles.. Participants in the experimental group attend the intervention program 3 times a week for 8 weeks at the center of the corrective exercise. The exercises were designed by the researcher with the approval of the treating physician and based on the patients' ability to perform the activity.

In order to comply with the principle of overload, the time and intensity of the training were gradually increased during these 8 weeks, in accordance with the readiness and ability of the subjects. At the beginning of each session, the subjects warmed up for 5 to 7 minutes, after which the main part of the exercise program was performed, and after the end of this part, for 5 to 7 minutes they performing dynamic movements and gentle stretching of the body to cooling themselves. A 10-point Borg scale was used to control exercise intensity. In this way, during the exercise, the questionnaire of the level of comprehension of the effort was in front of the subjects to express the intensity of the training as a number. On this scale, there are numbers from 0 to 10 that indicate the intensity of work from "very, very light", "very light", "light", "moderate", "somewhat intense", "very severe" and "very severe".. If the subjects chose numbers 3 to 6, the intensity of the exercise would be appropriate, otherwise the intensity of the exercise would have to be adjusted. To prevent any accidents for patients, it was recommended that they stop exercising if they feel pain in the chest, heart, and if they feel very tired. If some patients stated that they were more able to perform the activity, the time and intensity of training for them would increase compared to the previous session. It should be noted that there was no intervention in the control group.

Data was obtained from both experimental and control groups before and after 8 weeks of intervention. The data collection tools in this study included a personal information questionnaire based on two parts: demographic characteristics (age, sex, height, weight, marital status, level of education, number of children, job, etc) and information about the disease (duration of infection, recurrence and inpatient hospitalization over the past year, the type of medication used, the extent of the disability. The numeric pain rating scale was used for pain measurement (Figure 1), the reliability of which is reported to be between 85% and 95%, (32). The short form of quality of life assessment (33) assessed the quality of life of patients whose reliability coefficient has been reported to be between 77% and 90% (35).

The data were analyzed using SPSS statistical software version 25 and the independent t-test, and the Smirnov Kolmogorov test was used to analyze data and check the normality of the data.

## Results

Descriptive statistics of height, weight, and age variables are given in Table 1. Using independent t- test we found that there was no



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significant difference between experimental and control groups in demographic information. Also, the results of Kolmogorov-Smirnov test showed that the distribution of outcome variables was normal and parametric tests could be used. The results also showed that pain and quality of life in the experimental group improved significantly (Table 2,3).

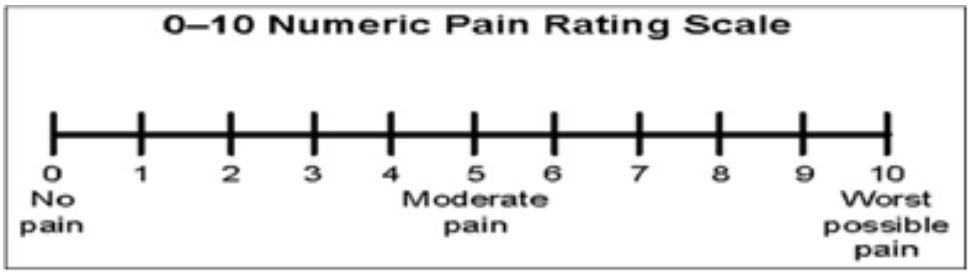


**Figure1**. Numeric pain rating scale to indicate the intensity of current, best, and worst pain levels on a scale of 0 (no pain) to 10 (worst pain imaginable).

**Table 1.** Descriptive characteristics of subjects.

| Variables | Experimental group | Control group | P value |
|---|---|---|---|
| Age (year) | 49.09 ± 8.1 | 48.81±8.24 | 0.102 |
| Height (cm) | 167 ± 3.65 | 163.28±5.73 | 0.201 |
| Weight (kg) | 74.45± 6.05 | 71.61±7.1 | 0.089 |

Data are shown as mean ± standard deviation

**Table 2.** Comparison of pain and quality of life in post-test.

| Variable | Experimental group | Control group | T | P value |
|---|---|---|---|---|
| Pain | 2.0±1.8 | 3.1±2.2 | 2.238 | 0.012 |
| Physical dimension | 63.2±4.5 | 34.1±4.1 | 10.340 | 0.001 |
| Psychological dimension | 64.7±4.9 | 38.4±4.1 | 9.560 | 0.001 |
| Activity dimension | 75.8±5.9 | 31.3±2.1 | 11.431 | 0.0001 |

The data are shown as mean ± standard deviation and were analyzed by Independent T-test.

**Table 3.** Comparison of pain and quality of life scores in pre-test and post-test between groups of study.

| Variable | Groups | Pre-test | Post-test | T | P |
|---|---|---|---|---|---|
| Pain | Experimental | 3.8±1 | 2.0±1.8 | -8.965 | 0.0007 |
| | Control | 3.1±1.2 | 3.1±2.2 | 0.127 | 0.16 |
| Physical dimension | Experimental | 32.3±4.2 | 63.2±4.5 | 9.780 | 0.002 |
| | Control | 33.9±3.6 | 34.1±4.1 | 0.348 | 0.096 |
| Psychological dimension | Experimental | 39.1±4.1 | 64.7±4.9 | 7.908 | 0.003 |
| | Control | 38.4±3.8 | 38.4±4.1 | 0.204 | 0.101 |
| Activity dimension | Experimental | 33.2±3.1 | 75.8±5.9 | 10.873 | 0.001 |
| | Control | 32.7±2.9 | 31.3±2.1 | 0.453 | 0.080 |

The data are shown as mean ± standard deviation and were analyzed by Independent T-test.

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## Discussion

The aim of this study was to determine the effect of 8 weeks of resistance training with theraband on pain and quality of life in patients with knee osteoarthritis. The results of this study showed that after eight weeks of intervention in the experimental group (resistance training with theraband) pain had a significant decrease compared to the control group. Also, eight weeks of intervention caused a significant difference in the quality of life of patients with knee osteoarthritis between the control and experimental groups as it increased in the experimental group compared to the control group.

According to the results, resistance exercises with theraband can reduce pain. Exercise can reduce the recurrence of chronic pain, improve physical performance, and reduce the symptoms of anxiety and depression (35). Chronic pain has a negative effect on physical health. It has been observed that people with chronic pain are more likely to have limited activity over time (35). Previous studies have shown the relationship between pain and reduced physical activity. The severity, duration or location of the pain, play a vital role in a person's physical performance. Decreased activity in people due to pain and overweight plays an important role in the process of reducing muscle strength and flexibility. A combination of these results may make people's pain worse (36). Epidemiological studies have also shown that pain is the most important cause of physical disability among patients with osteoarthritis (37, 38). Resistance programs with theraband are known as a way to increase a person's ability to function and reduce knee pain (39). The results of our research are in line with the results of researches by Chen et al. (40), Robert (41), Barati et al. (42), and Clausen et al. (43). Due to the relationship between joint pain onset and decreased muscle strength and movement, it has been recognized that pain causes improper use of the joints and the weakness of the muscles around the joint will in turn lead to abnormal movements, and again improper use of the joint can cause pain (41). Resistant programs with theraband are known as a method to increase people's functional ability by reducing the load on the knee and reducing pain, and by increasing sensitivity in the sensory motor structure of the quadriceps muscle, including the muscular spindle and Golgi, so reduce pain in patients with knee osteoarthritis (43).

The results of the present study further showed that after eight weeks of resistance training with theraband the quality of life of patients with knee osteoarthritis improved. Using a SF-36 questionnaire, Baker showed that after 4 months of exercise, physical performance scores, as well as mental and social health increased, and pain decreased (44). The results of this study are consistent with our research. Using the SF-36 questionnaire, Diracaco also found that physical performance scores, physical role and vitality scores, and physical performance scores on the Womek questionnaire in the kinetic group increased significantly compared to the resistance group after 8 weeks of exercise program (45). Glamis and his colleagues examined the effect of a 12-week combination of exercise program on the quality of life of female patients with osteoarthritis of the knee. They indicated a significant difference between two groups in all dimensions of SF-36. In another study, after six weeks of exercise, Foley and et all did not see any change in the Womack questionnaire. However, the score of the SF-12 questionnaire increased after the hydrotherapy program (46). Research has shown that regular exercise has a positive effect on quality of life. Rheumatology studies have shown that exercise can have a positive effect on quality of life by reducing muscle pain and stiffness (47). The fact that



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resistance training with theraband can strengthen people's functional ability by strengthening muscles, it causes a person have a better quality of life in terms of physical dimension. Also by doing these exercises and reducing the load on the knee joint and so reducing pain, and considering that performing group activities rejuvenates and improves a person's mood, such activities increase all aspects of quality of life in patients with knee osteoarthritis. Therefore, patients should focus on a specific exercise program that they do every day.

## Conclusion

In general, the findings of this study indicate that resistance training with theraband along with drug treatment has favorable effects on pain and quality of life in patients with knee osteoarthritis. One of the strengths of these exercises is that the person only needs a theraband that is low cost and it is possible to perform the exercise with it anywhere and no negative side effects have been seen from them, so using this type of exercise for patients with knee osteoarthritis recommended.

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## Ethical approval

The study was approved by the Institutional Ethical Committee for Sports Sciences Research Institution of Ministry of Science of Iran (Ethic code: IR.SSRI.REC.1397.217).

## Conflicts of interest

The authors declare that they have no conflict of interest.

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