



Effect of Mulligan Mobilization on Proprioception in Osteoarthritis of Knee Joint - A Systematic Review

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Osteoarthritis (OA) of the knee is a degenerative disorder that affects the joint which causes pain, stiffness, swelling, muscle weakness, and functional impairments. Proprioception in the OA knee seems to be impaired when compared with the normal counterparts. Manual therapy is one of the hands-on therapies delivered by physiotherapists. However, there is not much information on how manual therapy affects joint proprioception, although some studies show a positive response. Mulligan's mobilization technique is common for spinal and peripheral joints to correct positional faults.

Aim: To systematically identify and to evaluate the effects of mulligan mobilization on the proprioception of the OA knee.

Methods: Various electronic databases like PubMed Central, Medline, Google Scholar, ProQuest and CINAHL are searched from 2001 to 2021. Multiple search criteria were used in the search of relevant articles based on the selection criteria used. Four articles that fit the criteria were taken based on the PEDro Scores of above 5. The two specialists analysed all the papers. The articles

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which cover mulligan's mobilization and proprioception of the knee were only selected.

Results: Four articles that fit the criteria were reviewed which demonstrated baseline comparability and reported point estimates and measures of variability.

Conclusion: This systematic review has concluded that the knee joint proprioception was improved with applying the Mulligan's manual therapy, whereas the neurophysiological activity is not well understood.

Keywords: Osteoarthritis knee; mulligan's mobilization; joint position sense; proprioception; knee joint sense.

1. INTRODUCTION

Osteoarthritis (OA) is one of the articular disorders in adults over 60 years [1]. It is likely to increase as the age grows. It is the most prevailing condition which causes disability in the elderly population [2]. World health organization (WHO) has stated that about 9.6% of men and 18.0% of women above 60 years worldwide have symptomatic osteoarthritis. 80% have the limitation of movements in the joints, and 25% have difficulty performing major daily activities [3]. 22% - 39% of individuals have OA above 60 years [2].

Studies have identified that knee joint is more prevalent in OA compared with other OA joints; it was found that more than 37% above 60 years have OA Knee [4]. OA has multiple etiologies, such as articular cartilage loss, sclerosis over the subchondral region, bone margin hypertrophy, and alterations in the synovial membranes or the joint capsules [5]. Pain and restriction of motion are the common characteristics of OA [6]. Pain in the OA knee may not be related to the radiographic changes. However, severe radiographic changes with no symptoms were also noted [7].

Impairment in the proprioception is recently noted in the OA, and it may be involved as the pathology in the OA progresses [8]. Proprioceptive deficits could cause knee pain and the limitation of the activity in the knee [9]. There are marked proprioceptive deficits noted in the OA knee compared with people of a similar age without degeneration [10].

It was hypothesized that the mechanoreceptors of the articular cartilages get dysfunctional, which are seen in OA knees. This may lead to delayed proprioception in the knee joint. But there is no evidence to confirm the hypothesis [11]. There is an impairment of the proprioception of the joints, which may be due to the articular cartilage degeneration, and quadriceps weakness would

cause deficits in the balance [12]. In addition to that, knee OA reduces the mechanical sensory receptors on the knee ligaments and the soft tissues, which would also cause impaired balance [13].

Management of the OA knee has been categorized as conservative and surgical. Commonly traditional measures are used like drugs [14], braces, physiotherapy modalities [15], orthotics, exercise, and lifestyle modifications [16].

Physiotherapy management is focused on pain reduction, improving muscle strength, and maintaining joint mobility. Electrotherapy modalities usually recommended are transcutaneous electrical stimulation, Interferential therapy, Ultrasound, and Low-level laser. Most of the treatment efficacy of these modalities is not well known [17]. Aerobic exercises, Quadriceps strengthening, and resistance play a significant role in strengthening the knee muscles and reducing the disability [18,19].

Manual therapy is recommended in managing OA knee. It alleviates pain and improves the range of motion. Commonly prescribed techniques are glide mobilization, soft tissue massage, and high-velocity thrust techniques [20]. However, the evidence concerning its efficiency in managing the OA knee is not systematically observed. Mulligan's mobilization is a type of manual therapy that is used in the management of musculoskeletal conditions. Mulligan's mobilization reduces pain and improves the range of motion in the joint. The rationale discussed is by correcting the positional faults [21].

Several studies have demonstrated a sound effect of manual therapy on reducing pain and functional disability in the OA knee [22,23]. Furthermost, studies have identified with exercises, and very few have done on the

isolated effect of manual therapy [24,25]. Most of the literature found pain, range of motion, and functions as their primary outcomes, whereas proprioception and balance are not well studied. There are very few studies on the mulligan's mobilization on the proprioception improvement, and not many kinds of literature were done on this topic. It is now becoming an important issue to be concerned with and identify the role of proprioception on knee pain. Therefore, this systematic review evaluates the mulligan mobilization on proprioception in the OA knee.

2. METHODS

The literature search was conducted using electronic databases, including PubMed Central, Medline, Google Scholar, ProQuest, and CINAHL, and the search was limited only to English. The articles which are published after 2000 were selected. The literature search was conducted using the primary keywords like "OA Knee," "Mulligans manual therapy," "Proprioception," "Knee OA," "Osteoarthritis of the Knee," and "Joint position sense."

There are about 120 full-text articles identified in the national and international journals about Mulligan's manual therapy, and this systematic review includes the qualified articles following PICOS criteria.

2.1 Participants

Age above 45 years and diagnosed with OA knee as per American College of Rheumatology or the radiographic diagnosis of OA Knee [26,27].

2.2 Interventions

Mulligan's manual therapy or manual therapy with exercises or other electrotherapy modalities.

2.3 Comparators

Exercise therapy or Electrotherapy or combining [27].

2.4 Out Come

Proprioception of Knee joint or joint position sense.

2.5 Study Design

Experimental design or Case study or Case series. Studies that use outcomes as Pain,

Range of motion, or muscle strength are not considered, studies that are not in English are rejected, studies of other joints, and studies not focusing on manual therapy techniques or exercises are not included.

2.6 Study Selection

Database search was done, and the duplicate articles were removed. Two specialists reviewed the articles and ensured that the selected theme was suited for the criteria. All sources were evaluated and released the same publication during the database search. Two reviewers looked over the articles to make sure they met the criteria for inclusion. After gaining the necessary text articles, all remaining sources were independently screened for eligibility. The two reviewers' inter-rater reliability was high, at 0.80, and a third reviewer was not considered necessary.

2.7 Data Extraction Process

Two reviewers screened the article based on the prefixed parameters from the articles chosen. The parameters include the year of the study, the number of participants, study design, study duration, treatment applied, outcome measures, and conclusion. Both reviewers discussed and resolved through discussion if any difference of opinion arises.

2.8 Quality Control

The independent assessors reviewed the study using the Physiotherapy Evidence Database (PEDro) tool to assess the quality of the articles. The Pedro tool is used to analyse the methodological quality with RCTs, with a score ranging between 0 to 10, with a higher score indicating superior quality [28]. Any methodological flaws in the study that displayed low Pedro scores were not included.

3. RESULTS

Four articles were only selected from a group of 120 articles, as there was not much seen in the context of the condition. All the chosen articles with a PEDro score of above five were demonstrated baseline comparability and reported point estimates and measures of variability. The results are mentioned in Table 1.

Table 1. Summary of the study characteristics of the articles included in this review

S.N	Author/ Year	Groups	No of Participants	Interventions	Duration of treatment	Outcomes	Conclusion
1	Purswani et al., [29]	Case study	1	Mulligan technique, Joint distraction, and proprioceptive exercises	2 weeks	1) Romberg test 2) NPRS 3) Joint circumference	When treating arthritic cases of the lower extremity, working on proprioception and biomechanics combined should be considered.
2	Jupudi et al., [30]	Two groups	60	Group A: Mulligan Mobilization with Conventional Group B : Mulligan Mobilization with agility and perturbation exercises	6 weeks	1) Pain (VAS) 2) WOMAC score 3) Goniometer 4) TUG	Mulligan coupled with agility and perturbation exercises is more helpful in enhancing proprioception, strength, range of motion, reducing pain and disability, and developing functional capacity in people with knee osteoarthritis than mulligan itself.
3	Gupta et al., [31]	Three groups	60	Group A: Proprioceptive + Conventional exercises Group B: Mulligans + Conventional exercises Group C : Proprioceptive + Mulligan + Conventional exercises	2 weeks	1)Proprioceptive ROM, 2) Flexion ROM, 3) VAS 4) WOMAC score	Error Mulligan's Mobilization with Movement (MWM) has been shown to improve knee joint proprioception in osteoarthritis patients.
4	Lalit et al., [32]	Three groups	90 patients	Group A: Maitland mobilization + Conventional exercises Group B: Mulligans + Conventional exercises Group C: Conventional exercises only	1week	1) VAS 2) WOMAC 3) Proprioceptive testing	Exercises alone can help people with osteoarthritis in improving knee joint proprioception. Exercises alone provide benefits than adding manual therapy approaches.

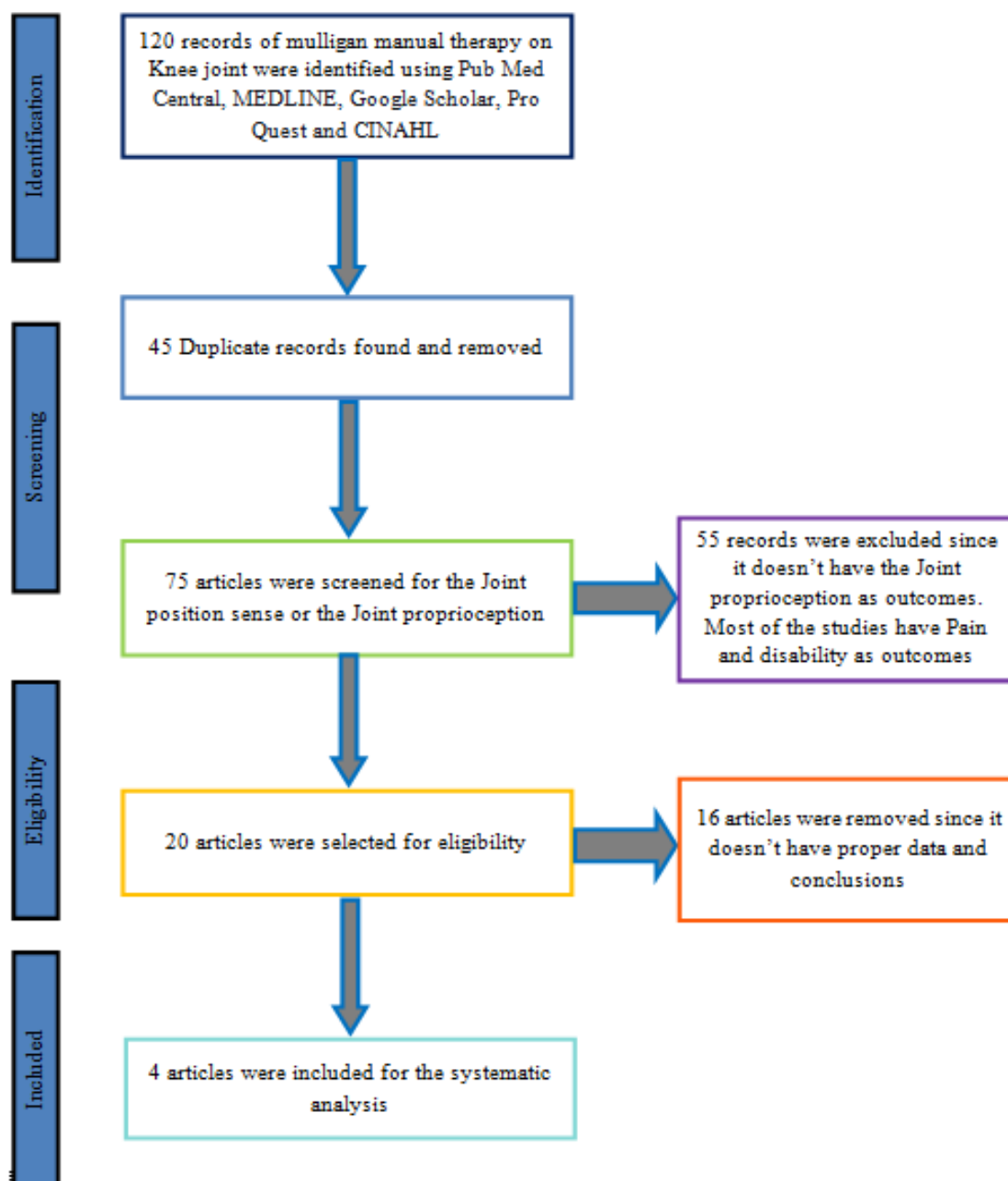


Fig. 1. A PRISMA flowchart illustrating the article selection process for this review

4. DISCUSSION

Osteoarthritis of the Knee is the most common degenerative disorder in the elderly. Progression of the OA knee is likely to be caused by increasing the loads in the articular cartilages could cause more damages with the remodeling process of cartilage to withstand the loads [33]. Proprioceptive impairments are becoming a common cause of knee pain and the limitation of the activity seen in the OA knee [34].

Proprioceptive signals arise from the joints, muscles, tendons, and skin which intact the neural control of movements [35].

Numbers of exercise interventions are designed to improve the proprioception on the knee joint as it aids in the improvement of motor recovery [36]. However, there is literature on the exercises, not on any other form of treatment [37]. Manual therapy has produced a neurophysiological effect in blocking nociception;

mechanoreceptors mediated pain gate as spinal cord dorsal horn [38]. Mulligan's gliding techniques which involve the passive accessory glides, also correct the positional faults [39].

This study on a systematic review revealed essential concepts on improving proprioception on the OA knee. It also identified that the mulligan's mobilization aid in enhancing the joint sense and improving the range of motion and pain reduction. Most of the articles focus on the functional abilities or the pain or movements.

A study conducted by Lalit et al., [32], stated that Mulligan's mobilization improves proprioception due to sedation of the nervous, facilitated nervous system, particularly on the dorsal horn, by bombarding it with the painless normality. They also concluded that the exercises and manual therapy would significantly improve position sense than manual therapy alone [32].

Mulligan's mobilization with movement stimulates the mechano-receptors and reduces the pain perception, leading to reorganization of the movement. Pain-free activity diminishes the fear of movement, enables the patient to do the movement well, and improves the joint's position sense [40]. A study done by Gupta et al., [31] has identified that Mulligan's group decreases pain, and improvement in the function is due to the alteration in the alignment of the bone and the joint. The correction of the joint alignment would improve the joint position sense in the OA knee.

Judi et al., 2017, explained that the mulligan's mobilization stimulate the Golgi tendon organ and muscle spindle activity which sends accurate information about the joint position and reduces perturbations [30]. They also concluded that mulligans mobilization with agility and perturbation exercises improve proprioception, range of motion, and pain reduction in knee osteoarthritis. Even though the appropriate mechanism of Mulligan's was not well addressed on the improvement of the proprioception, the researchers have posed that the correction of the positional fault would be the mechanism for improving the joint position sense [20].

5. CONCLUSION

This systematic review indicated that Mulligan's mobilization had provided virtuous improvement in the knee joint proprioception in addition to the pain reduction or modification of functional ability.

It is clear from these articles that proprioception is well improved by applying the mulligan manual therapy. The superiority of these interventions over other treatment methods is still up for debate. However, more studies need to be analyzed, and more studies need to be conducted to identify the appropriate effectiveness of the mulligan mobilization. Furthermore, there is no long-term follow-up, which needs to be addressed.

6. LIMITATIONS OF THE STUDY

This systematic review has only three research articles, and one case study was included, which is one of the limitations. Future studies are required to conduct various experimental studies with varying populations. Detailed studies need to conduct on the proprioceptive exercises and their role on pain perception.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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