groups: LLLT group (LLLTG), treated with an 808nm laser (16J) applied to TPs in the upper trapezius; and Sham group (SHAMG), which will receive the same protocol with a placebo LLLT. The treatment will consist of eight sessions, twice a week, over four weeks, with participants lying in a supine position, with their cervical spine in a neutral position. Pain perception (Numeric Pain Rating Scale), skin temperature (Tsk) (E54 thermographic camera, FLIR, USA), presence of TPs (palpation), and cervical disability index (Neck Disability Index) will be assessed at three time points: before, immediately after, and 48 hours post-protocol. The global perceived effect (GPE) will be evaluated after the final session and 48 hours later. The primary outcomes will be pain and Tsk. Statistical analysis will use linear mixed models in SPSS, and a Q-Q plot will be generated to check for normal distribution of the data.
Results: It is expected that the LLLT treatment protocol with an inhibitory dose of 16J on the trapezius will significantly reduce pain compared to the Sham group. Regarding skin temperature, it may increase if vasodilation is the predominant response to LLLT or decrease if there is a reduction in metabolic activity and inflammatory mediators. Improvements in the Neck Disability Index and global perception of improvement are also expected.
Conclusion: The findings of this study may provide evidence on the effects of the inhibitory dose of LLLT on pain and skin temperature in individuals with TPs. If the therapy proves effective, these results could contribute to the refinement of clinical follow-up and rehabilitation protocols.
Implications: The results may directly impact clinical practice by supporting a more effective treatment for TPs. If LLLT with an inhibitory dose demonstrates positive effects in reducing pain and modulating temperature, its application could serve as an alternative for the management of trigger points, expanding therapeutic options for physical therapists and other healthcare professionals. Meanwhile, thermography may serve as a useful tool for monitoring treatment responses.
Keywords: Pain, Low-Level Laser Therapy, Thermography

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EXPLORING THE RELATIONSHIP OF PAIN, DISABILITY, PSYCHOLOGICAL FACTORS, AND SLEEP QUALITY WITH SHOULDER MOBILITY DEFICITS IN FROZEN SHOULDER

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Background: Shoulder mobility restriction is a central feature in individuals with frozen shoulders, a musculoskeletal condition that significantly impacts the functionality of those affected. Psychological factors such as anxiety, depression, kinesiophobia, and pain catastrophizing, along with sleep quality, have been associated with pain and disability in various chronic pain conditions. However, it remains unclear which of these factors are most strongly associated with shoulder mobility deficits in individuals with frozen shoulder.
Objectives: To analyze the association of pain, disability, psychological factors (anxiety, depression, kinesiophobia, pain catastrophizing) and sleep quality with shoulder mobility deficits in individuals with frozen shoulder.
Methods: A cross-sectional study conducted via video call using Google Meet®. Shoulder mobility was assessed using Kinovea® software, considering flexion, abduction (in degrees), and external rotation (in centimeters) for the painful and non-painful sides. Pain and disability were measured using the Shoulder Pain and Disability Index (SPADI), while self-efficacy was evaluated using the Pain Self-Efficacy Scale (PSEQ-10). Anxiety and depression were assessed using the Hospital Anxiety and Depression Scale (HADS), kinesiophobia with the Tampa Scale for Kinesiophobia-11 (TSK-11), pain catastrophizing with the Pain Catastrophizing Scale (PCS), and sleep quality using the Pittsburgh Sleep Quality Index (PSQI). Data analysis was performed using multiple linear regression with two distinct models. In the first model, the external rotation mobility deficit (difference between painful and non-painful sides) was the dependent variable. In the second, the arm elevation deficit was calculated as the average of the differences in flexion and abduction, and was also a dependent variable. The other variables were considered independent.
Results: Ninety-six individuals participated, with 57 diagnosed with primary frozen shoulder and 39 with secondary frozen shoulder [72 women, mean age = 53.1 $\pm$ 10.8 years, BMI = 26.3 $\pm$ 4.8 kg/m^2]. For external rotation, none of the variables were associated with mobility deficits. However, for arm elevation, pain was significantly associated, contributing 5.5% to the variation in mobility ($f(1,94) = 6.52$, $p < 0.012$, adjusted $R^2 = 0.055$, RMSE = 19.35). Other psychological factors and sleep quality were not significantly associated with shoulder mobility deficits.
Conclusion: Pain was significantly associated with shoulder mobility restriction, particularly in arm elevation, although with a modest contribution. Psychological factors and sleep quality did not demonstrate a relevant association with mobility deficits.
Implications: These findings suggest that while pain has some impact on shoulder mobility, other factors not investigated in this study may have a more significant influence on mobility restriction. Psychological factors and sleep quality should likely not be the primary focus in addressing mobility deficits but could be incorporated as complementary strategies aimed at the patient's overall well-being.
Keywords: Frozen shoulder, shoulder pain, range of motion

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