

# Pathophysiological Changes Presented by Patients with Chronic Pain, Implications for Rehabilitation in Clinical Practice

## Editorial

Chronic pain is a pathology that is associated with increased mortality and disability in the world population [1]. According to the IASP (International Association for the Study of Pain), pain is defined as “An unpleasant sensory and emotional experience associated with, or similar to, actual or potential tissue damage” [2]. Nociception occurs after a harmful stimulus to the human body, be it mechanical, chemical, thermal, or even emotional stress. This mechanism occurs through the detection of harmful stimuli by nociceptors that will forward information from the peripheral nervous system to the central nervous system [2].

At a cortical level, from the moment we receive this information, it will make connections with cortical areas that are related to attention, affective connections, and the autonomic and immune nervous systems [2]. The pathophysiology of acute pain is associated with pain characterized by information from the central nervous system to the peripheral nervous system, understanding nociception as an unpleasant emotional or sensory experience [2]. Chronic pain is characterized by persistent pain for more than three months, that is, an adaptive response that continues due to a bad experience, which alters the synaptic network, concentration of neurotransmitters, and the size of the cerebral cortex [3].

The literature defined an altered pattern of functional connectivity in the brain of individuals with chronic pain, these changes were observed by a network meta-analysis that observed neurofunctional changes through magnetic resonance imaging compared with healthy individuals through brain map studies, where it was possible to detect patterns of neurofunctional abnormalities in individuals with chronic pain when performing a task [3]. The Authors observed significant differences in the insular cortex, which is related to pain response, the cingulate cortex, which is related to cognitive and emotional functions, the sensorimotor system, attention, memory, and planning [3].

## Editorial

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These changes can negatively interfere with the amplification of pain sensitivity, causing emotional and physical changes, which have been observed by other authors, such as the perception of the disease, attitudes towards pain, and beliefs, that may be responsible for pathological behaviors such as kinesiophobia, and depression [4]. It is possible to observe that the main triggering factor for this pathological pattern was the nodal stress mechanism [3]. The nodal stress mechanism is controlled by the autonomic nervous system, since Pain alters the physiological balance of this system, increasing the excitability of the sympathetic nervous system, increasing the resting heart rate, and a high concentration

of cortisol in the bloodstream, as a response. adaptive to stress [5,6].

The exacerbation of the nociception process when it acts persistently (chronification) physiologically alters the musculoskeletal system, being responsible for hyperalgesia and chronic muscle pain, arising from the increase in peripheral receptors, namely acid-sensitive ion channels, and acid-dependent ion channels. ligands, and ligand-gated ion channels [5,6]. Central sensitization of superior cortical areas, as mentioned above, associated with pathophysiological changes in the skeletal muscle system, are responsible for changes in the muscular structure such as a reduction in the cross-sectional area of the muscle and an increase in the number of glycolic fibers with a decrease in oxidative fibers, causing an increase in of fatigue and metabolic deficit for energy production for muscle contraction, changes observed by muscle biopsy [6].

Motor control is altered, with muscular inhibition observed due to evoked pain, aberrant postures and movement patterns triggered by movement adaptations, and proprioceptive changes, which directly affect the joint stability and physical capacity of the individual with chronic pain [5]. Such changes occur due to the imbalance of the neuromuscular inhibition and facilitation reflex, increased neural excitability in response to Pain, which can generate increased excitability of Gamma motor neurons, generating spasms and muscle contractures, causing changes in patterns of motor activity and recruitment during functional movement, this can be observed by studies using electroneuromyography [5].

Muscle inhibition is common among these individuals, arising from an adaptive behavior to protect against increased Pain, inducing muscle atrophy observed by ultrasound examinations, which is called a model of adaptation to Pain [5]. Pain alters the reaction time of

individuals, making balance difficult and decreasing their spatial perception, making it possible to observe a greater number of oscillations caused by a balance deficit, assessed by stabilometry [5]. We can then define a pattern of pathophysiological changes in the individual with chronic pain, which are an altered synaptic network in response to pain behavior, which is associated with fear, anxiety, depression, cognitive and affective changes, and memory deficits, associated with difficulty in carry out planning of a task [3,5].

Myopathies are associated with changes in the concentration of glycolytic and oxidative fibers, predisposing the individual to muscle fatigue and inability to generate the energy necessary for muscle contraction, neuromuscular dysfunctions of motor control, muscle inhibition, balance, and proprioception deficits [6]. Not necessarily all individuals will present all pathophysiological changes to the same magnitude [3-6]. Justifying a multimodal approach to patients with chronic pain, and elucidating the importance of a better understanding of the pathophysiology of pain, so that professionals can carry out more effective treatments [7].

Currently, some types of chronic pain classification already have well-established guidelines, but what is observed in recent studies is the lack of criteria for the development of exercise therapy that presents a multimodal approach, as well as studies with good methodological quality [8]. Despite the growing number of studies seeking appropriate pain treatment methods, we have not methodologically observed a comprehensive assessment of these individuals, making it possible only to observe subjective assessments [9]. The difficulty of diagnosis and the cost of carrying out specific assessments may justify this scenario, requiring greater encouragement for research and multicenter studies with the support of existing laboratories, for a more precise understanding and development of clinical practice based on evidence [9].

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