

We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900

Open access books available

186,000

International authors and editors

200M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com



Non-Pharmacological Pain Management

Ahmed El Geziry, Yasser Toble, Fathi Al Kadhi,
Muhammad Pervaiz and Mohammad Al Nobani

Additional information is available at the end of the chapter

<http://dx.doi.org/10.5772/intechopen.79689>

Abstract

Non-pharmacological pain therapy refers to interventions that do not involve the use of medications to treat pain. The goals of non-pharmacological interventions are to decrease fear, distress and anxiety, and to reduce pain and provide patients with a sense of control. When deciding the most effective non-pharmacological technique, take into consideration the patient's age, developmental level, medical history and prior experiences, current degree of pain and/or anticipated pain. The advantage of non-pharmacological treatments is that they are relatively inexpensive and safe.

Keywords: pain, non-pharmacological, physical, psychological, spiritual

1. Introduction

Non-pharmacological therapies are typically categorized into

1. Physical (sensory) interventions

Physical (sensory) interventions typically are patient-specific and inhibit nociceptive input and pain perception.

Some measures that can reduce pain intensity and improve the patient quality of life such as massage, positioning, hot and cold treatment, transcutaneous electrical nerve stimulation (TENS), acupuncture and progressive muscle relaxation.

2. Psychological interventions

Continuous pain may lead to development of maladaptive status and behavior that worsen day to day function, increase distress, or enhancing the experience of pain. Patients suffering pain tend to show increased vulnerability to a variety of psychiatric illnesses, including depressive and anxiety disorders, and posttraumatic stress disorder. In fact, the relationship between depression and pain is likely to be bidirectional, so that the presence of a depressive disorder has been identified as a key risk factor in the transition from acute to chronic pain.

Most commonly used psychological interventions are: cognitive behavioral therapy, mindfulness-based stress reduction, acceptance and commitment therapy (ACT), guided imagery and biofeedback.

3. Others

Spirituality and religion in pain management and music therapy.

2. Physical (sensory) interventions

2.1. Massage

Pain can complicate the patient condition as it can elevate stress, altering posture, and reduce one's ability to participate in daily activity [1]. It is the process of rubbing and kneading parts of the body, especially joints and muscles with hands to relieve pain and decrease tension. Massage can interrupt the patient's cycle of distress. It can increase the blood circulation as well as lymphatic circulation. Massage can also initiate an analgesic effect to the area being rubbed and decrease inflammation and edema. Moreover, it can release muscle spasms manually while increasing endogenous endorphin release, and conflicting sensory stimuli that override pain signals [2].

The process of rubbing and kneading soft tissues of the body can lead to relaxation of the tense muscles, increase blood flow to the underlying tissues and decrease pain. The exact mechanism of pain reduction in massage is still unknown; however, there are some studies and expert's hypothesis suggest that the process of massage can lead to an increase in dopamine levels which decrease pain. In addition to that, massage can lead to relaxation of the muscles tension that often arise when pain present [3].

There are many benefits of massage as it can reduce stress, promote muscle relaxation, lower blood pressure, improve circulation, help improve posture, and strengthen the body immune system. Moreover, there are some studies suggest that massage had been found to decrease pain and anxiety in many of the surgical and nonsurgical patients [3].

Massage can be beneficial in cancer patient as it can improve mood and quality of life among patients suffering from cancer. Both the massage and simple-touch groups had statistically, although not clinically, significant improvements in pain and quality of life over time despite no increases in total analgesic medication use [4]. In addition to that, there are some short-term benefits of massage which include improve psychological well-being and,

in some cases, reduced severity of physical symptoms. Depression and anxiety have shown significantly improve with massage.

2.2. Positioning

Positioning is a physical intervention that includes maintaining a proper body alignment to reduce stress and anxiety, especially in children.

It helps to prevent further complications, reduces the risk for developing injuries, prevents developing bed ulcers and most importantly reduce alleviate pain. Therefore, positioning the patient correctly and re-positioning can help with the above complications [5].

Positioning can help with many patients as it can relieve muscle pain, tension and discomfort. It can improve blood circulation which in turn prevents ulcers from developing. Moreover, elevating extremities while positioning can be beneficial in decreasing pain and prevent edema as well.

2.3. Hot and cold

Several studies have shown reduction in pain, anxiety, nausea and heart rate in patients treated with active warming for pain related to mild trauma, cystitis, urolithiasis, cholelithiasis, appendicitis, colitis, and rectal trauma. This is an inexpensive and easy-to-use therapy with minimal side effects when used appropriately. Cold therapy includes applying a cool substance or device to any part of the body. Numerous studies have reported that cold treatment can increase pain threshold, decrease edema, and suppress the inflammatory process. Cold compresses may be used between 15 and 30 min time periods and up to 2–3 times per day.

Hot and cold therapy has been used for many decades and centuries to relieve pain, which includes muscle pain, joints pain, extremities pain, back pain and arthritis. Some studies show evidence that ice and heat therapies are effective and can reduce pain when compared to over the counter meds such as Paracetamol and Ibuprofen.

One study showed that “superficial heat relieves pain in a number of different ways:

1. Heat stimulates the thermo receptors in the skin and deeper tissues. This can help to reduce pain by closing the gating system in the spinal cord.
2. Heat reduces striated muscle spasm by minimizing muscle spindle excitability and reducing tension in muscle trigger points.
3. By warming joints, heat reduces the viscosity of synovial fluid, which alleviates painful stiffness during movement and increase joint range” [5].

Although through history hot and cold-water therapy is frequently used in home environment. However, these home therapies can create some complications such as burns and water leak. Nowadays, mostly in hospital setting, they use wheat-based heat packs and electrical heating pads, which are safer and give the maximum effect of analgesics [6].

2.4. Acupuncture

This has been used for around 5000 years, and it is considered one of the world's oldest arts of an empiric body healing. Basically, acupuncture works by putting the needle in specific region of the body, which stimulates the nerve. Each needle will cause no discomfort to little discomfort to the patient, but it will produce a small injury at the insertion area which will stimulate the body and the immune system to increase circulation, wound healing, pain modulation and pain analgesia [7].

The number and location of the acupuncture used by Chinese ancient times has changed by the science of modern practitioners, and nowadays they are using clinical and physical observation of the patient and the therapeutic effect of the pricking. According to Lewin (1974) "Two therapeutic modes of acupuncture are used in practice today: (1) acupuncture used for the treatment of many diseases and (2) acupuncture employed as an anesthetic procedure (a more accurate term for this would be surgical analgesia)" [8].

Acupuncture can be used to treat many conditions and studies claiming that it can be helpful with allergies, anxiety and depression, chronic back, neck, or shoulders pain, hypertension, insomnia, migraines, morning sickness, strokes and menstrual cramps. In addition to that studies suggest that it can be beneficial with cancer and multiple sclerosis patients as well [9]. The benefits of acupuncture can go beyond conditions to go far to help with relaxation and pain management as well. Acupuncture can be helpful as an analgesic effect to patients who experience pain as well [7].

2.5. Transcutaneous electrical nerve stimulation

Transcutaneous electrical nerve stimulation (TENS) is an electrical device used to treat pain. It consists of battery-powered unit and has 2–4 leads connected to sticky pads, which are positioned over the skin to cover or surround the painful area.

The TENS unit delivers a low-voltage electrical impulse to the padded surface electrodes in a series of alternating electrical current impulses.

The larger impulses are postulated to activate large myelinated fibers.

Large nerve fiber stimulation is thought to block small pain-transmitting fibers. Some experts also believe that TENS unit activates the release of natural endorphins at the pituitary level by using alternating low-540 frequency pulses.

It is thought that TENS produce analgesia by stimulating large afferent fibers. It can help those patients with chronic back pain, arthritis, and neuropathic pain. In addition, it can help patients with mild to moderate acute pain.

When the TENS unit is turned on, patient feeling a light tingling sensation over the area where the pads are placed.

The signal intensity also known as pulse width (duration of the pulse) produced from the TENS device can be adjusted, the goal being to produce paresthesia without muscle contraction. At initial use, the patient adjusts the settings to find the most comfortable effective sensation [10].

TENS is virtually side effect free, and the mechanism includes activation of descending modulation systems and blocking of sympathetic outflow.

The unit can be attached to the patient's belt for ease of use.

TENS should not be used in patients with cardiac pacemakers or a history of cardiac dysrhythmia [11].

2.6. Progressive muscle relaxation

Progressive muscle relaxation is a technique where the participant involved tightens and relaxes different muscle groups throughout the body in a progressive manner that would provoke a sense of relaxation and comfort.

There are many indications to the use of PMR, including back pain, phantom limb pain, headache and stress. PMR is a safe technique with minimal if any adverse effects have been reported.

In a double-blinded randomized clinical trial the use of PMR was found to decrease intensity of pain, tenderness of masticatory muscles and maximum opening of mouth with and without pain in patient with myofascial pain dysfunction syndrome [12].

Relaxation techniques have shown positive results for patients with chronic neck pain, tension headache, low back pain and chronic pain related to rheumatologic and non-rheumatologic chronic inflammatory disorders [13–19].

The global spine care initiative for communities with low and medium income supports the use of biofeedback and progressive muscle relaxation techniques as an initial therapy for patient without a serious pathology chronic low back pain and neck pain [20].

In a randomized controlled trial, it was found that the use of PMR in combination with guided imagery and phantom exercises were useful in reducing phantom limb pain and phantom limb sensation [21].

In an interesting study which looked into deploying relaxation techniques over the Internet was found to be effective for patient suffering from chronic headaches. Other trials are ongoing that utilizes phone applications in other conditions like chronic back pain and neck pain [14, 22].

3. Psychological interventions

3.1. Cognitive behavioral therapy

Incorporating the biopsychosocial (BPS) model to pain management by targeting cognitive responses to pain and maladaptive behavioral in addition to social and environmental factors that may play an important role in modifying reactions to pain [23]. Such therapy has shown efficacy for many physical disorders and psychiatric illnesses, as well as pain [24]. Cognitive behavioral therapy (CBT) helps to develop important set of coping skills intended

to improve psychological functioning, including behavioral activation, structured relaxation exercises, recalling and scheduling of pleasurable events, dogmatic assertive communication, and behavior pacing aiming to avoid prolongation and/or exacerbation of flares of pain. CBT for pain also addresses maladaptive thoughts about pain and pain catastrophizing through formal use of cognitive restructuring.

According to recent meta-analytic studies [25], CBT for pain demonstrates small-to-medium effect sizes in a variety of domains and shows effects on pain and functioning compared to standard medical care for pain.

3.2. Mindfulness-based stress reduction

This approach aims to disconnect the link between the sensory elements of pain from the emotional and evaluative elements and enhances uncoupled awareness of both somatic and psychological sensations [26]. Because the signal of pain usually cannot be distinguished, such detachment may alter the response to pain [27].

Using mindfulness-based stress reduction strategies such as awareness and meditation, different ideas and beliefs about pain may be perceived as an unattached event rather than a sign of an underlying matter that requires linear and possibly maladaptive reactions.

3.3. Acceptance and commitment therapy

This approach implies that thoughts do not basically have to be changed or targeted but the responses to these thoughts may be altered in a way that the resulting negative consequences are ameliorated [28]. ACT approaches can augment the sense of well-being via purposeful and nonjudgmental acknowledgment of mental events like emotions and thoughts, facilitating acceptance of such events, and enhancing the capability of the patients to sustain present and be aware of personally relevant environmental and psychological factors. Keeping this in mind, patients might be able to modify their behavior in a way that is in line with their goals and values, instead of keep focusing on immediate relief from their emotions and thoughts [27]. While conducting pain management, ACT can boost purposeful awareness and pain acceptance, hence diverting the focus on decreasing pain and its thought content and redirecting efforts trying to achieve favorable fulfilling behavior.

3.4. Biofeedback

Applied psychophysiology or better known as biofeedback is a technique in which the patient receives extra “extrinsic” information that is not based on what the patient feels, and the information should be in real time and biological in nature, that is, the use of real-time ultrasound biofeedback for patient with pelvic floor muscle dysfunction or low back pain, or the use of electromyography (EMG) in real time for patients with musculoskeletal disorders [29]. In simple words by Schawarts and Olsen, “psychophysiology involves the scientific study of the interrelation of physiological and cognitive processes” [30–32].

In a randomized clinical trial, it looked into the difference between hypnosis for chronic low back pain and hypnosis with biofeedback techniques, it showed that biofeedback with hypnosis is significantly more effective than hypnosis alone [33].

In a meta-analysis by Sielski, he found that biofeedback led to a small to medium effect when it comes to pain intensity reduction in patients with chronic back pain, also it led to reducing depression, disability, muscle tension, and improved cognitive coping in the same patients' groups [34]. Biofeedback was also used successfully in patients with juvenile rheumatoid arthritis, in a randomized clinical trial for children aged 8–13, the use of electromyography biofeedback was associated with reduced pain intensity and improved quadriceps strength [35].

3.5. Guided imagery

It is a technique in which an experienced practitioner helps a patient provoke a state of mind or mental images in the absence of that stimuli, defined by Bresler and Rossman as a range of techniques from simple visualization and direct imagery-based suggestions through metaphor and storytelling [36]. Recently, it has been increasingly explored in different medical settings, like for managing post-operative pain, fibromyalgia, low back pain or musculoskeletal-related pain.

Those images if they are vivid enough, this may elicit a physiological response, through modulations at the level of the autonomic nervous system, such effects would result in changes of the cardiovascular, respiratory, nervous, endocrine and even immune system [37]. Many randomized clinical trials have shown significant reduction in pain scores using guided imagery or hypnosis, but there is a lack of rigorous high-quality studies, in a systematic review by Posadzki, he found only nine RCT with quality ranged between 1 and 3 on Jadad scale, eight of them suggested significant reduction of musculoskeletal-related pain, while one showed no significant change from the usual standard of care [38].

In another systematic review of randomized clinical trial by Posadzki, he found that 11 trials of the 15 included in his analysis showed significant reduction of non-musculoskeletal pain, while 4 trials showed no significant change from standard of care. Although the evidence remains inconclusive but simply looking at the risk to benefit ratio, we can simply conclude that benefits significantly outweigh the risk [39].

Many trials have looked into the efficacy of guided imagery and hypnosis in fibromyalgia cases, were they have shown a clinically significant benefit, moreover, a meta-analysis by Zechhave showed that combined therapy of cognitive behavioral therapy and hypnosis is superior to the use of cognitive behavioral therapy alone in patients with fibromyalgia [40].

4. Others

4.1. Spirituality and religion

In the middle ages, pain was considered a religious matter. Pain was seen as God's punishment for sins, or as evidence that an individual was possessed by demons. Spiritual counseling in such situation can be more of a priority than medical treatment [41]. Major parts of Hindu believers consider pain as a God punishment or as a result of personal actions. In Islam, it can be vindictive or Allah's willingness. A common Buddhist belief is that suffering is the price of attachment [42]. Spiritual and religious beliefs are important in many individuals' lives.

However, religious and spirituality are not the same. These beliefs can influence lifestyle, attitudes, and feelings about life, pain, and death. Spiritual and religious beliefs are important in many individuals' lives. However, religious and spirituality are not the same. These beliefs can influence lifestyle, attitudes, and feelings about life, pain, and death. Spiritual beliefs often place a greater significance at the time of illness than any other time in a person's life.

Both religious and spiritual beliefs help some people accept their own illness and help explain illness for others. Religion can supply the client, the family, and health professionals with a sense of strength, security, and faith during a time of need [41, 43].

Pain is an extremely complex phenomenon that involves multiple cascades of behavioral responses, thoughts, and emotions. A lot of non-physiologic factors such as psychological, familial and societal attitudes, life stressors, and cultural, spiritual and religious beliefs contribute significantly how the individuals experience and respond to pain. Emotional distress specifically depression and anxiety plays a vital role in pain experience. Numerous studies have demonstrated that individuals having pain perhaps report more severe pain and disability, if they have anxiety, depression or both. Interestingly, it has been found that fear of pain can cause more disability than that has been already caused by pain itself. There is a cyclical pattern of chronic pain leading to depression and depression causing an increase in chronic pain, creating a mutually reinforcing relationship [44, 45].

Since pain experienced in the context of biopsychosocial-spiritual system model (BPSSM), it should be understood that individuals' capacities to cope, tolerate, and accept disease and pain entail multiple levels of experience and thought. BPSSM suggests that illness disrupts the biological, interpersonal, and spiritual relationships unique to the individual. The BPSSM recognizes the potential impact of spiritual and religious variables that may increase or decrease experience of illness.

Spiritual interventions may differ depending on culture background. Generally, prayer is one of the most common daily spiritual activities, which can take variety of forms including gratitude, admission and confession, intercessory prayer or silent communion. The ultimate goal is to become more close to and loved one for God. Pain is often referenced in the context of people's relationships with God. God is responsible for wellbeing and health; therefore, spiritual beliefs are considered one of the most effective ways that influence healing. Individuals suffering pain may practice varieties of spiritual and religious activities including prayer and seeking specialized spiritual support, to cope more effectively with their pain [46]. Patients with chronic pain with a variety of conditions (e.g., musculoskeletal pain, cancer, or sickle cell) usually report that religiousness and spirituality are important in their lives [47].

4.2. Music therapy

Music has been used since ancient times to enhance wellbeing and reduce pain and suffering. Playing music for patients during or after surgery helps reduce pain and use of morphine and other sedatives, anxiolytics, and analgesics [48, 49].

Many randomized controlled studies adopting music therapy for subjects undergoing colonoscopy or sigmoidoscopy have found in comparison with the control group, those who listened to music reported a significant lower pain scores, less sedation and shorter examination times [50–52].

During labor, music has been shown to reduce women perceptions of and responses to pain. The same findings have been reported in premature infants as well as other categories of individuals living with chronic pain [53, 54]. Women during labor who enjoyed listening to slow soft music experienced less distress attributed to pain and reported music as a helpful and effective tool in pain control [54]. Elderly patients with chronic osteoarthritis who listened to music daily for twenty minutes for couple of weeks reported decreased pain levels as compared to a control group [55]. Cancer survivors reported moderate pain relief upon listening to music, and in many cancer centers, music is offered as an adjunctive therapy [56, 57].

One study has been designed to evaluate the effects of including music therapy on pain report, nausea, in addition to the time to engraftment for patients undergoing bone marrow transplant. Among such extremely ill individuals, those who received music therapy alongside with relaxation imagery experienced lower pain scales and less nausea. Moreover, they had faster engraftment [58].

5. Conclusion

The role of non-pharmacological approaches to pain management is evolving, and some non-pharmacological and complementary therapies have an increasingly important contribution to make to holistic patient care alongside analgesics.

Generally, these approaches are relatively inexpensive with high safety profile and low side effects.

There is evidence to support the use of patient education, cognitive behavioral therapy (CBT), relaxation, music, and other modalities. These therapies should be taken into consideration to help and support the standard pharmacological treatment in pain management. While medical drugs are essentially being used for treating the somatic (physiological and emotional) dimension of the pain, non-pharmacological therapies aim to treat the cognitive, affective, behavioral and socio-cultural dimensions of the pain.

These therapies can treat the pain as adjuvant or complementary at middle level and severe pain experiences.

Non-pharmacological approaches help to

- Increase the individual ability to control feeling.
- Reduce the feeling of weakness.
- Enhance the functional capacity and activity level.
- Reduces anxiety and stress.
- Decrease the pain behavior and focused pain level.
- Decrease the dosage of analgesic drugs, subsequently decreasing the well-known side effects of these drugs.

For this reason, research on non-pharmacological approaches to pain management is very important, so that patients are provided with information that ensures them the most effective options for treating their pain.

Author details

Ahmed El Geziry*, Yasser Toble, Fathi Al Kadhi, Muhammad Pervaiz and Mohammad Al Nobani

*Address all correspondence to: ageziery@hamad.qa

Department of Anaesthesia, ICU and Perioperative Medicine, Hamad Medical Corporation, Doha, Qatar

References

- [1] Thompson DL. Massage, movement & mindfulness. *Massage & Bodywork*. 2016;**31**(5): 88-97
- [2] Kutner JS, Smith MC, Corbin L, Hemphill L, Benton K, Mellis BK, et al. Massage therapy versus simple touch to improve pain and mood in patients with advanced cancer: A randomized trial. *Annals of Internal Medicine*. 2008;**149**(6):369-I38
- [3] Ward CW. Non-pharmacologic methods of postoperative pain management. *MedSurg Matters*. 2016;**25**(1):9-10
- [4] Rozet I, Vavilala MS. Risks and benefits of patient positioning during neurosurgical care. *Anesthesiology Clinics*. 2007;**25**(3):631-653
- [5] Chandler A, Preece J, Lister S. Using heat therapy for pain management (clinical practice). *Nursing Standard*. 2002;**17**(9):40+. Available from: <http://link.galegroup.com.ezproxy.lib.ucalgary.ca/apps/doc/A94820820/AONE?u=ucalgary&sid=AONE&xid=8ce9c9ba>
- [6] Top 6 ways to use hot and cold therapy in your practice. *Massage Magazine*. 2018; (261):26-27
- [7] White A, Editorial Board of Acupuncture in Medicine. Western medical acupuncture: A definition. *Acupuncture in Medicine*. 2009;**27**(1):33
- [8] Lewin AJ. Acupuncture and its role in modern medicine. *Western Journal of Medicine*. 1974;**120**(1):27
- [9] Richardson PH, Vincent C. Acupuncture for the treatment of pain: A review of evaluative research. *Pain*. 1986
- [10] Stannard C, Booth S. *Pain*. 2nd ed. Sydney, Toronto: Elsevier Churchill Livingstone; 2004

- [11] Hoppenfeld JD. Multi modal approach to pain treatment. In: *Fundamentals of Pain Medicine*. Philadelphia: Wolters Kluwer Health; 2014. pp. 2-275
- [12] Beitollahi JM, Sahebjamie M, Manavi A, Farrokhnia T, Golestan B. Effect of progressive muscle relaxation therapy on improving signs and symptoms of patients with myofascial pain dysfunction syndrome. *The Journal of Dental Medicine*. 2009;**21**(4):249-254. Available from: <https://doaj.org/article/b2de84d7192c4bf69fd92747cc9a9b72#?> [Accessed: 27-04-2018]
- [13] Arena JG, Hightower NE, Chong GC. Relaxation therapy for tension headache in the elderly: A prospective study. *Psychology and Aging*. 1988;**3**(1):96-98. DOI: 10.1037/0882-7974.3.1.96
- [14] Devineni T, Blanchard EB. A randomized controlled trial of an internet-based treatment for chronic headache. *Behaviour Research and Therapy*. 2005;**43**(3):277-292. DOI: 10.1016/j.brat.2004.01.008
- [15] Greco CM, Rudy TE, Manzi S. Effects of a stress-reduction program on psychological function, pain, and physical function of systemic lupus erythematosus patients: A randomized controlled trial. *Arthritis Care & Research (Hoboken)*. 2004;**51**(4):625-634. DOI: 10.1002/art.20533
- [16] Flor H, Birbaumer N. Comparison of the efficacy of electromyographic biofeedback, cognitive-behavioral therapy, and conservative medical interventions in the treatment of chronic musculoskeletal pain. *Journal of Consulting and Clinical Psychology*. 1993;**61**(4):653-658. DOI: 10.1037/0022-006X.61.4.653
- [17] Malone MD, Strube MJ. Meta-analysis of non-medical treatments for chronic pain. *Pain*. 1988;**34**(3):231-244. DOI: 10.1016/0304-3959(88)90118-2
- [18] Astin JA. Mind–body therapies for the management of pain. *The Clinical Journal of Pain*. 2004;**20**(1):27-32. DOI: 10.1097/00002508-200401000-00006
- [19] Metikaridis DT, Hadjipavlou A, Artemiadis A, Chrousos GP, Darviri C. Effect of a stress management program on subjects with neck pain: A pilot randomized controlled trial. *Journal of Back and Musculoskeletal Rehabilitation*. 2016;**30**(1):23-33. DOI: 10.3233/BMR-160709
- [20] Chou R, Côté P, Randhawa K, et al. The global spine care initiative: Applying evidence-based guidelines on the non-invasive management of back and neck pain to low- and middle-income communities. *European Spine Journal*. 2018. DOI: 10.1007/s00586-017-5433-8
- [21] Brunelli S, Morone G, Iosa M, et al. Efficacy of progressive muscle relaxation, mental imagery, and phantom exercise training on phantom limb: A randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*. 2015;**96**:181-187. DOI: 10.1016/j.apmr.2014.09.035
- [22] Blödt S, Pach D, Roll S, Witt CM. Effectiveness of app-based relaxation for patients with chronic low back pain (relaxback) and chronic neck pain (relaxneck): Study protocol for two randomized pragmatic trials. *Trials*. 2014;**15**(1):490. DOI: 10.1186/1745-6215-15-490

- [23] Kato K, Sullivan PF, Evengård B, Pedersen NL. Chronic widespread pain and its comorbidities: A population-based study. *Archives of Internal Medicine*. 2006;**166**(15):1649-1654. [PubMed]
- [24] Richardson LP, Russo JE, Katon W, et al. Mental health disorders and long-term opioid use among adolescents and young adults with chronic pain. *The Journal of Adolescent Health*. 2012;**50**(6):553-558. [PMC free article][PubMed]
- [25] Hayes SC, Luoma JB, Bond FW, Masuda A, Lillis J. Acceptance and commitment therapy: Model, processes and outcomes. *Behaviour Research and Therapy*. 2006;**44**(1):1-25. [PubMed]
- [26] Fordyce WE. *Behavioral Methods for Chronic Pain and Illness*. St Louis, MO: Mosby; 1976. p. 1
- [27] Gatzounis R, Schrooten MG, Crombez G, Vlaeyen JW. Operant learning theory in pain and chronic pain rehabilitation. *Current Pain and Headache Reports*. 2012;**16**(2):117-126. [PubMed]
- [28] Day MA, Thorn BE, Burns JW. The continuing evolution of biopsychosocial interventions for chronic pain. *Journal of Cognitive Psychotherapy*. 2012;**26**(2):114-129
- [29] Giggins OM, Persson UMC, Caulfield B. Biofeedback in rehabilitation. *Journal of Neuroengineering and Rehabilitation*. 2013;**10**(1). DOI: 10.1186/1743-0003-10-60
- [30] Hubbard D. Brief comments on the proposed definition of applied psychophysiology. *Applied Psychophysiology and Biofeedback*. 1999;**24**(1):41. DOI: 10.1023/A:1022842930241
- [31] Schwartz MS. What is applied psychophysiology? Toward a definition. *Applied Psychophysiology and Biofeedback*. 1999. DOI: 10.1023/A:1022874409768
- [32] Striefel S. Is the working definition of applied psychophysiology proposed by Schwartz too narrow/restrictive? *Applied Psychophysiology and Biofeedback*. 1999;**24**(1):11-19. DOI: 10.1023/A:1022826526606
- [33] Tan G, Rintala DH, Jensen MP, Fukui T, Smith D, Williams W. A randomized controlled trial of hypnosis compared with biofeedback for adults with chronic low back pain. *European Journal of Pain*. 2015;**19**(2):271-280. DOI: 10.1002/ejp.545
- [34] Sielski R, Rief W, Glombiewski JA. Efficacy of biofeedback in chronic back pain: A meta-analysis. *International Journal of Behavioral Medicine*. 2017;**24**(1):25-41. DOI: 10.1007/s12529-016-9572-9
- [35] Effect of Electromyographic Biofeedback Training on Pain, Quadriceps Muscle Strength, and Functional Ability in Juvenile Rheumatoid Arthritis. 2016;**95**(12):921-930. DOI:10.1097/PHM.0000000000000524
- [36] Utay J, Miller M. *Journal of Instructional Psychology*. 2006;**33** [V-U Pub. Co.]. Available from: <https://www.questia.com/library/journal/1G1-144014458/guided-imagery-as-an-effective-therapeutic-technique> [Accessed: 27-04-2018]

- [37] Waldman Steven D. Pain Management. 2nd ed. Philadelphia, PA: Elsevier; 2011
- [38] Posadzki P, Ernst E. Guided imagery for musculoskeletal pain. *The Clinical Journal of Pain*. 2011;**27**(7):648-653. DOI: 10.1097/AJP.0b013e31821124a5
- [39] Posadzki P, Lewandowski W, Terry R, Ernst E, Stearns A. Guided imagery for non-musculoskeletal pain: A systematic review of randomized clinical trials. *Journal of Pain and Symptom Management*. 2012;**44**(1):95-104. DOI: 10.1016/j.jpainsymman.2011.07.014
- [40] Zech N, Hansen E, Bernardy K, Häuser W. Efficacy, acceptability and safety of guided imagery/hypnosis in fibromyalgia—A systematic review and meta-analysis of randomized controlled trials. *European Journal of Pain*. 2017;**21**(2):217-227. DOI: 10.1002/ejp.933
- [41] White L, Duncan G. Medical Surgical Nursing: An Integrated Approach. 2nd ed. New York: Delmar Thomson Learning; 2002
- [42] Solimine MA. Spirituality. In: Hoeman SP, editor. *Rehabilitation Nursing Process, Application and Outcomes*. 3rd ed. St Louis: Mosby Corporation; 2002
- [43] Cusick J. Spirituality and voluntary pain. *APS Bulletin*. 2003. Available from: <http://www.ampainsoc.org/pub/bulletin/sep03/path1.htm> [Accessed: 18-08-2005]
- [44] Eccleston C. Role of psychology in pain management. *British Journal of Anaesthesia*. 2001;**87**:144-152. [PubMed]
- [45] Means-Christensen AJ, Roy-Byrne PP, Sherbourne CD, et al. Relationships among pain, anxiety, and depression in primary care. *Depression and Anxiety*. 2008;**25**:593-600. [PubMed]
- [46] Unruch A. Spirituality, religion, and pain. *The Canadian Journal of Nursing Research*. 2007;**39**:66-86. [PubMed]
- [47] Wachholtz AB, Pearce MJ. Does spirituality as a coping mechanism help or hinder coping with chronic pain? *Current Pain and Headache Reports*. 2009;**13**:127-132. [PubMed]
- [48] Koch ME, Kain ZN, Ayoub C, et al. The sedative and analgesic sparing effect of music. *Anesthesiology*. 1998;**89**:300-306
- [49] Nilsson U, Rawal N, Unosson M. A comparison of intra-operative or postoperative exposure to music: A controlled trial of the effects on postoperative pain. *Anaesthesia*. 2003;**58**:699-703
- [50] Schiemann U, Gross M, Reuter R, et al. Improved procedure of colonoscopy under accompanying music therapy. *European Journal of Medical Research*. 2002;**7**:131-134
- [51] Smolen D, Topp R, Singer L. The effect of self-selected music during colonoscopy on anxiety, heart rate, and blood pressure. *Applied Nursing Research*. 2002;**15**:126-136
- [52] Uedo N, Ishikawa H, Morimoto K, et al. Reduction in salivary cortisol level by music therapy during colonoscopic examination. *Hepato-Gastroenterology*. 2004;**51**:451-453
- [53] Butt ML, Kisilevsky BS. Music modulates behaviour of premature infants following heel lance. *The Canadian Journal of Nursing Research*. 2000;**31**:17-39

- [54] Joyce BA, Keck JF, Gerkenmeyer J. Evaluation of pain management interventions for neonatal circumcision pain. *Journal of Pediatric Health Care*. 2001;**15**:105-114
- [55] McCaffrey R, Freeman E. Effect of music on chronic osteoarthritis pain in older people. *Journal of Advanced Nursing*. 2003;**44**:517-524
- [56] Beck SL. The therapeutic use of music for cancer-related pain. *Oncology Nursing Forum*. 1991;**18**:1327-1337
- [57] Standley JM, Hanser SB. Music therapy research and applications in pediatric oncology treatment. *Journal of Pediatric Oncology Nursing*. 1995;**12**:3-10
- [58] Sahler O, Hunter B, Liesveld JL. The effect of using music therapy with relaxation imagery in the management of patients undergoing bone marrow transplantation: A pilot feasibility study. *Alternative Therapies in Health and Medicine*. 2003;**9**:70-74