

Associations between muscular and psychological adaptation mechanisms in individuals with chronic primary low back pain? A scoping review

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Summary

Chronic primary low back pain (CPLBP) is defined as pain lasting for more than 12 weeks, located between the edge of the posterior rib and the gluteal fold, and is characterized by complex interactions of physiological, psychological, and social factors. Previous studies indicated changes in neurophysiological adaptations to pain quantified by electromyography (EMG) in individuals with CPLBP. These muscular adaptations to pain may be associated with specific psychological mechanisms. The objective of this scoping review is to explore associations between psychological and muscular adaptation mechanisms in individuals with CPLBP.

Introduction

Muscular and psychological adaptation mechanisms specific to individuals with CPLBP, such as redistribution of intramuscular and intermuscular activity and fear avoidance beliefs, are well known. However, the interpretation of associations between muscular and psychological adaptation mechanisms remains challenging due to the complexity and heterogeneity of previously reported results. The objective of this scoping review is to explore associations between psychological and various muscular adaptation mechanisms observed in individuals with CPLBP.

Methods

The literature search was performed across PubMed, CINAHL, and PsycINFO, combining terms related to “low back pain”, “muscular adaptation”, and “psychology”. Articles published between 2000 and January 2025 were included. Eligibility criteria included studies that examined CPLBP and assessed associations between muscular adaptations through EMG and psychological variables. The EMG variables included measures of muscular activity, the flexion-relaxation ratio, and contraction duration, reflecting muscular adaptations, while psychological mechanisms encompassed variables commonly used to characterize the clinical profiles of individuals with CPLBP.

Results

Across the 22 included studies, 844 individuals had CPLBP (50.1% of whom were women), with a weighted mean age of 38.31 ± 5.58 years. Four main psychological mechanisms were identified and ranked in order of frequency as follows: kinesiophobia, pain catastrophizing, fear-avoidance beliefs, and anxiety/depression. While no consistent associations were found between kinesiophobia and muscle adaptations,

pain-related fear, catastrophizing, and anxiety/depression were more frequently associated with increased muscle activity and fatigue.



Figure 1: Proportion of associations and non-associations between psychological variables and muscular adaptations for each psychological variable

Discussion and conclusions

Results revealed diverse and non-significant associations between kinesiophobia, fear-avoidance beliefs, and muscular adaptations, which may be attributed to the task and muscle-dependent nature of these psychological mechanisms [1]. In contrast, positive associations between pain catastrophizing, anxiety, depression, and muscular adaptations suggest a potential role in exacerbating CPLBP [2]. Nevertheless, the methodological heterogeneity and mixed findings highlight the complexity of capturing these relationships, indicating that psychological factors might have a broader impact on behavioural and clinical outcomes rather than directly influencing specific muscular adaptations [3].

References

- [1] Hodges & Tucker (2011), *Pain*, **152**, 90-98.
- [2] Dunn et al. (2024), *Plos one*, **19**.
- [3] Luque-Suarez et al. (2019), *Br. J. Sports. Med.*, **53**, 554-559