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# NONPHARMACOLOGIC TREATMENT APPROACH TO PAIN

## AĞRIYA FARMAKOLOJİK OLMAYAN TEDAVİ YAKLAŞIMI

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**Abstract**

Chronic pain has various forms such as inflammatory pain, visceral pain, headache, disk-related pain, neuropathic pain, cancer pain. Although the biological basis of chronic pain is related to vulnerability, it continues with behavioral and psychological components. In the context of multimodal interventions, interventions other than systemic pharmacologic treatments for chronic pain are also present. Besides interventional approaches; there are several noninvasive options including cognitive behavioral therapy, biofeedback, relaxation therapy, physical therapy, thermal applications, transcutaneous electrical stimulation and spinal cord stimulation. The neuroscientific approach to pain can only be achieved by combining physical and mental components of the pain with neuroscience

**Keywords:** pain, neuroscience, treatment

**Özet**

*Kronik ağrının, enflamatuvar ağrı, visseral ağrı, baş ağrısı, disk ilişkili ağrı, nöropatik ağrı, kanser ağrısı gibi çeşitli biçimleri bulunmaktadır. Her ne kadar kronik ağrının biyolojik temeli yatkınlık ile ilişkili olsa da, davranışsal ve psikolojik bileşenleri de bulunmaktadır. Ağrıya çok yönlü müdahaleler kapsamında, sistemik farmakolojik tedaviler dışında müdahale seçenekleri de mevcuttur. Kronik ağrı tedavisinde girişimsel yaklaşımların yanı sıra; bilişsel davranışçı terapi, biofeedback, gevşeme terapisi, fizik tedavi, termal uygulamalar, transkütanöz elektrik stimülasyonu ve spinal kord stimülasyonu dahil olmak üzere birçok invaziv olmayan seçenekler bulunmaktadır. Ağrıya sinirbilimsel yaklaşım, sadece ağrının fiziksel ve ruhsal bileşenlerini nörobilim çerçevesinde ele alarak elde edilebilir*

**Anahtar Kelimeler:** ağrı, sinirbilim, tedavi

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## 1. Introduction

Pain is defined by the International Association for the Study of Pain (IASP) as "an unpleasant sensory and emotional experience related to actual or potential tissue damage" (IASP Task Force on Taxonomy, 1994). Acute pain is an essential, protective mechanism alerting about potential dangers (Woolf, 2004).

The biopsychosocial model consists of whole biological, psychological, social and behavioral factors that affect perception mechanism. In Turkey, %30 of the population which are over 18-year-old adults have pain depends on any problem, %9,5 have chronic pain. The mean persisting duration of pain is five years; chronic pain is eight years (Tulunay & Tulunay, 2000). To prevent delays in management of pain, the health professionals should present a multidimensional approach to pain as a part of a modern biopsychosocial concept.

Pain can be adaptive or maladaptive. Adaptive pain contributes to survival by protecting the organism from injury or promoting healing. Maladaptive or chronic pain represents pathologic functioning of the nervous system.

It is critical to identify the type of pain; acute or chronic. Acute pain appears as a symptom of body injury, and it does not last more than three months. However, chronic pain is a condition. It lasts more than three months with known or unknown reasons. The number of research focusing on a broad range of aspects of pain, from the molecular biology of pain pathways to the psychosocial aspects are growing. Such studies have resulted in notable gains in pain management and quality of life of patients (Dworkin et al., 2007).

Chronic pain has various forms such as inflammatory pain, visceral pain, headache, disk-related pain, neuropathic pain, cancer pain. Biological basis of chronic pain begins with vulnerability and then it continues with behavioral components. Treatment categories are very variable such as medications, chemotherapeutic agents, invasive options (such as nerve blocks or epidural steroid injections, physical therapy, biofeedback, acupuncture, and relaxation training. Emotion status, anxiety, catastrophizing (it will never stop), depression, cognition about pain (e.g. negative beliefs), active and passive coping strategies, significant others, are the psychological, behavioral and social factors related to pain (Stewart et al., 2015).

The neuroscientific approach to pain is possible with understanding of cortical association with sensorial, motor and cognitive pathways, plasticity, mirror neurons is essential while focusing on pain. Different related brain regions are affected in chronic pain. Studies demonstrate that dorsolateral prefrontal cortex, substantia nigra, brain reward system and neurotransmitter mechanisms' circuits are altered. One of the cortical areas affected by the mechanism of pain is the dorsolateral prefrontal cortex that is responsible for cognition, analyzing, motor planning and working memory. Thereby chronic pain may disrupt the cognitive and emotional process and led to anxiety, depression, mood disturbances. Brain imaging techniques demonstrated loss of the amount of substantia nigra and the association between chronic pain and brain

reward system (Borsook, 2012).

There is another subject which is needed to be thought about pain is mirror neuron effect. Mirror neurons translate the sensorial perception to behavior. Mirror neurons in the human brain are identified in the premotor cortex, posterior parietal lobe and visual cortex of temporal lobe. In a study that investigates the subjects' fMRI while they are observing faces from chronic pain patients, anterior insula, left anterior cingulate cortex, left inferior parietal cortex were found to be activated while watching (Craig et al., 2000). We know that anterior insula and anterior cingulate cortex are responsible for social learning. A meta-analysis study revealed that anterior cingulate cortex, anterior insulate cortex, somatosensorial cortex (S1-2) and brainstem's neuro-hemodynamic responses were restricted. These regions are activated in acute physical pain, called pain-matrix (Fan et al., 2016).

Decreasing pain and enhancing the quality of life is the primary focus of pain medicine (McGuigan, 2014). Nonpharmacological options that have support in patients with chronic pain include neurostimulation, physical therapy, acupuncture, massage, biofeedback and the cognitive-behavioral therapy, psychotherapy, and patient education.

The goal of treatment may not necessarily be to cure pain, but to manage it and restore functionality.

## 2. Nonpharmacologic Therapies

In the context of multimodal interventions, interventions other than systemic pharmacologic treatments for chronic pain are also present. Besides interventional approaches such as ablative techniques, botulinum toxin injections, nerve blocks and trigger point injections; there are several noninvasive options including cognitive behavioral therapy, biofeedback, relaxation therapy, acupuncture, physical therapy, thermal applications, spinal cord stimulation and transcutaneous electrical stimulation.

## 3. Cognitive-Behavioral Therapy

Cognitive-behavioral therapy (CBT) is the most commonly used behavioral medicine approach for pain patients. CBT focuses simultaneously on the environment, behavior, and cognition. Cognitive behavioral therapy is structured, goal-directed, problem focused, and time limited (often 10 to 20 sessions) (Beck, 2006). Emotion status, anxiety, catastrophizing (it will never stop), depression, cognition about pain (e.g. negative beliefs), active and passive coping strategies, significant others, are the psychological, behavioral and social factors related to pain (Stewart et al., 2015).

CBT for pain incorporates three components: patient education, behavioral skill training, and cognitive skill training (Okifuji et al., 2007). Behavioral skill training involves education related to the behavioral principles, such as conditioning, reinforcement, pain/illness behaviors, and attentional training, and how do they interact with pain and disability.

Cognitive training for pain management begins with discovering the situational factors that trigger their pain. CBT can be used with meditation. Instead of challenging the content of the thoughts, the patient learns to disassociate from them. Relaxation, meditation, acupuncture, and hypnosis might also be used. This eclectic form of psychotherapy is called Third-Wave CBT (Hanscom et al., 2015).

Although often delivered as a structured course of one-on-one sessions with a therapist, it appears that CBT can be effectively administered in a variety of other formats, including in a group, via the computer, or by telephone. In a randomized trial of subjects with chronic widespread pain, symptom improvement at six months was reported in 8 percent of patients assigned to usual care, 35 percent allocated to CBT via telephone, and 37 percent designated to a combination of telephone CBT and exercise (McBeth et al., 2012).

Stress management is also an critical factor in the treatment of pain. Stress has a significant role in exacerbation of chronic pain. Linton performed a meta-analysis and reported a significant connection between stress and pain (Linton, 2000). A review reported the relationship between depression and catastrophizing in patients with pain disorders (Edwards et al., 2011). Catastrophizing is related to amplified pain and diminished effectiveness of biomedical interventions.

#### 4. Biofeedback

Biofeedback is the process of earning elevated awareness of several physiological processes such as brainwaves, muscle tone, skin conductance, heart rate and pain perception primarily using instruments that give information on the activity of those systems, with a purpose of being capable of manipulating them at will (Nestoriuc & Martin, 2007).

Biofeedback has been observed to be effective for the treatment of chronic pain (Ma et al., 2011). Voluntary control of physiological functions using biofeedback may be also used in modulating pain perception (Ladouceur et al., 2012). When participants are exposed to pictures of different emotional valence (pleasant, neutral or unpleasant), pain perception and the spinal nociceptive flexion reflex are also modulated (Arsenault et al., 2013).

#### 5. Physical medicine approaches

An exercise regimen specifically tailored to the patient is at the core of a physical or occupational therapy program. Stretching is a fundamental component to restoring normal range of motion. After range of motion is normalized, muscle conditioning is addressed to improve stability, function, and pain. Muscle conditioning focuses on three areas: strength, endurance, and re-education (Stanos et al., 2007).

#### 6. Transcutaneous Electrical Stimulation

Transcutaneous Electrical Stimulation (TENS) requires the delivery of a low voltage electrical current from a

small battery-operated equipment to the skin via surface electrodes for pain relief. It is a harmless, noninvasive treatment that can be self-applied (Walsh et al., 2009). Conventional TENS produces paresthesia in the area under the electrodes.

Research on TENS for pain relief has suffered from a lack of randomized controlled trials, and systematic reviews have found variable and uncertain results related to the efficacy of TENS in chronic pain management (Nnoaham & Kumbang, 2008).

#### 7. Spinal cord stimulation

Spinal cord stimulation, a spinal neuromodulation analgesic system, is an option for chronic neuropathic pain which can arise from nerve or nervous system injury. It is a minimally invasive and reversible treatment option which can be permanently implanted after an appropriately conducted temporary screening trial with an external pulse generator to assess therapeutic efficacy and adverse effects. The technique inhibits chronic pain by stimulating the large diameter afferent nerve fibers in the spinal cord. Spinal cord stimulation remains to be a relevant tool in the treatment of chronic disabling pain (Cruccu et al., 2007; Jeon, 2012).

#### 8. Deep brain stimulation

Deep brain stimulation (DBS) is a neurosurgical intervention reported to improve symptoms of Parkinson disease, epilepsy, Tourette's syndrome, depressive disorder, obsessive-compulsive disorders and cluster headache. Since the 1950s, DBS has been used as a treatment to relieve the intractable pain of several aetiologies including post-stroke pain and neuropathic pains. However, this technique remains "off label" in the USA as it does not have Federal Drug Administration approval (Boccard et al., 2015).

#### 9. Conclusion

There is a growing recognition of the neuroscience of pain and its management. Psychological factors are also important in the assessment of pain patients. Optimal patient outcomes for chronic pain often emerge from a combination of multiple approaches such as pharmacologic, physical medicine, behavioral medicine and neuromodulation utilized in accord. Medication should not be the single focus of treatment but should be used in combination with other treatment modalities to increase the quality of life.

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