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Background: Conditioned pain modulation (CPM) evaluates the endogenous pain inhibitory mechanisms, and its identification may be crucial for understanding pathophysiology and pain mechanisms. Although CPM has been extensively studied in chronic pain conditions, there is still limited evidence in post-traumatic chronic pain conditions, mainly in upper limb injuries.

Objectives: The aim of this study was to investigate the correlation between conditioned pain modulation (CPM) and the upper limb disability in patients after traumatic musculoskeletal injuries.

Methods: Adult patients of both sexes with musculoskeletal trauma in the upper limb were evaluated after 3 months of the traumatic event. The pressure pain threshold assessment (PPT) was conducted using a digital algometer (Wagner Instrument) on the upper trapezius and the Disabilities of the arm, shoulder, and hand (DASH, 0-100) questionnaire was used. The evaluation of CPM was conducted using the painful conditioning stimulus, the Cold Pressor Test. Pain intensity was assessed using the Visual Numeric Scale (VNS), and the pressure pain threshold was measured with an algometer every 30 seconds and immediately after the hand was removed from the water. Pearson correlation was used to measure the strength and direction of the relationship between two continuous variables. Its value ranges from +1, indicating a perfect positive correlation, to -1, indicating a perfect negative correlation. A value of 0 suggests no linear correlation between the variables.

Results: This cross-sectional study evaluated 18 patients, predominantly men (66,7%), with upper limb fractures (88.9%) and complex injury (11.1%) with a mean age of 40,78 (15.3) years, involving the shoulder/arm (n = 55.50%), elbow/forearm (n = 16.70%), and wrist/hand (n = 27.8%). The mean score of DASH was 38.39 (20.6). The pain intensity was slight (32.7) in patients after three months of the traumatic musculoskeletal injury. The average hand immersion time in cold water was 83.8 (43.5) seconds. The PPT on the upper trapezius of the affected side was 6.1 (4.4) kg/cm² before the hand immersion in cold water and 5.8 (3.9) kg/cm² after the painful stimulus, i.e., the hand immersion in cold water. The post-pre difference averaged was - 0.3 (2.6) indicating a poor response of the endogenous pain inhibitory mechanisms. There was no correlation between the CPM and DASH score ($r = 0.11$, $p = 0.65$).

Conclusion: The endogenous pain inhibitory mechanisms was poor in patients after three months of the injury. However, there is no correlation between the endogenous pain inhibitory mechanisms measured by CPM and upper limb disability measured by DASH in patients after three months of the traumatic musculoskeletal injury. **Implications:** This is a cross-sectional study which does not allow for longitudinal analyses with a small sample size. However, the findings might have clinical relevance suggesting better understanding on pain mechanisms that contributes to pain chronification after traumatic injuries.

Keywords: arm injuries, disability, fractures, trauma

Conflict of interest: The authors declare no conflict of interest.

Funding: FAPEMIG - APQ 00444-21.

Ethics committee approval: No.6.204.652.

Registration: Not applicable.

<https://doi.org/10.1016/j.bjpt.2025.101477>

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EFFECTS OF TRANSCRANIAL DIRECT CURRENT STIMULATION ON ANXIETY AND DEPRESSION IN INDIVIDUALS WITH NEUROPATHIC PAIN: SYSTEMATIC REVIEW AND META-ANALYSIS

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Background: Neuropathic pain is a common disorder that may cause physical impairment and has been associated with anxiety and depression. The Transcranial Direct Current Stimulation (tDCS) may assist in managing populations with chronic symptoms. However, findings in the literature remain conflicting, with prior studies reporting small effect sizes and factors that may influence tDCS efficacy.

Objectives: To evaluate the effects of tDCS on anxiety and depression in patients with chronic neuropathic pain.

Methods: A literature search was conducted in the MEDLINE, CINAHL, EMBASE, and CENTRAL databases in February 2024. Included studies were controlled clinical trials involving patients with chronic neuropathic pain undergoing tDCS. The meta-analysis was calculated using the Standardized Mean Difference (SMD) with a 95% confidence interval (CI) and the level of evidence was assessed with GRADE approach.

Results: The search retrieved 1,729 articles. After screening, 9 studies were included and compared the effects of active tDCS versus sham tDCS on depression, with a combined sample of 256 participants, and 8 studies that investigated effects on anxiety, with a total of 216 participants. All studies applied anodal current to the stimulation target. The predominant stimulation site was the Primary Motor Cortex (M1), with current intensity ranging from 1 mA to 2 mA, 5–14 sessions, and session duration of 20–30 minutes each. Low-quality evidence indicated that active tDCS was not superior to sham tDCS in improving depression (SMD = -0.24; 95% CI [-0.55, 0.07]; $P = 0.13$), with low heterogeneity ($I^2 = 32\%$, $P = 0.16$). Low-quality evidence showed no superiority of active tDCS over sham tDCS in reducing anxiety (SMD = -0.23; 95% CI [-0.63, 0.17]; $P = 0.26$), with moderate heterogeneity ($I^2 = 50\%$, $P = 0.05$).

Conclusion: The meta-analysis indicated that tDCS was not superior to sham interventions for improving anxiety or depression in individuals with neuropathic pain.

Implications: tDCS should not be used for treating anxiety and depression in patients with chronic pain.

Keywords: Systematic Review, Neuropathic Pain, Transcranial Direct Current Stimulation

Conflict of interest: The authors declare no conflict of interest.

Funding: Not applicable.

Ethics committee approval: CAAE: 79684524.7.0000.5188.

Registration: Not applicable.

<https://doi.org/10.1016/j.bjpt.2025.101478>