

## **The effects of high intensity laser therapy on pain and function in patients with knee osteoarthritis.**

[Kim GJ](#)<sup>1</sup>, [Choi J](#)<sup>1</sup>, [Lee S](#)<sup>2</sup>, [Jeon C](#)<sup>3</sup>, [Lee K](#)<sup>4</sup>.

### **Author information**

1Department of Rehabilitation Science, Graduate School, Daegu University, Republic of Korea.

2Department of Physical Therapy, U1 University, Republic of Korea.

3Department of Physical Therapy, The Most Holy Trinity Hospital, Republic of Korea.

4Department of Physical Therapy, The Kang Hospital, Republic of Korea.

### **Abstract**

[Purpose] The purpose of this study was to examine the effects of high intensity laser therapy (HILT) on pain and function in patients with knee osteoarthritis. [Subjects and Methods] In this study, an experiment was conducted on 20 subjects who were divided into the control group (n=10), which would receive conservative physical therapy (CPT), and the experimental group (n=10), which would receive effects of high intensity laser therapy after conservative physical therapy. All patients received their respective therapies three times each week over a four-week period. In terms of the intensity of the high intensity laser therapy, it was applied to each patient in the tibia and femoral epicondyle for five minutes while the patient's knee joint was bent at around 30° and the separation distance between the handpiece and the skin was maintained at around 1 cm. The visual analogue scale was used to measure pain, and the Korean Western Ontario and McMaster Universities Osteoarthritis Index was used for functional evaluations. [Results] The comparison of differences in the measurements taken before and after the experiment within each group showed a statistically significant decline in both the VAS and the K-WOMAC. The comparison of the two groups showed that the high intensity laser therapy group had statistically significant lower scores in both the visual analogue scale and the Korean Western Ontario and McMaster Universities Osteoarthritis Index than the conservative physical therapy group. [Conclusion] High intensity laser therapy is considered an effective non-surgical intervention for reducing pain in patients with knee osteoarthritis and helping them to perform daily activities.

## Effectiveness of High Intensity Laser Therapy for Reduction of Pain in Knee Osteoarthritis.

[Angelova A<sup>1</sup>](#), [Ilieva EM<sup>1</sup>](#).

### Author information

<sup>1</sup>Medical University of Plovdiv, Plovdiv, Bulgaria.

### **Abstract**

*Introduction.* Osteoarthritis is the most common type of arthritis. It is the main cause of chronic musculoskeletal pain and disability among the elderly population. *Aim.* This is a pilot, randomized clinical study about the effect of high intensity laser therapy in patients with osteoarthritis of the knee (OA of the knee). *Material and Method.* 72 patients (aged between 39 and 83 years) with (clinically and radiographically proved) OA of the knee were included in the study. They were randomized in two groups: therapeutic (test) one ( $n = 37$ ,  $65,11 \pm 1,40$  (mean  $\pm$  SD) years old; patients were treated with HILT) and control group ( $n = 35$ ,  $64,71 \pm 1,98$ ; patients receive sham laser). Both groups had seven sessions of treatment. VAS and dolorimetry were used for assessment of pain before and after the therapy. Pedobarometric analysis (static and dynamic) was used to assess comparatively the contact surface area and maximum pressure under the heel. *Results.* Pain levels measured by VAS and dolorimetry decreased significantly in the therapeutic group after seven days of treatment ( $p < 0,001$ ). *Conclusion.* The results after seven days of treatment show more intensive and cumulative effect after the application of high intensity laser therapy in comparison to sham laser. This is the reason why HILT can be a method of choice in the treatment of gonarthrosis.

## **Photobiomodulation therapy (PBMT) and/or cryotherapy in skeletal muscle restitution, what is better? A randomized, double-blinded, placebo-controlled clinical trial.**

[de Paiva PR](#)<sup>1,2</sup>, [Tomazoni SS](#)<sup>3</sup>, [Johnson DS](#)<sup>4</sup>, [Vanin AA](#)<sup>1,5</sup>, [Albuquerque-Pontes GM](#)<sup>1,2</sup>, [Machado CD](#)<sup>1</sup>, [Casalechi HL](#)<sup>1</sup>, [de Carvalho PT](#)<sup>1,2,5</sup>, [Leal-Junior EC](#)<sup>6,7,8</sup>.

### **Author information**

1Laboratory of Phototherapy in Sports and Exercise, Universidade Nove de Julho (UNINOVE), Rua Vergueiro 235, 01504-001, São Paulo, SP, Brazil.

2Postgraduate Program in Biophotonics Applied to Health Sciences, Universidade Nove de Julho (UNINOVE), São Paulo, SP, Brazil.

3Department of Pharmacology, University of São Paulo, São Paulo, SP, Brazil.

4Multi Radiance Medical, Solon, OH, USA.

5Postgraduate Program in Rehabilitation Sciences, Universidade Nove de Julho (UNINOVE), São Paulo, SP, Brazil.

6Laboratory of Phototherapy in Sports and Exercise, Universidade Nove de Julho (UNINOVE), Rua Vergueiro 235, 01504-001, São Paulo, SP, Brazil.

ernesto.leal.junior@gmail.com.

7Postgraduate Program in Biophotonics Applied to Health Sciences, Universidade Nove de Julho (UNINOVE), São Paulo, SP, Brazil. ernesto.leal.junior@gmail.com.

8Postgraduate Program in Rehabilitation Sciences, Universidade Nove de Julho (UNINOVE), São Paulo, SP, Brazil. ernesto.leal.junior@gmail.com.

### **Abstract**

Cryotherapy for post-exercise recovery remains widely used despite the lack of quality evidence. Photobiomodulation therapy (PBMT) studies (with both low-level laser therapy and light-emitting diode therapy) have demonstrated positive scientific evidence to suggest its use. The study aims to evaluate PBMT and cryotherapy as a single or combined treatment on skeletal muscle recovery after eccentric contractions of knee extensors. Fifty healthy male volunteers were recruited and randomized into five groups (PBMT, cryotherapy, cryotherapy + PBMT, PMBT + cryotherapy, or placebo) for a randomized, double-blinded, placebo-controlled trial that evaluated exercise performance (maximum voluntary contraction (MVC)), delayed onset muscle soreness (DOMS), and muscle damage (creatine kinase (CK)). Assessments were performed at baseline; immediately after; and at 1, 24, 48, 72, and 96 h. Comparator treatments was performed 3 min after exercise and repeated at 24, 48, and 72 h. PBMT was applied employing a cordless, portable GameDay™ device (combination of 905 nm super-pulsed laser and 875- and 640-nm light-emitting diodes (LEDs); manufactured by Multi Radiance Medical™, Solon - OH, USA), and cryotherapy by flexible rubber ice packs. PBMT alone was optimal for post-exercise recovery with improved MVC, decreased DOMS, and CK activity ( $p < 0.05$ ) from 24 to 96 h compared to placebo, cryotherapy, and cryotherapy + PBMT. In the PBMT + cryotherapy group, the effect of PBMT was decreased ( $p > 0.05$ ) but demonstrated significant improvement in MVC, decreased DOMS, and CK activity ( $p < 0.05$ ). Cryotherapy as single treatment and cryotherapy + PBMT were similar to

placebo ( $p > 0.05$ ). We conclude that PBMT used as single treatment is the best modality for enhancement of post-exercise restitution, leading to complete recovery to baseline levels from 24 h after high-intensity eccentric contractions.

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## **High-intensity versus low-level laser therapy in the treatment of patients with knee osteoarthritis: a randomized controlled trial.**

[Kheshie AR](#)<sup>1</sup>, [Alayat MS](#), [Ali MM](#).

### **Author information**

<sup>1</sup>Department of Anatomy, Faculty of Medicine, Umm Al-Qura University, Mecca, Saudi Arabia.

### **Abstract**

The aim of this randomized controlled study was to compare the effects of low-level laser therapy (LLLT) and high-intensity laser therapy (HILT) on pain relief and functional improvement in patients with knee osteoarthritis (KOA). A total of 53 male patients participated in this study, with a mean (SD) age of 54.6 (8.49) years. Patients were randomly assigned into three groups and treated with HILT and exercise (HILT + EX), LLLT and exercise (LLLT + EX), and placebo laser plus exercise (PL + EX) in groups 1, 2, and 3, respectively. The outcomes measured were pain level measured by visual analog scale (VAS) and knee function measured by Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Statistical analyses were performed to compare the differences between baseline and posttreatment measurements. The level of statistical significance was set as  $P < 0.05$ . The result showed that HILT and LLLT combined with exercise were effective treatment modalities in decreasing the VAS and WOMAC scores after 6 weeks of treatment. HILT combined with exercises was more effective than LLLT combined with exercises, and both treatment modalities were better than exercises alone in the treatment of patients with KOA.

## **Analgesic effect of high intensity laser therapy in knee osteoarthritis.**

[Stiglić-Rogožnica N<sup>1</sup>](#), [Stamenković D](#), [Frlan-Vrgoč L](#), [Avancini-Dobrović V](#), [Vrbanić TS](#).

### **Author information**

<sup>1</sup>Center of Physical and Rehabilitation Medicine, Rijeka University Hospital Center, Rijeka, Croatia.

### **Abstract**

Knee osteoarthritis (KOA), the most common type of osteoarthritis (OA), is associated with pain and inflammation of the joint capsule, impaired muscular stabilization, reduced range of motion and functional disability. High-intensity laser therapy (HILT) involves higher-intensity laser radiation and causes minor and slow light absorption by chromophores. Light stimulation of the deep structures, due to high intensity laser therapy, activates cell metabolism through photochemical effect. The transmissions of pain stimulus are slowed down and result in a quick achievement of pain relief. The aim of our research was to investigate the prompt analgesic effect of HILT on patients with KOA. Knee radiographs were performed on all patients and consequently graded using the Kellgren-Lawrence grading scale (K/L). A group of 96 patients (75 female, 21 male, mean age 59.2) with K/L 2 and 3 were submitted to HILT therapy. Pain intensity was evaluated with visual analogue scale (VAS) before and after the treatment. HILT consisted in one daily application, over a period of ten days, using protocol wavelength, frequency and duration. The results showed statistically significant decrease in VAS after the treatment ( $p < 0.001$ ). Considering these results, HILT enables prompt analgesic effects in KOA treatment. Therefore HILT is a reliable option in KOA physical therapy.

## **Effects of low-level laser therapy applied before or after plyometric exercise on muscle damage markers: randomized, double-blind, placebo-controlled trial.**

[Fritsch CG](#)<sup>1</sup>, [Dornelles MP](#)<sup>1</sup>, [Severo-Silveira L](#)<sup>1</sup>, [Marques VB](#)<sup>1</sup>, [Rosso IA](#)<sup>1</sup>, [Baroni BM](#)<sup>2</sup>.

### **Author information**

<sup>1</sup>Physiotherapy Department, Universidade Federal de Ciências da Saúde de Porto Alegre, Rua Sarmiento Leite, 245, Porto Alegre, RS, 90050-170, Brasil.

<sup>2</sup>Physiotherapy Department, Universidade Federal de Ciências da Saúde de Porto Alegre, Rua Sarmiento Leite, 245, Porto Alegre, RS, 90050-170, Brasil. [bbaroni@yahoo.com.br](mailto:bbaroni@yahoo.com.br).

### **Abstract**

Promising effects of phototherapy on markers of exercise-induced muscle damage has been already demonstrated in constant load or isokinetic protocols. However, its effects on more functional situations, such as plyometric exercises, and when is the best moment to apply this treatment (pre- or post-exercise) remain unclear. Therefore, the purpose of this study was to investigate the effect of low-level laser therapy (LLLT) before or after plyometric exercise on quadriceps muscle damage markers. A randomized, double-blinded, placebo-controlled trial was conducted with 24 healthy men, 12 at pre-exercise treatment group and 12 at post-exercise treatment group. Placebo and LLLT (810 nm, 200 mW per diode, 6 J per diode, 240 J per leg) were randomly applied on right/left knee extensor muscles of each volunteer before/after a plyometric exercise protocol. Muscular echo intensity (ultrasonography images), soreness (visual analogue scale - VAS), and strength impairment (maximal voluntary contraction - MVC) were assessed at baseline, 24, 48, and 72 h post-exercise. Legs treated with LLLT before or after exercise presented significantly smaller increments of echo intensity (values up to 1 %) compared to placebo treatments (increased up to ~7 %). No significant treatment effect was found for VAS and MVC, although a trend toward better results on LLLT legs have been found for VAS (mean values up to 30 % lesser than placebo leg). In conclusion, LLLT applied before or after plyometric exercise reduces the muscle echo intensity response and possibly attenuates the muscle soreness. However, these positive results were not observed on strength impairment.

## **Effect of Laser Therapy on Chronic Osteoarthritis of the Knee in Older Subjects.**

[Youssef EF<sup>1</sup>](#), [Muaidi QI<sup>2</sup>](#), [Shanb AA<sup>1</sup>](#).

### **Author information**

1 Department of Physical Therapy, College of Applied Medical Sciences, University of Dammam, Dammam, Saudi Arabia.

2 Chairman of Physical Therapy Department; Vice Dean for Academic Affairs of College of Applied Medical Sciences, University of Dammam, Dammam, Saudi Arabia.

### **Abstract**

#### **INTRODUCTION:**

Osteoarthritis (OA) is a common degenerative joint disease particularly in older subjects. It is usually associated with pain, restricted range of motion, muscle weakness, difficulties in daily living activities and impaired quality of life. To determine the effects of adding two different intensities of low-level laser therapy (LLLT) to exercise training program on pain severity, joint stiffness, physical function, isometric muscle strength, range of motion of the knee, and quality of life in older subjects with knee OA.

#### **METHODS:**

Patients were randomly assigned into three groups. They received 16 sessions, 2 sessions/week for 8 weeks. Group-I: 18 patients were treated with a laser dose of 6 J/cm(2) with a total dose of 48 J. Group-II: 18 patients were treated with a laser dose of 3 J/cm(2) with a total dose of 27 J. Group-III: 15 patients were treated with laser without emission as a placebo. All patients received same exercise training program including stretching and strengthening exercises. Patients were evaluated before and after intervention by visual analogue scale (VAS), the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) index for quality of life, handheld dynamometer and universal goniometer.

#### **RESULTS:**

T test revealed that there was a significant reduction in VAS and pain intensity, an increase in isometric muscle strength and range of motion of the knee as well as increase in physical functional ability in three treatment groups. Also analysis of variance (ANOVA) proved significant differences among them and the post hoc tests (LSD) test showed the best improvements for patients of the first group.

#### **CONCLUSION:**

It can be concluded that addition of LLLT to exercise training program is more effective than exercise training alone in the treatment of older patients with chronic knee OA and the rate of improvement may be dose dependent, as with 6 J/cm(2) or 3 J/cm(2).

## **Low level laser therapy associated with a strength training program on muscle performance in elderly women: a randomized double blind control study.**

[Toma RL](#)<sup>1</sup>, [Vassão PG](#)<sup>2</sup>, [Assis L](#)<sup>2</sup>, [Antunes HK](#)<sup>2</sup>, [Renno AC](#)<sup>2</sup>.

### **Author information**

<sup>1</sup> Department of Biosciences, Federal University of São Paulo, Campus Baixada Santista, Av. Ana Costa, 95, 11060-001, Santos, SP, Brazil. [renataluri@gmail.com](mailto:renataluri@gmail.com).

<sup>2</sup> Department of Biosciences, Federal University of São Paulo, Campus Baixada Santista, Av. Ana Costa, 95, 11060-001, Santos, SP, Brazil.

### **Abstract**

The aging process leads to a gradual loss of muscle mass and muscle performance, leading to a higher functional dependence. Within this context, many studies have demonstrated the benefits of a combination of physical exercise and low level laser therapy (LLLT) as an intervention that enhances muscle performance in young people and athletes. The aim of this study was to evaluate the effects of combination of LLLT and strength training on muscle performance in elderly women. For this, a hundred elderly women were screened, and 48 met all inclusion criteria to participate in this double-blind placebo-controlled trial. Volunteers were divided in three groups: control (CG = 15), strength training associated with placebo LLLT (TG = 17), and strength training associated with active LLLT (808 nm, 100 mW, 7 J) (TLG = 16). The strength training consisted of knee flexion-extension performed with 80 % of 1-repetition maximum (1-RM) during 8 weeks. Several outcomes related to muscle performance were analyzed through the 6-min walk test (6-MWT), isokinetic dynamometry, surface electromyography (SEMG), lactate concentration, and 1-RM. The results revealed that a higher work ( $p = 0.0162$ ), peak torque ( $p = 0.0309$ ), and power ( $p = 0.0223$ ) were observed in TLG compared to CG. Furthermore, both trained groups increased the 1-RM load (TG vs CG:  $p = 0.0067$  and TLG vs CG:  $p < 0.0001$ ) and decreased the lactate concentration in the third minute after isokinetic protocol (CG vs TLG:  $p = 0.0289$  and CG vs TG:  $p = 0.0085$ ). No difference in 6-MWT and in fatigue levels were observed among the groups. The present findings suggested that LLLT in combination with strength training was able to improve muscle performance in elderly people.



## **Low Level Laser Therapy for chronic knee joint pain patients.**

Nakamura T1, Ebihara S2, Ohkuni I2, Izukura H2, Harada T2, Ushigome N2, Ohshiro T3, Musha Y4, Takahashi H1, Tsuchiya K1, Kubota A1.

### **Author information**

1Department of Orthopaedic Surgery, Toho University School of Medicine.

2Department of Rehabilitation Medicine, Toho University School of Medicine.

3Japan Medical Laser Laboratory.

4Department of Orthopaedic Surgery, Ohashi Hospital, Toho University School of Medicine.

### **Abstract**

#### **BACKGROUND AND AIMS:**

Chronic knee joint pain is one of the most frequent complaints which is seen in the outpatient clinic in our medical institute. In previous studies we have reported the benefits of low level laser therapy (LLLT) for chronic pain in the shoulder joints, elbow, hand, finger and the lower back. The present study is a report on the effects of LLLT for chronic knee joint pain.

#### **MATERIALS AND METHODS:**

Over the past 5 years, 35 subjects visited the outpatient clinic with complaints of chronic knee joint pain caused by the knee osteoarthritis-induced degenerative meniscal tear. They received low level laser therapy. A 1000 mW semi-conductor laser device was used to deliver 20.1 J/cm(2) per point in continuous wave at 830nm, and four points were irradiated per session (1 treatment) twice a week for 4 weeks.

#### **RESULTS:**

A visual analogue scale (VAS) was used to determine the effects of LLLT for the chronic pain and after the end of the treatment regimen a significant improvement was observed ( $p < 0.001$ ). After treatment, no significant differences were observed in the knee joint range of motion. Discussions with the patients revealed that it was important for them to learn how to avoid postures that would cause them knee pain in everyday life in order to have continuous benefits from the treatment.

#### **CONCLUSION:**

The present study demonstrated that 830 nm LLLT was an effective form of treatment for chronic knee pain caused by knee osteoarthritis. Patients were advised to undertake training involving gentle flexion and extension of the knee.