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Common Myofascial Trigger Points Found in Sports: A Scoping Review

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ABSTRACT

Background: This study emphasises the development of connections between various sites of Myofascial Trigger Points (MTrPs) in sports personnel. MTrPs are major contributors that can negatively impact an individual's performance. Sportspersons who engage in rigorous training are more susceptible to developing MTrPs, which can subsequently hinder their performance. Despite increasing research in this area, there remains limited synthesis focusing specifically on their distribution and management in athletic populations.

Objective: The aim of this research was to systematically review the literature on the prevalence, distribution and treatment approaches of MTrPs in sportspersons.

Methods: A comprehensive systematic search of the MEDLINE, PubMed and ResearchGate databases was conducted for the studies published between 2002 to 2023. To locate relevant studies, MeSH keywords such as "Myofascial Trigger Points," "Myofascial Pain Syndrome," "athletes," "players," and "sportsperson" were used in various sets of combinations. A total of 204 sport-related articles retrieved, of which only 28 met the predefined inclusion criteria and were included in this review.

Results: Studies involving athletes with MTrPs across various sports disciplines were included and analysed descriptively. The majority of research on MTrPs associated with athletes focused on the gastrocnemius (17%), followed by the upper trapezius (13%), and various shoulder joint and scapular muscle groups. Many researchers examined the infraspinatus (10%), while the rotator cuff as a whole was the focus in 8.6% of studies. A majority of studies focused on overhead and lower limb dominant sports, with dry needling being the most frequently investigated intervention. However, substantial heterogeneity was observed across studies in terms of sports type, athlete level and intervention protocols. Additionally, many studies demonstrated methodological limitations, including small sample sizes and limited reporting of randomisation and blinding procedures.

Conclusion: MTrPs are prevalent in key muscle groups relevant to athletic performance; however, current evidence is limited by methodological variability and heterogeneity among studies. There is a need for high-quality, standardised research with larger sample sizes and more diverse athletic populations to strengthen the evidence base and improve clinical applicability in sports rehabilitation. Existing studies often concentrate on individual muscles, specific injuries, or particular movements, highlighting the need for a more comprehensive approach to fully understand the impact of MTrPs on athletic performance across different sports and skill levels.

Keywords : Athletes, Sportsperson, Sports, Prevalence, Myofascial Trigger Points, Myofascial pain Syndrome

INTRODUCTION

Sports activities require exceptional levels of physical fitness, encompassing attributes such as speed, agility, strength, power, and endurance. A sportsperson countered through various levels of physical contact, which can vary from simple touch to robust gameplay which makes them vulnerable to injuries[1].

Injuries can exhibit a spectrum of severity: ranging from minor cases characterized solely by pain symptoms, not necessitating medical intervention, to severe injuries that result in an athlete's withdrawal from sports engagements[2]. Such injuries can yield undesirable consequences, affecting not only players' physical health but also their way of life. According to a recent study which states that these repercussions might include an elevated risk of emotional challenges like depression or anxiety, often accompanied by financial setbacks[3].

New research indicates that the process behind Musculoskeletal Pain Syndrome (MPS) and the consequences of Myofascial Trigger Points (MTrPs) start when muscle fibres experience too much stress or injury. This leads to a reduced supply of nutrients and oxygen to the muscles, causing the muscles to involuntarily shorten and protect themselves. This results in increased demands on the muscle tissue. Muscle strain from stretching and lengthening can also cause myofascial pain[4].

As per a study in 2017, it has been noted that almost 37% of men and 65% of women are impacted by myofascial pain[5]. MTrPs are the source of MPS, so any musculoskeletal pain or discomfort could be because of MPS[6]. A myofascial pain syndrome can be describing as a condition which is marked by muscles that are shortened or contracted, leading to heightened tension and rigidity, muscles have MTrPs as well[7]. MTrPs are painful sensory activity which could be a secondary manifestation to a high stimulation, may be provided by either direct blow to muscle or repeated overloading[8]. MTrPs may develop suddenly or gradually.

A sportsperson is highly prone to develop MTrPs during their sports journey[9] ; which can affect their performance and potentially harm muscles or groups of muscles[10]. As a result, athletes could experience reduced flexibility, decreased power and endurance.

These MTrPs are sensitive points within taut muscle fibres[11]. They can cause pain in in localised or referred to another area[12].

Clinically they can be divided into Active and Latent Trigger points. They can be differentiated according to the symptoms they provide especially on palpation[13] . Normally Latent (LTrPs) ones do not induce pain[14] , but may restricts range of motion of a joint, which furthers also reduces strength of a muscle[15].

The symptoms of active Myofascial Trigger Points (ATrPs) can involve ongoing pain during physical activity and sometimes even during periods of rest. Other signs include muscle weakness, reduced flexibility, and the possibility referred pain[16]. The compression of ATrPs can be tender enough that it can elicit jump sign, it may feel like hurting and may lead to motor disorder[17].

Other noticeable signs of MTrPs may include changes is musculoskeletal systems like, reduced muscle power, changes in motor points and increased muscle tension which impacts incomplete muscle stretching and so limited range of motion. This all may lead to reduced joint function and stability as well[18].

The sensitivity of nociceptors could be highly aggravated either due to sudden direct muscle trauma, high tensile situation or repetitive overstressing[19].

RESEARCH METHODOLOGY

Literature Search Approach:

To ensure a comprehensive review encompassing all relevant clinical studies which involves Myofascial Trigger Point treatment for sportspersons of various sports, a highly meticulous search strategy was formulated. The strategy aimed to optimise search terms to achieve both high sensitivity and high specificity. The initial search encompassed prominent databases, including PubMed[20], Medline Plus (from the National Library of Medicine)[21,22] and ResearchGate[23].

Drawing insights from these preliminary results, a set of keywords were identified and combined in different permutations. The selected keywords included the combination of "Trigger points," "Myofascial Trigger points", "Myofascial pain Syndrome" with "athletes," "players," and "sportsperson". Subsequently, a comprehensive literature search was conducted, considering articles published since 2001. Additionally, the list of references from the relevant review articles were also scrutinised to identify additional potential studies.

Article Selection, Data Extraction and Analysis:

The study selection process followed defined criteria. Inclusion encompassed clinical case series, review articles or meta-analyses that focused on MPS or MTrPs in the context of sports-related injuries among athletes.

On the other hand, exclusion criteria were applied systematically, including: (1) Studies conducted on non-human subjects or in vitro settings; (2) Studies not centred on athletes; (3) Incomplete research outputs lacking full-text availability (such as conference poster abstracts); (4) Studies addressing injuries but not referencing Myofascial Pain Syndrome or Myofascial Trigger Points; (5) Clinical comments or literature pertaining to sports or sports injuries; and (6) Studies not documented in the English language.

The screening process was executed meticulously, involving independent assessments of records based upon title and abstract with full text available articles. Initial removal of identical records with similar titles and authors was conducted. Subsequently, articles that didn't meet the stipulated inclusion criteria or were unrelated to sports medicine were eliminated. Further refinement occurred by excluding studies that aligned with the predefined exclusion criteria, ultimately leading to the identification of appropriate studies for inclusion in this review analysis, shown in form of flowchart in Figure 1.

Screening Process:

The sequential screening process is visually presented in Figure 1. The initial phase involved a comprehensive database search that yielded a total of 1871 potentially relevant articles. Following the removal of 574 duplicates, a subset of 1297 distinct records emerged, all identified through the outlined search strategy.

Subsequent screening was carried out meticulously, involving an evaluation of the titles and abstracts of the 1297 records. In the course of this process, 1093 articles were deemed ineligible for various reasons. These included factors such as incomplete full-text availability, non-English language, irrelevance to sports or the human subject matter.

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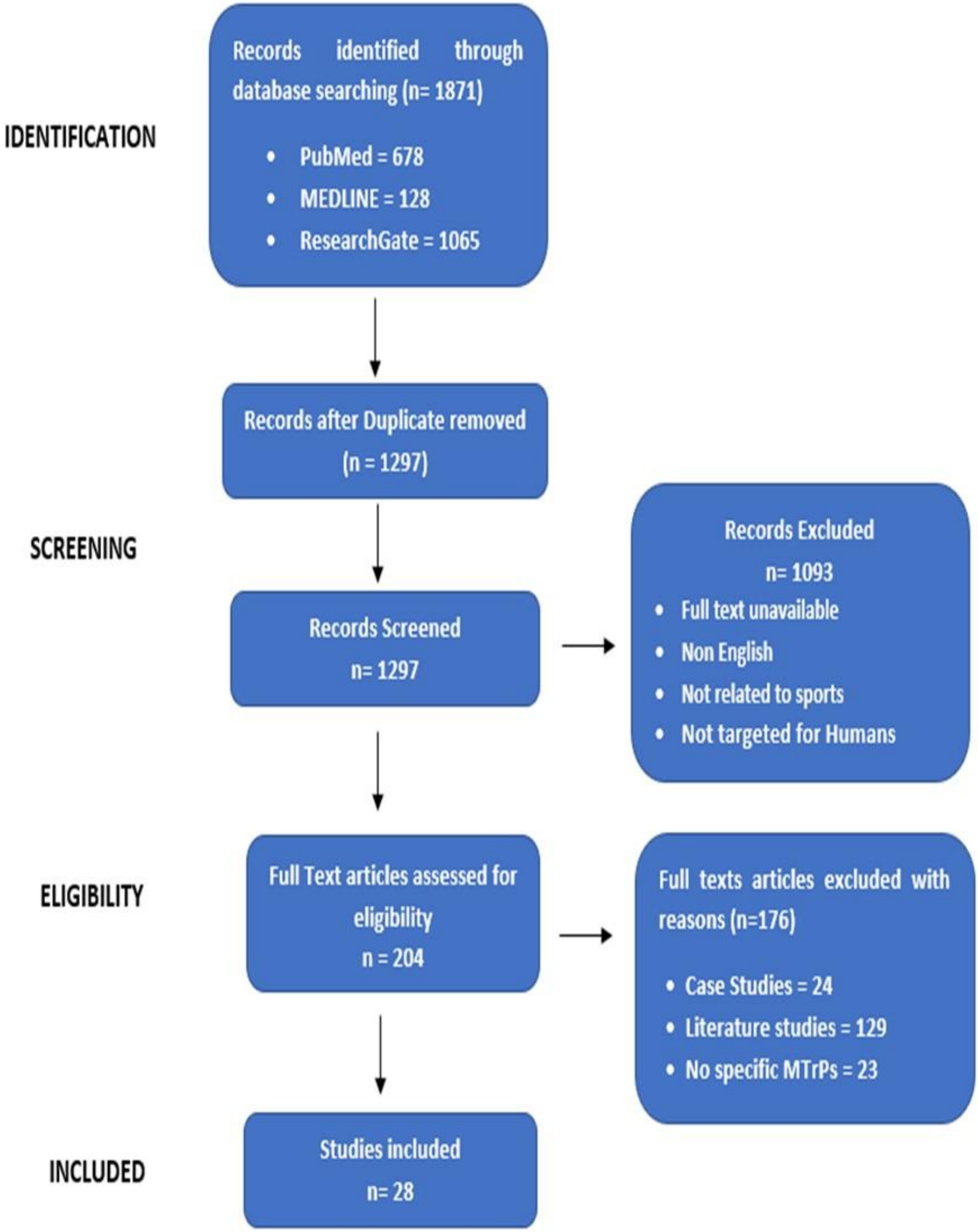


Figure 1: Screening Process – Flowchart

After careful scrutiny and full text review of the remaining 204 articles, a total of 28 research articles successfully met the predefined inclusion criteria, warranting their inclusion in this comprehensive review.

This study is also registered on the Open Science Framework (OSF) [https://doi.org/10.17605/OSF.IO/P42W5]. For a comprehensive snapshot of the characteristics defining the included studies, please refer to Table 1.

S. No	**Study**	**Sports Discipline**	**Muscles with MTrP**	**Intervention and Research Design**	**Summary**
1.	Andrés Rojas-Jaramillo, et al.[24] 2023	Cross Fit	Quadriceps, Gluteus, Gastrocnemius	Two groups Experimental – Dry needling Sham – needling on skin only. Treatment protocol – 15 minutes of needling. Research Design: ET	Researchers aimed to assess the immediate impact of deep dry needling on lower-limb muscle strength-related variables in CrossFit recreational athletes with latent trigger points. Nineteen healthy male CrossFit athletes were selected. Dry needling showed a better improvement in Maximal isometric hip abduction strength. No difference were found in jump height & maximal isometric strength.
2.	Rajdeep Das, et al.[25] 2023	Athletes (No specific sports discipline mentioned; neither any definition of athlete is mentioned)	Hamstring and Quadriceps	Two Groups: Group A – Athletes with Latent MTrPs (Hams & Quads) Group B – Athletes without LTrPs (Hams & Quads) Research Design: RCT	This study aimed to investigate the connection between latent MTrP and lower limb ROM in athletes. 46 male athletes were participants of the study out of which 23 were found to have latent LTrPs in Hamstrings and Quadriceps, while the rest did not. PPT and ROM of knee flexors and extensors were measured to analyse the corelation. Researchers observed that LTrPs could be significant causative factor of reduced knee flexors and extensors ROM. This indicates that LTrPs can hinder sports performance by limiting the ROM, emphasizing the importance of addressing and preventing this musculoskeletal disorder in athletes.

3.	Alexandra Gundersen; Haylee Borgstrom; Kelly C. McInnis;[26] 2023	All Sports	Rhomboideus; Infraspinatus; Paraspinals; Levator Scapulae; Trapezius; Pectorals; Latissimus Dorsi; Quadratus Lumborum	Review of literature on Thoracic injuries in athletes.	Aim of the study to give clinical review on thoracic injuries in athletes. The study mentions that common MTrP are found in thoracic are Rhomboid, paraspinal muscles; Levator Scapulae, Infraspinatus, Pectorals, Trapezius, Latissimus Dorsi and Quadratus Lumborum. Researchers stated potential sources of non-traumatic trunk pain encompass thoracic spine, ribcage and musculature of the torso. Specific conditions and injuries mentioned include disc prolapse, scoliotic or kyphotic changes, stress fractures, costochondritis, slipping rib syndrome, dysfunction of costotransverse or costovertebral joint and various muscle strains.
4.	Iacob George Sebastian, et al.[27] 2022	Soccer	Infraspinatus, Supraspinatus, Subscapularis, Teres Minor, Teres Major, Trapezius, Levator Scapulae	Two groups Group A – Dry needling & Medolight. Group B – Only Dry needling. Treatment protocol – 3 sessions / week. Research Design: RCT	Researchers aimed to evaluate the influence of Medolight in parascapular muscles' MTrPs along with Dry needling. A total of 26 healthy male soccer players were randomly assigned into two groups. The combination therapy showed better result in improving pain (NPRS) than dry needling alone.
5.	George Sebastian Iacob[28] ; et al. 2022	Various Sports: Football, Basketball Handball, Futsal, Tennis	Quadratus Lumborum, Iliopsoas, Gluteal muscles, Hamstrings, Quadriceps, Gastrocnemius, Trapezius, Large Dorsal and Spinal Erectors.	Two groups; Group A – Dry Needling (DN) & Manual therapy with Stretching (MTS) Group B – Manual therapy + Stretching (MTS) Research Design: RCT	64 professional athletes were randomly divided into two groups. Pain (NPRS) during passive stretching and hamstring flexibility were the variables assessed. The results illustrated that the group A were found significant in improving in passive stretching resistance and hamstring flexibility. These findings highlight the significance of incorporating dry needling therapy as part of a comprehensive treatment strategy for rehabilitating athletes with muscle injuries, contributing to pain reduction and enhanced functionality in the lower limbs.
6.	Lin-Ling Huang[29]; et al.	Overhead Athletes	Upper Trapezius	Two groups;	Researchers investigated the impact of MTrP in upper

	2022	(Baseball, Badminton, Tennis, Volleyball, & Swimming)		Group 1 – Trigger Point group (Athletes with present Trapezius Trigger Point) Group 2 – Control Group. (athletes without MTrP at Trapezius) Research Design: RCT A fatigue task involving sustained scapular elevation was performed and scapular movements and muscle activities were evaluated prior and after the activities.	trapezius muscle on scapular kinematics and muscle activity in overhead athletes. 34 participants were divided into 2 groups. Results showed that athletes with trigger points had reduced scapular posterior tipping and increased lower trapezius activity during arm movements after fatigue. Both groups exhibited that increased activity of upper trapezius muscle during lowering the arm and raising the arm enhances lower trapezius activity after the fatigue task. These findings suggest that upper trapezius trigger points can affect scapular movements and muscular activities during arm elevation, especially after fatigue, which could impact shoulder health and performance in overhead athletes.
7.	Ozgul Ozturk[30], et al., 2022	Rugby	Gastrocnemius (lateral)	31 Male Elite Rugby players. Research Design: ET	The study aimed to use of Myotonometer to assess Latent MTrP in lateral Gastrocnemius of Elite Rugby players. Researchers found that both LTrPs and taut bands had increased muscle stiffness and muscle tone compared to the surrounding muscle. While the stiffness of LTrPs were lower than that of taut bands, no significant differences were observed in frequency, stiffness, or decrement between them. Taut bands, however, displayed notable differences from non-taut bands in muscle tone, stiffness, and decrement. The study suggests that myotonometric measurement could be a valuable tool for identifying taut bands in elite athletes.

8.	Dr. Dharmendra Patel; Dr. Kritika Patel[31]; 2022	Football	Iliopsoas, Adductor Longus, And Rectus Abdominis Muscles	Two groups : Group A : Symptomatic football athletes with groin pain (30) Group B : Asymptomatic football athletes (30) Research Design: RCT	The study aimed to find the existence of MTrPs in the iliopsoas, adductor longus, and rectus abdominis muscles, as well as to examine the relationship between trigger points in these muscles and groin pain. The study found a strong association between MTrPs in the adductor longus and iliopsoas muscles and groin pain in football athletes. However, there was no association found between MTrPs in rectus abdominis muscle and groin pain.
9.	Kristo Xhardo[32], et al., 2022	Football	Peroneus longus and Brevis; Extensor Digitorum Brevis and Longus; Anterior Tibialis; Soleus; Gastrocnemius; Hallucis Longus Extender; Hallucis Brevis Extender	2 groups : Group A : Ergon therapy + Dry needling (30) Group B : Static stretching + Tissue Massage (30) Research Design: RCT	The study aimed to assess ergon therapy and dry needling on the recovery of footballers with grade II ankle sprains. Ergon therapy was found to be helpful in increasing joint mobility. Dry needling and instrument assisted soft tissue mobilization (IASTM) techniques contributed to proprioception recovery and pain reduction.
10.	María Benito-de-Pedro[33]; et al. 2021	Triathlon	Gastrocnemius muscle	Two groups; Group 1 – Dry needling (DN) Group 2 – Ischemic Compression Technique (ICT) Superficial EMG activity in both heads of gastrocnemius muscles measured before and after treatment.	This study compared the immediate effect of Deep DN and ICT on triathletes with LTrPs in the gastrocnemius muscle. EMG activity of lateral and medial gastrocnemius muscle were evaluated prior and immediately after treatment. 34 triathletes were divided into 2 groups receiving a single session of DN & ICT treatment. Study observed reduction in superficial EMG measurements differences in the DN than ICT. The study suggests that DDN could be beneficial for triathletes training below 1 m/s, however, ICT was found more suitable for speeds above 1.5 m/s.

				Research Design: RCT	
11.	Iacob George Sebastian[34], et al. 2021	Amateur sport players (These athletes must play at least once a week following games like football, tennis, swimming, running, etc.)	Lower back muscles: Quadratus Lumborum, Iliocostalis, Longissimus spinae, Gluteus minimus and medius muscles	Two Groups Group A – Dry needling (DN) techniques Group B – Bioptron light therapy (BLT) with dry needling (DN) techniques Research Design: RCT	Researchers evaluated the influence of BLT effect in treating MPS. 36 amateur sport players aged between 20-37 with myofascial pain in the lower back area participated. Participants were randomly divided into two groups. They underwent their specific therapies twice a week for a month. Both the groups showed significant pain reduction during palpation and movement, with improved lumbar spine range of motion in the final assessment.
12.	Luis Ceballos-Laita[35], et. al; 2021	Handball	Teres Major	Two Groups: Group 1 : Ultrasound guided DN Group 2: Control Group – no intervention Research Design: Single blind RCT	Researchers aimed to assess the effects of DN on pain, ROM, strength, and tissue extensibility of shoulder joint in professional handball athletes. The results indicated that a one setting of DN in the teres major muscle was beneficial in reducing pain during throwing actions, increasing internal rotation ROM and improving tissue extensibility. However, it didn't significantly impact isometric strength.
13.	Mireia Yeste-Fabregat[36]; et al., 2021	Basketball	Medial Gastrocnemius	Two groups: Control : Sham Treatment (15) Intervention: Tecar Therapy (17) Research Design: RCT	This study focused on professional basketball players and assessed the effects of Tecar therapy (TT) on the medial gastrocnemius muscle. The intervention group, which received TT, experienced a notable increase in muscle temperature. However, no significant differences were noted between both groups for Lunge Test and pressure algometry. The study highlights the potential benefits of TT in inducing temperature changes in specific muscle groups.
14.	Lacob George Sebastian;	Athletes (football, tennis,	Supraspinatus, Infraspinatus, Subscapularis,	Two Groups:	This study aimed to find the difference between short term effect of DTFM & DN with

	Măzăreanu Alexandru[37]; 2021	swimming, running, etc.)	Teres Minor, Trapezius, Levator Scapulae, Teres Major and Latissimus Dorsi.	Group A – DTFM (9) Group B – Dry needling with Manual Therapy (9) Research Design: RCT	manual therapy for the treatment of MTrPs among athletes for Upper Back. 18 professional players (male and female) of various sports are taken for this study and were randomly allocated to two groups. Both therapies were effective, but dry needling with manual therapy showed a produced more significant reduction in pain in athletes.
15.	Mohsem Miri[38], et al., 2020	Non - professional athletes (No specific sports discipline mentioned; neither any definition of athlete is mentioned)	Gastrocnemius muscle	Two groups; Group1 – Dry needling piston method Group 2 – rotational method. Pain intensity and jump height assessed using VAS and motion analysis system. Research Design: RCT	Researchers compared the effects of two techniques of dry needle treatment on active MTrPs in the Gastrocnemius muscle. 40 male non-professional athletes were selected for the study. Pain intensity and jump height were examined prior and post treatment in all 3 days of the treatment. The study concluded that the needle rotation method demonstrated strong antinociceptive effects and minimal discomfort in treated MTrPs. Both DN methods were found significant in improving vertical jump and pain reduction in recreational athletes with ATrPs in gastrocnemius muscle.
16.	Ricardo Becerro-de-Bengoa-Vallejo[18]; et al. 2020	Triathlon	Gastrocnemius muscle	Two groups: Group 1 – Dry needling (DN) Group 2 – Ischemic Compression Technique (ICT) Ankle dorsiflexion ROM & plantar pressure distribution during dynamic and static stance before and after treatment at various time intervals.	The study compared the immediate efficacy of one treatment session of DN & ICT on LTrPs in the shortened gastrocnemius of triathletes. 34 triathletes were participated who had LTrPs in shortened gastrocnemius. ROM of ankle dorsiflexor measured by using a universal goniometer. T-Plate platform pressure was used to assess the plantar pressure during static and dynamic stance. The results indicated no statistically significant differences in both the groups for improving ROM of ankle dorsiflexor and dynamic and static plantar pressures between.

				Research Design: RCT	
17.	Alireza Kheradmandi[39]; et al. 2020	Overhead athletes	Serratus anterior, Subscapularis, upper and lower Trapezius, Pectoralis minor muscles.	Two groups; Experimental Group – Dry needling (DN) with Manual Therapy (MT) Control Group – Manual Therapy (MT) Alone. Research Design: RCT	This study aimed to evaluate the effects of DN combined with MT versus MT on pain and function in overhead athletes with scapular dyskinesia (SD). 40 Participants were randomly assigned into two groups. Both groups were analysed for pain, disability, and SD improvement. The experimental group reduced pain and disability with improvement in tenderness (PPT) and Scapular rotation while Control Group only improved Scapular rotation while hands on waist. The study concluded that DN with MT can effectively reduce pain, disability, and dyskinesia in overhead athletes with SD.
18.	Marta San-Antolín[12], et al. 2020	Athletes (No specific sports discipline mentioned; neither any definition of athlete is mentioned)	Gastrocnemius muscle	Two Groups Group 1 – Gastrocnemius MPS Group 2 – healthy athletes. Self-reported depression symptoms and levels using Beck Depression Inventory II (BDI-II) Research Design: RCT	Researchers aimed to assess the effect of symptoms of depression and its levels in athletes having myofascial pain in the gastrocnemius muscle. 50 athletes were randomly allocated divided to 2 groups of MPS & healthy. It was observed that depression symptoms scores were found greater MPS Athletes. Furthermore, MPS of gastrocnemius muscle was identified as the sole predictor of higher depression symptoms scores. This study underscores the association between MPS and depression traits in athletes.
19.	Marta San-Antolın[40], et al. 2020	Athletes (No specific sports discipline mentioned; neither any definition of athlete is mentioned)	Gastrocnemius	2 Groups: Group 1 – Athletes with Chronic Gastrocnemius MPS (> 3 months) Group 2 – Healthy athletes	The study aimed to investigate two psychological factors, Kinesio-phobia and fear avoidance beliefs in athletes. There was total 50 athletes randomly divided into 2 groups. The research concluded that greater kinesiophobia and fear avoidance beliefs levels were influenced by the presence of gastrocnemius MPS with

				Research Design: RCT	comparison to Healthy individuals.
20.	Barrios Pitarque C; Yeste Fabregat M[41]; 2019	Basketball	Medial Gastrocnemius	One group of 20 Basketball athletes. Pre and post Dry Needling (DN) measurement done immediately after the intervention, after 15 and 30 minutes for Thermal changes in the muscle. Research Design: RCT	The researchers aimed to assess the occurrence of physiological changes in the medial gastrocnemius muscle with DN treatment using thermography. It focused on assessing temperature variations in the muscle before and after DN therapy. Dry needling appears to be an effective method for reducing inflammation in trigger points as it leads to a decrease in muscle temperature.
21.	María Benito-de-Pedro[42], et al. 2019	Triathletes	Triceps Surae	Two Groups: Group 1 – Dry needling (DN) Group 2 – Ischemic Compression Technique (ICT) Research Design: RCT	The study compared the immediate efficacy of a single setting of DN & ICT on LTrPs in the Triceps Surae of triathletes, focusing on measures like Pressure Pain Threshold (PPT) and thermography. Results showed that ICT might be a better option immediately after treatment for this specific population of athletes due to training and competition requirements.
22.	R. Ortega-Santiago[43]; et al.; 2019	Basketball (Wheelchair)	Supraspinatus, Infraspinatus, Subscapularis, Teres minor and major, Upper trapezius, Latissimus dorsi, Pectoralis minor and major, and Deltoids	Three groups: Group 1 : Wheelchair Basketball player (WBP) with shoulder pain (18) Group 2 : Wheelchair Basketball player (WBP) without shoulder pain (22) Group 3 : Abled Elite Basketball player (20)	The study aimed to assess the Wheelchair based sportsperson of basketball having shoulder pain which exhibited lower pain pressure thresholds (PPT) over specific anatomical points. Researchers stated that Active trigger points (ATrPs) may contribute to shoulder pain in the elite wheelchair based male basketball sportspersons. This can be indicated because of increased sensitivity to mechanical nociceptive stimulus which produces higher numbers of ATrPs in WBP with shoulder pain compared to without shoulder pain.

				Research Design: RCT	
23.	Hanieh Zarei[44]; et al., 2019	Female athletes	Gluteus Medius & Quadratus Lumborum	Two groups: Group 1 : Exercises only Group 2: Exercises with DN Research Design: Single blind RCT	Researchers aimed to compare the influence of exercises alone and with combination DN in Gluteus Medius and Quadratus Lumborum. Female players having patellofemoral pain Syndrome (PFPS) were the target population of the study. Combination therapy were found significant in improving pain and function of female players suffering from PFPS than exercises alone.
24.	Fahimeh Kamali; Ehsan Sinaei; Maryam Morovati[45]; 2019	Overhead athletes	Trapezius & Infraspinatus	Two Groups: Group 1: Dry Needling on Upper Trapezius (19) Group 2: Dry needling on Infraspinatus (ISP) (21) Research Design: Single blind RCT	This study aimed to compare the effectiveness between Upper Trapezius & Infraspinatus DN for treating SIS in overhead athletes. Both groups experienced significant reductions in pain, Pain pressure threshold (PPT) and disability (DASH). Researchers suggested that ISP DN can be used more effectively as it is more comfortable than UT DN for SIS in athletes.
25.	Aleksandra Kisilewicz[9], et al. 2018	Basketball	Trapezius	One group of 12 Right handed professional Basketball players with present of MTrP on Dominant Trapezius. Research Design: Test- Retest Reliability	Study aims to evaluate the reliability of the MyotonPRO device in the clinical evaluation of athletes. The study conducted to check muscle stiffness after compressing the Trigger point at right Trapezius. The study found beneficial significantly in relieving muscle stiffness by 11.8% of upper trapezius following a single treatment setting of compression trigger point therapy. MyotonPRO device demonstrated high reliability in assessing trapezius muscle stiffness in athletes.

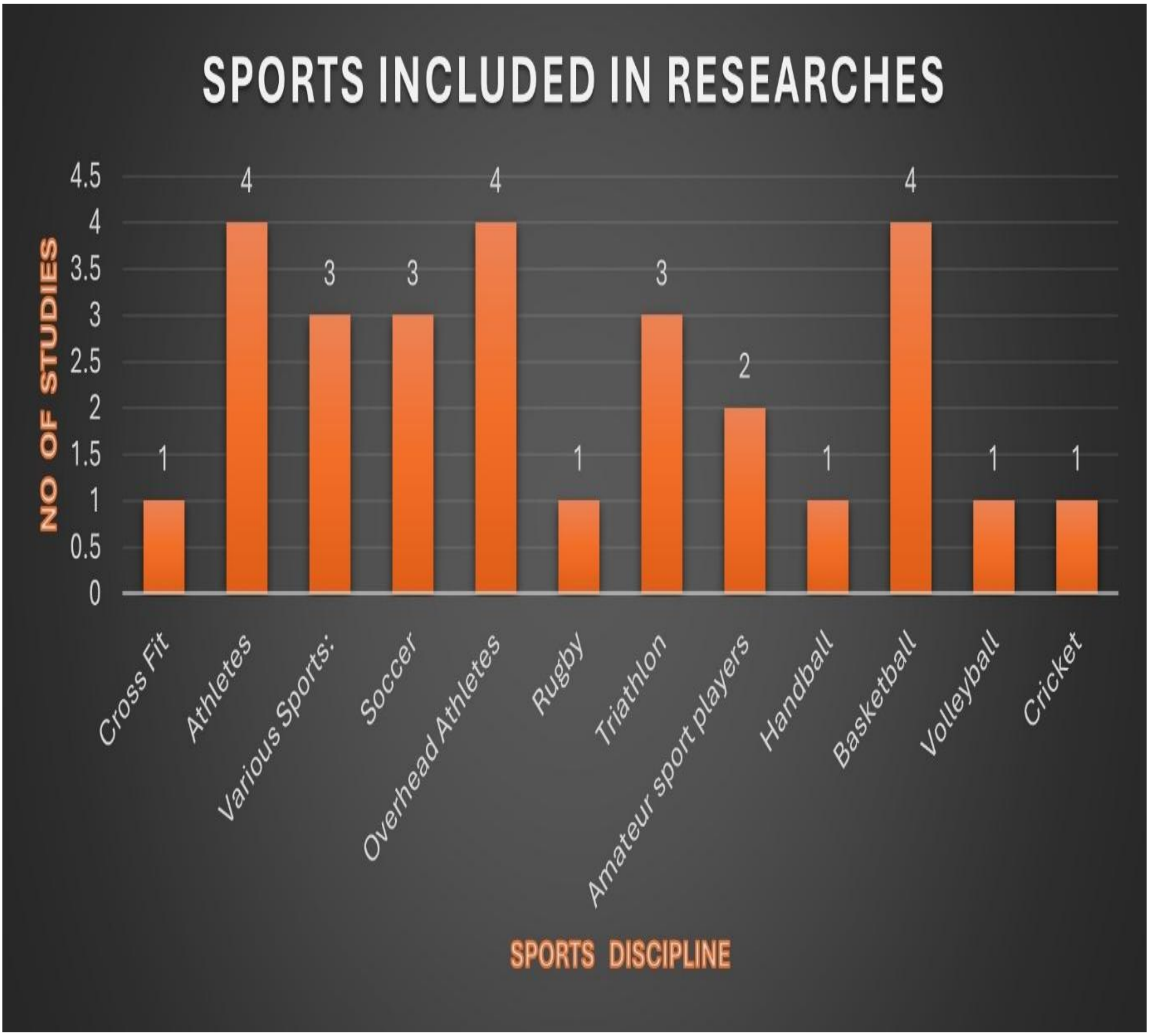
26.	Nichola J Osborne; Ian T Gatt[46]; 2010	Female Volleyball Athletes	Infraspinatus, teres minor	Four female national level volleyball player Research Design: Case Series	These case reports explored the short-term effect of DN treatment on professional female volleyball players with shoulder injuries sustained during intense competition. Both subjective and objective measures were used to assess the outcomes. The result shown that DN provided short-term pain relief and improved shoulder function, potentially promotes the strength and balance of rotator cuff muscles thereby decreasing the risk of worsening pain and injury.
27.	Darren Subrayan[47]; 2008	Cricket (Fast Bowlers)	Rotator Cuff Muscle	Two groups : Intervention Group : DN on any Rotator Cuff Active MTrP(20) Control Group: Sham Treatment (20)	Objective of this study was to investigate the acute effect of DN on the ATrPs in rotator cuff muscles on shoulder pain and bowling speed in 40 Cricket fast bowlers. The intervention group showed a significant treatment effect with increased bowling speed, algometer readings, and decreased NRS scores
28.	Gregg Audie[48] ; 2005	Overhead throwing athletes	Infraspinatus, teres minor, Subscapularis, Pectoralis Major And Deltoids	60 individual athletes from various sports Research Design: ET	The study aimed to screening for active MTrPs in the external rotator muscle group of dominant shoulder joint. The researcher used standardized isokinetic testing of internal/external rotation on a Cybex 700 Dynamometer. Also compared ER/IR ratios to established normative values. The results indicated that many overhead throwing athletes had altered ratios, with most having mainly agonistic trigger points

Table 1: Summaries of Included Studies

RESULTS

The studies included in this review drew subjects from either a single sport or more than one sports, resulting in a wide variety of sports mentioned in the articles selected for this review.

Out of the studies included in this review, almost 14% were focused on overhead athletes and basketball players each, and 11% each on various sports like soccer/football/futsal and triathletes. Additionally, there was one study each (comprising 3.5%) on rugby, handball, cricket, CrossFit, and volleyball. The distribution of data is represented in Graph 1.



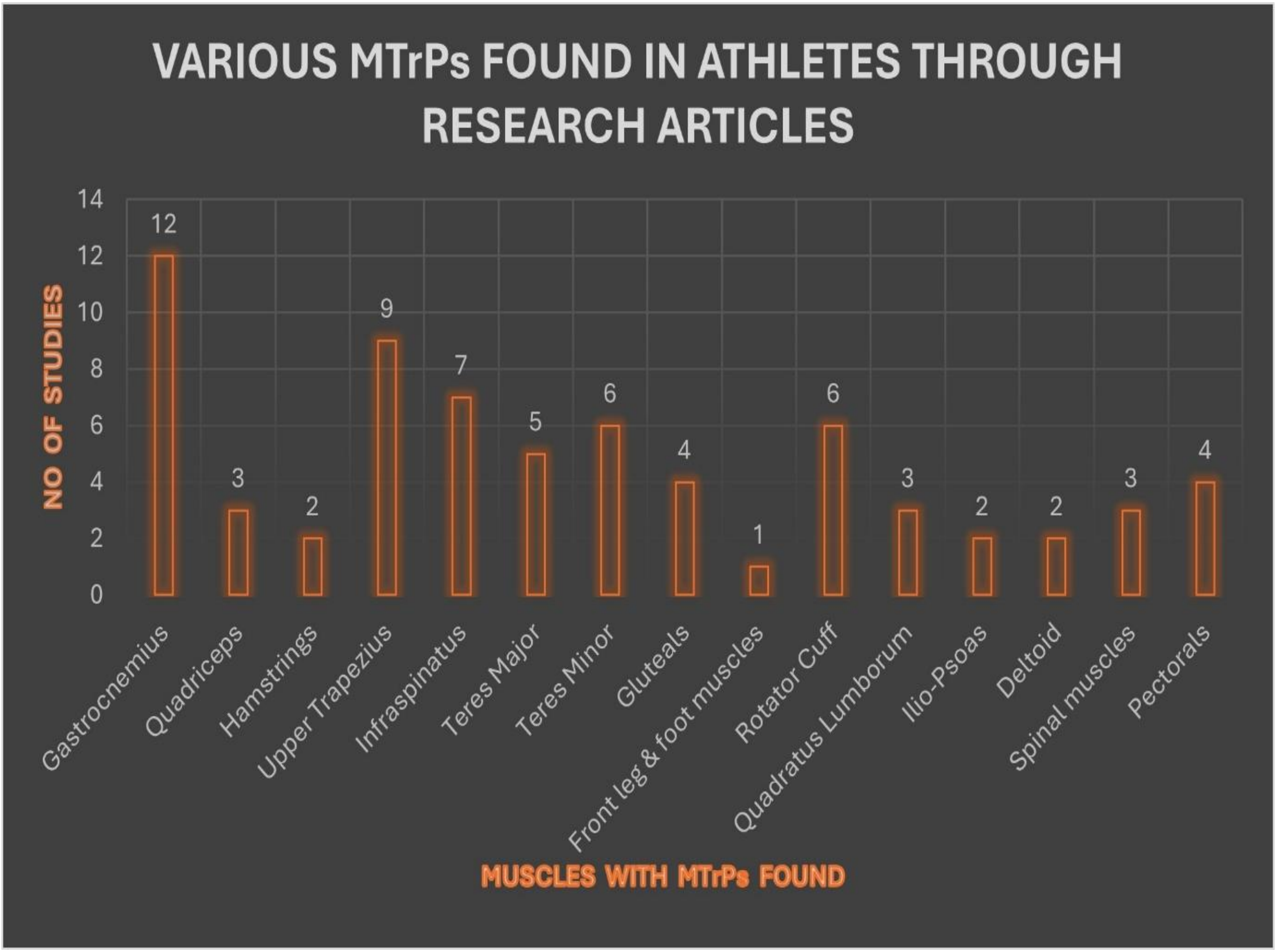
Graph 1: Sports Disciplines included in the studies for identification and treatment of MTrPs in athletes

It's worth noting that only 2 out of the 28 studies were exclusively dedicated to female athletes, accounting for just 7% of the total, and only one study, making up 3.5%, focused on Para athletes participating in wheelchair basketball.

Only 2 studies out of 28 were present which were dedicated to female athletes only, which is just 7% and only one study is found which was dedicated to Para athlete on Wheelchair Basketball which is 3.5% only.

This review seeks to explore the occurrence of MTrPs in sports personnel and the strategies used for their treatment. The studies encompassed in this review exhibited variability in their approach, either targeting a single muscle or multiple muscles for treatment. Notably, the Gastrocnemius muscle garnered the most attention, with 12 studies (17%) dedicated to its investigation. The Upper Trapezius followed closely behind, featuring in 9 studies (13%). Infraspinatus was the focus of 7 articles (10%), while both Teres Minor and the entire Rotator Cuff group were each subjects of research in 6 studies (8.6%). Regarding the lower limb, Gluteal muscles were examined in 4 articles (5.7%), Quadriceps in 3 articles (4.3%), and Hamstrings and Iliopsoas in 2 articles (3%) each.

Additionally, MTrPs were identified in other muscles, including Pectoral muscles (5.7%), Spinal muscles (4.3%), and Deltoid muscles (3%). All the data is shown in Graph 2.



Graph 2: Various MTrPs Found in Athletes

It is noteworthy that the Rotator Cuff muscles collectively accounted for 27.5% of the studies, making them the most commonly studied group of muscles associated with MTrPs based on the data extracted from the articles included in this review.

DISCUSSION

As per the researchers in 2013, it has been identified that MPS constituted the most prevalent aetiology of hand paraesthesia with 68%, significantly greater proportion than cervical radiculopathy (27%), shoulder impingement syndrome (11%), tenosynovitis (8%) and Carpal Tunnel Syndrome (5%). They also stated that the MTrPs were found the most in the Infraspinatus muscle (65.4%), followed by the trapezius (57.7%) and the flexor carpi radialis (38.5%) for upper limb[49]. In comparison, the present review also highlights the predominance of rotator cuff involvement in athletes. However, when considering individual muscles, then Upper Trapezius was the most frequently chosen by researchers to treat than Infraspinatus. This discrepancy may be attributed to the different population studied; as the data from this review is focused on athletes only while the referenced study examined desk workers.

Another review reported that most common MTrP is found in Upper Trapezius followed by Gastrocnemius. The other muscles which had a fewer incidence of reporting were Rotator cuff muscles, pectorals, soleus and Latissimus dorsi[50]. . In contrast, the present review demonstrates a higher prevalence of MTrPs in the gastrocnemius among athletes than Upper Trapezius. This variation may be explained by the increased biomechanical demands placed on lower limb musculature in sports involving running, jumping and rapid directional changes, thereby predisposing these muscles to overuse and trigger point development.

Previous literature has also indicated that periscapular pain is commonly associated with MTrPs in the following muscles: Trapezius, Infraspinatus, Levator Scapulae, Latissimus Dorsi, Rhomboideus and Thoracic Paraspinal muscles[51]. The findings of this review are consistent with these observations, particularly in athletes engaged in overhead activities, where repetitive shoulder movements contribute to increased muscular load and susceptibility to trigger point formation.

Evidence suggests that the trapezius muscle is highly susceptible to MPS[52] in the upper body, while the gastrocnemius[53] is more commonly affected in the lower body. The present review supports these findings, indicating that these muscle groups are not only frequently affected but also commonly targeted for therapeutic interventions in athletes.

A deeper analysis of the included studies in this review reveals a significant focus on sports that predominantly involve overhead activities. These sports, including but not limited to baseball, swimming, basketball, cricket, overhead throwers and volleyball, collectively constitute 53% of the studies, underscoring the prevalence of MTrP research in athletes engaged in such activities. This highlights a research bias toward sports involving repetitive upper limb activity. Additionally, approximately 14% of studies included athletes without specifying the sport, further limiting the ability to draw sport-specific conclusions. Within this group, it's conceivable that a portion of these athletes could also belong to the overhead sports category. Such heterogeneity in sports disciplines, training demands, and athlete characteristics restricts the generalizability of findings across all athletic populations.

Furthermore, there is a clear underrepresentation of certain athlete groups, including female athletes, para-athletes and participants from combat sports. These populations have unique physiological and biomechanical demands, which may influence the development and presentation of MTrPs. The limited inclusion of these groups highlights a significant gap in the literature and underscores the need for more inclusive and diverse research in this field. Including these, will facilitate a more holistic understanding of MTrPs and their implications in the realm of sports medicine, ultimately benefiting athletes from a broader array of disciplines.

Overall, while the existing literature provides valuable insights into the prevalence and management of MTrPs in athletes, the variability in study design, sample size and participant characteristics presents challenges in drawing definitive conclusions. Future research should aim to adopt more standardized methodologies, include diverse athletic populations and explore sport-specific risk factors to enhance the applicability of findings in clinical and sports rehabilitation settings.

Limitations

Despite providing a comprehensive overview of MTrPs in athletes, this review has several limitations that should be acknowledged. Firstly, the included studies demonstrated considerable methodological variability, including differences in study design, sample size and outcome measures. Many studies had relatively small sample sizes and limited reporting on key methodological aspects such as randomization and blinding, which may increase the risk of bias and affect the strength of the conclusions drawn.

Secondly, there was substantial heterogeneity among the included studies in terms of sports disciplines, training intensity and athlete level (recreational versus elite). This variability limits the generalisability of the findings across all athletic populations and makes it challenging to establish sport-specific conclusions.

Thirdly, this review did not include a formal meta-analysis or quantitative synthesis due to the heterogeneity of study designs and outcome measures. As a result, the findings are primarily descriptive and may not fully capture the magnitude of effects of various interventions. Additionally, the review was restricted to studies published in the English language and those with full-text availability, which may have introduced selection bias and excluded potentially relevant research.

Lastly, there was an underrepresentation of certain athlete groups, including female athletes, para-athletes, and participants from less-studied sports such as combat sports. This limits the inclusivity of the findings and highlights the need for more diverse and representative research in this field.

CONCLUSION

Over the past two decades, research on MPS and MTrPs has revealed a notable trend exploring their role within athletic population. This review highlights that MTrPs are commonly identified in muscles such as the gastrocnemius, upper trapezius and rotator cuff group, reflecting the biomechanical demands placed on athletes, particularly in overhead and lower limb dominant sports. These findings reinforce the clinical importance of early identification and targeted management of MTrPs to optimise athletic performance and reduce injury-related impairments.

However, the current body of evidence is characterized by methodological limitations, including small sample sizes, variability in study design and inconsistent reporting of key parameters such as randomization and blinding. Additionally, the heterogeneity in sports disciplines, athlete levels of play and intervention protocols limits the generalisability of findings and restricts the ability to draw sport-specific clinical recommendations.

The absence of quantitative synthesis further constrains the strength of the conclusions, emphasizing the need for more standardised and high-quality research. Future studies should focus on larger, well-designed randomized controlled trials with uniform outcome measures, while also incorporating diverse athletic populations, including female athletes, para-athletes and underrepresented sports disciplines.

Research has primarily centred on overhead sports like throwing, swimming, handball, baseball, volleyball and basketball followed by Soccer. The muscles commonly studied in this context, such as the gastrocnemius, rotator cuff and upper trapezius, are frequently affected due to the specific demands of these sports.

In conclusion, while existing literature provides valuable insights into the prevalence and management of MTrPs in athletes, there remains a need for more rigorous and comprehensive research to support evidence-based clinical decision-making and to enhance the applicability of findings across varied sporting contexts.

Disclosures for all authors

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Data Availability Statement

Data Sharing not applicable: This review article did not generate or analysed in this study. The data presented in this study were extracted from previously published research articles available in the MEDLINE, PubMed and ResearchGate databases, as detailed in the methodology. All articles included in the review are accessible through the listed references.

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