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# Effect of high-intensity laser on upper trapezius myofascial pain syndrome: Single-blinded randomized control trial

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***Keywords***

*cervical myofascial trigger points; high-intensity laser therapy; musculoskeletal disorder; pressure pain threshold; visual analogue scale;*

**Abstract**

Aim of the study: As high-intensity laser therapy (HILT) is capable of reaching and stimulating deeper and larger tissues than traditional physiotherapy modalities, we studied its influence on cervical myofascial pain. Subject and methods: 50 patients with chronic upper trapezius muscle myofascial trigger points (MTrPs) within the age range of 20 to 40 years old were assigned to group A that received traditional treatment only (transcutaneous electrical nerve stimulation (TENS), ultrasound massage (US), stretch and exercise), while group B received HILT with traditional treatment. Outcome measures included pain severity via visual analogue scale (VAS), pressure pain threshold (PPT) by pressure algometer, neck functional activities by neck disability index (NDI) and cervical range of motion by CROM apparatus. Results: both groups showed significant improvement in the posttreatment outcome measures, but the HILT group (group B) showed a more significant improvement than the control group (group A) with a p-value >0.001. Conclusion: HILT is a supportive physical therapy modality that may provide preferable results for a cervical MTrP patient.



**Contents**



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## 1 Introduction

Trapezius myofascial pain syndrome (MPS) is a major cause of cervical pain in primary care (Edwards & Knowles, 2003; Dundar et al., 2015) characterized by the skeletal muscles and fascia's extensive pain and the presence of one or more myofascial triggers points (Dundar et al., 2015). The sensitive trigger point is usually provoked by trauma, mechanical overload, postural faults, or psychological stress. It is associated with a palpable taut band where phasic muscles become inhibited while postural muscles become tighter, causing muscle imbalance that leads to TrPs in the cervical region (Ziaeifar et al., 2014; Diz et al., 2016). Although MTrPs can develop in muscle groups, previous studies revealed that the upper trapezius muscle (UT) is probably the most commonly affected (Dundar et al., 2015; Travell & Simons 1992; Cou et al., 2012).

Clinically, utmost myofascial pain syndrome treatments are either injection or physical therapy targeting the palpable taut band of MTrPs, including electro-Thermo, manual and cold therapies, where stretch and exercise are frequently used (Travell & Simons 1992; Charles et al., 2019; Alvarez & Rockwell, 2002).

Recently, low-level laser therapy (LLLT) treated myofascial trigger points, utilizing red and near-infrared types over trigger points to improve both acute and chronic pain (Starkey, 2013; Corbetta et al., 2015; Shahimoridi et al., 2020; Imani & Habolhasan, 2011; Munguia et al., 2018). Lately, HILT has emerged as a means of photo-therapeutic devices that have gained popularity for treating acute and chronic inflammatory pain and re¬lated impairments (Parr et al., 2010). Also, it has been proven that HILT has a more significant effect on inflammation, oedema, and analgesic effects and can stimulate deeper joints and treat a wide area. Thus, the application of HILT for MPS may improve pain and function (Dundar et al., 2015; Jin Song et al., 2018; Harrington et al., 2012).

However, further research with larger sample sizes involving both gender and testing the effect of HILT on the cervical region by assessing more outcome measures is still required (Jin Song et al., 2018; Harrington et al., 2012). So, this study aimed to investigate the effect of HILT on pain threshold and severity, range of motion, and function in patients suffering from chronic cervical myofascial trigger points.

## 2 Materials and Methods

Single-blind two groups pre- and post-randomized controlled trial was conducted in the outpatient clinic, Faculty of Physical Therapy, Badr University, from April 2019 to August 2019. The study was approved and accepted by the Research Ethical Committee, Faculty of Physical Therapy, Cairo University, (P.T.REC/012/002348) and the Pan African Clinical Trial Registry database under the identification number PACTR202003764134697. All patients signed an informed consent form before participating in the study after fully explaining the study purpose and procedures following the principles outlined in the Helsinki Declaration.

*Subjects*

By computation using G-power 3.1 an effect size of 0.8 at a significance level of 0.05, and a testing power of 0.8, a sample size of 25 participants for each group was suitable to test pain and CROM. So, a total of fifty patients (32 female and 18 male) out of sixty were recruited after referral by an orthopedist within the age range of 20–40 years old with bilateral active upper Trapezius TrP for over which palpated as tender nodule in a taut band that referred pain specifically for upper Trapezius, with the pain of at least 30 mm on VAS and limitation in cervical range of motion (Suryasa et al., 2022). During eligibility screening, 10 patients were

eliminated because six did not meet the inclusion criteria and four were recruited to another study simultaneously (figure 3-1).

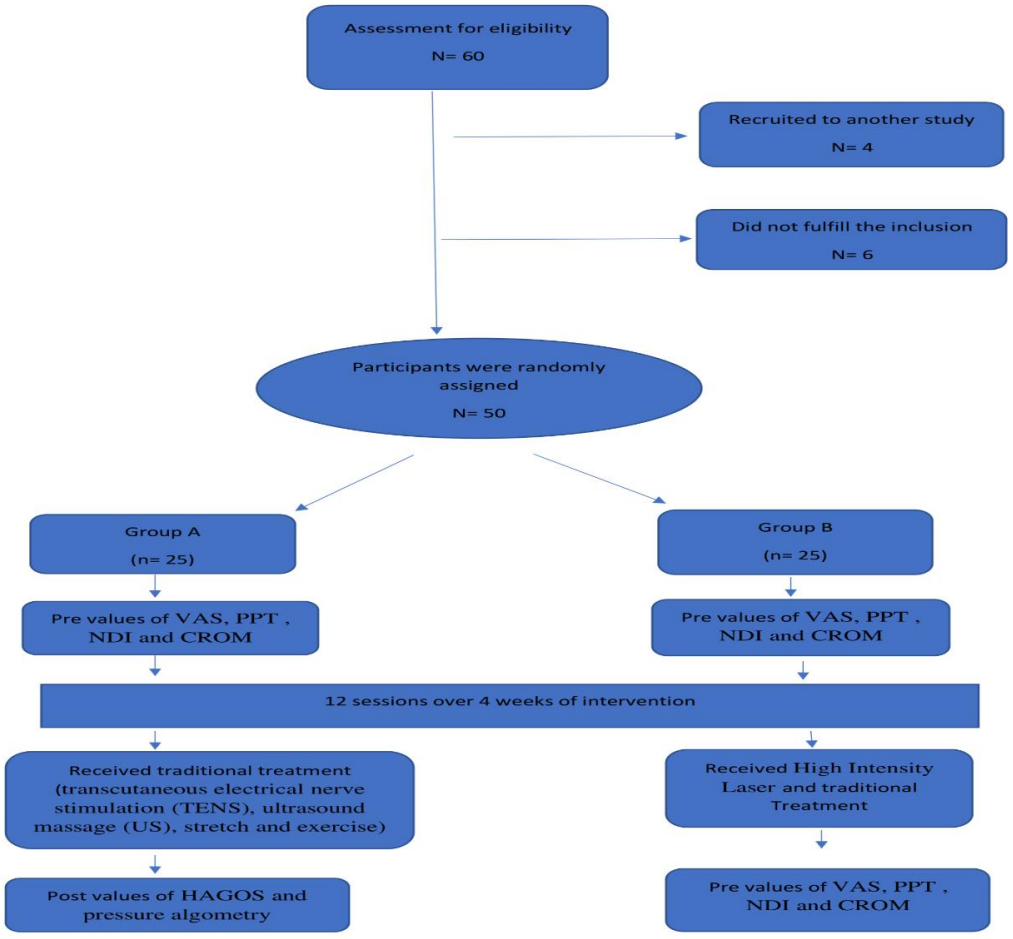


Figure 1. Eligibility assessment

The presence of MTrPs was determined by the diagnostic criteria described by Simons 1990, where five major criteria and at least one of three minor criteria by Simons were needed for a clinical diagnosis of MPS (Simons, 1990). The primary criteria were local neck pain or altered sensation in the expected distribution of referred pain from a myofascial trigger point or palpable taut band in an accessible muscle or exquisite spot tenderness at one point along the length of the taut band or some degree of restricted ROM when measurable (Rickards, 2006). The minor criteria included reproducing clinical pain or altered sensation by pressuring the tender spot or eliciting a local twitch response by transverse snapping palpation at the tender spot or needling the taut band's tender spot or pain alleviated by stretching the muscle or injecting the trigger point (Sciotti et al., 2001). Exclusion included any diagnostic history of fibromyalgia syndrome, surgery of the cervical spine, whiplash injury, radiculopathy or myelopathy, disc herniation, spinal stenosis, pathological findings on cervical X-rays, local anaesthetics or anti-inflammatory injections into the trigger points within 6 months and any myofascial pain therapy within the past 3 months before the study determined by their primary care physician (Parmin et al., 2020). To avoid bias, random patient assignment to either the experimental or control group was conducted by opening an envelope prepared by an independent subject with a random number generation of 25 participants in each group and an allocation ratio of 1:1.

*Measurement Procedures*

*Pain intensity by visual analogue scale (VAS)*

Accurate (Scrimadhow & Maher, 2001) and reliable (Roach et al., 1997) applicable VAS to a variety of practice and research settings were used (Boonstra et al., 2008). It commonly consists of a 10cm horizontal line anchored with two opposite labels; patients marked a score on the scale using a vertical line (Boonstra et al., 2008).

*Pressure pain threshold (PPT) by pressure algometer*

Valid and reliable (Kinser et al., 2009), portable Wagner Force One Model FDIX 50TM, Wagner Instruments, Greenwich, Conn algometer aimed to measure PPT and tolerance levels of cervical tender and trigger points through a 4-digit LCD screen with 3 buttons keypad and a 1cm$^2$ round rubber tip. The patient sat upright on a chair with a backrest, hands rested on both knees and facing forward while the round rubber tip pressed vertically on the trapezius muscle's upper border, causing pressure (HR) between the middle and lateral border of the acromion (Kojidi et al., 2016; Kim & Lee, 2018). Another vertical point was at the midline of the upper ventral border of the muscle near the vertical fibers attached to the clavicle (VT) (Kim & Lee, 2018). The VT and HR points were assessed bilaterally. Next, a speed of 1kg/cm$^2$/s increased pressure till a painful sensation was recorded (Kojidi et al., 2016), then the pressure was released, and the score was noted. At each point, the mean of three measurements was recorded and represented in kg (Kojidi et al., 2016; Kim & Lee, 2018). The same procedure was conducted on the right and left sides of the cervical region.

*Functional activities by neck disability index (NDI)*

Arabic form of NDI was utilized to evaluate the level of functional neck disability. The patients were requested to read the instructions and answer a 10-item self-report measure related to pain and different activities. Each item is rated on a 6point scale (0-5). The outcomes were computed and conveyed on a scale from 0 to 100% (no disability to maximum disability, respectively) (Shaheen et al., 2013).

*Cervical range of motion by (CROM)*

The CROM (deluxe version - Performance Attainment Associates, Lindstrom, MN) was used to measure the cervical range of motion for flexion, extension, bilateral lateral bending, and rotation using separate inclinometers adjusted to the occipital area with a Velcro to avoid oscillations during cervical movements while the patient sitting upright on a chair with a backrest, with relaxed shoulders, hands rested on thighs, and with hips and knees flexed at 90°. These inclinometers are attached to a frame similar to eyeglasses: one in the sagittal plane for flexion – extension—a second in the frontal plane for lateral flexion, and a third in the horizontal plane for rotation. Two inclinometers have a gravity-dependent needle (in the sagittal and frontal planes), and the other has a magnetic needle (in the horizontal plane). The patient wore a magnetic neck brace. Measurements were expressed in degrees with high validity (Tousignant et al., 2000) and reliability (De Koning et al., 2008). During flexion and extension, the therapist stood at the side of the patient while bending the neck forward into flexion within the limit of pain, then back to starting position, then bent the neck back into extension, whereas, during lateral flexion, the therapist stood in front of the patient who was asked to relax both shoulders then bend the neck laterally to one side within the limit of pain then back to starting position then bend to the other side. Finally, during cervical rotation, the therapist stood behind the patient, who was asked to fix the trunk and shoulder and rotate to one side within the limit of pain then to the starting position then rotate to the other side (Shah et al., 2008).

*Treatment Procedures*

*High-Intensity Laser*

HILT device ZIMMER OPTON PRO, manufactured in 4/2015, was used with a dual-wavelength (810nm and 980nm), max 7W CW. During application, the patient was positioned in a relaxed sitting position on a chair with a backrest with both hands resting on the thighs while facing forward. The therapist wearing protective goggles directed the probe on the bilateral MTrP of the upper trapezius muscle with the small spacer 3.1cm$^2$ at 3W, 5Hz, serial pulses, 20 joules/ point for 13 seconds (Alayat et al., 2016). The session was repeated for two days over four weeks with a total of 8 sessions.

*Transcutaneous electrical nerve stimulation (TENS)*

TENS Chattanooga device, model 2760, was used. The negative electrode of the TENS unit was placed on the MTrP of the upper trapezius muscle, and the positive electrode was placed near the insertional site of the muscle above the spine of the scapula. Asymmetrical rectangular biphasic form current of conventional TENS was applied at a pulse repetition frequency of 100Hz and duty cycle of 250 microseconds; the intensity was set at a level that each subject could feel, but that was not strong enough to induce muscle contraction. The current was applied for 20 minutes (Hou et al., 2002), and the session was repeated two days per week for four weeks.

*Ultrasound*

Ultrasound device Chattanooga, model 2760 with a pulsed mode, frequency 1 MHz, intensity 0.5 W/cm$^2$ for 5 minutes, and a transducer head of 5 cm$^2$ was placed over MTrPs of upper trapezius muscle by circular moving technique at a rate of 4 cm/s for 5 minutes (Aguilera et al., 2009). The treatment was carried out two days per week for four weeks.

*Stretching of upper trapezius and sternocleidomastoid muscles*

While the patient was in a sitting position, the therapist stood behind the patient, placing one hand on the lateral end of the trapezius muscle near the acromioclavicular joint while the other hand on the lateral side of the head where a passive low, intensity stretching technique towards the opposite ear was applied till the end of the available ROM and the patient felt from mild to moderate stretch. It was maintained for 30 seconds followed by 4 repetitions with 1-minute rest for optimum relaxation effect (Jagad & Jagad, 2013). Stretching included bilateral upper trapezius muscles and sternocleidomastoid (SCM) muscles for four weeks between the repetitions and was applied two days per week for four weeks.

*Strengthening exercise for the upper trapezius muscle*

All the patients did an isometric exercise program for the upper trapezius muscle for 3 sets of 10 repetitions for both sides every other day for four weeks while the patient was in a sitting position and the therapist standing behind the patient giving a good amount of resistance to perform isometric contraction with rest periods between the sets for 30 seconds (Kisner et al., 2017).

*Statistical analysis*

The IBM SPSS statistics 22 software was used for statistical analysis using descriptive statistics and a 2×2 mixed model Analysis of Variance (ANOVA) with two groups (control vs. experimental) as the subjects factor and two times for measuring the dependent variables (pre-treatment and post-treatment) as the within subjects' factor. The P-value was set at 0.05. Before data analysis, Shapiro–Wilk and Levene tests were used to test data normality and the equality of variances, respectively. The differences in demographic characteristics for both groups were assessed using unpaired t-tests.

## 3 Results and Discussions

There were 25 participants in each group, and their demographic data is represented in Table (1). There was no statistically significant difference between both groups in demographic data and pre-treatment dependent variables between the two groups (P>0.05). Shapiro–Wilk and Levene tests revealed no violations of the assumptions of normality and homogeneity of variance for any of the dependent variables. Descriptive statistics of pain level, functional disability, pressure algometer, and cervical ROM are presented in Table (2). The adherence rate of the session was 100% for both groups.

The 2×2 mixed-model ANOVA analysis demonstrated significant improvements in the pain level for both groups after treatment as the main effect of time was statistically significant (p<0.0001), but the experimental group showed significant improvement over the control group post-treatment as the main effect of group was statistically significant (p<0.001) and time × group interaction effect was also significant (p<0.0001) as shown in Table (3).

Table 1
Demographic characteristics of the participants

| Characteristics | Control group | Experimental group | P-value |
|---|---|---|---|
| Age | 30.12±5.66 (year) | 29.22±5.3 (year) | 0.56 |
| Weight | 67.7±8.59 (Kg) | 64.98±9.9 (Kg) | 0.3 |
| Height | 170.26±7.95 (Cm) | 167.44±9.32 (Cm) | 0.25 |
| BMI | 23.26±1.54 (Kg/m$^2$) | 23.04±1.55 (Kg/m$^2$) | 0.62 |

Table 2
Descriptive statistics of pain level, functional disability, pressure algometer, and cervical ROM for both groups pre-treatment and post-treatment

| Variables | Group | Pre-treatment | Post-treatment |
|---|---|---|---|
| Pain level | Control | 6.6±1.25 | 4.76±1.16 |
| (VAS) | Experimental | 6.68±1.24 | 2.6±0.7 |
| Functional Disability | Control | 22.08±4.85 | 16.32±3.96 |
| (NDI) | Experimental | 21.68±4.64 | 8.12±2.6 |
| Pressure Algometer | Control | 1.24±0.28 | 1.54±0.26 |
| (RT VT) | Experimental | 1.26±0.31 | 1.97±0.31 |
| Pressure Algometer | Control | 1.36±0.18 | 1.53±0.19 |
| (RT HR) | Experimental | 1.32±0.27 | 1.94±0.24 |
| Pressure Algometer | Control | 1.05±0.16 | 1.26±0.19 |
| (LT VT) | Experimental | 1.04±0.19 | 1.6±0.21 |
| Pressure Algometer | Control | 1.21±0.23 | 1.44±0.23 |
| (LT HR) | Experimental | 1.25±0.25 | 1.86±0.27 |
| Cervical Flexion | Control | 58.6±8.84 | 64.8±8.47 |
| (Degree) | Experimental | 59.8±6.68 | 75.8±4.49 |
| Cervical Extension | Control | 43.4±8.12 | 49.8±7.56 |
| (Degree) | Experimental | 44.2±8.37 | 60.8±7.59 |
| Cervical RT Rotation | Control | 61.6±5.72 | 65.4±5.57 |
| (Degree) | Experimental | 60.6±7.94 | 75.8±4.71 |
| Cervical LT Rotation | Control | 59.4±7.26 | 65.2±6.68 |
| (Degree) | Experimental | 60.2±6.03 | 74.2±5.13 |
| Cervical RT Side | Control | 31.6±4.72 | 35.2±5.09 |
| Bending (Degree) | Experimental | 31.2±4.63 | 42.2±2.91 |
| Cervical LT Side | Control | 30.2±3.94 | 35.4±4.06 |
| Bending (Degree) | Experimental | 30.8±4.01 | 42.8±2.92 |

*SD: standard deviation

The functional disability measured by NDI significantly improved following treatment, where the main effect of time was statistically significant (p<0.0001). However, significant improvement post-treatment was observed in the experimental group than in the control group as the leading group, and time × group interaction effects were statistically significant (p<0.0001), respectively, as shown in Table (3).

The pressure algometer (RT VT) and (RT HR) points represented significant improvements in both groups after treatment as the main effect of time was statistically significant (p<0.0001) and also showed significant improvement in the experimental group post-treatment compared to the control group as the main effect of group was statistically significant (p<0.006, <0.004) respectively and time × group interaction effect was also significant (p<0.0001) for both points as shown in Table (3).

Furthermore, pressure algometer (LT VT) and (LT HR) points significantly improved following treatment in both groups as the main effect of time was statistically significant (p<0.0001). Also, significant improvement in the experimental group post-treatment compared to the control group was shown as the main effect group was statistically significant; the experimental group was superior to the control group post-treatment as the main effect group was statistically significant (p<0.003, 0.002) respectively and time × group interaction effect was also significant (p<0.0001) as shown in Table (3).

For cervical flexion and extension ROM, significant improvements in both groups after treatment were observed as the main time effect significantly improved (p<0.0001) and also, and the experimental group showed significant improvement compared to the control group post-treatment, where the main group effect was statistically significant (p<0.003 and 0.005 respectively) and time × group interaction effect was also significant (p<0.0001) as shown in Table (3).

Similarly, cervical right and left rotation ROM showed significant improvement in both groups following treatment as the main time effect was statistically significant (p<0.0001), and also an experimental group showed significant improvement in the control group post-treatment as the main group effect was statistically significant (p<0.006) and time × group interaction effect was also significant (p<0.0001) for both ROM as shown in Table (3).

Additionally, the cervical right and left side bending ROM significantly improved in both groups after treatment, as the main time effect was statistically significant (p<0.0001). The experimental group was superior to the control group as well post-treatment as the main group effect were statistically significant (p<0.007 and 0.0001, respectively), and the time × group interaction effect was also significant (p<0.0001) for both, as shown in Table (3). time × group interaction effect was also significant (p<0.0001), as shown in Table (3).

*Complications and side effects*

Patients from both groups did not report any complications or side effects during or after treatment.

*Discussion*

This study aimed to investigate the effect of HILT on pain threshold, pain intensity, range of motion, and function in patients suffering from chronic bilateral cervical myofascial trigger points (Lucas et al., 2010). Our results showed that the HILT and traditional treatment (experimental) had significant improvement in post-treatment outcome measures (VAS, PPT, NDI, CROM), whereas the improvement was more significant in the experimental group than in the traditional treatment alone. This variation in the amount of improvement between the two groups was due to the further effect of HILT in decreasing pain and inflammation at the site of the trigger point and improving cervical ROM.

The use of HILT in physical therapy is relatively recent and constantly evolving and is well established for its thermal and mechanical effect and for inducing electromagnetic field, photoelectric, electrochemical, and other changes in the exposed tissues (Moskvin & Buylin, 2006). Therefore, pain reduction by HILT was attributed to the stimulated secretion of endogenous opioids b-endorphins and dynorphins that consequently inhibit pain sensations at the level of CNS (Hsieh et al., 2015). Whereas in the peripheral nervous system, laser therapy could decrease the secretion of substance P, which sensitizes pain transmitting neurons leading to hyper-algesia (Alayat et al., 2016; Hsieh et al., 2015), also laser therapy might increase the latency and decrease the conduction velocity of sensory nerves by inhibiting A-delta and C-fiber transmission; these, in turn, may decrease the transmission of pain signals (Acar & Yilmaz, 2012; Chow et al., 2011). Additionally,

laser therapy may also reduce pain indirectly by increasing microcirculation within the tissue by increasing levels of nitric oxide (Moriyama et al., 2009), which widens the arterial and capillary vessels, stimulates electrolyte interchange in the cellular protoplasm, increases oxygen consumption, and enhances nucleic acid and protein synthesis (Alayat et al., 2016; Moriyama et al., 2009).

Consequently, reducing neck pain could significantly increase the range of motion and the quality of life, eventually improving the patient's functional ability (Harrington et al., 2012; Pekyavas & Baltaci, 2016). Hagiwara et al. (2007), supported the idea that HILT has active participation in stimulating the opioid system by increasing the secretion of endogenous opioids like β-endorphin, released from inflammatory cells 24 hours after laser exposure (Hagiwara et al., 2007).

Table 3
Results of a 2 X 2 mixed-model ANOVA

| Source of variance | | F-value | P-value |
|---|---|---|---|
| Pain level (VAS) | Between subjects (Group) | 12.8 | <0.001* |
| | Within subjects (Time) | 565.26 | <0.0001* |
| | Time X group | 80.92 | <0.0001* |
| Functional disability (NDI) | Between subjects (Group) | 16.29 | <0.0001* |
| | Within subjects (Time) | 428.44 | <0.0001* |
| | Time X group | 69.83 | < 0.0001* |
| Pressure Algometer (RT VT) | Between subjects (Group) | 8.23 | <0.006* |
| | Within subjects (Time) | 854.25 | <0.0001* |
| | Time X group | 143.85 | <0.0001* |
| Pressure Algometer (RT HR) | Between subjects (Group) | 9.13 | <0.004* |
| | Within subjects (Time) | 616.57 | <0.0001* |
| | Time X group | 197.28 | <0.0001* |
| Pressure Algometer (LT VT) | Between subjects (Group) | 9.87 | <0.003* |
| | Within subjects (Time) | 499.04 | <0.0001* |
| | Time X group | 102.68 | < 0.0001* |
| Pressure Algometer (LT HR) | Between subjects (Group) | 11.27 | <0.002* |
| | Within subjects (Time) | 969.23 | <0.0001* |
| | Time X group | 202.54 | < 0.0001* |
| Cervical Flexion (Degree) | Between subjects (Group) | 10.03 | <0.003* |
| | Within subjects (Time) | 209.12 | <0.0001* |
| | Time X group | 40.75 | < 0.0001* |
| Cervical Extension (Degree) | Between subjects (Group) | 8.48 | <0.005* |
| | Within subjects (Time) | 143.49 | <0.0001* |
| | Time X group | 28.22 | < 0.0001* |
| Cervical RT Rotation (Degree) | Between subjects (Group) | 8.31 | <0.006* |
| | Within subjects (Time) | 274.87 | <0.0001* |
| | Time X group | 98.95 | < 0.0001* |
| Cervical LT Rotation (Degree) | Between subjects (Group) | 8.27 | <0.006* |
| | Within subjects (Time) | 320.46 | <0.0001* |
| | Time X group | 54.96 | < 0.0001* |
| Cervical RT Side Bending (Degree) | Between subjects (Group) | 8.21 | <0.007* |
| | Within subjects (Time) | 222.04 | <0.0001* |
| | Time X group | 57.04 | < 0.0001* |
| Cervical LT Side Bending (Degree) | Between subjects (Group) | 16.75 | <0.0001* |
| | Within subjects (Time) | 418.64 | <0.0001* |
| | Time X group | 65.43 | < 0.0001* |

*Significant at $\alpha < 0.05$.

Kheshie concurred that HILT, compared to LLLT, was more effective in treating painful chronic knee osteoarthritis (Kheshie et al., 2014). Similarly, Angelova and Ilieva proved the advantage of HILT in reducing

painful knee osteoarthritis as its effectiveness is based on the distinctive high peak power of the laser pulse, which conveyed a large amount of energy in a short time compared to the time consumed to deliver the same amount of energy by LLLT increasing buildup of heat and tissue damage (Angelova & Ilieva, 2016).

Furthermore, Gocevska revealed that HILT maintained reduced pain for three months in patients with chronic low back pain (Gocevska et al., 2019), whereas Mohamed demonstrated that combining HILT with traditional exercises in chronic neck pain had effective results on pain, function, and range of motion (Alayat et al., 2016).

Moreover, our findings agreed with Santamanto, who reported that HILT compared to therapeutic ultrasound, caused more significant pain reduction and improved articular movement and muscle strength in treating shoulder subacromial impingement (Santamato et al., 2009).

HILT is significantly effective in many musculoskeletal painful conditions, like shoulder pain (Santamato et al., 2009), knee arthritis (Kheshie et al., 2014), low back pain (Alayat et al., 2014), and chronic lateral epicondylitis (Dundar et al., 2015). Recently, Dundar manifested that HILT improved pain and NDI scores in females with trapezius muscle myofascial pain (Dundar et al., 2015).

Furthermore, El-Shamy's research supported our study as pulsed high-intensity laser in hemophilic patients enhanced the six-minute walk test compared to other treatment groups allowing an ultimate result of a better quality of life (El-Shamy et al., 2018). Also, Haładaj proclaimed that the HILT to Saunders traction device significantly improved pain and NDI on short- and long-term effects (Haładaj et al., 2017). Besides, Ordahan supported our results where their functional activity scores of the foot and ankle plantar fasciitis increased, which advanced the patients' quality of life in the HILT group more than in the LLLT group (Ordahan et al., 2018). Finally, Elsodany proved that pulsed Nd: YAG laser improved shoulder ROM and disability index after treating rotator cuff tendinopathy (Elsodany et al., 2018).

This inability to obtain the results of HILT alone due to adding HILT to traditional treatment makes a recommendation of lone investigation of the HILT effect a priority. Also, investigating the HILT effect with different MTrps treatment techniques and the effect of HILT on different areas of MTrps on the body and different cervical pathologies is recommended.

## 4 Conclusion

Adding HILT to traditional treatment could significantly decrease pain and improve cervical ROM and neck functional ability in patients with chronic cervical myofascial trigger points compared to traditional treatment alone. These results could help physiotherapists to consider a proper treatment for myofascial trigger points rather than consuming time and effort on other techniques that could be less effective.

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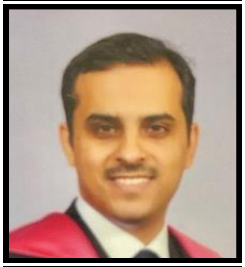

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