

## Effect of yoga on the Myofascial Pain Syndrome of neck

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### ABSTRACT

Myofascial Pain Syndrome (MPS) refers to pain attributed to muscle and its surrounding fascia, which is associated with “myofascial trigger points” (MTrPs). MTrPs in the trapezius has been proposed as the main cause of temporal and cervicogenic headache and neck pain. Literature shows that the prevalence of various musculoskeletal disorders (MSD) among physiotherapists is high. Yoga has traditionally been used to treat MSDs in various populations. But there is scarcity of literature which explains the effects of yoga on reducing MPS of the neck in terms of various physical parameters and subjective responses. Therefore, a pilot study was done among eight physiotherapists with minimum six months of experience. A structured yoga protocol was designed and implemented for five days in a week for four weeks. The outcome variables were Disability of Arm, Shoulder and Hands (DASH) score, Neck Disability Index (NDI), Visual Analogue Scale (VAS), Pressure Pain Threshold (PPT) for Trigger Points, Cervical Range of Motion (CROM) - active & passive, grip and pinch strengths. The variables were compared before and after the intervention. Finally, the result revealed that all the variables (DASH:  $P < 0.00$ , NDI:  $P < 0.00$ , VAS:  $P < 0.00$ , PPT: Left:  $P < 0.00$ , PPT: Right:  $P < 0.00$ , Grip strength: left:  $P < 0.00$ , Grip strength: right:  $P < 0.01$ , Key pinch: left:  $P < 0.01$ , Key pinch: right:  $P < 0.01$ , Palmar pinch: left:  $P < 0.01$ , Palmar pinch: right:  $P < 0.00$ , Tip pinch: left:  $P < 0.01$ , Tip pinch: Right:  $P < 0.01$ ) improved significantly after intervention.


**Key words:** Myofascial pain syndrome; physiotherapist; yoga.

### INTRODUCTION

Pain attributed to muscle and its surrounding fascia is termed as Myofascial Pain. Myofascial Pain Syndrome (MPS) is one of the most common, non-articular forms of musculoskeletal pain.<sup>[1,2]</sup> Cervical myofascial pain occurs due to either overuse or trauma to the muscles that support the shoulders and neck.<sup>[3]</sup> MPS is associated with ‘hyperirritable spots’ or ‘trigger points’ (MTrPs) within palpable taut bands of the skeletal muscle or fascia that are painful on compression. These can give rise to characteristic referred pain, tenderness or autonomic nervous system symptoms.<sup>[4]</sup> Furthermore, MTrPs in the trapezius has been proposed as the main cause of temporal headache,<sup>[5]</sup> cervicogenic headaches, and neck pain.<sup>[6,7]</sup> The cervical myofascial pain syndrome is very common in the general

population.<sup>[8]</sup> Cervical pain (neck pain) is the second most common, work-related musculoskeletal disorder in the world. Similar to other Work-Related Musculoskeletal Disorders (WRMSD), the risk factors for the development of neck pain are repetition, awkward posture, static posture, force, long duration of exposure, psychosocial risk factors, and other non-occupational factors. Tasks that need repetition of movement, demand of precision or repetitive light lifting are more likely to lead to MPS, especially in the shoulder and neck region.<sup>[9]</sup> Previous studies have shown that the prevalence of various musculoskeletal disorders (MSD) among physiotherapists is high.<sup>[10-12]</sup> Physiotherapy is a process of treating patients manually. In this process the therapist often exerts extensive force, in a static awkward posture, while treating the patient. In addition, physiotherapists are exposed to other risk factors such as lifting, carrying, bending, and twisting, lack of reporting of injury, self-treatment, long working hours, and treating many patients in a single shift.<sup>[13]</sup> These factors are considered to be responsible for the development of musculoskeletal discomfort including neck pain, which is often myofascial in nature. It is further stated in literature that the prevalence of neck pain, including MPS, among physiotherapists is very high; it varies from 15 to 48%.<sup>[14-16]</sup>

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Musculoskeletal disorders among the workforce affect the performance, productivity, and quality of work,<sup>[17-21]</sup> which is applicable for the physiotherapists as well. To maintain the quality of work (treatment of the patients), the physiotherapist needs to be free of pain and discomfort. Therapists suffering from musculoskeletal pain often change the way of working, which may adversely affect the quality of treatment. Studies have also shown that MSDs among physiotherapists often lead to early retirement or change in profession.<sup>[22]</sup> Yoga has been traditionally used to treat MSDs in various populations. However, there is scarcity of literature that explains the effect of yoga on reducing specific MSDs like the Cervical Myofascial Pain Syndrome in terms of various physical parameters and subjective responses.<sup>[23]</sup> Keeping that in mind a pilot study was planned, to evaluate the effect of yoga on relieving pain, improving the quality of life and productivity among physiotherapists diagnosed to have the cervical myofascial pain syndrome.

## SUBJECTS AND METHODS

- a. **Study Setting:** Tertiary Rehabilitation Center
- b. **Study Population:** Physiotherapists with cervical myofascial pain syndrome

### Recruitment strategy

#### Inclusion criteria

1. Physiotherapists suffering from the cervical myofascial pain syndrome were included. The diagnosis of MPS was made by an Orthopedic/Rehabilitation Specialist (more than ten years experience treating MPS) using the Simons Criteria,<sup>[24]</sup> that required five major and at least one of the four minor criteria to be satisfied.

##### Major criteria:

- Localized spontaneous pain
- Spontaneous pain or altered sensations in the expected referred pain area for the given MTrP
- Taut, palpable band in the accessible muscle
- Exquisite, localized tenderness in a precise point along the taut band
- Some measurably reduced movement range.

##### Minor criteria:

- Reproduction of spontaneously perceived pain and altered sensations by pressure on MTrP
- Elicitation of local twitch response of muscular fibers by transverse 'snapping' palpation or by needle insertion into the MTrP
- Pain relief obtained by muscle stretching or dry needling injection of the MTrP
- Electromyographic demonstration of spontaneous electrical activity, characteristic of active loci in the tender nodule of a taut band in the muscle

2. Physiotherapists treating more than five patients in a day
3. Minimum six months of professional experience
4. Age between 20 years to 35 years.

#### Exclusion criteria

1. Diagnosis of any other musculoskeletal disorders
2. Any other associated problems such as vertebral basilar insufficiency, articular instability, significant cervical spondylosis or arthritis
3. Any other systemic health problems.

#### Ethics

The procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation. Approval was obtained from the Institutional Review Board before starting the study.

#### Procedure

Physiotherapists working at a Tertiary Rehabilitation Center, who complained of neck pain, were assessed for the presence of cervical myofascial pain syndrome based on the Simon's Criteria. Ten physiotherapists who were diagnosed with having cervical myofascial pain syndrome were selected, of whom two dropped out due to reasons unrelated to the study, that is, change of employment. Hence, a total of eight physiotherapists with cervical myofascial pain syndrome participated in this study. All the methods and modalities of the experiment were explained to the subjects and signed informed consent was obtained from all the participants. The data collection was handled by a single researcher, to avoid interpersonal bias. The outcome measures were Instrumented Cervical Range of Motion (CROM) – active and passive, Hand Grip and Pinch Strength, using a Jamar Dynamometer (a mechanical dynamometer), Pain Threshold for Trigger Points using a Wagner Pressure Algometer (an instrument for measuring sensitivity to pressure), Disability of Arm, Shoulder, and Hands (DASH) score, Neck Disability Index (NDI), and Short Form 36 (SF 36). Before starting the intervention, all the subjects were asked to fill up a questionnaire, which comprised of DASH, NDI, and SF 36, and the investigators performed the objective measurements. All the parameters were again measured after completion of the intervention.

#### Program

All the subjects were asked to report to the laboratory fifteen minutes before starting the intervention. The intervention was a four-week program of *Hatha Yoga*, which included *prānāyāma*, *āsana*s, and meditation, specific for the cervical region, for one hour per day. The program, for the first two weeks, was *prānāyāma* (*Anulom Vilom* and *Nadi Shodhan Pranayama*), and Diaphragmatic Breathing explained

in Figure 1) and Relaxation Training (*Shavāsana* – Body Scanning, Imagery techniques; Figure 2). In the third and the fourth weeks *āsana*s (*Trikonasana*, *Tadasana*, *Vakrasana*, *Balasan* and *Vajrasana* explained in Figures 3-6), *prānāyāma* and Relaxation Training were taught. All the *āsana*s were taught according to the participant's comfort level.

### Measures

**Grip strength:** Grip strength was measured by the Jamar Hand Grip Dynamometer.<sup>[25,26]</sup>

**Pinch strength:** Pinch strength was measured by Jamar Pinch Meter.<sup>[27]</sup>

**Cervical range of motion:** Cervical Ranges of Motion (rotation, flexion, extension, and lateral bending) were measured by a Magnetic Inclinometer.<sup>[28]</sup>

**The algometer pain test:** (From Wagner Instruments, USA) was performed on prone subjects with TrP areas exposed. Pressure was applied perpendicularly and gradually



Figure 1: Anulom- Vilom Pranayam



Figure 2: Shavasana



Figure 3: Balasan



Figure 4: Tadasana



Figure 5: Trikonasana



Figure 6: Vakrasana



through an Algometer (1.0 cm<sup>2</sup> tip) at each palpated point. When a subject verbally cued pain onset, the pressure level was noted.

*Visual Analog Scale (VAS):* This is a 10 cm Horizontal line representing the extreme left as ‘no discomfort’ and extreme right as ‘maximum discomfort’. It is a well-validated scale for pain measurement.<sup>[29]</sup>

*Disability of arm, shoulder, and hand:* The Disability of Arm, Shoulder, and Hands (DASH) is a questionnaire developed and validated in 1994, by the American Academy of Orthopedic Surgeons, the Council of Musculoskeletal Specialty Societies, and the Institute for Work and Health.<sup>[20]</sup> DASH was developed to measure physical disability and symptoms of the upper limbs in a heterogeneous population, that is, men and women, and individuals with mild, moderate or severe disability and a wide variety of upper extremity disorders.<sup>[31]</sup>

*Neck disability index:* The Neck Disability Index (NDI) was designed to measure neck-specific disability.<sup>[32]</sup> It was developed from the Oswestry Index<sup>[33]</sup> for back pain and the Pain Disability Index.<sup>[34]</sup> The authors were from the Canadian Memorial Chiropractic College in Toronto, Canada. This questionnaire contained ten individual factors concerning pain and activities of daily living, including personal care, lifting, reading, headaches, concentration, work status, driving, sleeping, and recreation, on a six-point Likert scale. Its reliability and validity is well-established.<sup>[35]</sup>

*SF-36:* The SF-36 is a multipurpose, short-form health survey, with 36 questions. The experience to date with the SF-36 has been documented in nearly 4000 publications. The two overall health consistent summary scores — Physical Health and Mental Health — were the average of four subscales each. The Physical Health scale was comprised of physical functioning, role-physical, bodily pain, and general health; Mental Health was comprised of social functioning, role-emotional, mental well-being, and vitality. All items were rated on a five-point scale, with five representing better health. The internal reliability, construct validity, and changes in disease-related symptoms, over time, of the SF-36, have been well-documented.<sup>[36]</sup>

**Statistical tool**

Comparative and inferential statistics were carried out using the Statistical Package for Social Studies (SPSS) 17.0.

**RESULTS**

The total number of participants in this study was eight. All the subjects attended all the given sessions on a regular

basis. The demographic data of the subjects is presented in Table 1.

All the outcome measures were compared before starting the treatment and after finishing the treatment. All the outcome measures were compared using the paired *t*-test. The results are presented in Tables 2-6.

The above table revealed that grip and pinch strength (key, palmar, and tip) for both the hands improved significantly from the baseline condition to the end of intervention.

The above table revealed that both the active and passive range of motion for all the cervical movements improved from the baseline to the end of intervention.

**Table 1: Demographic data**

Parameters	Age (years)	Height (cm)	Weight (kg)	BMI (kg/m <sup>2</sup> )
Mean	24.88	164.49	62.13	22.85
Standard deviation	±1.25	±9.44	±14.88	±4.50

The mean year of professional experience of the subjects was 17.75 (± 12.97) months

**Table 2: Comparison of grip and pinch strength**

Parameters	Before	After	t value	P value
Grip strength (left)	35.69 (±8.95)	40.00 (±9.90)	6.76	0.00*
Grip strength (right)	32.75 (±10.40)	36.44 (±10.21)	3.71	0.01*
Key pinch (left)	6.13 (±0.99)	6.75 (±1.34)	3.29	0.01*
Key pinch (right)	6.06 (±0.94)	6.94 (±1.29)	2.97	0.01*
Palmer pinch (left)	5.38 (±1.09)	6.44 (±0.86)	2.98	0.01*
Palmer pinch (right)	5.38 (±1.58)	6.44 (±1.74)	4.04	0.00*
Tip pinch (left)	4.13 (±0.88)	5.00 (±0.76)	4.60	0.00*
Tip pinch (right)	4.75 (±1.25)	5.56 (±1.27)	3.65	0.01*

\*Significant

**Table 3: Comparison of cervical range of motion**

Parameters	Before	After	t value	P value
Flexion active	50.00 (±13.09)	58.13 (±11.32)	2.93	0.01*
Flexion passive	57.50 (±12.82)	65.00 (±11.34)	3.87	0.00*
Extension active	54.38 (±16.35)	65.00 (±13.89)	4.67	0.00*
Extension passive	59.38 (±18.21)	69.38 (±12.37)	2.32	0.03*
Lateral flexion (left) active	41.25 (±8.76)	50.63 (±6.23)	3.74	0.00*
Lateral flexion (left) passive	46.88 (±7.99)	55.00 (±7.07)	3.58	0.01*
Lateral flexion (right) active	42.50 (±6.55)	50.00 (±7.56)	4.08	0.00*
Lateral flexion (right) passive	48.75 (±5.18)	56.88(±8.43)	5.46	0.00*
Rotation (right) active	64.38 (±14.00)	72.50 (±11.95)	3.27	0.01*
Rotation (right) passive	78.75 (±15.53)	83.13 (±12.80)	2.65	0.02*
Rotation (left) active	65.00 (±15.35)	71.88 (±13.08)	2.75	0.02*
Rotation (left) passive	74.38 (±12.66)	82.50 (±9.26)	2.41	0.03*

\*Significant

**Table 4: Result of algometry and visual analog scale**

Parameters	Before	After	t value	P value
Pressure pain threshold (left)	1.93 ( $\pm 0.19$ )	3.21 ( $\pm 0.53$ )	7.97	0.00*
Pressure pain threshold (right)	2.01 ( $\pm 0.31$ )	3.28 ( $\pm 0.49$ )	7.39	0.00*
VAS	6.25 ( $\pm 1.39$ )	2.38 ( $\pm 1.77$ )	10.58	0.00*

\*Significant, VAS = Visual analog scale

**Table 5: Result of disability of arm, shoulder, and hand and neck disability index**

Parameters	Before	After	t value	P value
Total DASH score	23.79 ( $\pm 14.93$ )	8.45 ( $\pm 8.78$ )	3.75	0.00*
Work module	18.75 ( $\pm 16.70$ )	3.13 ( $\pm 4.72$ )	2.50	0.02*
NDI	44.58 ( $\pm 14.18$ )	30.43 ( $\pm 9.70$ )	3.04	0.01*

\*Significant; NDI = Neck disability index; DASH = Disability of arm, shoulder, and hand

**Table 6: Result of SF 36**

Parameters	Before	After	t value	P
SF 36	55.63 ( $\pm 16.57$ )	78.50 ( $\pm 11.35$ )	3.25	0.01*
Physical health	51.13 ( $\pm 16.99$ )	76.50 ( $\pm 11.19$ )	3.41	0.00*
Mental health	59.13 ( $\pm 14.28$ )	76.50 ( $\pm 12.75$ )	2.22	0.03*

\*Significant

The result of pressure algometry and visual analog scale also showed improvement from the baseline to the end of intervention.

Disability of arm, hand, shoulder and neck also reduced significantly as compared to the baseline levels.

The above table revealed that there was an improvement in the Physical and Mental Health along with the Total Score of SF 36.

## DISCUSSION

The results of the present study suggested that the intervention of a planned yoga program led to significant improvement in the quality of health, physical capacity (strength), cervical range of motion, and pressure threshold of the trigger points, and decreased the disability and pain for the physiotherapists who were diagnosed to have cervical myofascial pain syndrome. Several reasons exist to explain the efficacy of Yoga in the therapy for cervical myofascial pain. In the cervical myofascial pain syndrome, breathing is invariably strained, shallow, and mainly thoracic, which in turn affects other rhythmic phenomena like neuronal flow and vital cyclic rhythms with high flat cortisol levels, similar to the chronic arousal response.<sup>[37,38]</sup> *Āsanās* and *prānāyāma* activates the Parasympathetic system, by increasing the local blood flow, which influences the endocrine system and nerve plexuses, affecting the neuronal flow.<sup>[39]</sup> Deep yogic breathing with prolonged exhalation relaxes most of the skeletal muscles.<sup>[40]</sup> *Āsanās* and *prānāyāma* initiate a 'relaxation response'<sup>[41]</sup> in the neuroendocrinal system that harmonizes the physiological system (metabolic,

respiratory, cardiovascular, musculoskeletal, and neural) resulting in decreased myofascial tension.<sup>[42]</sup> Meditation and *pranayama*, along with relaxing *asanas* can help individuals deal with the reactive aspects of chronic pain, reducing anxiety and depression effectively.<sup>[43]</sup> *Hatha yoga* improves strength, range of motion, balance, and agility, reduces pain, enhances flexibility, muscle tones, and releases muscle tension.<sup>[44-47]</sup> Mindfulness meditation helps in the reduction of pain, improvement in physical function, and the quality of life.<sup>[48,49]</sup> Meditation and *prānāyāma* have both been found to be helpful in pain management.<sup>[39,50]</sup> Meditation and *prānāyāma* techniques included in this intervention study have increased the participants' mindfulness. The subjects who practice yoga learn about mental focus, which helps people to increase their awareness of non-optimal ways of moving and positioning their body. Subjects also learn how to relax tensed muscles, and to relieve mental stress.<sup>[51,52]</sup> Moreover, yoga therapy encourages the subjects to heal by resting the area of pain and teaches the proper alignment of bones, muscles, and connective tissues, in movements that minimize the risk factors for discomfort. Therefore, it helps in minimizing and ultimately correcting the underlying physical malfunctions.<sup>[53]</sup> A study carried out by Kabat-Zinn showed that 65% of the patients with chronic pain, who had not improved with traditional medical care, felt lesser pain after practicing mindfulness meditation for ten weeks.<sup>[54]</sup> In the present study also similar results were found, which were measured with subjective responses and quantified by a visual analog scale. Apart from pain reduction, there was a significant improvement in the functional capacity and quality of health. Therefore, it was concluded that a planned yoga program for physiotherapists who were suffering from cervical myofascial pain syndrome resulted in significant improvement in pain levels, which in turn could lead to improved quality of treatment. The sample size of the present study was only eight and there was no control group. Therefore, a further study is required to generalize the result of the present study on a larger sample size.

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