Effectiveness of Myofascial Release Therapies on Physical Performance Measurements

A Systematic Review

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ABSTRACT

The muscular and skeletal systems work interdependently to provide efficient movement. Efficient movement can be inhibited by fascial restrictions and myofascial trigger points (MTrP). Myofascial release therapies target fascial restrictions and MTrPs to increase range of motion (ROM) and muscle function prior to rehabilitation or physical activity. A systematic review was needed to examine the effectiveness of these therapies so that clinicians and athletes may use only the most efficacious methods. A search of PubMed, SPORTDiscus, CINAHL, and Cochrane Library electronic databases was completed to identify articles; 10 articles were included. All but 2 studies observed a significant increase in ROM, whereas no study observed a significant change in muscle function following treatment. Therefore, clinicians should use myofascial release therapies prior to rehabilitation or physical activity, as they effectively increase ROM without decreasing muscular function, resulting in increased movement efficiency and decreased injury risk. [*Athletic Training & Sports Health Care.* 2014;6(4):189-196.]

The musculoskeletal system is an intricate network of interconnecting and independent tissues that must work together effectively to provide efficient movement. When muscles and fascia are subjected to microtrauma, fascial restrictions may form and inhibit normal muscular function.[1-3] Myofascial trigger points (MTrP) may develop independently or in conjunction with fascial restrictions, resulting in inhibition of normal muscular function.[4]

Intra- and extramuscular fascia may become restrictive and create deficits in muscular function. These deficits manifest as decreased joint range of motion (ROM), altered neuromuscular properties, and decreased strength.[1-3] In addition, fascia may contract as part of an evolutionary adaptation that prepares the body for activity, as well as to attempt to protect the body from repetitive stresses by providing increased stability to the musculoskeletal system.[2] These adaptations can increase perimysium thickness, resulting in greater decreases in ROM.[3] Myofascial trigger points may form in conjunction with fascial restrictions or may form independently. Myofascial trigger points are hyperirritable areas within taut bands of skeletal muscle or fascia that can further decrease ROM and inhibit the strength of the affected muscle.[4] Myofascial trigger points are subdivided into active and latent categories; active MTrPs cause pain and irritation during rest and activity, whereas latent MTrPs generate pain only when palpated and during activity.[4] Collectively, myofascial restrictions and MTrPs can contribute to dysfunctional movement patterns[1-4] that can increase an individual's injury risk.

A number of soft tissue manual therapies have been developed to address fascial restrictions and MTrPs to restore normal ROM and muscular function. These manual therapies are commonly used by sports medicine clinicians, strength and conditioning professionals, and athletes prior to rehabilitation and physical activity to improve movement efficiency through increased ROM and muscular function. Improved movement efficiency results in decreased injury risks.[5] Common noninvasive therapies used by clinicians, strength and conditioning professionals, and

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athletes include positional release therapy (PRT),[6] active release technique (ART),[7,8] trigger point pressure release,[9-12] and self-myofascial release.[13-15] Positional release therapy is a manual therapy that places the muscle in a shortened position to promote muscle relaxation.[16,17] Positional release therapy has evolved from a strain–counterstrain technique, where the clinician applies light pressure to the MTrP throughout the treatment.[18,19] Active release technique is used to treat areas of tension or adhesions found in muscles or surrounding soft tissues. The muscle is taken from a shortened position to a lengthened position while the clinician maintains contact with the problematic area to keep constant tension on the fibers of that tissue.[7] Trigger point pressure release, formerly referred to as "ischemic compression," involves applying a downward pressure on an MTrP. The downward pressure locally lengthens sarcomeres[20] and creates a flushing of cellular metabolic by-products commonly associated with MTrPs, which can assist in reestablishing normal metabolic functions of the involved tissues.[21] Self-myofascial release involves the individual applying pressure to an MTrP or area of fascial restrictions with the use of a specialized device, such as a foam roller[13] or a hand-held rolling device.[14,15]

Myofascial release therapies are not limited to the previously described manual therapies. Additional therapeutic modalities found to be efficacious in reducing signs and symptoms associated with myofascial restrictions and MTrPs include therapeutic ultrasound with[10] and without medication,[11] therapeutic low-level laser treatment,[10] thermotherapies,[22] electrical stimulation,[22] and dry needling.[23] However, these modalities can be costly, time consuming, and physically invasive. Because of the limitations of these modalities, they are not readily available to all sports medicine clinicians, strength and condition professionals, or athletes. Therefore, the focus of the current review is on noninvasive manual therapies that involve physical contact between the clinician or a specialized device and the athlete, as these therapies can be easily learned and efficiently applied to and by the athletes themselves.

A systematic review was needed to examine the effectiveness of each of the previously described noninvasive manual therapies for reducing the effects of myofascial restrictions and MTrPs. Such a review would provide sports medicine clinicians and strength and conditioning professionals with vital information to improve clinical practice and the health of the athletes they serve. Although many of the aforementioned manual therapies decrease pain associated with myofascial restrictions and MTrPs,[10-12] this review will examine the effectiveness of each of the manual therapies for increasing ROM, muscular activation, and muscular force production. These clinical measures may be of the greatest importance to sports medicine clinicians, strength and conditioning professionals, and athletes alike, as not all myofascial restrictions and MTrPs result in active pain,[4,12] and some of the discussed therapies are used prophylactically prior to the onset of pain.[13-15] More importantly, improvements in ROM and muscular function can lead to improved movement efficiency and reduced injury risk.[5]

LITERATURE REVIEW

Search Strategy

An electronic literature search of the PubMed, SPORTDiscus, CINAHL, and Cochrane Library databases was completed through June 2013 by one author (T.C.M.). Keywords related to fascial restrictions, MTrPs, and myofascial release therapies were included, and these keywords were searched individually and in multiple combinations. **Table 1** shows a list of the search terms, combinations, and search-term modifiers that were used. A manual search of the reference list of each selected article was also completed by the same author to identify articles not returned in the original search.

Study Inclusion and Exclusion Criteria

Articles were included if they fulfilled the following criteria: (1) written in English; (2) focused on the treatment of fascial restrictions or MTrPs through the use of therapies involving mechanical pressure; (3) ROM, electromyography, muscular activation, or muscular force results were reported pre- and posttreatment; and (4) effect size was able to be calculated through data available in the article or through correspondence with the respective author. Articles that reported effects on pain or self-perceived function only or utilized modalities that used energies other than mechanical pressure were excluded from the review. Systematic reviews and meta-analyses were also excluded, as the authors wanted to develop their own interpretations of the available data.

Study Selection

One author (T.C.M.) ensured that all selected studies met the minimum requirements for inclusion. The author then conferred with another author (D.A.P.) to confirm inclusion and appropriateness of each article.

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TABLE 1

Comprehensive List of Electronic Database Search Terms

SEARCH TERM
Self-myofascial release
Foam rolling
Self-massage
Myofascial trigger point release
Self-myofascial release + EMG
Self-massage + range of motion
Ischemic compression + EMG + NOT cardiac + NOT myocardial
Ischemic compression + range of motion + NOT cardiac + NOT myocardial
Ischemic release + EMG + NOT cardiac + NOT myocardial
Ischemic release + range of motion + NOT cardiac + NOT myocardial
Passive release therapy + EMG passive release therapy + range of motion
Active release technique + EMG
Active release technique + range of motion

Abbreviation: EMG, electromyography.

Data Abstraction

One author (T.C.M.) abstracted information from the selected articles. The abstracted information included study population, treatment utilized, duration of the treatment, length of time until follow-up measurements, and measured outcomes.

Data Synthesis

Effect Size Calculation. The effect size for each treatment was calculated as it pertained to ROM, muscular activation, or muscular force. Effect sizes were calculated from the means, standard deviations, and sample sizes provided through the articles or through personal correspondence with the articles' authors. Effect sizes >0.70 were rated strong, 0.41 to 0.70 were moderate, and <0.40 were weak.[24] This allowed for comparison between treatments and the various measured outcomes.

Methodological Quality Assessment. The authors used the PEDro scale[25] to assess the methodological quality of all studies included in the current review. The PEDro scale evaluates for 11 criterion to determine the methodological quality of a study. PEDro scores range from 0 = *poor* to 10 = *high*. The article by Maher et al[25] reports additional information about PEDro scoring. The authors recognize that the PEDro scale is intended to be used solely for randomized control trials; however, we were unaware of any standardized assessment of the quality of crossover or quasi-experimental studies. Two authors (T.C.M., D.A.P.) independently scored each study included in the current review and then conferred with one another, discussed any disparities in the scores, and reached a consensus on each item included in the PEDro scale. Following data abstraction and methodological quality assessments, all authors compiled the findings of the included studies to form a comprehensive synthesization and interpretation of the data.

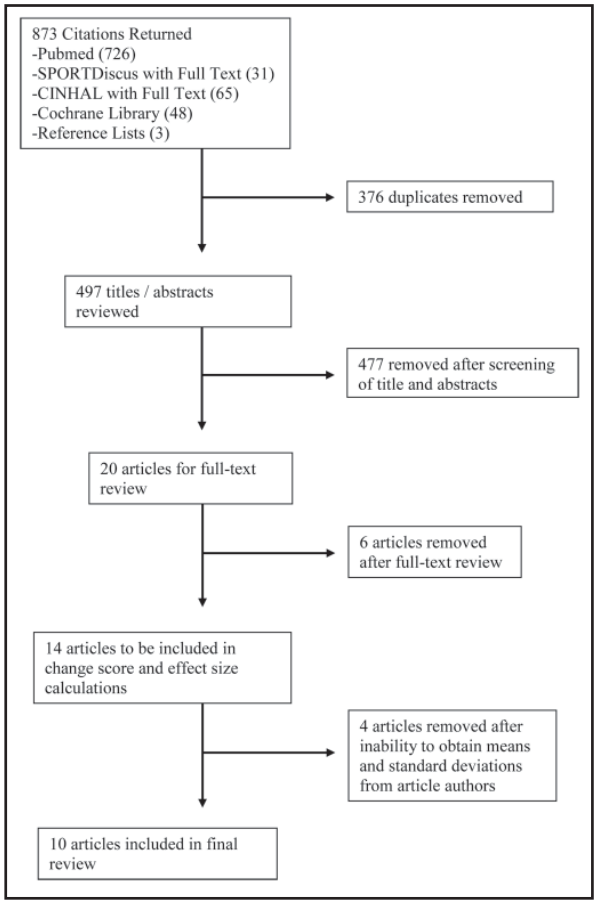

Figure. Flow chart of systematic literature search results and data abstraction.

RESULTS

Search Results

The initial search of the electronic databases resulted in 873 articles available for review. Duplicate articles were removed, and 497 titles and abstracts were reviewed. Review of the 497 titles and abstracts resulted in 477 articles being removed. Six additional articles were excluded following full-text review. The reference list of each remaining article was reviewed, and an additional 3 articles were identified. The inability to abstract the necessary data from certain ar-

TABLE 2

Systematic Literature Review Overview

STUDY (YEAR)	STUDY DESIGN	STUDY PARTICIPANTS (AGE [Y])	TARGETED MUSCLE	INCLUSION CRITERIA	TREATMENT		
					TYPE	DURATION	NO. SESSION
Birmingham et al[6] (2004)	Cross-over	33 M/F (18+)	Hamstrings	Lacking ⩾10° knee extension	PRT	90 sec	1
Drover et al[8] (2004)	Quasi-experimental	9 M/F (18+)	Quadriceps, patellar tendon	Anterior knee pain	ART	Not reported	1
George et al[7] (2006)	Quasi-experimental	20 M (21 to 30)	Hamstrings	Physically active	ART	4 passes	1
Grieve et al[9] (2011)	RCT	20 M/F (18+)	Triceps surae	⩽10° dorsiflexion	MTrP release	3 min	1
Kannan[10] (2012)	RCT	45 M/F (20 to 40)	Upper trapezius	MTrPs	IC + static stretching	5 min	5
MacDonald et al[13] (2013)	Quasi-experimental	11 M (18+)	Quadriceps	Resistance trained	Foam rolling	2 x 1 min	4
Mikesky et al[14] (2002)	Cross-over	30 M/F (18+)	Lower extremity	NCAA Div II athlete	SMR	2 min	1
Oliveira-Campelo et al[26] (2013)	RCT	117 M/F (18+)	Upper trapezius	MTrPs	IC	90 sec	1
Sarrafzadeh et al[11] (2012)	RCT	60 F (18+)	Upper trapezius	MTrPs	MTrP release	90 sec	6
Sullivan et al[15] (2013)	Cross-over	17 M/F (18+)	Hamstrings	Physically active	SMR	1 x 5 sec, 2 x 10 sec	1

Abbreviations: ART, active release technique; F, female; IC, ischemic compression; M, male; MTrP, myofascial trigger point release; NCAA Div, National Collegiate Athletic Association Division, PRT, positional release therapy; RCT, randomized control trials; SMR, self-myofascial release.

ticles or through correspondence with the articles' authors resulted in 4 articles being removed. In total, 10 articles were included in the current review. The **Figure** depicts a flow chart of the article search results and data abstraction.

Characteristics of Included Studies

One article focused on PRT,[6] 2 focused on ART,[7,8] 4 focused on a variation of trigger point pressure release,[9-11,26] and 3 focused on some form of self-myofascial release.[13-15] Nine articles reported pre- and posttreatment ROM measurements or posttreatment measurements between the treatment and control groups.[6,7,9-11,13-15,26] Three articles reported pre- and posttreatment muscular activation measurements,[8,13,15] and 3 articles reported muscular force production measurements.[8,13,15] **Table 2** presents an overview of the included studies.

Range of Motion. Nine articles examined the effects of the previously mentioned therapies on ROM; 4 focused on hamstring flexibility,[6,7,14,15] 1 focused on quadriceps flexibility,[13] 1 focused on triceps surae flexibility,[9] and 3 focused on cervical neck flexibility.[10,11,26] All but 2 studies observed a statistically significant increase in ROM for at least 1 ROM measurement following treatment. **Table 3** shows all ROM results.

Muscular Activation. Three articles examined the effects of the mentioned therapies on muscular activation levels; 2 focused on the quadriceps[8,13] and 1 focused on the hamstrings.[15] No study reported statistically significant differences between pre- and posttreatment measurements for any variable measuring muscular activation. **Table 4** presents muscular activation results.

Muscular Force Production. Three articles examined the effects of the mentioned therapies on muscular force production; 2 focused on the quadriceps[8,13] and 1 focused on the hamstrings.[15] No study reported statistically significant differences between pre- and posttreatment measurements for any measure of force or rate of force development. **Table 5** shows the muscular force activation results.

Methodological Quality

Assessment of methodological quality was based on the calculated PEDro scores. Standard interpretation of the scores was used to determine the methodological quality of the included studies.[27] The methodological quality was

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TABLE 3

Systematic Literature Review Range of Motion Results

		PRETREATMENT		POSTTREATMENT		
STUDY (YEAR)	**MEASUREMENT**	**MEAN**	**SD**	**MEAN**	**SD**	**EFFECT SIZE**
Birmingham et al[6] (2004)	Right popliteal angle	156.1	3.7	156.6	3.3	0.14
Birmingham et al[6](2004)	Left popliteal angle	155.9	3.7	156.9	3.3	0.14
George et al[7] (2006)	Sit-and-reach[a]	35.5	7.6	43.8	7.1	1.13
Grieve et al[9] (2011)	Dorsiflexion ROM[a]	4.60	3.8	7.9	5.7	0.68
Kannan[10] (2012)	Cervical contralateral flexion[a]	1.20	1.1	2.2	1.4	0.78
MacDonald et al[13] (2013)	Knee flexion ROM, 2 min[a]	77.6	10.2	88.2	8.5	1.13
MacDonald et al[13] (2013)	Knee flexion ROM, 10 min[a]	77.6	10.2	86.4	8.9	0.92
Mikesky et al[14] (2002)	Hip flexion (hamstrings)	92.0	2.0	93.0	2.0	0.50
Oliveira-Campleo et al[26] (2013)	Cervical flexion, 10 min	55.6	10.9	59.5	9.6	0.38
Oliveira-Campleo et al[26] (2013)	Cervical flexion, 24 hrs	55.6	10.9	59.1	10.1	0.33
Oliveira-Campleo et al[26] (2013)	Cervical flexion, 1 wk	55.6	10.9	58.6	10.3	0.28
Oliveira-Campleo et al[26] (2013)	Cervical extension, 10 min	64.7	12.2	68.6	11.0	0.34
Oliveira-Campleo et al[26] (2013)	Cervical extension, 24 hrs	64.7	12.2	66.9	10.8	0.19
Oliveira-Campleo et al[26] (2013)	Cervical extension, 1 wk	64.7	12.2	66.7	10.7	0.17
Oliveira-Campleo et al[26] (2013)	Cervical ipsilateral flexion, 10 min	46.1	4.6	47.4	5.4	0.26
Oliveira-Campleo et al[26] (2013)	Cervical ipsilateral flexion, 24 hrs	46.1	4.6	46.2	4.5	0.02
Oliveira-Campleo et al[26] (2013)	Cervical ipsilateral flexion, 1 wk	46.1	4.6	45.7	4.0	0.09
Oliveira-Campleo et al[26] (2013)	Cervical contralateral flexion, 10 min[a]	39.8	5.1	46.0	5.8	1.14
Oliveira-Campleo et al[26] (2013)	Cervical contralateral flexion, 24 hrs[a]	39.8	5.1	46.6	5.4	1.29
Oliveira-Campleo et al[26] (2013)	Cervical contralateral flexion, 1 wk[a]	39.8	5.1	46.8	5.4	1.33
Oliveira-Campleo et al[26] (2013)	Cervical ipsilateral rotation, 10 min[a]	71.2	5.7	76.3	4.5	0.99
Oliveira-Campleo et al[26] (2013)	Cervical ipsilateral rotation, 24 hrs[a]	71.2	5.7	77.2	4.0	1.22
Oliveira-Campleo et al[26] (2013)	Cervical ipsilateral rotation, 1 wk[a]	71.2	5.7	76.5	6.7	0.85
Oliveira-Campleo et al[26] (2013)	Cervical contralateral rotation, 10 min	77.3	4.3	78.4	3.7	0.27
Oliveira-Campleo et al[26] (2013)	Cervical contralateral rotation, 24 hrs	77.3	4.3	78.8	3.6	0.38
Oliveira-Campleo et al[26] (2013)	Cervical contralateral rotation, 1 wk	77.3	4.3	79.3	4.3	0.47
Sarrafzadeh et al[11] (2012)	Cervical lateral flexion[a]	37.1	4.2	42.1	4.3	1.18
Sullivan et al[15] (2013)	Sit-and-reach, 1 × 5 sec	31.2	8.2	32.2	8.3	0.13
Sullivan et al[15] (2013)	Sit-and-reach, 1 × 10 sec	31.3	8.6	32.9	8.8	0.21
Sullivan et al[15] (2013)	Sit-and-reach, 2 × 5 sec	31.1	9.1	32.0	9.1	0.10
Sullivan et al[15] (2013)	Sit-and-reach, 2 × 10 sec[a]	31.7	0.2	33.6	9.2	0.20

Abbreviation: ROM, range of motion.
[a] Denotes significant difference.

deemed to be high (6 to 10) for 6 studies[6,9,10,14,15,26] and fair (4 to 5) for 4 studies.[7,8,11,13]

DISCUSSION

The current systematic review provides a comprehensive review of noninvasive myofascial release therapies and their effects on ROM, muscular activation, and muscular force production. Evidence supports the use of myofascial release therapies to improve ROM following both single and multiple sessions of treatment.[7,9-11,13,15,26] The evidence also suggests that myofascial release therapies do not inhibit or improve muscular performance.[8,13,15] These conclusions are based on a limited number of studies of fair to high methodological quality. The findings of the current review are important because myofascial release therapies continue to gain popularity in the rehabilitation and sports performance environments.

TABLE 4

Systematic Literature Review Muscular Activation Results

		PRETREATMENT		POSTTREATMENT		
STUDY (YEAR)	MEASUREMENT	MEAN	SD	MEAN	SD	EFFECT SIZE
Drover et al[8] (2004)	Quadriceps inhibition, immediate	18.3	9.6	17.4	6.8	0.11
Drover et al[8] (2004)	Quadriceps inhibition, 20 min	18.3	9.6	16.8	6.6	0.18
MacDonald et al[12] (2013)	Quadriceps EMG, 2 min	0.3	0.2	0.2	0.1	0.06
MacDonald et al[12] (2013)	Quadriceps EMG, 10 min	0.3	0.2	0.3	0.2	0.00
Sullivan et al[15] (2013)	Hamstrings EMG, 1 × 5 sec	40.1	9.4	37.8	18.5	0.16
Sullivan et al[15] (2013)	Hamstrings EMG, 2 × 5 sec	37.7	21.6	41.1	28.1	0.14
Sullivan et al[15] (2013)	Hamstrings EMG, 1 × 10 sec	41.7	21.5	43.9	28.6	0.09
Sullivan et al[15] (2013)	Hamstrings EMG, 2 × 10 sec	39.8	16.6	40.5	18.6	0.04
Sullivan et al[15] (2013)	Hamstrings electromechanical delay, 1 × 5 sec	21.8	7.6	20.2	5.9	0.24
Sullivan et al[15] (2013)	Hamstrings electromechanical delay, 2 × 5 sec	21.0	6.1	21.7	4.6	0.13
Sullivan et al[15] (2013)	Hamstrings electromechanical delay, 1 × 10 sec	21.4	6.2	22.8	7.1	0.21
Sullivan et al[15] (2013)	Hamstrings electromechanical delay, 2 × 10 sec	21.0	4.9	22.9	8.1	0.28

Abbreviation: EMG, electromyography.

Maintaining and regaining normal ROM is vital for injury prevention and performance gains. Although not all studies showed significant gains in ROM following treatment,[6,14] the majority of studies did (effect size range = 0.20 to 1.33).[7,9-11,13,15,22,26,28] Gains in ROM were seen following single-treatment sessions,[7,9,15,26] as well as multiple-treatment sessions.[10,11,13] These findings are further supported by a study that was not included in the formal review due to our inability to identify the data necessary to calculate the effect sizes for the study. In that study, Hou et al[22] found significant gains in ROM following treatment of MTrPs with ischemic compression. All but 1 study[15] with statistically significant increases in ROM had strong effect sizes (effect size range = 0.68 to 1.33), indicating both statistical and clinical significance. Therefore, these findings are important for sports medicine clinicians who want to increase their athletes' ROM prior to rehabilitation exercises, as well as strength and conditioning professionals and athletes who want to increase tissue extensibility prior to stretching or activity.

It is not surprising that 2 studies did not observe a significant increase in ROM following treatment. Mikesky et al[14] studied well-trained athletes with normal hamstring ROM and found that it is likely the athletes reached a ceiling effect; thus, they did not significantly increase their ROM following treatment (effect size = 0.50). Birmingham et al[6] evaluated a population lacking at least 10° of active knee extension, but they also did not observe a significant gain in ROM (effect size = 0.14). In both studies,[6,14] only 1 treatment session was provided; however, additional treatment sessions may be required to produce a significant gain in ROM.[8] No study reported a significant decrease in ROM following myofascial release therapies. These therapies may not always result in gains in ROM, but nor do they inhibit it.

Gains in muscular activation and force production following myofascial release treatments would be ideal, as these gains could increase movement efficiency and athletic performance, but this does not appear to be the case. However, myofascial release therapies do not decrease muscular activation (effect size range = 0.04 to 0.28) or force production.[8,13,15] No changes were observed in force production capabilities[8,13,15] (effect size range = 0.01 to 0.46) or rate of force development (effect size range = 0.50 to 0.52).[13] The weak-to-moderate effect sizes observed for the studies reviewed indicate that the nonsignificant statistical differences are also not likely to be clinically significant. This is further supported by Mikesky et al[14] who showed that National Collegiate Athletic Association Division II athletes did not experience decreases in measures of athletic performance following an acute bout of self-myofascial release. If myofascial release therapies did inhibit muscular performance, they would not be an effective modality prior to the start of activity. Therefore, the absence of muscular deactivation and reduction in force development following myofascial release treatments is of great importance to sports medicine clinicians, strength and condition professionals, and athletes.

Myofascial release therapies do help to restore normal muscular resting electrical activity.[12,28] Pressure release

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TABLE 5

Systematic Literature Review Muscular Force Production Results

		PRETREATMENT		POSTTREATMENT		
AUTHOR (YEAR)	MEASUREMENT	MEAN	SD	MEAN	SD	EFFECT SIZE
Drover et al[8] (2004)	Knee extension moment, immediate	165.0	65.0	159.0	51.0	0.10
Drover et al[8] (2004)	Knee extension moment, 20 min	165.0	65.0	156.0	55.0	0.15
MacDonald et al[13] (2013)	Quadriceps force, 2 min	727.5	101.3	692.8	98.5	0.35
MacDonald et al[13] (2013)	Quadriceps force, 10 min	727.5	101.3	683.9	86.9	0.46
MacDonald et al[13] (2013)	Quadriceps RFD, 2 min	566.3	99.7	496.2	171.3	0.50
MacDonald et al[13] (2013)	Quadriceps RFD, 10 min	566.3	99.7	517.3	89.1	0.52
Sullivan et al[15] (2013)	Hamstrings force, 1 × 5 sec	32.0	18.4	30.9	19.3	0.06
Sullivan et al[15] (2013)	Hamstrings force, 1 × 10 sec	32.6	16.9	30.6	18.9	0.11
Sullivan et al[15] (2013)	Hamstrings force, 2 × 5 sec	32.6	20.3	31.7	20.6	0.04
Sullivan et al[15] (2013)	Hamstrings force, 1 × 10 sec	32.5	17.7	32.6	19.5	0.01

Abbreviation: RFD, rate of force development.

therapy decreases spontaneous electrical activity immediately surrounding MTrPs,[12] as well as improves basal electrical activity.[28] These findings may shed light on how myofascial release therapies are effective in increasing ROM. Increased levels of spontaneous electrical activity and basal electrical activity have been suggested to result in decreased ROM, as they cause the muscle to be locally overactive while at rest and result in pain that may cause individuals to compensate by voluntarily reducing ROM.[12,28] Restoring normal resting muscle activity would allow for the muscle to be stretched, potentially reducing the pain associated with some MTrPs,[12] and potentially reducing deficits in muscular function, altered neuromuscular properties, and decreased strength commonly associated with MTrPs and fascial restrictions.[1-3]

Of the studies reviewed and discussed, few utilized multiple treatment sessions,[10-13] 3 evaluated the effectiveness of myofascial release therapies in conjunction with other modalities,[10,12,22] 8 evaluated pathologic populations,[6,8-12,22,26] and 5 used a true randomized control trial design.[9-11,26,28] All of the studies described the therapy used; however, only 3 mentioned the training of the clinician or the athlete applying the therapy.[7,13,15] Proper training and experience in myofascial release therapies is crucial to optimizing therapeutic outcomes. It is evident that additional research is needed to gain a better understanding of the effects of myofascial release therapies on ROM, muscular activation, and muscular force production.

Future Research

Future research should study pathologic populations, as the previously mentioned therapies may be most effective in this group. In addition, studies utilizing multiple treatment sessions, as well as myofascial release therapies, in conjunction with other modalities, are vitally important because this is commonly performed clinically.[5,12,22] This is supported by Bell et al[5] who reported self-myofascial release in conjunction with static stretching, followed by isolated strengthening of antagonistic muscles and functional exercises, was successful in improving joint ROM and movement quality.[5] Studies evaluating the length of time the benefits of myofascial release therapies are present are also needed.

Study Limitations

The major limitation of the current systematic review is that it focused only on physical, objectively measured effects of myofascial release therapies. A number of studies both included in and excluded from this review focused on the effects of these therapies on pain and self-perceived performance. These are important factors to consider because they can limit an individual's activity and performance. Also, this review included only studies in which an effect size was able to be calculated from the available data; additional studies, which were discussed, provided further information on this topic, but they were excluded from the formal review.

CONCLUSION AND IMPLICATIONS FOR CLINICAL PRACTICE

The findings of this systematic review have practical applications for sports medicine clinicians, strength and conditioning professionals, and athletes. The findings of this study indicate that myofascial release therapies are effective in restoring and increasing ROM, with-

out having a detrimental effect on muscular activity or performance. Gains in ROM allow for more efficient movement patterns and ultimately result in better performance and decreased risk of musculoskeletal injury. These gains in ROM were observed with as little as 20 seconds of treatment[15] but more commonly with 1.5 to 3 minutes of treatment.[9-11,13,26]

In addition, these findings are not limited to a single population or a single therapy. The findings have been shown across a variety of populations and therapies, and were observed in both clinician and self-applied myofascial release therapies. This implies that a skilled clinician can teach an individual how to perform self-myofascial release and that the individual will receive the same benefits of the treatment, without using the clinician's time. This will allow the clinician to focus on other therapeutic activities with 1 individual or with other individuals who are receiving therapy or training at the same time. ■

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