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Evidence on Total Motion Release Therapy in Musculoskeletal and Sports Rehabilitation: A Literature Review

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Abstract

Background and Purpose: Total Motion Release® (TMR) is a holistic rehabilitative approach that conceptualizes the body as a kinetic chain, promoting balance, functional recovery, and ease of movement rather than pain or restriction. This review aims to summarize the available evidence on the effectiveness of Total Motion Release® in musculoskeletal rehabilitation, particularly among overhead athletes and neck and back pain, hamstring extensibility as well as in post-surgical conditions such as, total shoulder arthroplasty and Anterior Cruciate Ligament reconstruction. **Methods:** A literature search identified six randomized controlled trials, one observational cohort study, two case reports, and two pilot studies evaluating the impact of Total Motion Release® on pain reduction, Range of Motion (ROM), and functional recovery. **Results and Main Findings:** Findings consistently highlight significant improvements in Range of Motion and pain reduction across populations. Overhead athletes demonstrated enhanced shoulder mobility, patients with spinal dysfunction reported improved function and reduced discomfort, and postsurgical individuals exhibited better recovery trajectories. Collectively, these results suggest that Total Motion Release® is a promising rehabilitative technique with applications across diverse clinical contexts. **Conclusion:** Importantly, while preliminary outcomes are encouraging, further high-quality trials are required to establish standardized protocols and validate Total Motion Release® as an evidence-based approach in routine clinical rehabilitation.

Major Findings: Total Motion Release® consistently improved pain, Range of Motion and functional performance across overhead athletes and musculoskeletal conditions and post-surgical population.

Keywords: Holistic Therapy, Movement-Based Therapy, Musculoskeletal Rehabilitation**,** Pain Reduction, Physical Therapy Interventions, Range of Motion

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1. Introduction

There are numerous therapeutic techniques used in physiotherapy and new physiotherapy treatment options are always being developed[1]. These treatments are focused to improve the condition of the patient to a large extent by joint range improvement, pain reduction, and muscle strength improvement. Pain and decreased joint range of movement are the prime factors that limit functional activity performance in the patient[2]. The causes of pain are primarily related to acute trauma or repetitive micro-trauma, with less than one percent of cases involving serious pathology[3]. Factors contributing to reduced Range of Motion include muscle, tendon, and ligament injuries, neurological problems, infections, and swelling[4]. Pain and the restricted joint mobility predispose individual to biomechanical adaptation and movement asymmetry especially among athletes, even in the athletes, these

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biomechanical alterations not only reduce the athletic performance, also leads to biomechanical alteration in normal movement pattern leads to movement asymmetry that require appropriate rehabilitation. The lack of Range of Motion in some actions, mainly in the dominant limb, can result from overuse. For example, research has confirmed that overhead athletes experience a reduction in internal rotation and total Range of Motion in the shoulder joint, along with an increase in external rotation. This is largely due to tightness in the posterior capsule and rotator cuff, caused by repetitive cocking motions[5,6], which lead to pain, reduced range of motion, and decreased performance in athletes[7,8]. Pain and joint Range of Motion (ROM) are closely related. Pain often limits the ability to move, resulting in decreased ROM and vice versa[9], due to which movement asymmetries will be noticed. Movement asymmetries are differences or imbalances that occur during a movement that we would expect to be identical or symmetrical. Although symmetry between the two limbs cannot be consistently observed, it is highly likely that the condition will affect motor and postural outcomes; consequently, it predisposes the athletes, normal individuals, geriatrics, and fragile subjects to the risk of injury and falls not only during their professional, sporty, or daily life activities but also when they are at rest[10,11]. Inter-limb asymmetry occurs due to motor experience, movement nature, and a limb dominance effect[12]. So, this imbalance needs to be corrected to avoid any injury associated with it. These imbalances were recently detected using a method called Total Motion Release, which clinicians have adopted to address movement asymmetries. The method detects imbalances by assessing patient-reported symptoms during motion. When an imbalance is identified, that is, a difference in scores between sides, patients self-treat by performing the activity that shows the greatest imbalance on the side with the lowest score[13,14]. (i.e., preferred side)

Total Motion Release® (TMR®) is a new concept. It looks at the body as one integrated unit, trying to achieve a dynamic center of gravity. It analyses and treats activity asymmetries, considering that movements in one segment of the body are capable of producing symptoms of pain or dysfunction in another segment. Patients are asked to grade their pain, strength, quality, and quantity of motion between 0 (no dysfunction, pain, or asymmetry) and 100 (total dysfunction, pain, or asymmetry[15]. TMR® treatment initiates at the motion showing the most imbalance, determined through bilateral comparison. Unlike traditional therapies, TMR involves repetitions, static holds, or both, performed on the good side, or side of ease[16]. If initial treatment is not successful, the physiotherapist changes parameters such as the repetition and the speed, and then retest the patient. They then progress to the next most severe imbalance, treating and re-evaluating until the motion scores are improved (a score of 5 or less) and all imbalances are treated[16,17].

Although the theoretical principles of TMR® are well established, its clinical effectiveness must be supported by scientific evidence. Therefore, several studies have investigated its application across different musculoskeletal conditions. Through research, it has been noticed that therapeutic exercise using TMR® (Total Motion Release®) has resulted in a decrease in pain and an increase in function and ROM in the knee, lower back, and shoulder. It is quite important since very few studies have been conducted on TMR® in care delivery to patients. It was observed that the TMR® restored ROM limits that are non-painful, An imbalance was recently detected using a method called Total Motion Release, which Physiotherapists have adopted to address movement asymmetries. There was also a significant statistical clinical improvement in functional movement after treatment. The aim of the current literature review is to critically analyze and summarize the existing evidence on the effectiveness of Total Motion Release (TMR) therapy in reducing pain and improving functional outcomes in individuals with musculoskeletal disorders and movement dysfunctions[18,19]. To accomplish this objective, a structured literature search and predefined eligibility criteria were employed to identify the most relevant studies evaluating the effectiveness of TMR®.

2. Study Selection

2.1 Inclusion Criteria

The literature review included studies published in English between 2013 and 2023 that were retrieved from Google Scholar and PubMed databases. Studies examining the effectiveness of Total Motion Release® (TMR) techniques in enhancing Range of Motion and alleviating pain n musculoskeletal condition were considered eligible. The review incorporated various study designs, including original research articles, randomized controlled trials, pilot studies, case reports, systematic reviews, and meta-analyses associated with physiotherapy and manual

therapy interventions. Only studies with full-text availability were selected for inclusion.

2.2 Exclusion Criteria

Studies published in languages other than English, as well as those published before 2013 or after 2023, were excluded from the review. Duplicate publications, conference abstracts lacking full-text access, editorials, commentaries, and opinion-based articles were also omitted. In addition, animal studies, cadaveric research, unpublished theses or dissertations, and studies unrelated to Total Motion Release® techniques, shoulder mobility, pain management, physiotherapy, or musculoskeletal rehabilitation were excluded. The study identification and selection process was conducted according to the PRISMA guidelines and is summarized in the following flow diagram

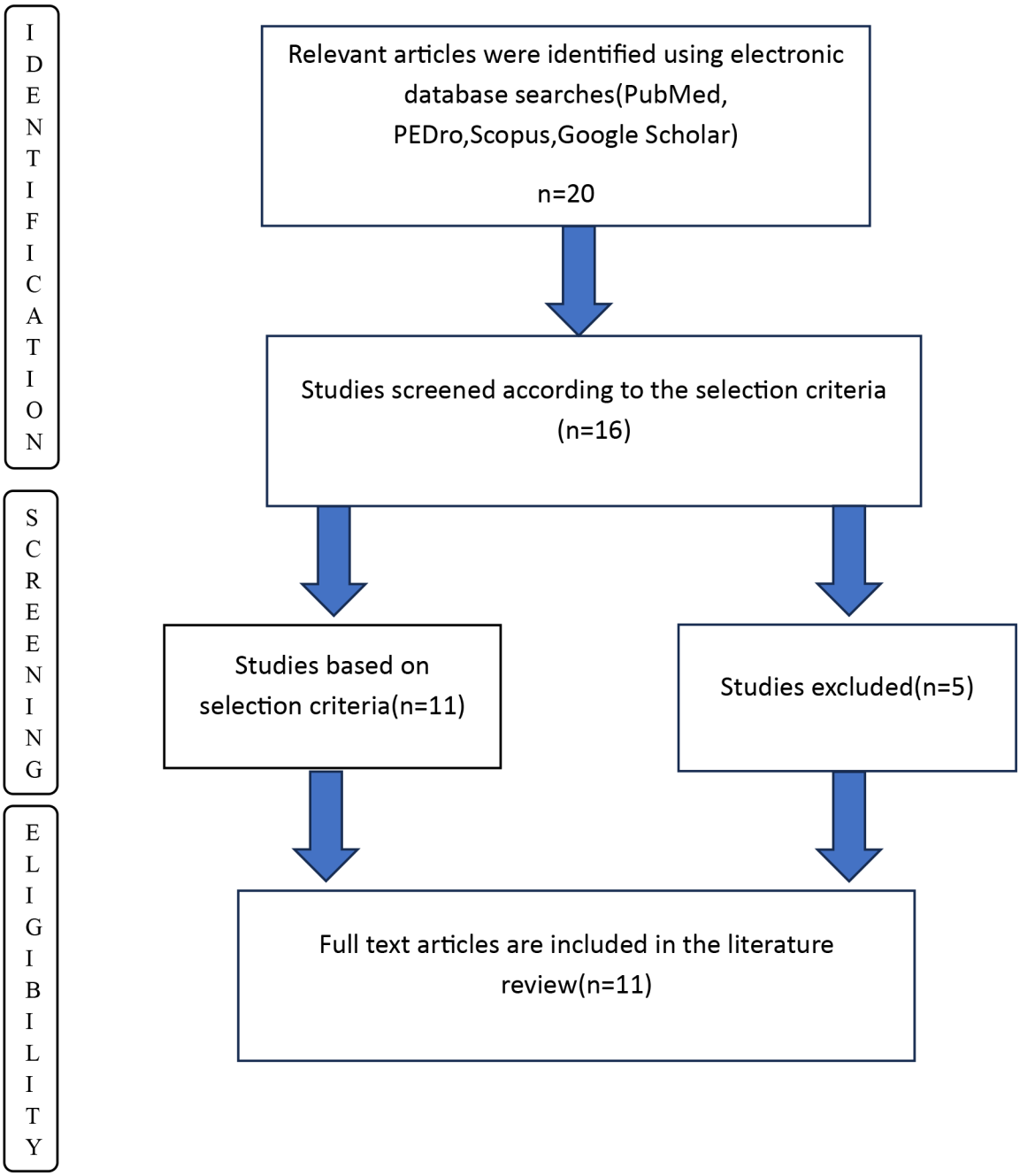


Figure 1. Prisma flow chart.

2.3 About Total Motion Release

Total Motion Release® Technique is a novel yet effective approach to physical therapy. It allows the body to spontaneously realign and repair, resulting in greater effectiveness. The Total Motion Release® Technique delivers virtually instant alleviation for your aches and pains. Once you understand the notion that you'll have a lifetime skill to help treat your pains and discomforts[15]. The exercises consist of shoulder flexion, single-arm push-up, trunk rotation, single-leg sit-to-stand, hip flexion, and unilateral bent knee squat[16].

Intervention often begins with isometric holds, for instance, 20s holds at end range, or repetitions, such as 2 sets of 20 repetitions, on the 'good' side of the motion that has the highest TMR® score (i.e. greatest impairment/imbalance). The patient re-evaluates the same motion bilaterally after the treatment, for instance, two sets of twenty repetitions, and feeds back an updated score by the TMR® 0 to 100 scale. If the responses of the patients are scoring 10 points lower than the previous baseline score, then the clinician will keep those treatment parameters. It would be carried out for as long as the patient rated the amount of asymmetry in motion a 5 or less on the TMR® 0 to 100 scale. The clinician usually modulates parameters including repetitions, rate of movement, etc. and reappraises the patient's response to the treatment. If it does not work, then usually the next most severe motion impairment or imbalance is further addressed by treating that motion and re-evaluating the motion scores of the patient. Treatment will normally be continued up to the point when all the imbalances are fully corrected, reassessment being made following a series of treatments or after any motion limitation is no longer present (scored as 5 or less)[16,17]. The characteristics and clinical outcomes of the included studies are presented below to summarize the current evidence regarding the effectiveness of Total Motion Release® therapy.

3. Results

A total of 11 studies were selected for inclusion in the present review. The studies that were selected represented a variety of methodologies including; Randomized Controlled Trials (RCT), Observational Cohort Study, Pilot Studies and Case Reports. The summaries of these studies characteristics and primary outcomes have been presented below (Table 1).

4. Applications of Total Motion Release in Musculoskeletal and Rehabilitation

4.1 Hamstring Tightness

The hamstring muscles serve as extensors for the hip and flexors for the knee. This limitation is due to the relatively short length of the hamstring muscles. Hamstring tightness is relatively common among college students aged 18-25. The Tight hamstring muscles are associated with dysfunction in the lumbar spine area, pelvis, and lower limb, which leads to low back pain and abnormal gait[27]. Apart from causing a reduction in range of motion, hamstring tightness can contribute to various orthopedic conditions, such as hamstring strain, plantar fasciitis, and low back pain. Muscle tightness affects hamstring muscle's ability to maintain a constant length-tension relationship and absorb stress[28]. This decreased flexibility creates a cycle of a limited Range of Motion and increased postural abnormalities. Muscle tension also constricts blood vessels, leading to suboptimal functioning[29]. Faulty motor control patterns are associated with hamstring tightness, resulting in suboptimal firing of postural muscles and hamstrings acting more as stabilizers than primary movers. This fundamental alteration in function leads to the presentation of hamstring tightness[30]. Faulty motor control patterns are often associated with hamstring tightness, where postural muscles fail to activate efficiently and the hamstrings compensate as stabilizers rather than functioning as primary movers. This altered recruitment strategy contributes to the presentation of "apparent" hamstring tightness rather than true tissue shortening. In such cases, interventions like Total Motion Release® (TMR®) have been proposed as an effective alternative, as they focus on correcting asymmetries and dysfunctional movement patterns rather than directly targeting muscle extensibility through traditional stretching techniques. By identifying and mobilizing the "good side," TMR® aims to restore efficient neuromuscular control, producing rapid and often significant improvements in mobility and symptom reduction that surpass outcomes expected from tissue remodeling alone. Consequently, TMR® serves not only as a potential intervention for hamstring inflexibility but also as a valuable screening tool to differentiate between true muscular tightness and apparent restrictions arising from neuromuscular or movement dysfunction[31].

Table 1. Characteristics, interventions, outcome measures, and main findings of the included studies

Author and study design	Sample size and age of the population	Intervention	Outcome measure	Main finding
Richard D. Patterson *et al.,* in the year 2024 conducted Observational Cohort study[65]	A convenience sample of 20 healthy participants (10 males, 10 females) were recruited from three institutions. Between the age group 16-19 were taken	The TMR® group completed the "Fab 6" evaluation and treatment, while the control group performed one repetition of standing active hip flexion every 30-seconds for 15-minutes with both knees in full extension.	Active knee extension test, passive straight leg rise test, Visual scoring scale were used.	A significant time × group interaction was observed for AKET and PSLR ($p \leq 0.001$), except for the preferred-leg PSLR at the 24-hour follow-up. The TMR® group showed greater improvement in AKET of the non-preferred leg (12.15° ± 2.94°) compared with the control group (7.15° ± 1.56°), demonstrating significant improvements in hamstring extensibility and hip ROM.
R. Ross. Dexter *et al.*, in the year 2019 conducted randomized controlled Trail[20]	22 student-athletes, ages between 18 to 25, from clubs, NCAA Division I, III, and secondary institutions were taken	TMR® protocol (TMRG; 11) in addition to the conventional warm-up (TWG; 11). For Total motion release group seated Straight Leg Rise (SLR) and Forward Flex Trunk Twist (FFTT) and for warm up group set of warm up exercises has been given	Clinometer smartphone application used to measure Hip internal and external rotation	The TMR® group showed greater immediate improvements in bilateral hip rotational ROM than the traditional warm-up group, with mean changes of +6.27°, +12.2°, +4.8°, and +11.9° compared with +0°, +1.9°, −1°, and +1°, respectively. These findings suggest that TMR® is an effective warm-up strategy for improving hip mobility in overhead athletes.
R. Ross. Dexter *et al.*, in the year 2019 conducted randomized control Trail[21]	22 seniors in secondary schools, clubs, and NCAA Division I, III, between the ages of 18 and 25 Had been taken	TMR® protocol (TMRG; 11) in addition to the conventional warm-up (TWG; 11). For warm up in 5 phase warm up protocol has been given and similarly for the total motion release group Straight Leg Rise (SLR) and Forward Flex Trunk Twist (FFTT) had been given	Active shoulder internal and external rotation was measured using Clinometer smartphone application	The TMR® group showed greater improvements in shoulder Range of Motion than the traditional warm-up group, with mean increases of 9.5° in dominant shoulder internal rotation, 7.5° in non-dominant shoulder internal rotation, and 4.7° in non-dominant shoulder external rotation, compared with 1.7°, −6.7°, and −4°, respectively. The TMR® protocol also required only 7 minutes, compared with 25 minutes for the traditional warm-up, making it a more efficient approach for improving shoulder AROM in overhead athletes.
Gamma, Stephen C *et al.*, in the year 2020 conducted randomized cross-over design[19]	The twenty male baseball players in high school and college age range from 16 to 20 had been taken	Group 1: set of dynamic warm up followed by total motion release technique known as, trunk twist and arm rise had been given Group 2: Total Motion Release technique known as, trunk twist and arm rise had been given followed by set of dynamic warm up exercise	ROM measurements for the shoulder's IR and ER. Using Goniometry	The TMR® intervention resulted in significant improvements in dominant shoulder internal rotation (IR, $p \leq 0.005$, $d = 1.52$) and external rotation (ER, $p \leq 0.018$, $d = 1.22$), with significant time and time × group interaction effects ($p \leq 0.001$). Compared with a dynamic warm-up, TMR® produced greater improvements in shoulder ROM. Participants who received TMR® after the dynamic warm-up also showed further significant gains in IR ($p \leq 0.001$, $d = 3.08$) and ER ($p \leq 0.001$, $d = 2.56$).

Table 1. Continued...

Author and study design	Sample size and age of the population	Intervention	Outcome measure	Main finding
Stephen C Gamma *et al.,* In the year 2014 conducted Cohort study[15]	10 male Pitchers between the age range 16 to 20 were included in the study	Group 1: Total Motion Release ® only (Trunk twist + Arm Rise) and Range of motion measured. Group 2: Dynamic warm-up has given and measured Range of motion Total Motion Release ® (Trunk twist + Arm Rise) then Range of motion measured again	Using Goniometry ROM values for the IR and ER of the dominant shoulder.	The TMR® group demonstrated significantly greater improvements in shoulder internal rotation (IR, $p = 0.025$) and external rotation (ER, $p = 0.014$) than the traditional warm-up group following the initial intervention. After both groups completed the TMR® intervention, no significant between-group differences were observed for IR ($p = 0.44$) or ER ($p = 0.23$), suggesting that TMR® effectively improved throwing shoulder ROM.
Varun Naik *et al.,* In the year 2016 conducted pre- test and post-test pilot study[22]	Thirty subjects between the ages of eighteen and forty-five had an acute neck discomfort diagnosis were included in the study.	Seven days of hot pack paired with the Total motion release approach was given	Neck Disability Index (NDI) Visual Analog Scale, Goniometry	The TMR® intervention significantly reduced pain (VAS: 6.98 ± 1.11 to 5.00 ± 1.35; $p < 0.001$) and neck disability (NDI: 39.9 ± 12.06 to 28.8 ± 9.93; $p < 0.001$), while improving cervical Range of Motion after seven treatment sessions. Significant improvements were observed in flexion, extension, bilateral lateral flexion, and left rotation ($p < 0.001$).
Rachel Drake *et al.*, in the year 2016 conducted Randomized three-group pretest-post-test experiment[18]	29-collegiate swimmers were included in the study	The groups were divided into 3. control groups, TMR 2, and TMR 6, TMR 2 group performed only the trunk twist and arm raise motions. for the 3rd group TMR 6 all six motions were given for treatment and for the control group no treatment was given	A goniometer was utilized to measure the shoulder Internal and External rotation range in the dominant as well as non-dominant upper limb. .	The TMR2 group demonstrated significant improvements in shoulder internal rotation (IROM) in both the dominant and non-dominant arms. Significant differences were observed for dominant arm IROM ($F(4,52) = 3.790$, $p = 0.009$, $\eta^2 = 0.226$) and non-dominant arm IROM ($F(3.121,40.567) = 4.651$, $p = 0.006$, $\eta^2 = 0.236$). In contrast, the TMR6 group showed improvements primarily in dominant shoulder external rotation (EROM), while no significant difference was observed for dominant arm EROM ($p = 0.498$). Overall, these findings suggest that TMR® is an effective approach for improving shoulder Range of Motion in collegiate swimmers compared with the control group.
Krystal A. Tyree *et al.,* In the year 2018 Conducted case report[23]	17-year-old female cheerleader was included in the study	Total motion release, (trunk twist, arm rise) Clamshell Diaphragm Reset, Triggering Twist and Stretch	Numeric Rating Scale (NRS), inclinometer, Optimal Breathing Assessment	The combined breathing intervention and TMR® program led to clinically meaningful improvements in shoulder function. Internal rotation increased by 27° (MDC = 8°), external rotation by 21° (MDC = 9°), flexion by 11° (MDC = 8°), and abduction by 45° (MDC = 4°). Pain also improved beyond the Minimal Clinically Important Difference (MCID), indicating meaningful functional recovery.

Table 1. Continued...

Author and study design	Sample size and age of the population	Intervention	Outcome measure	Main finding
Diane L *et al.*, in the year 2020 conducted Case Study[24]	a female intercollegiate soccer player, between the age 20 has been included in the study	Total motion (Fab 6 exercise) release, ice massage, traditional Range of Motion exercise, additional rehabilitation exercises	Patient-Reported Symptom Score (TMR® Scale), Knee Range of Motion (ROM)	After 12 TMR® sessions, the patient demonstrated substantial improvements in knee function, with the straight leg raise score improving from 70 to 0, knee hyperextension from 60 to 5, and sit-to-stand from 80 to 5. Knee extension recovered to 99.0% and flexion to 96.4% of pre-surgical levels, with 100% knee flexion (140°) and −2° extension achieved at the one-month follow-up and maintained at six months.
Prashant Naik *et al.*, in the year 2019 conducted Pilot Study[26]	Individual between the ages of 20 and 45 who have experienced acute low back pain lasting lesser than three weeks were included.	Total motion release, hot pack	The Modified Schober's technique, the Visual Analogue Scale, and the Oswestry Disability Questionnaire (MODQ) are utilized.	The combination of TMR® and a hot moist pack significantly reduced pain (VAS: $t = 17.857$, $p = 0.001$) and functional disability (MODQ: $t = 16.807$, $p = 0.001$). It also produced significant improvements in lumbar flexion ($t = 7.999$, $p = 0.001$), extension ($t = 8.120$, $p = 0.001$), and left lateral flexion ($t = 4.418$, $p = 0.001$), while no significant change was observed in right lateral flexion ($p = 0.693$).
Baker RT, Hansberger BL, Warren L, Nasypany in the year 2015 conducted. Case Report[30]	Single subject 27-year-old former competitive speed walker.	Total motion release, Instrument assisted soft tissue mobilization	Sit and reach test, Active straight leg rise,90/90 Active knee Extension Test, Tripod Test, Slump Test	After 12 treatment sessions, the patient showed substantial improvements in flexibility and overall function. Sit-and-reach distance increased by 10 cm, bilateral straight leg raise improved by an average of 39°, and pain decreased by 5 points on the Numeric Rating Scale, exceeding the minimal clinically important difference (MCID). The patient regained normal range of motion, with the PSFS improving from 4/10 to 10/10, and these improvements were maintained at both the 1- and 3-month follow-ups.

4.2 Neck pain

Neck pain is a complex, multifactorial condition with significant health and economic impacts, including high healthcare costs and lost productivity[32,33]. It often follows an episodic course, with higher prevalence in women, urban populations, and developed countries, which is because of soft tissue dysfunction, structural abnormalities, trauma, or systemic conditions. Conventional treatments include pharmacological and non-pharmacological approaches such as massage, acupuncture, yoga, and aquatic therapy[34,35]. Total Motion Release® is a holistic technique based on myofascial release principles that addresses musculoskeletal imbalances by identifying the primary movement or position causing pain. Exercises are performed on the unaffected side while reassessing the affected side, targeting asymmetries and movement dysfunction rather than tissue length alone. In this study, TMR® significantly reduced pain, improved neck disability scores, and increased cervical range of motion, supporting its potential as an effective intervention for neck pain and related functional limitations[22].

4.3 Back pain

Low Back Pain (LBP) is a prevalent public and occupational health problem, imposing significant social, economic, and professional burdens. Up to 84% of individuals experience LBP at some point in their lives, with high recurrence rates, making it a leading cause of work disability and sick leave[36,37]. Non-specific LBP, which occurs without identifiable serious spinal pathology, is the most common type and is influenced by factors such as age, sedentary lifestyle, obesity, poor posture, and occupational or recreational strain[38,39]. The lumbar region is particularly susceptible due to structural and biomechanical stresses, including weight bearing, shearing forces, and repetitive strain on muscles, ligaments, and intervertebral discs. Pain may arise from injury or irritation to these structures, leading to functional limitations and reduced quality of life[40,41]. Conventional management strategies include manual therapy and electrotherapy modalities, such as McKenzie mobilization, muscle energy techniques, IFT, and TENS, aimed at reducing pain and improving function.

Total Motion Release® is an emerging manual therapy approach that offers a holistic and patient-driven method for managing low back pain. Unlike traditional therapies that primarily target localized tissue damage, TMR® focuses on identifying musculoskeletal asymmetries and movement dysfunctions that contribute to pain. Specific movements are performed on the less affected side, which then alleviates symptoms on the side which is affected by restoring balance, mobility, and functional performance. By addressing the primary postural or movement restrictions underlying LBP, TMR® demonstrates potential as an effective intervention for reducing pain, enhancing lumbar function, and improving overall quality of life in individuals with non-specific low back pain[26].

4.4 Frozen shoulder

Frozen Shoulder (FS) is a common but challenging musculoskeletal condition associated pain, stiffness, and significant restriction of both passive and active Range of Motion (ROM) of the glenohumeral joint[42]. It is most prevalent in women aged 40-65 years and it is frequently linked with additional health condition such as diabetes mellitus and thyroid disorders[43,44]. The natural course of FS typically progresses through three stages: the freezing stage, marked by insidious onset of pain in the shoulder and progressive loss of motion; the frozen stage, where pain subsides gradually but stiffness persists with equal limitation in active and passive ROM; and the thawing stage, characterized by gradual improvement of motion and resolution of symptoms[45,46]. Traditionally, FS has been considered a self-limiting condition, with conservative management including low-grade mobilizations and pain-free stretching exercises, which may require several weeks to months for noticeable improvement[47]. However, recent evidence highlights the potential of Total Motion Release (TMR®) techniques as an alternative or adjunctive approach. TMR, when coupled with breathing treatments, has shown immediate improvements in shoulder internal and external rotation, exceeding Minimal Detectable Change (MDC) values after just one or two sessions. These improvements are achieved faster than traditional therapy, which often demands prolonged treatment duration. By addressing asymmetries and restoring functional movement patterns, TMR may provide faster pain relief, enhanced ROM, and quicker return to activity in individuals with frozen shoulder, particularly those presenting with high irritability[23].

4.5 Normal Knee Function after ACL Reconstruction

Rehabilitation following Anterior Cruciate Ligament (ACL) reconstruction is a lengthy process, often requiring 6-9 months for patients to recover to pre-injury levels of activity[48]. In the first four weeks after surgery, rehabilitation is intensive, with patients spending 30-150 minutes per session several times per week, incorporating bracing, crutches, swelling and pain management, neuromuscular electrical stimulation, and sometimes Continuous Passive Motion (CPM) machines to restore early Range of Motion (ROM) and prevent scar tissue formation[48-50]. By the end of the fourth week, rehabilitation goals typically include achieving pain-free bilateral step-up progressions, stationary biking, swimming, and proprioceptive training, along with restoring normal gait and knee flexion from 0° to 130° [51-53]. While traditional rehabilitation focuses on local modalities and strengthening exercises, Total Motion Release® offers an alternative approach by utilizing movements performed on the unaffected side to influence neural connections and sensory processing related to the injured area. This concept, known as cross-education, relies on central neural adaptation, where force applied to muscles on one side of the body can positively impact

balance, strength, and ROM on the injured side. TMR® aims to correct imbalances by relaying on unaffected side to produce therapeutic effects in the affected side, potentially enhancing ROM, muscle re-education, and pain reduction while also decreasing the duration of rehabilitation sessions[54-56]. The populations, treatment goals, interventions, and comparisons reported across studies investigating TMR® in musculoskeletal rehabilitation are summarized in (Table 2).

5. Applications of Total Motion Release in Overhead Athletes

5.1 Regional Interdependence and Functional Movement Optimization

In overhead athletes, trunk stability and kinetic-chain integration between the lower and upper extremities are essential for performance and injury prevention. Repetitive shoulder movements can cause adaptations in the joint and surrounding musculature, often resulting in increased External Rotation (ER) and decreased Internal Rotation (IR) of the dominant shoulder[57-59]. Altered hip and trunk mechanics can further affect shoulder stability, rotational velocity, and overall force production. Reduced hip ROM has been linked to increased risk of shoulder, lower extremity, and low back injuries, while elite athletes with greater hip mobility demonstrate performance advantages[60-62].

Traditional warm-up protocols-including aerobic activity, static/dynamic stretching, and sport-specific drills-often produce limited and short-term improvements in shoulder and hip ROM. Addressing the interconnected neuromuscular and fascial systems-a concept known as Regional Interdependence (RI)-may be more effective for injury prevention and performance optimization, as changes in one region can influence other interdependent regions[15,19]. Total Motion Release® (TMR®) leverages RI through cross-education, neural coupling, and fascial interconnectedness. Athletes perform bilateral, pain-free movements, comparing motion quality and pain between sides. Dysfunctional movements on the bad side are treated via the "good" side through static holds or set/rep schemes until asymmetry is minimized. By targeting interdependent regions such as the hip and trunk, TMR® can improve active ROM, enhance functional movement, promote symmetry, and support performance readiness and injury prevention-often achieving results faster than traditional warm-ups[16].

5.2 Sport-Specific Applications and Comparative Effectiveness

In baseball, repetitive throwing stresses the glenohumeral and elbow joints, often resulting in deficits such as Glenohumeral Internal Rotational Deficit (GIRD), decreased trunk rotation, and hip rotational imbalances. These deficits can increase injury risk by transferring deceleration demands to the shoulder and disrupting optimal force production along the kinetic chain. Traditional warm-ups, including running, lunges with rotation, skips, dynamic stretches, and light throwing,

Table 2. Summary of Total Motion Release® (TMR®) Population, interventions, treatment goals, and populations included in musculoskeletal rehabilitation

Population / Area	Treatment Goal	Intervention
Hamstring tightness	Increase hamstring flexibility in healthy participants	TMR® group completed the "Fab 6" evaluation and treatment
Neck pain	Decreasing pain in the neck and disability as well as increasing range of motion.	Total motion release approach, along with moist heat for 7 days
Back pain	Pain relief and functional disability and also significant improvement in lumbar flexion and extension range.	After the assessment, subjects were given Total Motion Release technique in combination with Hot Moist Pack for 45 minutes of 5 sessions daily.
Frozen shoulder	Improve glenohumeral Range of Motion	Breathing treatments and TMR® intervention exercises
ACL Reconstruction	Restore joint ROM, reduce pain, enhance safe functional return	Rehabilitation sessions consist of 15 minutes of ice massage for the quadriceps with simultaneous quadriceps contraction/relaxation immediately followed by TMR ®.

Table 3. Summary of Total Motion Release® (TMR®) Population, interventions, treatment goals, and populations included in sports rehabilitation

Population / Area	Treatment Goal	Intervention/ Comparison
Baseball Players	Enhances the internal and external rotation of the dominant arm and shoulder	The entire TMR® Trunk Twist and Arm Rise protocol took 8 to 10 minutes compared with a traditional warm-up
Baseball Players	Compare the immediate effects of Total Motion Release (TMR) to a generic dynamic warm-up program in baseball athletes.	The entire TMR® Trunk Twist and Arm Rise 3 sets of a 30-second compared with a traditional warm-up compared with a traditional warm-up compared with a traditional warm-up
Overhead Athletes	TMR increases shoulder ROM	The TMRG performed 3 sets of FFTT and SLR, each held for 20 seconds to the side of ease compared with a traditional warm-up
Collegiate Swimmers	To increase the range of internal and external rotation of the shoulder	TMR2 or TMR6. TMR2 included trunk twist and arm raise (3 sets × 30 sec static hold, side of ease). TMR6 used the top two asymmetrical motions: arm raise, trunk twist, leg raise (3 sets × 30 sec hold), and bent arm wall push, single-leg sit-to-stand, weight-bearing toe reach (3 sets × 15 reps, side of ease). compared with a traditional warm-up
Overhead athletes	Hip Range of Motion with active rotation	The TMRG performed three sets of forward flexed trunk twist and seated straight leg raise held for 20 seconds each to the side of ease with a 30-second rest interval. compared with a traditional warm-up

aim to improve core temperature, mobility, and performance[63,64]. However, their effectiveness is limited, particularly in addressing regional interdependence and movement asymmetries[15,63].

TMR® addresses these limitations by targeting interdependent regions, such as the trunk, shoulder, and hips, to improve functional ROM and symmetry. Studies in baseball athletes have shown that TMR® using trunk twist and arm raise patterns significantly increased internal and external shoulder rotation compared to conventional dynamic warm-ups, while requiring less time to complete. These findings suggest that TMR® may offer a time-efficient, targeted alternative to traditional warm-ups, enhancing performance readiness, correcting asymmetries, and potentially reducing injury risk[15,19,63]. TMR® has been investigated in various athletic populations, including baseball players, overhead athletes, and collegiate swimmers, with interventions targeting improvements in range of motion and movement performance. The populations, treatment goals, and intervention protocols reported in these studies are summarized in (Table 3).

6. Discussion

Total motion release® (TMR®) over the last few years has become a versatile technique with applications for the treatment of clients across the spectrum, from post-surgery to those with no pain but range-of-motion impairments or imbalances. Clinical experience and multiple studies have thus far centered on TMR® as an alternative therapeutic tool. The research includes numerous fields from restricted ROM of the shoulder and hip in over-head athletes, to surgeries such as ACL reconstructions, and disorders such as neck and back pain[16,25] A study conducted by C Gamma on overhead athletes report that the TMR® group underwent trunk twist and the arm rise before their warm up session, while the other group underwent the dynamic warm up, it was reported that the subjects in the TMR® group (TMRG) had significantly greater improvements in shoulder Internal Rotation (IR) and External Rotation (ER) ROM than those in a Traditional Warm-up Group (TWG). While TWG also had the largest increase in ROM post-TMR treatment, the changes in ER were not statistically significant. This could possibly be due to the small sample size or even a ceiling effect for the already high ER found in this population. These results are consistent with other related studies that provide evidence for the effectiveness of TMR® in ROM. This therefore shows that compared to a general dynamic warm-up and general stretching techniques, this particular TMR® protocol clearly points to its effectiveness in increasing the ROM of both

dominant shoulder IR and ER in professional baseball players. Change over time in final ROM measures was significantly influenced by the order of intervention, where TMR® applied before generic warm-up resulted in a statistically significant improvement beyond published expectations[15,19]. Also, a study was done by Dexter Ross evaluated the effect of TMR® forward flexion trunk twist and straight leg rise techniques on Hip and Shoulder ROM in Overhead Athletes to test whether TMR® effects as compared to the effects of traditional warm-ups, would result in increased hip and shoulder ROM in overhead athletes. He concluded that the TMR® technique is more effective than traditional athletic warm-ups and faster at immediately increasing the bilateral hip ER and total hip rotation. This implies that TMR can be used by sports performance professionals when implementing the warm-up activities to increase the ROM of the hip. Moreover, TMR® increased the bilateral shoulder IR and decreased the non-dominant shoulder ER deficit, reducing both performance and possible injury risks arising from the lack of IR in the dominant shoulder. The TMR® Forward Flexion Trunk Twist (FFTT) and straight leg rise techniques SLR techniques were more efficient on time and consumed less time compared to conventional techniques of warm-up to achieve shoulder AROM. The incorporation of TMR within warm-up protocols could decrease the risk of injury and optimize performance via increased shoulder IR AROM[20,21]. A study done on college swimmers on two techniques of TMR®. TMR2 (raising of arms and twisting of trunk) and TMR6 to improve shoulder mobility in that TMR2 improved bilateral internal rotation and dominant shoulder external rotation where as TMR6 improved dominant shoulder external rotation[18]. A study conducted on collegiate swimmers comparing two forms of the Technique Mobility Range (TMR), TMR2 (raising of the arms and rotating of the torso) and TMR6 (to increase shoulder mobility) showed both techniques produced a similar improvement in the swimmers' shoulder external rotation but also showed TMR2 to produce greater improvements in bilateral internal rotation and dominant shoulder external rotation than did TMR6[18]. An observational study utilizing the TMR Fab 6 Protocol, by Richard D. Patterson, assessed participants completing a series of movement evaluations to determine movement asymmetry including six different assessments (arm raise, arm press, trunk rotation, leg raise, sit-to-stand, and toe touch). The treatment for participants was provided to the non-restricted/unaffected ("good") side via repetitive movement utilizing the principle of regional interdependence. One single session of TMR improved hamstring flexibility and increased hip ROM when compared to the control group ($p < 0.001$). Found TMR® to be the method that helped restore the knee Range of Motion quicker compared to any other traditional method. Other complementary treatments include Quadriceps contraction combined with an ice massage and use of a stationary bike. TMR® is presented as a practical and time-efficient alternative for clinicians to enhance ROM post-ACL surgery. As healing ensued, TMR guided the patient safely in making the return to maximal functional mobility. These are simple tools that a patient can now own the condition and be functional again[24,25]. Varun Naik and Prashant Naik used FAB5 protocol of TMR® for treatment of neck and back pain, where the movement can be performed on the un effected side to reduce pain and improve mobility with considerable results. They reported a study on neck pain and showed a considerable reduction in pain, with a decrease in the neck disability scores and an increase in the cervical ROM among all 30 subjects after treatment. Interestingly, treating the unaffected side improved the affected side effectively. The effectiveness of this approach was further ascertained when, in a two-week case study of a 49-year-old female with right shoulder pain, carrying out FAB5 on the left side reduced pain significantly, and the ROM on the right side increased. Low Back Pain and Functional Disability A study on low back pain revealed that, based on Modified Oswestry Disability Questionnaire scores, there were significant improvements in functional ability for all the subjects. Post-treatment mean and standard deviation were low and uniform compared to pre-treatment. The calculated correlation value showed that a significant association, i.e., 71.7% movement was in the same direction at the level of 5%. Hence, TMR effectively improved functional disability due to low back pain[24,26]. The present review included 11 studies, comprising six randomized controlled trials, one observational cohort study, two pilot studies, and two case reports. The majority of the included studies were randomized controlled trials, suggesting a reasonably strong level of evidence for the use of Total Motion Release® (TMR) in improving pain, range of motion, and functional outcomes. At the same time, the presence of pilot studies and case reports indicates that research on TMR is still developing. Many of the available studies involved small sample sizes and differed in their methodology, making it difficult to

draw definitive conclusions. Therefore, larger, high-quality randomized controlled trials with standardized treatment protocols are needed to further validate the effectiveness of TMR in clinical rehabilitation. Based on the evidence synthesized from the included studies, the following conclusions can be drawn regarding the clinical effectiveness of Total Motion Release® therapy.

5. Conclusion

The findings of the literature reviews have indicated that the use of TMR® appears to be a potentially effective method of providing individuals with Musculoskeletal Disorders (MSD), instant restoration of range of motion, movement symmetry and function; numerous studies reviewed have reported improved outcomes after using TMR®, particularly among athletic populations including those who participate in overhead activities. Additionally, TMR® appears to be an efficient means of implementing therapy when compared to traditional methods of rehabilitating MSDs, as well as provide clinically significant improvements in functional outcomes. Although the currently available evidence suggests that there are potential benefits associated with the use of TMR®, it is not sufficient to support its inclusion into evidence-based practice. Therefore, future high-quality research will need to be conducted prior to making specific clinical recommendations regarding the use of TMR.

6. Limitations

The majority of the included studies were based on a relatively small number of participants; therefore, the ability to generalize the results is reduced. A disproportionate amount of this research was comprised of pilot studies or case reports, which have less evidence regarding the efficacy of TMR compared to Randomized-Controlled Trials (RCTs). Furthermore, most of the research has focused on the effects of TMR within populations that participate in sport-related activities, specifically those who throw overhead. Few studies investigated the effects of TMR among general musculoskeletal populations. As noted above, the included studies demonstrated heterogeneity in their design (study design), interventions (protocols), outcomes (measures) and durations of follow-up. These differences make it challenging to directly compare findings from these studies. Consequently, as noted previously, current evidence should be viewed with caution and larger multicenter RCTs with standardized treatment protocols are necessary to increase the quality of evidence supporting the clinical effectiveness of TMR.

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Author Contribution

Nireeksha N Shenoy: Designed the study, contributed to study selection supervision, manuscript review, and Graphical abstract and approved the final version for submission. Deekshith. K- Drafted the Manuscript, and manuscript editing and revision, and approved the final version for submission. Both authors Literature search, Read and approved the final version of the manuscript.

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