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A Feasibility Study on Active Neurodynamics at Home in Patients with Knee Osteoarthritis

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Abstract

Knee Osteoarthritis (OA) is a prevalent musculoskeletal condition affecting millions worldwide. Traditional treatments often focus on pain management and lifestyle adjustments. However, emerging research suggests that interventions targeting neurodynamics may offer promising therapeutic avenues. This feasibility study aims to assess the viability of incorporating active neurodynamics exercises into home-based management for patients with knee OA. Through a combination of literature review, theoretical framework exploration, and practical considerations, this study evaluates the potential benefits, challenges, and implications of such an intervention.

Keywords: Neurodynamics • Osteoarthritis • Knee • Intervention

Introduction

Knee Osteoarthritis (OA) is a degenerative joint disorder characterized by cartilage breakdown, inflammation, and structural changes within the knee joint. It commonly leads to pain, stiffness, and reduced function, significantly impacting patients' quality of life. While various treatment modalities exist, including pharmacological, surgical, and lifestyle interventions, many patients continue to experience persistent symptoms and functional limitations. In recent years, there has been growing interest in the role of neurodynamics in musculoskeletal disorders, including OA. Neurodynamics refer to the interplay between the nervous system and the musculoskeletal system, encompassing neural tissue mobility, tension, and sensitivity. Research suggests that alterations in neurodynamics may contribute to pain perception and functional impairment in knee OA patients [1-3].

Active neurodynamic exercises aim to restore optimal neural tissue mobility, reduce neural tension, and modulate pain sensitivity through controlled movements and exercises targeting the nervous system. While these interventions have shown promise in various musculoskeletal conditions, their feasibility and effectiveness in knee OA management, particularly in a home-based setting, remain underexplored. Existing literature on neurodynamics and knee OA predominantly focuses on passive interventions such as manual therapy and neural mobilization techniques administered by healthcare professionals. While these approaches have demonstrated short-term benefits, their long-term efficacy and feasibility in real-world settings are limited by factors such as accessibility, cost, and patient compliance. In contrast, incorporating active neurodynamic exercises into home-based management offers several potential advantages. Home-based programs provide patients with greater autonomy, flexibility, and convenience, facilitating long-term adherence to exercise regimens. Additionally, active interventions promote self-efficacy and self-management skills, empowering patients to take an active role in their treatment.

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Literature Review

Preliminary studies examining the feasibility of home-based neurodynamic interventions in other musculoskeletal conditions, such as low back pain and neck pain, have shown promising results. These interventions typically involve a combination of stretching, strengthening, and neural gliding exercises tailored to individual patient needs. However, their applicability to knee OA requires further investigation due to the unique biomechanical and pathophysiological characteristics of the knee joint.

The feasibility of implementing active neurodynamic exercises in knee OA management can be conceptualized within the framework of behavior change theory and rehabilitation psychology. According to the transtheoretical model of behavior change, individuals progress through stages of readiness to adopt new behaviors, including pre-contemplation, contemplation, preparation, action, and maintenance [4-6]. Incorporating active neurodynamic exercises into home-based management aligns with the principles of self-determination theory, which emphasizes the importance of autonomy, competence, and relatedness in promoting intrinsic motivation and behavior change. By empowering patients to engage in self-directed rehabilitation activities, this approach enhances patient autonomy and self-efficacy, fostering long-term adherence and positive health outcomes.

Furthermore, social cognitive theory highlights the role of observational learning, self-regulation, and outcome expectations in shaping health behaviors. Providing patients with educational materials, instructional videos, and social support networks can facilitate skill acquisition, goal setting, and self-monitoring, enhancing exercise adherence and self-management skills. This feasibility study will employ a mixed-methods approach to evaluate the implementation of active neurodynamic exercises in home-based management for patients with knee OA. The study will recruit a sample of knee OA patients aged 40-65 years who meet the inclusion criteria, including a confirmed diagnosis of knee OA based on clinical and radiological criteria.

Discussion

Participants will undergo a comprehensive assessment of knee OA severity, pain intensity, physical function, and psychosocial factors using validated outcome measures such as the Western Ontario and Mcmaster Universities Osteoarthritis Index (WOMAC), Visual Analog Scale (VAS), and Hospital Anxiety and Depression Scale (HADS). The intervention will consist of a structured home exercise program comprising active neurodynamic exercises targeting neural tissue mobility, tension, and pain modulation. Participants will receive personalized exercise prescriptions based on their

individual needs and functional limitations. They will also receive educational materials, instructional videos, and telehealth support to facilitate exercise adherence and self-management. Quantitative data on exercise adherence, symptom improvement, and functional outcomes will be collected at baseline, post-intervention, and follow-up assessments using standardized outcome measures. Qualitative data on patient experiences, barriers, and facilitators to exercise adherence will be obtained through semi-structured interviews and thematic analysis [7].

Conclusion

This feasibility study aims to provide valuable insights into the potential role of active neurodynamic exercises in home-based management for patients with knee OA. By combining theoretical frameworks, empirical evidence, and practical considerations, this study seeks to address the existing gaps in knowledge regarding the feasibility and effectiveness of neurodynamic interventions in knee OA rehabilitation. In conclusion, this feasibility study represents a critical step towards advancing our understanding of active neurodynamics in knee OA management and optimizing rehabilitative strategies for improving patient outcomes and quality of life. Knee osteoarthritis poses significant challenges for patients and healthcare providers alike, necessitating innovative approaches to enhance treatment efficacy and patient engagement. Active neurodynamic exercises offer a promising avenue for addressing the neurophysiological mechanisms underlying knee OA symptoms and functional limitations.

Acknowledgement

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Conflict of Interest

None.

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