JOURNAL OF ATHLETIC TRAINING
Volume 48 Issue 1, pp. 57–67

doi:10.4085/1062-6050-48.1.12

Does Phototherapy Enhance Skeletal Muscle Contractile Function and Postexercise Recovery? A Systematic Review

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Context: Recently, researchers have shown that phototherapy administered to skeletal muscle immediately before resistance exercise can enhance contractile function, prevent exercise-induced cell damage, and improve postexercise recovery of strength and function.

Objective: To critically evaluate original research addressing the ability of phototherapeutic devices, such as lasers and lightemitting diodes (LEDs), to enhance skeletal muscle contractile function, reduce exercise-induced muscle fatigue, and facilitate postexercise recovery.

Data Sources: We searched the electronic databases PubMed, SPORTDiscus, Web of Science, Scopus, and Rehabilitation & Physical Medicine without date limitations for the following key words: *laser therapy, phototherapy, fatigue, exercise, circulation, microcirculation, and photobiomodulation*.

Study Selection: Eligible studies had to be original research published in English as full papers, involve human participants, and receive a minimum score of 7 out of 10 on the Physiotherapy Evidence Database (PEDro) scale.

Data Extraction: Data of interest included elapsed time to fatigue, total number of repetitions to fatigue, total work performed, maximal voluntary isometric contraction (strength), electromyographic activity, and postexercise biomarker levels. We recorded the PEDro scores, beam characteristics, and treatment variables and calculated the therapeutic outcomes and effect sizes for the data sets.

Data Sythesis: In total, 12 randomized controlled trials met the inclusion criteria. However, we excluded data from 2 studies, leaving 32 data sets from 10 studies. Twenty-four of the 32 data sets contained differences between active phototherapy and sham (placebo-control) treatment conditions for the various outcome measures. Exposing skeletal muscle to single-diode and multidiode laser or multidiode LED therapy was shown to positively affect physical performance by delaying the onset of fatigue, reducing the fatigue response, improving postexercise recovery, and protecting cells from exercise-induced damage.

Conclusions: Phototherapy administered before resistance exercise consistently has been found to provide ergogenic and prophylactic benefits to skeletal muscle.

Key Words: photobiomodulation, laser therapy, skeletal muscle fatigue

Key Points:

- Phototherapy administered before resistance exercise may enhance contractile function, reduce exercise-induced muscle damage, and facilitate postexercise recovery.
- The effectiveness of phototherapy is dose dependent, so selecting appropriate treatment variables, such as wavelength and output power, is important.
- In attempting to reproduce clinical outcomes, clinicians and researchers should use evidence-based decision making when selecting treatment variables in phototherapy
- Given the increased beam reflection and attenuation at the skin interface, a larger treatment dose may be necessary when using light-emitting diodes (LEDs) instead of a semiconductor laser.

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