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ORIGINAL ARTICLE **OPEN ACCESS**

A Study to Find the Effect of Balance Enhancing Exercise Program on Pain and Quality of Life Among Elderly with Chronic Musculoskeletal Pain

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ABSTRACT

The study investigated the efficacy of a balance-enhancing exercise program in alleviating pain intensity and improving the quality of life among elderly individuals with chronic musculoskeletal pain (CMP). Significant improvements were observed using the Friedman Test, with median Numeric Pain Rating Scale (NPRS) scores decreasing from 6 to 3 and Short Form 12 Scale (SF-12) scores increasing from 40 to 50 over the 6-week intervention period in the intervention group. These improvements were statistically significant ($p < 0.001$) and consistent with trends observed in the control group. Post-hoc analyses revealed significant improvements in NPRS and SF-12 scores between various time intervals within both groups. The findings highlight the program's efficacy in reducing pain intensity and enhancing quality of life among elderly individuals with CMP. These outcomes underscore the multifaceted benefits of the exercise program, extending beyond pain relief to encompass broader aspects of well-being and functional outcomes. The study contributes valuable insights for healthcare practitioners and policymakers aiming to optimize care for this population. Further research is warranted to explore the long-term sustainability and underlying mechanisms of these improvements, as well as the cost-effectiveness and scalability of such interventions in real-world settings.

Keywords: Balance Exercise, Chronic Musculoskeletal Pain, Pain, Quality of Life (QOL), Elderly Population

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INTRODUCTION

Chronic musculoskeletal pain (CMP) presents a significant health challenge worldwide, particularly affecting the aging population. The World Health Organization (WHO) estimates that 20% to 33% of individuals globally endure persistent musculoskeletal discomfort, emphasizing the urgent need to address this multifaceted issue. Among the most vulnerable demographics are the elderly, whose advancing age often exacerbates the severity and impact of CMP on their daily lives. (1,2) In India, a nation undergoing significant demographic shifts, the aging population is projected to reach an estimated 198 million by 2030. This demographic transition underscores the pressing need to mitigate the challenges posed by CMP, especially among older individuals who face heightened risks of falls and associated injuries. (3,4,5) The repercussions of CMP extend beyond physical discomfort, permeating various aspects of individuals' lives, including functional abilities, psychological well-being, and social participation. The WHO's 2015 report underscored the profound implications of musculoskeletal health issues on healthy aging, highlighting them as a significant threat to the well-being of aging populations worldwide. (4,6,7,8) Central sensitization—a neurological phenomenon intricately linked to the perpetuation of CMP—amplifies pain perception and contributes to heightened sensitivity to stimuli. This condition not only exacerbates pain but also impairs mobility and balance, significantly increasing the risk of falls among the elderly population. Recognizing the intertwined nature of chronic pain and mobility challenges underscores the imperative for targeted interventions aimed at mitigating both aspects to enhance the well-being of affected individuals.(9,10) In light of these pressing concerns, this study aims to investigate the efficacy of a balance-enhancing exercise program in alleviating pain and improving the quality of life among elderly individuals with chronic musculoskeletal pain. By elucidating the potential benefits of such interventions, this research endeavors to inform evidence-based strategies aimed at improving the well-being and reducing the burden of CMP among the elderly population, particularly in the context of India's demographic transition. (11,12,13) The purpose of this study is to look into how balance-enhancing exercise regimens, specifically

sensory motor training, affect older people with chronic musculoskeletal pain in terms of pain and quality of life.

MATERIAL AND METHODS

The P.P. Savani School of Physiotherapy expansion OPD in Kosamba, the P.P. Savani School of Physiotherapy at the University Campus, and the P.P. Savani Heart Institute and Multi-specialty Hospital in Surat will all be included in an exciting randomized controlled study. With the balance as the main outcome measure, the sample size calculation, based on assumptions of a high effect size of 0.8, power of 0.9, and Type I error of α=0.05, results in a total of 80 participants with an estimated 15% dropout rate.

There will be two types of sampling: computer-generated arbitrary sampling and basic random selection (stratified). The interference will last for six weeks, with allocation decided by the sealed envelope method. The inclusion criteria are male community-dwellers, patients with chronic musculoskeletal pain during a 3-month period. Numerical Pain rating scale (NPRS) and Short form-12 scale (SF-12) – will be the outcome measure for Pain and Quality of life respectively.

Group A (Control group)	Group B (Intervention Group)
Pre assessment: Pain, and Quality of life	Pre assessment: Pain, and Quality of life
Conventional exercises	Conventional exercises and Balance enhancing exercise Program (Sensory motor training)
Post assessment: Pain, and Quality of life assessment at the end of 3rd week and 6th week.	Post assessment: Pain, and Quality of life at the end of 3rd week and 6th week.

Treatment Protocol for Control Group:

Hydrocollateral packs, isometric quadriceps exercises, strengthening of the knee and hip muscles, calf and hamstring stretches, short arc quadriceps movements, and a home exercise regimen are all part of the treatment for osteoarthritis knee. Hydrocollateral packs, thoracolumbar fascia stretching, core stability exercises, stretching and strengthening, and a home exercise regimen were administered for non-specific low back pain. Treatment for cervical spondylosis involves hydro collateral packs, strengthening posterior neck muscles, soft tissue manipulation, and home exercise Programme. Treatment for Periarthritis shoulder includes pulley exercises, pendular exercises, capsular stretching and strengthening, hydro collateral packs, and home exercise Programme.

Treatment Protocol for Intervention group:

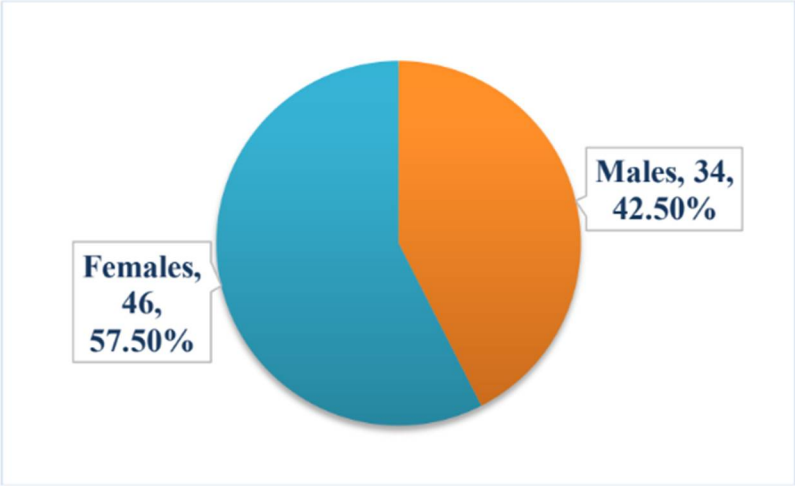
The three stages of the sensorimotor training program are static, dynamic, and functional, and they are combined with traditional treatment. Exercises are performed three to five times during each session, with sufficient rest intervals. Exercises go from easy to hard gradually, following a set routine. Static balance exercises are done for the first two weeks, moving from standing up straight on a hard surface to balancing on one leg on a spongy surface. The next two weeks will be dedicated to introducing dynamic exercises such as forward stepping lunges and T-band kicks. The last two weeks are devoted to functional training, which includes a thorough program to increase strength, mobility, and balance. Included are toe and heel skipping variations, squatting against and away from walls, one-leg squats, and walking exercises on foam or solid surfaces. In addition, wobble board balancing exercises

RESULT

This randomized control trial was conducted in 80 patients having chronic musculoskeletal pain who were divided in 2 groups: 40 patients in intervention group and 40 patients in control group.

Table 4. 1Comparison of Age Distribution of Intervention and Control Group

Sr. No.	Group	Mean Age (±SD) in Years	Median Age (IQR) in Years	Test Statistics and p value
1	Intervention Group (n=40)	64.83 (2.31)	65 (63 - 66.75)	Independent Samples t test = 1.134, df = 78, p=0.26
2	Control Group (n=40)	64.23 (2.42)	64 (63 - 66.5)	



Graph 1: Gender Distribution of Study participants

Using the Friedman Test, significant improvements were observed in pain intensity and quality of life measures among elderly individuals with chronic musculoskeletal pain participating in a balance-enhancing exercise program. In the intervention group, median Numeric Pain Rating Scale (NPRS) scores decreased from 6 to 4 at the 3rd week and further to 3 at the 6th week, while Short Form 12 Scale (SF-12) scores increased from 40 to 45 at the 3rd week and to 50 at the 6th week. These improvements were statistically significant ($p < 0.001$). Similar trends were observed in the control group. Post-hoc analyses revealed significant improvements in NPRS and SF-12 scores between various time intervals within both groups. These findings highlight the program's efficacy in reducing pain intensity and enhancing quality of life, emphasizing its potential benefits for elderly individuals with chronic musculoskeletal pain.

DISCUSSION

The results of the study demonstrate promising outcomes regarding the efficacy of a balance-enhancing exercise program in alleviating pain intensity and improving quality of life among elderly individuals with chronic musculoskeletal pain (CMP). The significant reductions observed in Numeric Pain Rating Scale (NPRS) scores indicate a tangible improvement in pain management over the course of the intervention. This reduction in pain intensity is crucial, as chronic pain not only affects physical comfort but also has profound implications for mental well-being and functional capacity. Moreover, the noteworthy improvements in Short Form 12 Scale (SF-12) scores signify enhancements in various domains of quality of life, including physical functioning, mental health, and overall vitality. These findings underscore the multifaceted benefits of the exercise program, extending beyond mere pain relief to encompass broader aspects of well-being and functional outcomes. The observed improvements in both pain intensity and quality of life are consistent with previous research highlighting the positive effects of exercise interventions on chronic pain management and functional outcomes. The balance-enhancing exercises incorporated in the program likely contributed to improvements in mobility, proprioception, and muscle strength, thereby reducing pain levels and enhancing overall quality of life. (15,16) The significance of these findings lies in their potential to inform evidence-based interventions aimed at improving the well-being

and functional capacity of elderly individuals with CMP. By demonstrating the effectiveness of a targeted exercise program in addressing both pain and quality of life, this study provides valuable insights for healthcare practitioners and policymakers seeking to optimize care for this population. However, further research is warranted to explore the long-term sustainability of these improvements and to elucidate the underlying mechanisms driving the observed effects. Additionally, future studies may consider investigating the cost-effectiveness of such interventions and their scalability in real-world settings to ensure broader accessibility and impact for individuals living with chronic musculoskeletal pain.

ETHICS COMMITTEE APPROVAL
The study obtained ethical clearance from the P P Savani ethical committee prior to recruiting patients.

CONFLICT OF INTEREST: No conflict of interest

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