



Updates on Novel Technologies in Pain Management

ARTICLE INFO

Article Type
Editorial letter

Authors

Saeed Pourhassan.MD¹,
Nastaran Maghbouli, MD-MPH²

How to cite this article

Pourhassan S, Maghbouli N. Updates on Novel Technologies in Pain Management. IJMPP. 2024; 9(1): 973-974.

¹ Internal Medicine Department, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.

² Physical Medicine and Rehabilitation Department, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.

* Correspondence

Address: Physical Medicine and Rehabilitation Department, School of Medicine, Tehran University of Medical Sciences, Poorsina st, Enghelab Sq., Tehran, Iran.
P.O.Box: 6135715794
Tel: +98-21-64432592
Fax: +98-3336 2414
E-mail: nmaghbouli@sina.tums.ac.ir

Article History

Received: Feb 2, 2024
Accepted: Mar 9, 2024
E Published: Mar 14, 2024

Chronic pain can cause limitations in mobility, daily activities, and sleeping disturbances leading to feelings of anxiety, depression, and isolation in addition to long-term disabilities in some cases. Chronic pain influence on person's physical and emotional well-being highlights needs for timely and effective pain management strategies. We discuss some new technologies in this subject to be updated.

One new and novel strategy in pain management is the use of Virtual Reality (VR) technology. Recent studies have shown that VR can be an effective tool in managing pain by distracting patients and creating an immersive environment that helps to reduce their perception of pain. Patients can be transported to a virtual world where they can engage in activities that take their minds off their pain, such as walking on a beach or exploring a new city. Moreover, focus shifting and skill-building are other mechanisms introduced in literature⁽¹⁾. This non-pharmacological approach to pain management has shown promising results in various clinical settings such as fibromyalgia, trauma, postop pain, stroke, diabetes, multiple sclerosis and cancer⁽²⁾. Although VR application in pain management is reasonable especially for children, future research is needed to find the most

effective protocol of treatment and long-term benefits.

Another innovative strategy in pain management is the use of biofeedback therapy. Bio feedback involves teaching patients how to control physiological processes in their bodies, such as heart rate and muscle tension, through monitoring and feedback mechanisms. Studies have shown that biofeedback can help patients to reduce their pain levels by learning to better regulate their responses to stress and pain triggers⁽³⁾. This technique has been used in various chronic pain conditions, such as fibromyalgia, pelvic pain, low back pain and migraines, with positive outcomes⁽⁴⁻⁶⁾. Furthermore, neurofeedback is a type of biofeedback focusing on the brain signals to control and improve activities. The source of signals can be Electro Encephalon Graphy (EEG) or functional Magnetic Resonance Imaging (fMRI). This intervention is mostly used in headaches with promising results⁽⁷⁾.

One emerging strategy in pain prevention is the use of neuromodulation techniques, such as Transcranial Magnetic Stimulation (TMS) and Spinal Cord Stimulation (SCS). These non-invasive procedures involve the use of electrical or magnetic stimulation to modulate pain signals in the brain or spinal cord. Recent studies have shown that neuromodulation can be effective

in managing chronic pain conditions, such as neuropathic pain, fibromyalgia, central pain and migraine, by altering the activity of pain pathways in the central nervous system⁽⁸⁾. These techniques offer a promising alternative to traditional pain management approaches, especially for patients who do not respond well to medications or other treatments known as resistant pain cases. Although studies using TMS for trigeminal neuralgia, phantom pain, low back pain, myofascial pain, pelvic pain, and complex regional pain syndrome are existed in literature, amount and level of evidence for routine use of TMS is not enough⁽⁹⁾.

One new strategy in pain assessment and management is the use of wearable technology, such as smart devices and sensors, to monitor and track pain levels in real-time. These devices can provide patients with valuable information about their pain patterns and triggers, which can help physicians to better manage their pain and make informed decisions about their treatment options. Recent studies have shown that wearable technology can be a valuable tool in pain management by allowing for early detection of pain flare-ups and providing patients with personalized feedback and support⁽¹⁰⁾.

In conclusion, the field of pain management is continuously evolving with new and novel technologies being developed to improve outcomes for patients. From the use of virtual reality and biofeedback therapy to neuromodulation techniques, there are various innovative approaches that show promise in managing pain and enhancing quality of life for individuals with chronic pain conditions.

Through exploring these cutting-edge strategies and incorporating them into clinical practice, healthcare providers can offer more personalized and effective pain management interventions that address the complex nature of pain and promote

better patient outcomes.

Conflict of Interest

The authors state no conflicts of interest to declare.

References:

1. Ahmadvour N, Randall H, Choksi H, Gao A, Vaughan C, Poronnik P. Virtual Reality interventions for acute and chronic pain management. *Int. J. Biochem. Cell Biol.* 2019;114:105568. doi: 10.1016/j.biocel.2019.105568
2. Chuan A, Zhou J, Hou R, Stevens CJ, Bogdanovych A. Virtual reality for acute and chronic pain management in adult patients: a narrative review. *Anaesthesia.* 2021;76(5):695-704.
3. Flor H. Psychological pain interventions and neurophysiology: implications for a mechanism-based approach. *AM PSYCHOL.* 2014;69(2):188-96
4. Wagner B, Steiner M, Huber DFX, Crevenna R. The effect of biofeedback interventions on pain, overall symptoms, quality of life and physiological parameters in patients with pelvic pain: A systematic review. *Wien. Klin. Wochenschr.* 2022;134:11-48
5. Reneau M. Heart rate variability biofeedback to treat fibromyalgia: an integrative literature review. *Pain Manag Nurs.* 2020;21(3):225-32.
6. Sielski R, Rief W, Glombiewski JA. Efficacy of biofeedback in chronic back pain: a meta-analysis. *Int. J. Behav. Med.* 2017;24:25-41.
7. Roy R, de la Vega R, Jensen MP, Miró J. Neurofeedback for pain management: A systematic review. *Front. Neurol.* 2020;671.
8. Knotkova H, Hamani C, Sivanesan E, Le Beuffe MFE, Moon JY, Cohen SP, et al. Neuromodulation for chronic pain. *The Lancet.* 2021;397(10289):2111-24. doi: 10.1016/S0140-6736(21)00794-7.
9. Yang S, Chang MC. Effect of repetitive transcranial magnetic stimulation on pain management: a systematic narrative review. *Front. Neurol.* 2020;11:114. <https://doi.org/10.3389/fneur.2020.00114>
10. Leroux A, Rzasal-Lynn R, Crainiceanu C, Sharma T. Wearable devices: current status and opportunities in pain assessment and management. *Digit. Biomark.* 2021;5(1):89-102.