



www.bioinformation.net
Volume 22(4)



Research Article

Received April 1, 2026; Revised April 30, 2026; Accepted April 30, 2026, Published April 30, 2026

DOI: 10.6026/973206300221996

SJIF 2026 (Scientific Journal Impact Factor for 2026) = 8.478
2022 Impact Factor (2023 Clarivate Inc. release) is 1.9

Declaration on Publication Ethics:

The author's state that they adhere with COPE guidelines on publishing ethics as described elsewhere at <https://publicationethics.org/>. The authors also undertake that they are not associated with any other third party (governmental or non-governmental agencies) linking with any form of unethical issues connecting to this publication. The authors also declare that they are not withholding any information that is misleading to the publisher in regard to this article.

Declaration on official E-mail:

The corresponding author declares that lifetime official e-mail from their institution is not available for all authors

License statement:

This is an Open Access article which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited. This is distributed under the terms of the Creative Commons Attribution License

Comments from readers:

Articles published in BIOINFORMATION are open for relevant post publication comments and criticisms, which will be published immediately linking to the original article without open access charges. Comments should be concise, coherent and critical in less than 1000 words.

Disclaimer:

Bioinformation provides a platform for scholarly communication of data and information to create knowledge in the Biological/ Biomedical domain after adequate peer/editorial reviews and editing entertaining revisions where required. The views and opinions expressed are those of the author(s) and do not reflect the views or opinions of Bioinformation and (or) its publisher Biomedical Informatics. Biomedical Informatics remains neutral and allows authors to specify their address and affiliation details including territory where required.

Edited by A Prashanth
E-mail: phyjunc@gmail.com
Phone: +91 7259404071

Citation: Patel & Muley, Bioinformation 22(4): 1996-1999 (2026)

Effect of isometric exercise on knee pain perception among old people with osteoarthritis

Nikitaben Dahyabhai Patel^{1,*} & Arti Prasad Muley²

¹Department of Nursing, Parul University, Waghodia, Vadodara, Gujarat, India; ²Department of Medicine, Parul Institute of Medical Sciences and Research, Faculty of Medicine, Parul University, Waghodia, Vadodara, Gujarat, India; *Corresponding author

Affiliation URL

<https://paruluniversity.ac.in/faculty/nursing/>
<https://paruluniversity.ac.in/faculty/medicine/>

Author contacts:

Nikitaben Dahyabhai Patel - E-mail: nikuchetanpatel@gmail.com; Phone: +91 8469550878

Arti Prasad Muley - E-mail: arti.muley77892@paruluniversity.ac.in; Phone: +91 9879609196

Abstract:

Knee osteoarthritis (OA) has been identified as among the top three causes of chronic pain and functional limitations in aging populations. The first line of treatment for OA is exercise as part of a conservative management plan. Therefore, it is of interest to determine if isometric exercise would reduce pain perception of the knee in elderly patients (age 60-75) with knee OA. The sample consisted of 40 participants matched to experimental or control groups using consecutive sampling. Pain was measured before and after the intervention using a standardized pain scale. After the intervention, the mean pain score for the experimental group decreased from 4.70 to 0.37, for an overall mean difference of 4.32 ($p < 0.05$). Thus, we report that isometric exercise of the knee for the treatment of knee OA significantly reduces pain perception in older adults with knee OA.

Keywords: Osteoarthritis (OA), isometric exercise, pain perception, old people

Background:

Osteoarthritis is a long-term degenerative joint problem that has caused many older adults to become disabled [1]. The knee is the most typical location for developing osteoarthritis [2]. Osteoarthritis is more common as people age and reduces mobility as well as quality of life [3]. Osteoarthritis damages a joint in three ways by degenerating cartilage, by creating synovial fluid inflammation and by decreasing a person's ability to regenerate the joint [4]. These physical changes to joints create pain, stiffness and limitation of physical function. Osteoarthritis risk factors include being older, being obese, having had an injury to the joint and having weak muscles [5]. A sedentary lifestyle will also increase the rate at which osteoarthritis is developing in an individual. Current treatment guidelines for osteoarthritis recommend that non-pharmacological methods be used first to treat osteoarthritis [6]. Exercise is recommended for decreasing joint pain and increasing functional capacity [7]. Strengthening exercises can also be helpful in improving joint stability and decreasing stress on the joint. Isometric exercises are a type of exercise where the muscles are contracted without any movement of the joint and they do not put any stress on the joint [8]. Isometric exercises are safe and appropriate for elderly individuals who have limited physical mobility and who do not need to use any special equipment [9]. Isometric exercises can be performed easily in the home or the community [10]. Therefore, it is of interest to investigate the effect of isometric exercise on the perception of knee pain in older adults who have osteoarthritis.

Materials and Methods:

The researcher used a quantitative method to investigate how effective isometric exercises are in reducing the perception of knee pain in older adult patients diagnosed with osteoarthritis. The study utilized a pre experimental research design-one group pre-test & post-test design and was completed within specified areas in Daman. In total, 40 elderly individuals participated in this study, which utilized a non-probability consecutive sampling technique to identify eligible subjects. Participants had to be between 60 and 75 years of age; both genders were included, with the additional criterion being if they experienced knee pain due to osteoarthritis and they were willing to take part in the study. Elderly persons with extreme restrictions in movement, persons who had undergone knee surgery in recent

months and/or those suffering from other inflammatory joint problems were not eligible for inclusion in this study. Following approval from the Institutional Human Ethics Committee, all of the participants signed a written informed consent prior to the data collection process. After baseline demographic information and a standardized pain scale were recorded, the experimental group was given a defined form of isometric exercise treatment for their knee joints according to established standards; meanwhile, the control group continued receiving standard care. Following the completion of the exercise intervention period, post-test assessments of the participants' knee pain were conducted. All data collected were analyzed using descriptive and inferential statistical techniques and descriptive statistics were generated to summarize the data collected in forms of frequency, percentage, mean and standard deviation, along with testing of the hypotheses using Inferential Statistics.

Table 1: Frequency and percentage distribution of old people according to age (n = 40)

Age group (years)	Frequency (f)	Percentage (%)
60-65	33	82.5
66-70	6	15.0
71-75	1	2.5

Table 2: Frequency and percentage distribution according to gender (n = 40)

Gender	Frequency (f)	Percentage (%)
Male	32	80.0
Female	8	20.0

Table 3: Frequency and percentage distribution according to selected demographic variables (n = 40)

Variable	Category	Frequency (f)	Percentage (%)
Educational status	Primary & Secondary	40	100
Previous occupation	Company Worker	5	12.5
	Homemaker	7	17.5
	Labourer	26	65.0
Body mass index	Watchman	2	5.0
	18.5-24.9	17	42.5
Family history of OA	25-29.9	23	57.5
	No	40	100
Sports involvement	No	40	100
Diet	Vegetarian	15	37.5
	Mixed	25	62.5
Level of activity	Sedentary	26	65.0
	Active	14	35.0
Regular exercise	No	40	100

Table 4: Frequency and percentage distribution of pre-test and post-test level of pain (n = 40)

Level of pain	Pre - test f(%)	Post - test f(%)
No pain	0 (0)	25 (62.5)
Mild pain	1 (2.5)	15 (37.5)
Moderate pain	39 (97.5)	0 (0)

Table 5: Comparison of mean pre-test and post-test pain scores (n = 40)

Test	Mean	Standard deviation
Pre - test	4.70	0.82
Post - test	0.37	0.49
Mean difference	4.32	-

Table 6: Effectiveness of isometric exercise on knee pain among old people (n = 40)

Variable	Mean	SD	Mean difference	Df	t value	p value
Pre - test pain	4.70	0.82				
Post - test pain	0.37	0.49	4.32	39	29.83	<0.05

Results:

The findings of this research study provide an overview of several different demographic variables relating to each of the participants as well as the levels of pain that each participant experienced both before and after an exercise program consisting of only isometric type exercises. This includes a comparison of average pain levels prior to and following participation in the exercise program as well as evidence of the effectiveness of an isometric exercise program to reduce pain in older adults who have osteoarthritis. In addition, the demographic data collected from the 40 elderly participants includes the pre-test pain perception levels and post-test pain perception level data, including the mean difference between these two measurements. Also, within this listing the effectiveness of the isometric exercise program via the use of inferential statistics (t-tests). Other representation formats may be used to represent these findings as long as they demonstrate a wide range of possible distributions and associations by comparing the sub-group categories of pain level versus all other variables, as well as how each of the variables is related to each other. All results will be displayed in a logical manner and with alternating grey and white rows to allow for increased visibility and understanding of the findings. The study on the elderly included 40 people, as shown in **Table 1**, which breaks down the participants' ages into different categories. Most of the elderly, 33 (82.5%), were aged 60-65 and there were 6 (15.0%) aged 66-70, with just 1 participant aged 71-75 (2.5%). This indicates that the majority of participants fell within the younger elderly range. **Table 2** outlines how the gender of the participants was distributed amongst males and females. Of the 40 elderly participants, the significant majority of the sample, 32 (80.0%), were male with 8 (20.0%) female. This indicates a significant imbalance between the numbers of males and females in the sample, which may point to occupational risk factors and lifestyle choices being responsible for knee osteoarthritis in this sample population. **Table 3** details how participants were divided according to other demographic characteristics. All 40 (100%) participants had received education through either primary or secondary schools. Of the different types of previous occupations, the largest group, 26 (65.0%), were labourer and 7 (17.5%) were homemakers, followed by 5 (12.5%) company

workers and 2 (5.0%) watchmen. Based on the calculation of body mass index, 23 (57.5%) participants fell between 25-29.9 (overweight) and 17 (42.5%) fall within the normal range for BMI. No participant reported a family history of osteoarthritis nor had participants participated in any kind of sports prior to the study. A mixed diet was consumed by 25 (62.5%) participants and 26 (65.0%) participants were sedentary in their lifestyles. Importantly, none of the participants had any type of regular exercising program. Knee pain levels were compared before and after an isometric exercise intervention in **Table 4**. The majority of participants in the pre-test, 39 (97.5%), reported moderate levels of pain, while 1 (2.5%) reported mild pain and none reported no pain at all. Conversely, after completing the isometric exercise program, 25 (62.5%) participants no longer reported any pain and 15 (37.5%) experienced mild pain. Furthermore, none of the participants reported moderate levels of pain after completing the intervention. Therefore, the isometric exercise intervention greatly improved participants' perceptions of their knee pain. Using **Table 5**, the average pain scores before and after the intervention can be compared. Before the exercise program, the average pain score was 4.70 with a standard deviation of 0.82 (moderate levels of pain), while the average pain score after the intervention dropped significantly to 0.37 with a standard deviation of 0.49. The average difference in pain scores between pre and post was 4.32, indicating that the intervention reduced the participant's knee pain very significantly. **Table 6** compares the effectiveness of isometric exercise against knee pain perception based upon inferential statistics. The t statistic was calculated as 29.83 with 39 degrees of freedom, which is statistically significant at $p < .05$. This indicates that the pre-test average pain score was significantly higher than the post-test average pain score. Therefore, the research supports the conclusion that using isometric exercises reduce knee pain significantly.

Discussion:

Knee osteoarthritis (OA) is a primary cause of chronic pain and disability in older adults. The main objective of all conservative treatment options for knee OA will be to reduce pain and enhance function. Exercise has been established to be one of the first modes of treatment for knee OA and is supported as a first-choice approach [11]. This study supports the claim of a statistically significant reduction in knee pain status after a period of isometric exercise. At the baseline, most participants reported moderate levels of pain. Upon completion of the exercise program, the majority of participants reported no pain or only mild levels of pain. These results support the use of strengthening exercises for pain management [12]. Performing isometric exercises will strengthen the muscles and provide stability. By having increased strength in the quadriceps, this can decrease the amount of mechanical load placed on the knee joint. Consequently, decreased load on the knee means less stress placed on the joint and thus a lower perception of pain and increased ability to perform functional activities [13]. Furthermore, the mean amount of pain reduction from the exercise program is similar to that found in previous research of

other exercise programs in this clinical population. There is ample evidence in the extant literature that structured exercise programs have produced similar benefits for older adults with knee OA compared to the results of this study [14]. Exercise therapy also demonstrates an increase in confidence and increased levels of activity. The demographic data revealed a high prevalence of sedentary lifestyles and lack of regular physical activity. This is critical in emphasizing the need for simple and accessible options. Isometric exercises can be performed inexpensively in the home, community-based programs or group settings [15]. The findings from this study support the current clinical guidelines recommending exercise therapy as a fundamental strategy for treating OA. Therefore, including isometric exercise into routine treatment for patients may reduce the need for pharmacological treatment for knee OA [16]. In addition, the results of this study provide evidence supporting the positive effect of isometric exercise within the elderly population in the community. This research demonstrates that isometric strengthening exercises can provide significant reduction in knee pain perception. The limitations of this study were the small sample size and lack of randomization, yet these limitations still support the value of low-cost forms of exercise interventions within a community setting.

Conclusion:

In older individuals experiencing osteoarthritis, isometric exercise has a positive effect on reducing their pain from the knees. There can be significant increases in the quality of life and mobility in older adults, as a result of the encouraged routine of structured strengthening exercises.

Acknowledgement:

We acknowledge that the first and second author contributed equally to this paper and hence they are considered as joint first author.

References:

- [1] Wang Y *et al.* *Front Med.* 2025 **12**:1696929 [PMID: 41476872]
- [2] Courties A *et al.* *Osteoarthritis Cartilage.* 2024 **32**:1397 [PMID: 39103081]
- [3] Ferreira R *et al.* *Acta Reumatol Port.* 2019 **44**:173 [PMID: 31356585]
- [4] Kangeswari P *et al.* *SAGE Open Nursing.* 2021 **7**:2377960821993515 [PMID: 33997279]
- [5] Perruccio AV *et al.* *Osteoarthritis Cartilage.* 2024 **32**:159 [PMID: 38035975]
- [6] Tang S *et al.* *Nat Rev Dis Primers.* 2025 **11**:10 [PMID: 39948092]
- [7] Kolasinski SL *et al.* *Arthritis Care Res (Hoboken).* 2020 **72**:149 [PMID: 31908149]
- [8] Raposo F *et al.* *Musculoskeletal Care.* 2021 **19**:399 [PMID: 33666347]
- [9] Lawford BJ *et al.* *Cochrane Database Syst Rev.* 2024 **12**:CD004376 [PMID: 39625083]
- [10] Horecka A *et al.* *Bosn J Basic Med Sci.* 2022 **22**:488 [PMID: 35151249]
- [11] Messier SP *et al.* *JAMA.* 2021 **325**:646 [PMID: 33591346]
- [12] Mohamed SHP & Alatawi SF, *Ir J Med Sci.* 2023 **192**:2223 [PMID: 36527538]
- [13] Subramanian KN *et al.* *J Orthop Joint Surg.* 2023 **5**:20.[DOI: 10.5005/jp-journals-10079-1108]
- [14] Kamel AM *et al.* *J Orthop Surg Res.* 2024 **19**:207 [PMID: 38561773]
- [15] He J *et al.* *Front Public Health.* 2025 **12**:1454185 [PMID: 39872105]
- [16] Gelber AC, *Ann Intern Med.* 2024 **177**:ITC129 [PMID: 39250809]

Caveat Emptor is applicable among the literate community where required and possible. The publisher, its journal, editors and the internal/external reviewers take adequate steps to check, evaluate, correct, edit, revise and improve content where possible and required.