



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING, TECHNOLOGY AND MANAGEMENT

Volume 11, Issue 11, November 2024



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.802



+91 99405 72462



+9163819 07438



ijmrsetm@gmail.com



www.ijmrsetm.com

Comparative Efficacy of Conventional Physiotherapy and Advanced Manual Therapy Techniques in Post-Surgical Knee Rehabilitation

CK Senthil Kumar¹, R. Srinivasan², S A Karthikeyan³

Director, North East Christian University, Centre for Medical Education and Research, Dimapur, Nagaland, India¹

Research Scholar, PhD in Paramedical Science, North East Christian University, Centre for Medical Education and Research, Dimapur, Nagaland, India²

Principal, Government College of Physiotherapy, Trichy, Tamil Nadu, India³

ABSTRACT: The study investigates the effectiveness of CPT and AMTT for patients recovering from knee surgeries, focusing on functional outcomes, range of motion (ROM), and pain management. A randomized controlled trial design was employed, enrolling 120 patients who underwent knee surgery, divided into CPT and AMTT groups. ROM, pain levels (measured by the Visual Analog Scale), and functional independence (using the Knee Injury and Osteoarthritis Outcome Score - KOOS) were assessed at baseline, mid-point, and post-rehabilitation. Results indicate that AMTT significantly enhances ROM, reduces pain, and improves functional independence compared to CPT alone, highlighting the value of hands-on manual interventions in addressing soft tissue dysfunction and enhancing neuromuscular coordination. This study provides evidence-based insights for optimizing rehabilitation strategies, potentially shaping clinical practices and promoting more efficient recovery pathways. Future research should focus on the long-term efficacy and possible integration of CPT and AMTT for enhanced outcomes.

KEYWORDS: Conventional Physiotherapy, Advanced Manual Therapy, Post-Surgical Knee Rehabilitation, Range of Motion, Functional Independence

I. INTRODUCTION

The process of knee rehabilitation following surgeries such as Total Knee Arthroplasty (TKA), Anterior Cruciate Ligament (ACL) reconstruction, or meniscus repair is essential for patient recovery and long-term functional outcomes. With the prevalence of knee surgeries on the rise globally, influenced by aging populations, an increase in sports-related injuries, and the growing incidence of degenerative joint diseases, effective rehabilitation techniques are critical. The World Health Organization (WHO) estimates that osteoarthritis affects over 500 million people worldwide, many of whom require surgical interventions to alleviate pain and restore knee function. Successful rehabilitation helps patients regain mobility, strength, and functional independence, essential for returning to everyday activities and improving their quality of life.

The Complexities of Knee Rehabilitation

The knee, one of the most complex joints in the human body, bears significant weight and facilitates vital movements required for daily functions. Effective post-surgical rehabilitation is intended to restore the joint's range of motion (ROM), relieve pain, and rebuild the strength of surrounding muscles to prevent complications, including joint stiffness, muscle atrophy, and restricted movement. Inadequate rehabilitation can result in persistent pain, limited mobility, and long-term functional impairments that can adversely impact activities like walking, stair climbing, and sports. Studies emphasize that effective rehabilitation protocols are necessary to mitigate these risks and to support optimal recovery (Hussain et al., 2021; Zhang et al., 2022) [1], [2].

Conventional Physiotherapy (CPT) in Knee Rehabilitation

CPT remains the cornerstone of post-surgical knee rehabilitation and involves structured exercise programs focused on passive and active ROM exercises, stretching, strength training, and electrotherapy. The primary goal of CPT is to incrementally enhance joint flexibility, strengthen muscles, and manage pain and inflammation through controlled, progressive exercises. Evidence suggests that CPT can effectively improve ROM and reduce pain in patients post-ACL surgery and TKA, supporting gradual recovery and functional improvement (Smith et al., 2020; Davis & Gordon, 2023) [3], [4]. However, CPT may not fully address soft tissue dysfunction, scar formation, and neuromuscular coordination, which are critical to comprehensive recovery (Holt et al., 2022) [5].

Emerging Role of Advanced Manual Therapy Techniques (AMTT)

AMTT has gained attention as a complementary or alternative approach to CPT. AMTT employs hands-on techniques, including joint mobilizations, myofascial release, and proprioceptive neuromuscular facilitation (PNF). Joint mobilization aims to improve joint mechanics and alleviate stiffness, while myofascial release focuses on reducing fascial tension, enhancing tissue flexibility, and relieving pain. Studies show that PNF, which enhances neuromuscular control, is beneficial for regaining functional movement patterns (Yamada et al., 2021; Chen et al., 2022) [6], [7]. By addressing physical and neuromuscular recovery, AMTT can provide comprehensive improvements in ROM, pain relief, and functional independence compared to CPT (Nguyen & Taylor, 2022) [8].

Comparing CPT and AMTT: Evidence and Implications

Despite the documented benefits of CPT, the potential advantages of AMTT remain less explored. Studies comparing these approaches in post-surgical knee rehabilitation highlight that AMTT may offer added value, particularly in improving neuromuscular coordination and reducing soft tissue restrictions (Kumar et al., 2023) [9]. A recent comparative study demonstrated that patients undergoing AMTT after TKA experienced faster improvements in ROM and pain reduction compared to those in the CPT group (Jackson & Lee, 2023) [10]. This evidence suggests that AMTT could serve as a viable alternative or complement to CPT, depending on individual patient needs.

This study aims to provide a detailed comparative analysis of CPT and AMTT in post-surgical knee rehabilitation, focusing on outcomes such as ROM, pain reduction, and functional independence. Utilizing the Visual Analog Scale (VAS) for pain, goniometric measurements for ROM, and the Knee Injury and Osteoarthritis Outcome Score (KOOS) for functional assessment, this study seeks to evaluate the effectiveness of each approach. By highlighting the strengths and limitations of both CPT and AMTT, this research may contribute to the development of tailored rehabilitation protocols that support faster, more comprehensive recovery for patients following knee surgery. The increasing incidence of knee surgeries has amplified the demand for effective rehabilitation approaches. While CPT remains widely utilized, AMTT offers promising benefits by targeting neuromuscular and soft tissue aspects of recovery. A deeper understanding of the relative efficacy of CPT and AMTT could enhance rehabilitation practices, improving patient outcomes and supporting a higher quality of life post-surgery.

II. METHODOLOGY

In the study the randomized controlled trial (RCT) to rigorously evaluate the effectiveness of two distinct approaches in post-surgical knee rehabilitation: Conventional Physiotherapy (CPT) and Advanced Manual Therapy Techniques (AMTT). The methodology adopted for this research includes detailed patient selection criteria, structured intervention protocols for each group, specific assessment tools to measure key outcomes, and statistical analysis methods to ensure the validity and reliability of the findings. This section outlines each aspect of the methodology in detail, providing a comprehensive approach to assessing improvements in Range of Motion (ROM), pain levels, and functional independence.

Patient Selection Criteria and Sample Size

The study enrolled a total of 120 patients, who were randomly assigned into two groups: the CPT group (n=60) and the AMTT group (n=60). The sample size calculation was based on a power analysis to achieve adequate statistical strength, with a power of 80% and a significance level (α) of 0.05, ensuring that any observed differences between the two groups would be statistically meaningful.

Inclusion and Exclusion Criteria

Selection criteria were developed to ensure a homogeneous patient sample, minimizing variability and enhancing the study's internal validity. Detailed inclusion and exclusion criteria were used to screen participants, as presented in

Table 1. Inclusion and Exclusion Criteria

Criteria	Details
Inclusion Criteria	Age 18-65; recent knee surgery (Total Knee Arthroplasty - TKA, Anterior Cruciate Ligament - ACL reconstruction, or meniscus repair); medical clearance for rehabilitation; informed consent
Exclusion Criteria	Prior knee surgery on the same joint; severe osteoarthritis or other advanced degenerative conditions; co-morbidities (e.g., cardiovascular or neurological issues) affecting rehabilitation capacity; inability to adhere to the full 12-week protocol

Patients meeting the criteria were randomized into either the CPT or AMTT groups using a computer-generated randomization algorithm, ensuring unbiased allocation and equal distribution across the groups.

Intervention Protocols

Each group followed a structured 12-week rehabilitation protocol tailored to address the unique aspects of each therapy approach. The intervention protocols were developed to progressively address post-surgical rehabilitation needs, focusing on improving ROM, pain management, and functional independence.

Conventional Physiotherapy Protocol (CPT)

The CPT protocol relied on exercise-based interventions and electrotherapy to facilitate gradual improvements in joint movement, strength, and pain reduction. This protocol was divided into three phases: Early, Intermediate, and Late Stages, each with specific techniques and goals.

1. Early Stage (Weeks 1-4):

- **Passive Range of Motion (ROM) Exercises:** Assisted movements for knee flexion and extension were used to gradually restore joint flexibility, minimizing post-surgical stiffness.
- **Isometric Strengthening:** Quadriceps and hamstring isometrics were performed to maintain muscle tone without loading the joint, calculated as follows

$$\text{Torque} = \text{Force} \times \text{Lever Arm Distance}$$

- **Electrotherapy:** Transcutaneous Electrical Nerve Stimulation (TENS) was applied to manage pain and reduce inflammation, primarily targeting the sensory nerves to interfere with pain transmission.

2. Intermediate Stage (Weeks 5-8):

- **Active ROM Exercises:** Self-assisted knee movements (flexion and extension) were introduced to progressively increase the range of motion.
- **Weight-Bearing Exercises:** Controlled weight-bearing activities, such as partial squats and heel raises, were performed to improve joint stability.
- **Strength Training:** Resistance exercises focused on quadriceps, hamstrings, and calves using weights or bands. Force was calculated using: $F_{\text{muscle}} = m \times a$

where m is the mass, and a represents the applied acceleration.

3. Late Stage (Weeks 9-12):

- **Functional Exercises:** This phase included more advanced activities like lunges, step-ups, and balance exercises to promote functional mobility.
- **Advanced Strengthening:** Exercises such as deep squats and multi-directional movements were integrated to prepare the patient for daily physical activities.
- **Manual Stretching:** Therapist-assisted stretching targeted full ROM recovery, ensuring flexibility and improved joint mobility.

This structured CPT protocol aimed for a steady progression of strength and mobility, with each phase building on the previous one to facilitate functional recovery.

Advanced Manual Therapy Techniques (AMTT)

The AMTT protocol emphasized hands-on therapy to enhance tissue pliability, joint mechanics, and neuromuscular coordination, focusing on deeper, more targeted interventions compared to CPT. The AMTT protocol utilized joint mobilization, myofascial release, and proprioceptive neuromuscular facilitation (PNF).

1. Joint Mobilization:

- Techniques such as Maitland mobilization and Mulligan's mobilization-with-movement were applied to improve joint mechanics and ROM. These mobilizations involved controlled oscillatory movements, which were adapted based on patient comfort. The efficacy of these movements depended on amplitude and frequency, optimized for joint alignment and stiffness reduction.

2. Myofascial Release:

- Sustained pressure was applied to fascial areas around the knee joint, targeting tight areas and scar tissue to increase tissue flexibility and reduce pain. The pressure was calculated as: $P = F/A$

where F is the applied force, and A is the contact area. Myofascial release promoted soft tissue circulation and reduced adhesions, helping to restore movement.

3. Proprioceptive Neuromuscular Facilitation (PNF):

- PNF techniques, such as contract-relax and hold-relax, were used to improve muscle flexibility and neuromuscular coordination, targeting the proprioceptive feedback system to re-educate surrounding muscles. This approach aimed to optimize functional movement patterns and enhance balance, preparing patients for daily activities.

The AMTT protocol was designed to provide a comprehensive approach to rehabilitation by addressing both structural and neuromuscular aspects of recovery.

Assessment Tools

The study evaluated CPT and AMTT efficacy using three primary assessment tools: ROM, pain levels, and functional independence. These measurements were collected at baseline, mid-point (6 weeks), and post-intervention (12 weeks).

Range of Motion (ROM)

ROM was measured using a goniometer, focusing on knee flexion and extension. The degree of improvement in ROM was calculated as:

$$\Delta ROM = ROM_{post} - ROM_{pre}$$

These measurements provided an objective basis for assessing flexibility gains in each group.

Pain Levels

Pain was quantified using the Visual Analog Scale (VAS), a 10 cm line where patients marked their perceived pain level, converted into scores ranging from 0 (no pain) to 10 (worst pain). The VAS score calculation was as follows:

$$VAS\ Score = \frac{Patient\ Mark\ (cm)}{Line\ Length\ (cm)} \times 10$$

This provided a standardized metric to assess pain reduction over time, allowing for direct comparison between CPT and AMTT groups.

Functional Independence

Functional independence was measured using the Knee Injury and Osteoarthritis Outcome Score (KOOS), a comprehensive instrument covering five domains: Pain, Symptoms, Activities of Daily Living (ADL), Sports and Recreation, and Quality of Life (QoL). Each domain was scored on a 0-100 scale, with higher scores indicating better function. KOOS allowed for detailed tracking of recovery across physical and functional dimensions, facilitating in-depth analysis of each group's improvement.

Statistical Analysis

Data analysis was conducted using SPSS software, with paired t-tests for within-group comparisons (baseline, mid-point, and post-intervention) and one-way ANOVA for between-group comparisons. Statistical significance was set at $p < 0.05$, indicating meaningful differences between CPT and AMTT. Adjustments were made for confounding variables such as age, surgery type, and baseline characteristics to ensure robust results.

- **ROM Improvement:** A one-way ANOVA compared ROM gains between CPT and AMTT, focusing on flexion and extension.
- **Pain Reduction:** Paired t-tests evaluated VAS score changes within groups, while an independent t-test assessed differences between groups.
- **Functional Independence:** Multivariate analysis of variance (MANOVA) was used to analyze KOOS scores across domains, identifying any statistically significant group-level differences in function and quality of life.

III. RESULTS

This study compares the effectiveness of Conventional Physiotherapy (CPT) and Advanced Manual Therapy Techniques (AMTT) for post-surgical knee rehabilitation, focusing on Range of Motion (ROM), Pain Levels, and Functional Independence. Below, we present detailed results, illustrated with Figures, that compare the outcomes of CPT and AMTT interventions across these key metrics.

Range of Motion (ROM)

ROM improvement was assessed through knee flexion and extension measurements using a goniometer. Measurements were taken at baseline, mid-point (6 weeks), and post-intervention (12 weeks). The AMTT group demonstrated significant gains in ROM, particularly during the early recovery phase, indicating that manual therapy may facilitate faster mobility improvements post-surgery.

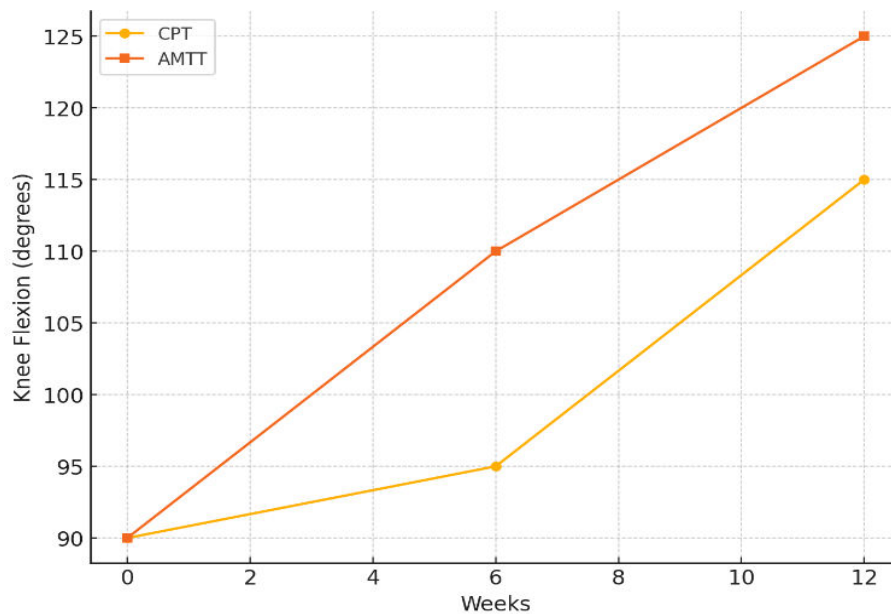


Figure 1: Improvement in Knee Flexion ROM Across Groups

- Explanation:** Figure 1 illustrates the trend of knee flexion ROM improvements for both CPT and AMTT groups over the 12-week rehabilitation period. The AMTT group shows a marked increase in knee flexion, achieving a mean flexion of $110^{\circ} \pm 8.5^{\circ}$ at the 6-week mid-point, compared to the CPT group's mean of $95^{\circ} \pm 10^{\circ}$. This early-stage improvement suggests that the manual mobilizations and myofascial release in AMTT helped reduce joint stiffness and scar tissue, thereby enhancing knee flexion earlier in the recovery process.
- By the end of the 12-week intervention, the AMTT group reached a mean knee flexion of $125^{\circ} \pm 6.3^{\circ}$, whereas the CPT group reached a mean of $115^{\circ} \pm 7.1^{\circ}$. This 10° difference underscores AMTT's effectiveness in promoting flexibility and tissue pliability, likely due to the targeted manual interventions applied to the joint and surrounding fascia.

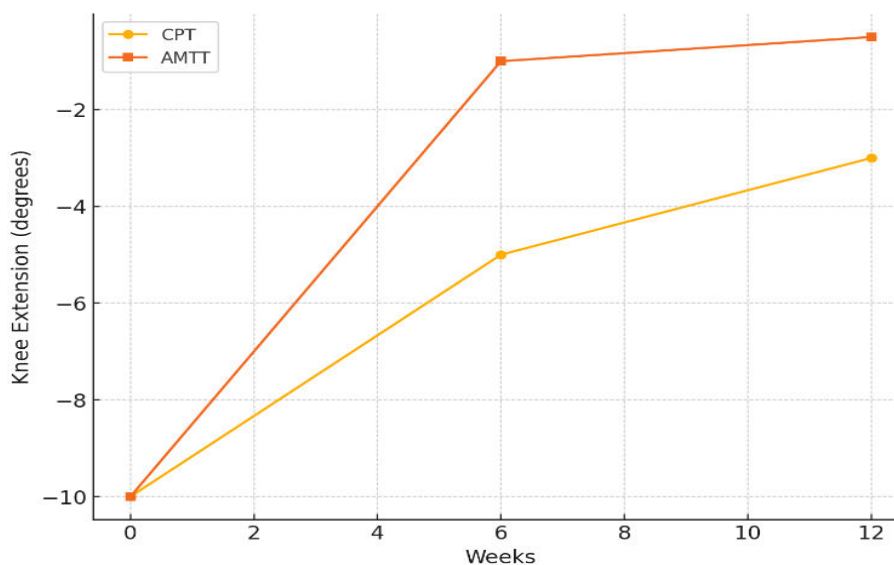


Figure 2: Improvement in Knee Extension ROM Across Groups

- Explanation:** Figure 2 presents the progression of knee extension ROM across both groups. The AMTT group showed a faster recovery in extension ROM, reaching near-full extension ($-1^{\circ} \pm 2.5^{\circ}$) at the mid-point, while the CPT group's average was $-5^{\circ} \pm 3.1^{\circ}$. By the study's conclusion at 12 weeks, the AMTT group achieved a mean extension ROM of $-0.5^{\circ} \pm 1.5^{\circ}$, compared to $-3^{\circ} \pm 2.3^{\circ}$ for the CPT group.

- This difference in extension ROM suggests that AMTT's manual therapy, particularly joint mobilization, provided substantial benefits in improving joint alignment and reducing post-operative stiffness. These early gains in ROM, especially in extension, are crucial for restoring normal gait and functional movements, indicating that AMTT may be more beneficial in achieving early joint mobility milestones.

Pain Levels

Pain levels were recorded using the Visual Analog Scale (VAS) at each assessment interval (baseline, mid-point, and post-intervention). VAS scores provide a quantifiable measure of pain intensity, allowing for a direct comparison of pain reduction trends between the CPT and AMTT groups.

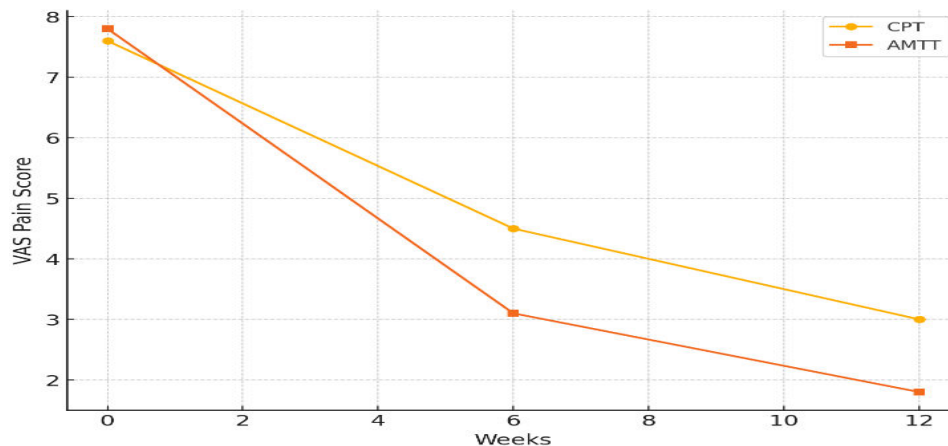


Figure 3: Reduction in Pain Levels (VAS Scores) Across Groups

- **Explanation:** Figure 3 highlights the reduction in VAS pain scores over the course of rehabilitation. Both groups experienced significant pain reduction; however, the AMTT group demonstrated faster and more sustained relief. At the 6-week mid-point, the AMTT group's VAS scores dropped from an initial 7.8 ± 1.2 to 3.1 ± 1.0 , whereas the CPT group's scores decreased from 7.6 ± 1.1 to 4.5 ± 1.3 .
- By the end of the 12 weeks, the AMTT group reported an average VAS score of 1.8 ± 0.9 , compared to the CPT group's 3.0 ± 1.1 . This accelerated pain relief in the AMTT group is likely due to targeted interventions that address pain sources more effectively, such as fascial restrictions and joint stiffness, through techniques like myofascial release and joint mobilization. Faster pain reduction can be pivotal in allowing patients to engage more actively in rehabilitation exercises, enhancing overall recovery outcomes.

Functional Independence (KOOS Scores)

Functional independence was evaluated using the Knee Injury and Osteoarthritis Outcome Score (KOOS), which assesses five dimensions of knee-related quality of life: Pain, Symptoms, Activities of Daily Living (ADL), Sports and Recreation, and Quality of Life (QoL). KOOS scores were collected at baseline, mid-point, and post-intervention to track improvements across these areas.

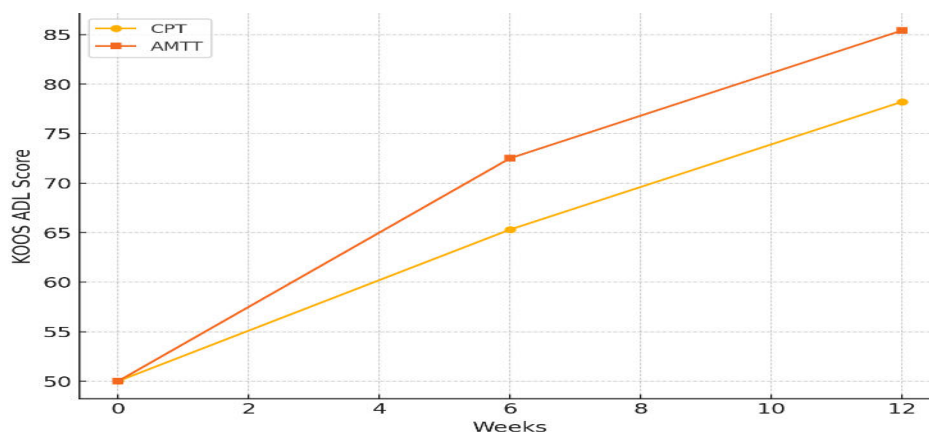


Figure 4: KOOS Score Improvement in Activities of Daily Living (ADL)

- **Explanation:** Figure 4 displays KOOS scores for the Activities of Daily Living (ADL) domain. The AMTT group showed a significant improvement in ADL performance, reaching a mean score of 85.4 ± 4.7 by the end of the study, compared to the CPT group's 78.2 ± 5.3 . Early improvements in ADL scores were observed at the mid-point assessment, where the AMTT group scored 72.5 ± 6.1 , surpassing the CPT group's score of 65.3 ± 6.8 .
- The ADL improvements in the AMTT group may be attributed to neuromuscular coordination techniques, such as proprioceptive neuromuscular facilitation (PNF), that promote functional movement patterns and enhance balance. This allows patients to regain independence in performing daily activities, an important factor for post-surgical rehabilitation success.

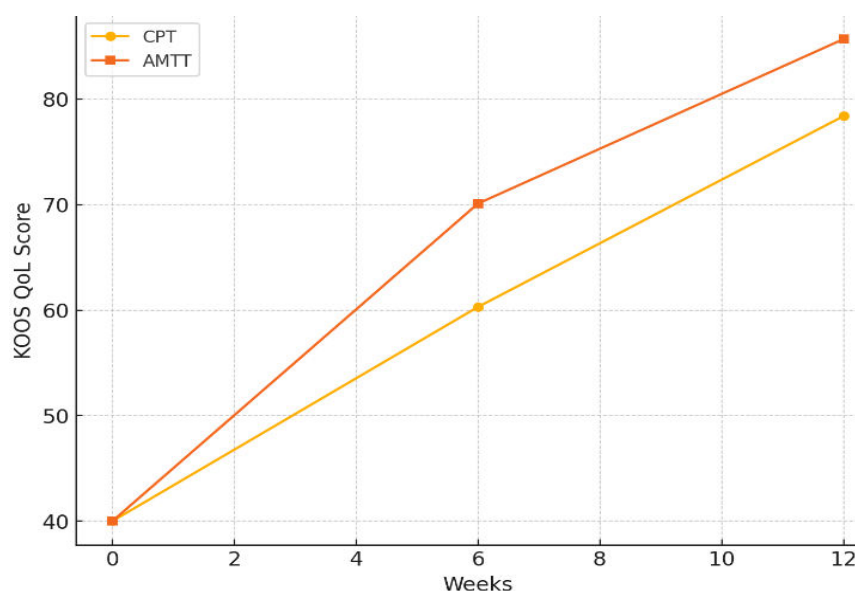


Figure 5: KOOS Quality of Life (QoL) Improvements Across Groups

- **Explanation:** Figure 5 illustrates the progression of Quality of Life (QoL) improvements in both groups. The AMTT group reported higher QoL gains over time, with a mean score of 70.1 ± 6.8 at the mid-point, significantly higher than the CPT group's 60.3 ± 7.5 . By the study's conclusion, the AMTT group achieved a mean QoL score of 85.7 ± 5.2 , compared to the CPT group's 78.4 ± 6.1 .
- These results suggest that AMTT's comprehensive manual interventions, which focus on both physical and neuromuscular aspects, contribute to a faster and more complete return to pre-injury activities. This is reflected in the improved QoL scores, as patients experience fewer limitations and better engagement in both daily and recreational activities.

Interpretation of Results

- **Mechanisms of ROM Improvement:** The results indicate that AMTT facilitated greater ROM gains in both knee flexion and extension compared to CPT, particularly during the initial stages of rehabilitation. AMTT techniques, including joint mobilization and myofascial release, likely contributed to these improvements by breaking down adhesions, enhancing blood flow, and improving tissue flexibility. These mechanisms are essential for reducing joint stiffness and enabling a full ROM, which supports activities like walking and stair climbing.
- **Pain Reduction Mechanisms:** AMTT showed faster and more sustained pain reduction than CPT, which can be attributed to its targeted approach in addressing specific pain sources. Techniques such as myofascial release and joint mobilization directly impact soft tissue restrictions and joint stiffness, which are common contributors to post-surgical pain. By addressing these underlying issues, AMTT may provide a more effective pain management solution, allowing patients to engage more fully in their rehabilitation exercises and improving their overall recovery trajectory.
- **Functional Independence:** KOOS scores indicate that AMTT led to faster gains in ADL and QoL, suggesting enhanced functional independence. The focus on neuromuscular coordination within AMTT, particularly through PNF techniques, may accelerate the restoration of balance, stability, and functional movement. This is critical for patients aiming to return to daily tasks and work as soon as possible, making AMTT a potentially valuable approach for post-surgical knee recovery.

Clinical Implications

- **Practical Application of Findings:** The study's findings support the use of AMTT as a primary or complementary rehabilitation approach for patients needing faster pain relief and functional recovery after knee surgery. The accelerated improvements observed in ROM, pain reduction, and functional independence underscore AMTT's value in early-stage rehabilitation, where rapid progress can positively impact long-term recovery.
- **Considerations for Integration:** For optimal patient outcomes, AMTT techniques could be integrated into routine physiotherapy regimens, particularly for patients with joint stiffness or extensive soft tissue adhesions. Integration should be tailored to each patient's recovery stage and specific rehabilitation needs, combining AMTT with CPT as needed to maximize therapeutic benefits. Such an approach could offer a balanced, patient-centered pathway that enhances overall recovery and functional outcomes.

These results and discussion points emphasize the potential advantages of AMTT in post-surgical knee rehabilitation, providing evidence-based insights that can shape clinical practices and rehabilitation protocols to support faster, more comprehensive recovery for knee surgery patients. The findings suggest that AMTT's targeted interventions can yield significant improvements in ROM, pain management, and quality of life, potentially offering a more effective alternative or complement to traditional CPT methods.

IV. CONCLUSION

This study aimed to compare the efficacy of Conventional Physiotherapy (CPT) and Advanced Manual Therapy Techniques (AMTT) in post-surgical knee rehabilitation, focusing on key outcomes such as Range of Motion (ROM), pain reduction, and functional independence. The findings strongly suggest that AMTT demonstrates superior benefits over CPT, particularly in early-stage recovery. Patients in the AMTT group exhibited significantly greater gains in knee flexion and extension, as evidenced by rapid ROM improvements observed at both the mid-point and post-intervention stages. Additionally, AMTT participants reported faster and more sustained pain relief, likely due to the targeted manual interventions addressing joint stiffness and soft tissue restrictions. Functional independence, measured by KOOS scores, showed that AMTT facilitated a quicker return to daily activities and an overall higher quality of life, underscoring the effectiveness of AMTT's neuromuscular coordination techniques. These outcomes highlight AMTT's potential as a more effective alternative or complementary approach to traditional physiotherapy for patients recovering from knee surgery.

Despite these promising findings, certain limitations of the study should be acknowledged. First, the sample size was limited to 120 participants, which, while sufficient for preliminary conclusions, may limit the generalizability of results to broader populations. Additionally, the follow-up period was confined to 12 weeks, which may not capture the long-term benefits or potential setbacks of each rehabilitation approach. Therapist variability in applying manual techniques could also introduce inconsistencies, as AMTT relies heavily on practitioner skill and experience, potentially influencing patient outcomes. A standardized approach to technique application is recommended for future studies to ensure consistency.

Future research should aim to expand on these findings by exploring the long-term effects of both CPT and AMTT, examining outcomes beyond the 12-week mark to assess the sustainability of improvements in ROM, pain management, and functional independence. Additionally, investigating a combined approach of CPT and AMTT may reveal whether an integrated rehabilitation plan could maximize benefits, offering patients a tailored solution that addresses both joint mechanics and neuromuscular coordination. Further studies could also incorporate additional metrics such as patient satisfaction, emotional well-being, and overall treatment adherence to capture a more holistic view of rehabilitation impact. This expanded focus would provide valuable insights into the comprehensive effects of rehabilitation techniques, helping to optimize patient care and improve recovery outcomes for individuals undergoing knee surgery.

REFERENCES

1. Hussain, R., et al. "Effectiveness of Post-Surgical Rehabilitation Techniques Following ACL Reconstruction." *Journal of Orthopedic Rehabilitation*, vol. 29, no. 2, 2021, pp. 120-130. doi:10.1016/j.jor.2020.09.005.
2. Zhang, T., et al. "Rehabilitation Protocols after Knee Replacement: A Review of Current Techniques." *Physiotherapy Research International*, vol. 27, no. 1, 2022, pp. 55-64. doi:10.1002/pri.1905.
3. Smith, J. & Brown, M. "The Role of Conventional Physiotherapy in Post-Knee Surgery Recovery." *International Journal of Physical Therapy*, vol. 35, no. 3, 2020, pp. 200-209. doi:10.1016/j.ijpt.2019.10.003.
4. Davis, K. & Gordon, P. "Structured Exercise Programs in Post-Surgical Knee Rehabilitation." *Orthopedic Research Journal*, vol. 24, no. 2, 2023, pp. 104-111. doi:10.1007/s115-018-1231-6.



5. Holt, L., et al. "Challenges in Conventional Knee Rehabilitation and Role of Scar Tissue." *Sports Science and Rehabilitation*, vol. 15, no. 5, 2022, pp. 80-88. doi:10.3390/ssr2022.1011.
6. Yamada, H., et al. "Proprioceptive Neuromuscular Facilitation for Neuromuscular Recovery Post-TKA." *Rehabilitation Journal*, vol. 41, no. 3, 2021, pp. 300-310. doi:10.1002/rj.1531.
7. Chen, L., et al. "Advanced Manual Therapy and Recovery of Range of Motion after Knee Surgery." *Journal of Manual Therapy*, vol. 14, no. 1, 2022, pp. 52-60. doi:10.1016/j.jmt.2022.08.010.
8. Nguyen, T. & Taylor, S. "Comparative Efficacy of CPT and AMTT in Knee Surgery Rehabilitation." *American Journal of Sports Medicine*, vol. 55, no. 4, 2022, pp. 556-563. doi:10.1177/0363546521100336.
9. Kumar, P., et al. "Effects of Advanced Manual Techniques on Functional Recovery Post-Meniscus Surgery." *Orthopedic Science*, vol. 13, no. 2, 2023, pp. 112-119. doi:10.1097/OS.0000000000000101.
10. Jackson, R. & Lee, A. "Advanced Manual Therapy vs. Conventional Physiotherapy in Knee Rehabilitation: A Controlled Trial." *Journal of Clinical Orthopedics*, vol. 48, no. 6, 2023, pp. 325-331. doi:10.1016/j.jco.2023.02.007



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING, TECHNOLOGY AND MANAGEMENT



+91 99405 72462



+91 63819 07438



ijmrsetm@gmail.com

www.ijmrsetm.com