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E-B Environment - Behaviour Proceedings Journal

AicE-Bs2022KotaKinabalu

https://www.amerabra.org

e-IPH e-International Publishing House Ltd., United Kingdom

10th Asia-Pacific International Conference on E-B Studies
The Magellan Sutera Resort, Kota Kinabalu, Sabah, Malaysia, 07-08 Sep 2022

Myofascial Release on Pain and Function in Adults with Low Back Pain: A systematic review

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Abstract
Poor posture in sitting and standing exerts stress on the spine muscle leading to non-specific low back pain (LBP). Myofascial release (MFR) on the back and leg muscles may reduce fascial tension in an individual with LBP is unclear. This review describes the effects of MFR on flexibility, pain, disability, and stress level among non-specific LBP individuals. The findings showed that the direct or indirect apply MFR on the back or lower limbs improve flexibility, pain, and disability. However, insufficient information on stress levels. MFR therapy is recommended to enhance low back pain rehabilitation

Keywords: low back pain; myofascial release; superficial backline; back rehabilitation

DOI: https://doi.org/10.21834/ebpj.v7i21.3752

1.0 Introduction

Low back pain (LBP) refers to discomfort and pain below the below the costal margin till above the bottom of gluteal folds, with or without radicular pain to the lower extremities (Mattila et al., 2017). Prevalence of LBP increased worldwide in the year 2019, which ranges up to 20% (Fatoye et al., 2019). The LBP is identified as a primary cause of years lived with disability for all age groups and both gender in the Global Burden of Disease research (GBD 2017 Disease and Injury Incidence and Prevalence Collaborators, 2018). The LBP becomes more common and burdensome as people get older (de Nascimento et al., 2019). The prevalence of LBP was among the 9th and 5th most common complaints in Malaysian public and private healthcare facilities reported in 2018 (Hani & Liew, 2018).

1.1 Postural dysfunction and myofascial pain

Poor posture, namely prolonged slouched sitting position, cause reduced lumbar flexibility and hamstring stiffness, contributing to low back discomfort (Lopez & Alacid, 2010). Wilke et al. (2016) addressed the aforementioned condition as linked between muscles and chains through fascial structures. Myers (2014) emphasizes the relationship between these muscle chains, namely the superficial backline line (SBL). The author stated that SBL is refer to myofascial meridians, namely a pathway connecting the supraorbital ridge on

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DOI: https://doi.org/10.21834/ebpj.v7i21.3752

the anterior surface of the cranium, galea aponeurotica, erector spinae, sacro lumbar fascia, sacro tuberous ligament, popliteus, hamstring, gastrocnemius, Achilles' tendon, and plantar fascia. The consequences of SBL dysfunction might lead to a decrease in global flexibility and increased muscle tension (Wilke et al., 2018).

De Ridder et al. (2013) proposed postural dysfunction may attribute to myofascial tension linked to the shortening of the posterior chain. The posterior chain role is to provide stabilization over shoulder girdle and lower body muscles, and foot intrinsic muscles. The healing tissues' tensile strength improves over time, but it never reaches uninjured, healthy tissue levels (Roylance et al., 2013). Abenhaim and colleagues (1988) highlighted that myofascial pain is attributed to a lack of soft tissue repair and replacement of immature reparative tissue. Myofascial pain appears as either tightness or weakness due to overactive or underactive of muscles leading to musculoskeletal misalignment (Roylance et al., 2013).

1.2 Myofascial Release

Myofascial Release (MFR) may correct abnormal body alignment, regain lost motion, and improve flexibility by breaking down tissue resistance, healing tissue injuries, and retraining the appropriate body posture. Also, MFR modulates the reaction in connective tissue viscoelasticity, and piezoelectric and restores optimal muscle and soft tissue function, hence, increasing flexibility and reducing pain and disability (Pilat, 2011). A systematic review of 14 articles of 260 healthy subjects reported short-term effects of self-MFR on quadriceps, hamstring, back muscle, and plantar fascia improve joint range of movement, post-exercise muscle recovery, and muscle performance in the adults population (Cheatham et al., 2015). Previous studies reported self-MFR on SBL improve the hamstring, and lumbar spine flexibility among healthy subjects (Williams & Selkow, 2019). Another study among 60 healthy participants observed that MFR at the proximal SBL (suboccipital region) significantly increased hamstring flexibility (Wilhite et al., 2019). Another study among 31 healthy adults demonstrates that self MFR on the distal of SBL (plantar fascia) showed an improvement in the hamstring and lumbar spine flexibility measured using the toe touch test and straight leg raise test (Grieve et al., 2015).

A single-blinded randomized controlled trial demonstrated an immediate effect of MFR using a rubber hammer along the SBL significantly improved flexibility measure with sit and reach test, modified Schober's Test, and straight leg raise in 18 healthy subjects (Chakhuttray et al., 2019). Do et al. (2018) obserserved an acute effect of MFR using a foam roller on the plantar fascia (SBL) showed improved hamstring and lumbar spine among healthy adults. The study conducted by MacDonald et al. (2013) demonstrated that 2-minute of self MFR in the quadriceps using a form roller improves hamstring muscle flexibility. Joshi et al. (2018) proposed that the improvement in hamstring flexibility could be attributable to treatment targeting the region of the SBL in a more extended period, which may lead to further improvement in outcome. Though direct MFR reduce hip and neck flexbility among health sedentary adults with tightness of hamstring (Martinez-lema et al., 2021), one technique of MFR did no showed superior to other intervention (Williams & Selkow, 2019).

For the effectiveness of MFR on stress, a study among 24 healthy participants demonstrated the positive effect of MFR on stress levels after one session of 30 minutes MFR (Kim et al., 2014). However, this study used a small sample size and only healthy participants, the result may not be generalized to participants with non-specific LBP.

A recent clinical trial using MFR combined with stabilization exercises showed a reduction in pain and disability compared to stablization exercises alone in patients with lumbar spine fushion (Elsayyad et al., 2021).Self MFR on any segment of SBL may improve hamstring flexibility and ankle range of motion (Fauris et al., 2021). The effect of self MFR on the plantar fascia is lack known among non-specific LBP patients. It is vital to investigate the effects of MFR on the SBL could improve the symptoms of LBP among individuals with low back pain. Thus, this review aimed to update the evidence of the effects of MFR on the region of the superficial back line (SBL) on pain, flexibility, and level of stress among adults with non-specific LBP. The finding of this review may suggest an alternative management strategy and preventive measure for chronicity of non-specific LBP.

2.0 Materials And Methods

2.1 Study Design

This review design follows the McMaster Critical Review Form, which includes the study purpose, literature, design, sample, outcome, intervention, result, conclusion, or implication.

2.2 Search Strategy

Articles were collected from available online databases through PubMed, MEDLINE (via EBSCO), Google Scholar, and Science Direct, and ranged from the year 2014 until July 2022. The authors start searching for relevant articles using MeSH headings and variations of text words [tw]. The keywords were combined and searched using the Boolean Operators 'AND' and 'OR' to narrow down and specify the search results that were relevant to the study. Finally, the keywords used were ("myofascial release" OR "self-myofascial release") AND ("low back pain" OR "back pain" OR "lumbar pain" OR "backache" OR "lumbago pain") AND ("pain" OR " pain intensity") AND ("functional activity" OR "functional disability") AND ("stress*" OR "depression"),

Firstly, the authors (SH, CSK) start searching for relevant articles using MeSH headings and variations of text words [tw]. The process continues with removing duplicate articles from the selected databases. We screened the titles, abstracts, and full texts according to the first and last authors' inclusion and exclusion criteria. Finally, the author performed the admissibility procedure, and a discussion with another author (ZZ) was conducted till a consensus was reached.

2.3 Eligibility criteria of the study

The inclusion criteria include 1) research studies published from 2014 until July 2022, 2) focusing on myofascial release, 3) assessing the flexibility, pain, disability, and level of stress, 4) focusing on participants with low back pain. The articles are excluded if they are: 1) published studies in other languages except for English, 2) published in non-peer-reviewed journals such as abstracts, paper presentations, and e-books.

2.4 Data extraction

In the theme of published studies, the study design, subjects, critical review, and findings are extracted. The reviewed papers were stated and described. The McMaster Critical Review Form for Quantitative Studies was used to critically analyse methodological quality of each study.

3.0 Result

A total of 256 articles were discovered after a thorough search of electronic resources. After removing duplicates and screening papers against the inclusion and exclusion criteria, this review includes 13 articles. Three articles were fully complied the McMaster Critical Review Form for Quantitative Studies (Table 1).

Table 1. The rating of McMaster Critical Review

Authors (year)	McMaster Critical Review							
	Study Purpose	Literature	Design	Sample	Outcome	Intervention	Result	Conclusion /implication
Ajimsha et al. (2014)	Y	Y	Y	N	Y	Y	Y	Y
Arun (2014)	Y	Y	Y	N	Y	Y	Y	Y
Balasubramaniam et al. (2014)	Y	Y	Y	N	Y	Y	Y	N
Branchini et al. (2015)	Y	Y	Y	N	Y	Y	Y	Y
Yu et al. (2016)	Y	Y	Y	N	Y	Y	Y	Y
Arguiselas et al. (2017)	Y	Y	Y	N	Y	Y	Y	Y
Arguiselas et al. (2019)	Y	Y	Y	N	Y	Y	Y	Y
Lee et al. (2019)	Y	Y	Y	N	Y	Y	Y	Y
Ozsoy et al. (2019)	Y	Y	Y	N	Y	Y	Y	Y
Sawali et al. (2019)	Y	Y	Y	N	Y	Y	Y	Y
Boff et al. (2020)	Y	Y	Y	Y	Y	Y	Y	Y
Bhat et al. (2021)	Y	Y	Y	Y	Y	Y	Y	Y
Tamartash et al. (2022)	Y	Y	Y	Y	Y	Y	Y	Y

Korea (n=2), Indonesia(n=1), and Iran (n=1).

3.1 Study Design and Location

Most of the studies' randomized control trials are prospective cross-sectional designs, and two studies are quasi-experimental. Previous studies were conducted in various of countries, namely Italy (n=1), Spain (n=2), Turkey (n=1), Brazil (n=1) and in Asia i.e., India (n=4),

3.2 Single versus combination Myofascial release therapy with passive versus active intervention

Some studies use MFR alone compared to sham MFR (Arguisuelas et al., 2017), or the electrotherapy modalities (Tamartash & Bahrpeyma, 2022). Previous studies evaluated the effects of MFR on the back and lower limb muscles (Arguiselas et al., 2017; 2019; Balasubramaniam et al., 2014; Branchini et al., 2015); combined MFR with manual therapy (Ajimsha et al., 2014) or physical modality (Arun 2014) or active exercises (Ajimsha et al., 2014; Bhat et al., 2021; Yu et al., 2016).

3.3 Site and duration of Myofascial release therapy

Previous studies evaluated the effects of MFR on the thoracic and back (Tamartash & Bahrpeyma, 2022), back muscle, and lower limb muscles (Arguiselas et al., 2017; 2019; Balasubramaniam et al., 2014; Branchini et al., 2015). The study conducted by Sawali et al. (2019) found that six times MFR was superior to three times MFR. Another study among 80 nurses with LBP showed who received about 40 minutes of MFR therapy on the thoracic and lumbar muscles, gluteus region, and hamstrings combined with specific back exercises showed reduced LBP and disability (Ajimsha et al., 2014).

Lee et al. (2019) apply MFR using diverse techniques for relaxing the inguinal region of the abdomen and MFR for the iliopsoas muscle with hip and knee movement. The longitudinal sliding technique applied to the thoracolumbar fascia demonstrated superior to sham MFR in respect of pain intensity and disability at 3-month follow-up in adults with chronic nonspecific LBP (Arguisuelas et al., 2017). Tamartash and Bahrpeyma (2022) conducted four sessions of MFR using Myer's techniques for two weeks improve pain, lumbar range and pelvic inclination. A study among older women observed 8 weeks MFR on the abdominal region and iliopsoas muscles has yielded a similar effect of abdominal drawn in exercises on pain, flexibility, and balance (Yu et al., 2016). A recent study conducted by Boff et al. (2021) reported the MFR on the sacroiliac region with active hip abduction and external rotation, followed by pelvis tilt anteriorly in addition to spinal manipulation is superior to spine manipulation alone in adults with chronic nonspecific LBP.

3.4 Assessment tools used in the articles

Previous studies utilized standardized and non-standardized tools for outcome measures. This present review looked at 13 articles that specifically identified the effect of MFR on pain and disability (n= 9), flexibility (n=9), pelvic inclination (n=1), stress and depression levels (n=1) in adults with non-specific LBP. Table 2 shows the assessments /outcome measures used in previous studies.

Table 2. The outcome measures used in previous studies

Authors (year)	Flexibility					Pain						Disability		Level of stress
	Modified Schober	Schober Test	Sit & reach	L Flex angle	Pel tilt angle	VAS	BPI	PDI	SF-MPQ	MPQ	RMDQ	ODI	QBP DS	BDI
Ajimsha et al. (2014)											/			
Arun (2014)							/	/				/		/
Balasubramaniam et al. (2014)								/						
Branchini et al. (2015)						/		/						
Yu et al. (2016)		/				/					/			
Arguiselas et al. (2017)						/			/					
Arguiselas et al. (2019)									/					
Lee et al. (2019)	/													
Ozsoy et al. (2019)			/			/				/				
Sawali et al. (2019)						/								
Boff et al. (2020)						/								
Bhat et al. (2021)						/				/			/	
Tamartash et al. (2022)				/	/									

L Flex: Lumbar flexion; Pel tilt: Pelvic tilt; VAS: Visual Analogue Scale; BPI: Brief Pain Inventory; PDI: Pain Disability Index; SF-MPQ: Short form McGill Pain Questionnaire; MPQ: McGill Pain Questionnaire; RMDQ: Rolland-Morris Disability; ODI: The Oswestry Index; QBPDS: Quebec Back Pain Disability Scale; BDI: Beck Depression Inventory

3.4.1 Level of pain and disability

Ten studies investigated the effectiveness of MFR on the level of pain and disability among LBP individuals. Five studies showed an improvement in the level of pain and disability after MFR treatment among LBP individuals (Arguiselas et al., 2019; Boff et al., 2021; Branchini, 2015; Tamartash & Bahrpeyma 2022; Yu et al., 2016). However, an RCT showed no difference in pain intensity using MRF compare to sham MFR (Arguiselas et al., 2017). The time-series experiment design showed that six sessions of MFR reduced pain intensity at $p < 0.05$ (Sawali et al., 2019). An RCT among 24 participants with LBP showed a superior effect on the level of pain after 4-week of MFR on the back muscles, gluteus (piriformis and gluteus), and hamstrings combined with standard manual therapy (Ajimsha et al., 2014).

Another study by Bhat et al. (2021) showed a consistent result that using MFR therapy on lumbar to sacroiliac muscles with strengthening exercise enabled them to reduce pain and physical disability among patients with LBP. Boff et al. (2021) reported the combination of spinal manipulation and MFR has yielded a similar effect in pain intensity and disability compared to the spine manipulation group post-3-week intervention and at follow-up.

3.4.2 Level of stress

There is limited study on the effect of MFR on the level of stress among LBP individuals. A quasi-experimental study conducted by Arun (2014) showed that 18 sessions of MFR therapy combined with hot therapy on the back muscles reduced the level of stress/ depression among individuals with LBP (Arun, 2014).

4.0 Discussion

This review aimed to update the evidence of the effects of MFR on the region of SBL on pain, flexibility, and stress level among adults with non-specific LBP. The finding of this review identified the effect of self-MFR on pain, flexibility, and stress levels in adults with non-specific low back pain.

4.1 Flexibility, pain, and disability

Self-MFR on the quadriceps using a form roller improves hamstring muscle flexibility. Do et al. (2018) found that increased muscular tension in one region of the body may generate excessive tension in other body sections related to the body's continuity. The improvement in hamstring flexibility after MFR could be attributable to treatment targeting the region of the SBL and, in a more extended period, which may further lead to additional improvement in outcome (Joshi et al., 2018). Long-term hypomobility with noticeable fibrosis and stiffness can be relieved by direct tissue stretch administered during myofascial release to the muscles, fascia, capsule, and ligaments. MFR effectively breaks down tissue resistance, heals tissue injuries, and retrains the appropriate body postures' functionality (Langevin & Sherman, 2007). It improves myofascial limitation by breaking intermolecular crosslinks and redistributing the internal fluids (Rezkallah & Abdullah, 2018).

A previous study by MacDonald et al. (2013) highlighted self-MFR on the quadriceps using a form roller improves hamstring muscle flexibility. This finding can be due to increased muscular tension in one region of the body generates excessive muscular tension in other

body sections related to the body's continuity (Do et al., 2018). Thus, fascia continuity strain may influence other surrounding structures in the fascia and support them (Myers et al., 2014). For example, MFR in the suboccipital region showed an immediate improvement in flexibility and function of the hamstring, suggesting MFR may influence the superficial backline (Aparicio et al., 2009). Myers (2014) stated that any strain at a specific part of the SBL in an "anatomy train" may have adverse consequences, and decreased global flexibility, based on the "schematic map" of the body's fascia connections. The muscle is inked in identifiable chains and through fascial structures, creating a structural continuity system (Wilke et al., 2016). Wilke et al. (2018) explained that muscle tension in one of the areas of the superficial backline increase; the other connected area may increase muscle tension. For example, MFR in the suboccipital region showed an immediate improvement in flexibility and function of the hamstring suggesting MFR may influence the superficial backline (Aparicio et al., 2009). In contrast, Rodrigues et al. (2021) demonstrated that ten sessions of applied superficial or deep MFR with 40 minutes per session for five weeks did not show a positive effect on lumbar erector spinae muscles measured by electromyographic activity in healthy adults.

MFR is a manual therapy that stimulates mechanoreceptors in the lumbar spine's soft tissues and facet joints and aids in correcting abnormalities within the movement system, which may enhance the activation pattern of para-spinal muscles, resulting in increased pain-free ROM (Bhat et al., 2021). The action of these receptors continuously feeds the central nervous system, allowing neuro-reflexive muscle activation, reducing pain, and physical impairment, and subsequently improving lumbar spine ROM (Bhat et al., 2021). MFR also aids vascular and lymphatic circulation (Harrison et al., 2000). It helps in the reduction of tone and pain caused by an underlying disease.

4.2 Level of stress

There is remain unclear about the effectiveness of MFR on the level of stress among individuals with nonspecific LBP. The stress level may be attributed to the release of facial restrictions combined with the correction of fascia dysfunction at the intestinal level, which aids sleep (Arun, 2014). According to Castro et al. (2010), the MFR technique may activate the secretion of serotonin and endorphins secretion that acts as a relaxing mediator for the body and a happy stimulator for the brain, respectively. When these hormones are released, the stress hormone (cortisol) is naturally reduced and promotes relaxation by more than 40%, subsequently reducing the level of stress among patients with LBP.

The limitation of the current review is: firstly, the minimal number of studies included in this review, subgroup analysis on the comparison of differences across groups was not possible. Secondly, a comparison of the efficacy of MFR procedures was not conducted as different types of myofascial release techniques were applied. Lastly, the majority of the studies included in the review did not have long-term follow-ups, and the length of the follow-up differed widely between studies.

5.0 Conclusion and Recommendation

The literature review revealed that MFR along the superficial back line demonstrates a positive outcome on flexibility, pain, and disability in individuals with non-specific LBP. Myofascial release combined with other treatments such as an active trunk or lower limb exercise, hot therapy, and spinal manipulation may provide a better outcome when compared to MFR treatment alone. The increased muscle tension in one of the areas of the SBL may increase muscle tension in another connected area. Myofascial release directly on the back muscles rather than the distal part along the superficial back line such as plantar fascia in addressing pain. Management strategy for low back pain should address the superficial backline of LBP individuals to reduce physical and psychological impairment. Future studies may consider more rigorous research addressing the effect of MFR on superficial backline stress levels among individuals with non-specific LBP is a warrant.

Acknowledgments

This study is supported by grant Universiti Teknologi MARA Malaysia (GPK-K5TP)(009/2020).

Paper Contribution to Related Field of Study

This finding may contribute to an understanding of myofascial release on body parts may reduce pain intensity and flexibility of trunk and lower limbs in the individual with nonspecific chronic low back pain.

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