

The Role of Rehabilitation Therapy in the Management of Lower Back Pain

Emefo, Blessing Ujunwa

**Department of Sport and Exercise Science, Faculty of Education, University of Port
Harcourt, Nigeria**

annabelemefo@gmail.com

08142211022

Abstract

This study explored the concept of rehabilitation therapy and how effective it is in managing lower back pain. The definition, scope, and its benefits to patients were highlighted. The study showed that rehabilitation therapy can provide significant benefits for people with lower back pain when it comes to pain relief, improving their quality of life and overall health. It plays a role through the reduction of stiffness, enables one to regain the ability to do everyday tasks like bending, twisting, and lifting, improve posture and biomechanics to prevent future injuries, increase muscle strength and flexibility, increase self-confidence and independence, making it easier to manage pain. Rehabilitation therapy can also treat a wide range of health conditions, such as musculoskeletal disorders, cardiovascular diseases, neurological disorders, mental health conditions, and traumatic injuries, such as brain injuries or spinal cord injuries.

Keywords: Rehabilitation therapy, Lower back pain, Management.

Introduction

Lower back pain is a prevalent condition that significantly impacts an individual's quality of life. In recent times, it has been observed that various factors contribute to its occurrence, with aging being a prominent influencer. Additionally, individual characteristics, occupational factors, lifestyle choices, socio-economic status, cultural background, and access to rehabilitative care centers all influence the prevalence and severity of lower back pain (Woolf & Fleger, 2003; Brooks, 2005).

Consequently, recognized as the second most common affliction after the common cold, lower back pain poses a significant health challenge, particularly among older adults, resulting in pain and functional limitations (American College of Rheumatology, 2012). Multiple conditions such as lumbar strain, disc herniation, spinal compression, fractures, and acute injuries contribute to lower back discomfort (Patrick, Emansik & Knaub, 2014). Similarly, among older adults, several risk factors exacerbate the likelihood of experiencing lower back pain, including sedentary lifestyles, smoking, alcohol consumption, obesity, poor posture, low educational attainment, and occupational activities involving heavy lifting and repetitive motions (Wong et al., 2017). Furthermore, dietary habits also emerge as another influential factor, with poor

nutrition exacerbating the risk of chronic lower back pain in aging individuals (Kim et al., 2014).

However, rehabilitation therapy stands as a pivotal process in aiding individuals with physical, mental, or emotional disabilities to regain or enhance their functional capabilities and engagement in daily life activities and despite its profound significance, this field often remains underappreciated and overlooked by many, who may lack an understanding of its meaning, roles, and benefits while traditional remedies like bone setting persist, overshadowing the holistic approach and conservative treatments advocated by rehabilitation therapy. This holistic approach encompasses lifestyle modifications, addressing aspects such as dressing, diet, and psychological well-being, recognizing the multifaceted impact of injury or illness on various facets of life including self-care, vocational pursuits, recreation, and social interactions.

Rehabilitation therapy offers multifaceted benefits in addressing lower back pain, encompassing improved mobility, pain reduction, and enhanced quality of life. It also employs diverse modalities such as acupuncture, rest, heat and ice therapy, manual massage, counselling, and biofeedback. Rehabilitation therapy has proven to be effective in enhancing range of motion, alleviating muscle stiffness, enhancing blood circulation, promoting relaxation, facilitating weight reduction, and expediting recovery (Massage techniques, 2017).

Lower Back Pain

Lower back pain is a common problem that affects many people and can be caused by a variety of factors, including poor posture, injuries, and certain medical conditions (Ogunleye, 2008). The human back is composed of a complex structure of muscles, spine, ligaments, tendons, and bones. There are 24 vertebrae (small bones) which are together known as the spine. Those small bones are connected by a gel-like cushion called a vertebral disc. The lower back includes five vertebrae, which is the L1 – L5. It is also called the lumbar region, which is the area of the back that starts below the ribcage. Lower back discomfort is caused by the fact that it is one of the weight-bearing areas of the body (Stephen, 2017). Hence, back pain is a very common problem. Pain that comes on suddenly is acute. It might happen during sports or heavy lifting, whilst pain that lasts more than 3 months is considered chronic. "Chronic lower back pain" is defined in the European Guidelines for the Management of Chronic Nonspecific Low Back Pain (2004) as lower back pain that persists for at least 12 weeks. The way one walks, sits, or moves often influences one's back health. Back pain affects any age group for different reasons. As people get older, the chances of getting back pain increases. Back pain can range from mild, intermittent pain, to persistent, severe, disabling pain. Pain between the 12th rib and the gluteal

sulcus with or without radiating leg pain (Wong, Kawchuk, parent & Parasad, 2013). This disease affects the muscles, nerves, and bones of the back; men and women are equally affected by lower back pain. In the lumbar region, the spine is one of the musculoskeletal systems that undergoes the greatest morphological changes, resulting in physical limitations, with age (Pinheiro, Uchida, Mathias, Perez & Cordeiro, 2014).

Causes of Lower Back Pain

Everyone can experience it, regardless of age, culture, or nationality among other factors. Back pain that is caused by the spine, intervertebral disc, or surrounding soft tissues is called mechanical lower back pain (Patrick et al., 2014). Anatomical locations outside the spine are not included, and in most instances, there is no specific pathology (Endean, Palmer & Coggn, 2011). Non-specific lower back pain occurs when there is no cause. Spinal degeneration, spondylolysis and fractures are among the causes of mechanical lower back pain (Patrick *et al.*, 2014). Most of the mechanical back pain is caused by lumbar strain or sprain, 10 percent by age-related degenerative changes in the discs and facets, 4 percent by herniated disc, 4 percent by osteoporotic compression fractures, and 2 percent by spinal stenosis. There are several risk factors linked with persistent lower back pain in older adults. In most cases, lower back discomfort is self-limiting and disappears within a few days or weeks.

- **Bulging disc:** The bulging disc also known as a slipped disc occurs when the gel-like cushion bulges out and compresses neighbouring nerves. As one age, this risk increases because these discs become dehydrated and stiff. A bulging disc causes shooting pains in the back which radiates to the legs. Traumatic accidents or sudden movements can cause this problem.
- **Endometriosis:** Endometriosis is a gynaecological problem that causes uterus tissues to grow outside the womb. In this condition, there is chronic back pain which generally flares during menses. Other symptoms include painful menstruation, pain in the genital region, and lower abdominal pain.
- **Cancers:** Certain spinal cancers and uterine cancers (like cancer of the cervix, cancer of endometriosis) can cause severe and long-standing back pain. They can be referred to as the pain of metastatic breast or lung cancer.
- **Pelvic inflammatory diseases:** Many women have chronic back pain and discomfort where pelvic inflammatory disease (PID) can be a cause. It presents with lower back pain, abdominal pain, fever, and unusual vaginal discharge. PID is generally a bacterial infection that can be dangerous if untreated.

- **Disc degeneration:** The disc can be caused due to old age, injuries, or repetitive motions. The pain can extend to the buttocks and legs from the back. The pain is usually longstanding and dull and relieved by rest.
- **Kidney infection:** It is also known as pyelonephritis where one may present with lower abdominal pain, back pain, and groin pain. It also includes chills with fever and frequent urination.
- **Muscle Strain or Sciatica:** Muscle strain is often the cause of back pain from heavy lifting or vigorous exercise. There are small jelly-filled disks meant to protect the space between vertebrae and if one of the disks bulges or breaks, it can push on a nerve. When it's the sciatic nerve, pain runs from the buttock down one leg. This is referred to as sciatica.
- **Job/ Occupation:** If one's job involves lifting, pulling, or anything that twists the spine, it may contribute to back pain. However, sitting at a desk all day comes with risks of its own, especially if one's chair is uncomfortable. Prolonged sitting or standing overtime can cause low back pain.
- **Posture:** Mothers were right when they said, "Stand up straight! One's back supports weight best when one doesn't slouch". Poor posture can put extra pressure on the spine, leading to muscle strain, nerve compression, and other issues that can cause lower back pain. The way one walks, sits, or moves often influences one's back health. Good posture is necessary for alleviating lower back pain. Fernando et al (2021), analyzed several studies on the relationship between posture and low back pain, and found that good posture can help reduce back pain.
- **A Bulky Wallet:** Fat wallet syndrome made its debut in the mid-1960s, when men began to stuff credit cards into their wallets -- then sit on them. When one sits on a pocket bulging with cash, cards, and papers, muscles in the buttocks and sciatic nerves get strained. This can trigger lower back pain. A slim, uncluttered wallet in the front pocket can solve the problem.
- **Herniated Disk:** The spine's vertebrae are cushioned by gel-like disks that are prone to wear and tear from aging or injuries. A weakened disk may rupture or bulge, putting pressure on the spinal nerve roots. This is known as a herniated disk and can cause intense pain.

It has been stated earlier that the anatomy of the lower back is complex, carrying most of the weight of the upper body and often prone to pain and injury (Stephen, 2017). Several specific and non-specific factors including biophysical, psychological, social, and genetic factors can contribute to lower back pain.

Risk Factors of Lower Back Pain

Age, smoking, alcohol misuse, obesity, improper posture, and mental disorders are among the variables linked with persistent lower back pain. Slavery, sedentary lifestyle, and job tasks that involve severe flexion, rotation, and vibration on the chest (Wong et al, 2017). Modifiable and non-modifiable risks were classified by Wong et al. Modifiable risk factors include psychological distress (e.g., anxiety or depression), inactivity, smoking, social variables, self perceived, health and physical exercise (Wong *et al.*, 2017). Occupations involving lifting, bending, and twisting have been recognized as possible risk factors for persistent lower back pain (Kim, et al. 2014). An older adult's prior exposure to physically demanding employment may raise their risk of lower back discomfort. According to Plouvier *et al.* (2015), bending/twisting or driving for at least 10 years increased the risk of persistent low back pain in older adults, including retired individuals aged 58-67, after adjusting for body mass index and psychological disorders. The study involved more than 1500 individuals. Older people with lower education levels, income levels and smoking rates are more likely to suffer from LBP (Williams *et al.*, 2015). Educated people have less back pain because they have a better knowledge of therapy and a stronger commitment to a healthy lifestyle, according to research. (Traeger *et al.*, 2014). On the other hand, people with limited resources may delay seeking the attention of a physician until the symptoms which would have been earlier taken care of turns chronic because of lower income. (Dunn, Hestback & Cassidy 2013).

Concept of Rehabilitation Therapy

Rehabilitation therapy, or "rehab," is a process that helps people recover from illness or injury and improve their health and functioning. It involves a combination of treatments, therapies, and exercises that are designed to help people regain their independence, mobility, and quality of life. Rehabilitation can take place in a variety of settings, such as hospitals, rehabilitation centers, or even at home. Ogunleye (2008) defined rehabilitation therapy as "the process of assisting individuals to regain their physical, social, and psychological well-being and function in a safe and effective manner. It is a process aimed at enabling people with disabilities to reach and maintain their optimal physical, sensory, intellectual, psychological, and social functional levels.

Rehabilitation therapy is an integrated, holistic process that aims to enable the individual with a disability to achieve his or her optimal level of physical, psychological, and social functioning (American Occupational Therapy Association, 2002). It helps people gain greater independence, participate more fully in their communities, and often improve their quality of life. People who might benefit from rehabilitation include those who have experienced a stroke, spinal cord or brain injury, amputation, joint replacement, or other debilitating illness or traumatic event (Merck, 2022). The centers for Disease control and prevention (2022) defined rehabilitation as the process of helping a person who has suffered an injury, illness, or disability to regain skills and function and to return to the highest level of independent function possible. According to Medline plus (2022), rehab is the care given to a person to improve abilities needed for daily life. These abilities may be physical, mental, or cognitive and may have been lost because of a disease or injury, or as a side effect from a medical treatment. Royal College of Surgeons of England (2004) defined it as the process by which the impaired functions of a person are improved through multidisciplinary management involving medical, psychological, social, and vocational therapies. These therapies are provided with a view to returning the disabled individual to the highest possible functional capacity, including the optimal capacity for self-care, work, and play. According to Klonoff (2005), There are several types of rehabilitation therapy, including: physical therapy, occupational therapy, speech- language therapy, recreational therapy.

The Role of Rehabilitation Therapy in the Management of Lower Back Pain

LBP may be treated with pharmacological therapy, surgical interventions, or rehabilitation, which includes physical therapy, exercise, spinal manipulation, and other practices. Among the rehabilitative efforts for lower back pain are physical therapy (directional preference exercise, sensorimotor exercises, stabilization exercises, flexibility exercises, strength and conditioning exercises, aerobics, and general fitness exercises), spinal manipulation, occupational therapy or work- and sport-specific exercises, cognitive behavioral therapy, mindfulness meditation, orthotics, bracing, hot or cold therapy, kinesiology tape, patient education, traction, and rest (Alrwaily et al, 2016).

Rehabilitation therapy can have several benefits for an individual experiencing lower back pain. First, it can reduce pain and stiffness, it can restore mobility and help people regain the ability to do everyday tasks like bending, twisting, and lifting, it can improve posture and body mechanics to prevent future injuries, it can increase muscle strength and flexibility, it can increase self confidence and independence, making it easier to manage pain. It can help people

get back to work and other activities more quickly. Also, it can reduce reliance on medications and their side effects.

One important aspect of rehabilitation therapy for lower back pain is education. This includes teaching people about the anatomy and biomechanics of the spine, as well as how to properly lift, bend, and twist. In addition, people are taught how to set up their work and home environments to reduce strain on the back (Matheson et al, 2013). This education can be beneficial in preventing future injuries and promoting overall wellness.



- **Physical Therapy and Exercise**

This type of rehabilitation therapy uses exercises and other physical treatments to improve strength, mobility, and function. Physical therapists also educate patients on how to improve their posture and body mechanics to reduce the risk of future injuries. It focuses on restoring physical function and reducing pain. It can include things like range of motion exercises, strengthening exercises, and gait training, stretching, low impact aerobic activity, manual therapy, and electrical stimulation.

Exercise is effective for patients with subacute lower back pain or chronic lower back pain. Strength-building exercises, which aim at building up support of the spine, may be recommended; an added benefit of such exercises is that they may improve posture and endurance. Directional preference exercises provide to lower back pain patients rapid and durable pain relief after performing repeated lumbar flexions, extensions, side glide exercises, and rotations. These exercises can be performed in the patient's preferred direction or in the opposite direction. Aerobic exercise has established benefits for overall well-being, fitness, and

cardiovascular health (Fang et al, 2016) but its role for the treatment of patients with chronic lower back pain is unclear.

A rehabilitation program can guide one through stretches, strength exercises, and low-impact cardio that will help one get back to daily activities. An exercise system centering on controlled movement, breathing, and stretching. Exercise induces pain relief by the activation of central inhibitory paths. Mechanisms involving opioids, serotonin, and *N*-methyl-D-aspartate (NMDA) in the rostral ventromedial medulla stimulates pain relief associated with exercise (Da Silva, & Galdino, 2018). Exercises are selectively prescribed for pain relief. It can help reduce tension and radiating pain. Progressive strengthening exercises increase the strength and endurance of gliding muscles around the spine. It can increase mobility, flexibility, endurance, strength, and range of motion. Flexibility is a component of health-related fitness that shows the range of motion that a given point (joint) permits (Iro, 2008). "The tissues that must be stretched include not only the ligaments, fascia, and other connective tissue linked to the joints, but in many cases also the antagonistic muscles - that is, the muscles that resist the movement in which the joint motion is restricted," explains Ogunleye in 2015.

Some of the benefits of physical therapy include.

- Personalized Care. It considers one's body type, age, lifestyle (whether a sedentary person or an athlete), existing health conditions, and how one responds to different types of movement.
- Decreased pain.
- Restored mobility. Physical therapists not only treat pain, but they also look for the root cause of discomfort. For example, if one's lower back is stiff, the therapist will focus on easing that stiffness. If the back muscles are weak, the therapist may recommend strengthening exercises that will aid in recovering full range of motion.
- May eliminate the need for surgery. Surgery should only ever be considered as a last resort, and physical therapy is one of the most proactive ways to attempt to resolve back pain conservatively.
- Reduces the risk of further injury. If a person is required to do repetitive movements due to job duties or athletic activity, physical therapy will consider such movements and suggest recovery stretches to avoid future back injury.
- Reduces the risk of falls. If one has poor posture or a degenerative disease that increases the likelihood of falling, a physical therapist will design a plan to improve balance, as well as improve coordination.

- Strengthen lumbar and abdominal muscles.

- **Nerve Stimulation**



Research is being conducted on certain treatments that stimulate nerves to reduce chronic back pain. One of such is the use of transcutaneous electrical nerve stimulation (TENS), during which mild electric pulses are delivered to the nerves to block incoming pain signals. Transcutaneous electrical nerve stimulation (TENS), and ultrasound therapy is used to reduce pain. Each machine is uniquely adept at targeting the structures causing back pain. They are effective in reducing pain and inflammation.

- Chiropractic care is a type of rehabilitation therapy that focuses on the spine and other joints in the body. Chiropractors use techniques like adjustments and manipulation to reduce pain and improve function. They also provide education on ergonomics and exercises to help prevent future injuries. Chiropractic adjustments are one of the main techniques used by chiropractors. These adjustments involve applying controlled force to a joint to improve its range of motion and reduce pain. Another technique is called mobilization, which is a slower and more gentle form of joint manipulation. Chiropractors also use soft tissue therapy, such as massage, to reduce muscle tension and improve mobility. In addition to these techniques, chiropractors often recommend stretches and exercises to help improve strength and function.

Chiropractic treatment for lower back pain uses spinal manipulation and mobilization for the treatment of back pain. It helps restore the range of motion at the joints in the back and improves their function. It also helps reduce nerve irritability and improve the movement of soft tissues

around the spine. Both chiropractors and manual therapists use spinal manipulation as a treatment for lower back pain.

- Cognitive Behavioural Therapy and Mindfulness Meditation: Progressive muscle relaxation techniques, in which individuals with lower back pain are encouraged to relax, become mindful of various body parts, and consciously try to relax these body areas, was found to improve pain better.
- Hot and Cold Therapy: Cold and heat therapy are both commonly used in treating low back pain. Cold therapy, or cryotherapy, involves applying cold packs or ice to the affected area to reduce inflammation and pain. Heat therapy, or thermotherapy, involves applying heat to the affected area to increase blood flow and promote healing. Both cold and heat therapy can be effective in treating low back pain, but the best approach may depend on the individual and the severity of the pain.
- Occupational therapy focuses on helping people do everyday activities, like dressing, cooking, and working. Occupational therapists use a variety of techniques, such as adaptive equipment, assistive devices, and training on how to perform daily tasks. An occupational therapist is a trained professional that can implement specific treatments and lifestyle changes to help optimize functional activities. For back pain, treatment focuses on using proper body mechanics, energy conservation methods, and learning pain signals to avoid overexertion. The occupational therapists will start by examining the overall activities of a patient at work and recreation and design a program based on this. They can help recommend any adjustments or equipment one may need for home or work environment to make it easier. Occupational therapists often help people with activities like eating, dressing, bathing, grooming, cooking, cleaning, working and help with leisure activities, like reading, playing sports, and going to social events. One way they do this, is by modifying the environment or using adaptive equipment. For example, they may add grab bars to the bathroom or put rails on the stairs to make it easier for someone to move around. They may also provide assistive devices, like wheelchairs, walkers, and orthotic devices. They also teach people how to adapt their behaviors and skills to complete everyday activities.
- Recreational therapy is a more holistic approach that uses leisure and recreational activities to help people improve their physical, emotional, and social well-being. The benefits of recreational therapy include improved mood, reduced stress and anxiety, increased self-confidence, and better social skills. Recreational therapy can be used to

assist people with a wide range of conditions, including neurological disorders, chronic pain, depression, anxiety, traumatic brain injury, autism, and addiction. The goal of recreational therapy is to improve quality of life by helping people find new ways to engage in meaningful leisure activities. This can be anything from art therapy to sports and fitness to music therapy. The key is to find activities that the individual enjoys and that will help them reach their goals. An important aspect is the idea of "normalization," which means helping people feel like they are part of the larger community, regardless of their disability. This can be incredibly empowering for people, especially those who have experienced a major life change, like a stroke.

Other methods rehabilitation therapy can adapt in the treatment of lower back pain is acupuncture, rest, heat and ice, manual massage, talk therapy, biofeedback and more. It has numerous benefits such as improved mobility, reduced pain, and improved quality of life. Several studies have found that rehabilitation therapy is an effective treatment for lower back pain. A study by Maher et al (2014) published in the Journal of pain research found that physical therapy was as effective as surgery for treating chronic low back pain. Another study by Weiner et al (2018) published in the Journal of General Internal Medicine found that chiropractic care was more effective than conventional medical care for treating chronic low back pain. It recommended that chiropractic care be considered as a viable treatment option for patients with this condition, especially those seeking non-pharmacological solutions. Chiropractic care was effective in reducing pain and improving function for people with chronic low back pain. This evidence shows that rehabilitation therapy can be a safe and effective treatment for lower back pain.

These studies show that there is strong scientific evidence supporting the use of rehabilitation therapy for lower back pain. Also, it can provide significant benefits for people with low back pain when it comes to pain relief. For example, a systematic review of the evidence found that people who received physical therapy for low back pain had less pain after 6 to 12 months, compared to those who did not receive physical therapy (Fritz et al, 2011). Physical therapy was also found to be more effective than other treatments, such as medication or surgery. In addition, people who received physical therapy were also less likely to experience disability and had better physical function.

For chronic lower back pain, the rehabilitation therapists recommend the use of non-pharmacological therapies. These include tai chi, yoga, massage, exercise, psychological (cognitive behavioural therapy), and spinal manipulation. These should be tried before

pharmacological interventions, such as nonsteroidal anti-inflammatory drugs (NSAIDs) and antidepressants, are considered. All pharmacological interventions should be at the lowest effective dose and for the least possible time (Almeida *et al.*, 2018).

Conclusion

The study concluded that low back pain occurs because of multiple reasons and the intensity and severity depend on the injury mode and the extent of damage. Furthermore, lower back pain may also occur due to other medical conditions such as infection, malignancy, inflammatory diseases, arthritis, or pregnancy-related backache. It established that the older persons may be more susceptible to lower back pain because of work effect and other causes such as radiculopathy, osteoporosis, vertebral fractures, degenerative lumbar scoliosis, tumors/cancers, poor posture, prolonged sitting and standing and one's occupation.

The study demonstrated that rehabilitation therapy is a comprehensive and effective way to help people regain their independence and improve their quality of life, most importantly, recovery from lower back pain.

Suggestions

In view of the foregoing, this paper hereby recommends the following:

1. Older adults should engage in non-stress exercise so as to improve their posture and body mechanics.
2. Older adults should engage in rehabilitation therapy to help bring relief and improve their day-to-day activities.
3. Tertiary institutions in Nigeria should include the course in their schools thereby having more graduates and specialists in this field.
4. Sports institute, sports managers, directors, coaches, and sports men should be made aware of rehabilitation therapy and its benefits in the prevention, treatment, and management of sports injuries and lower back pain.
5. The government and other health organizations should establish centers for rehabilitation therapy, as well as reduce cost of treatment to create accessibility and affordability.

References

- Almeida, M., Saragiotto, B., Richards, B. & Maher C. G. (2018). Primary care management of non-specific low back pain: key messages from recent clinical guidelines. *The Medical Journal of Australia*, 208(6), 272–275.
- Alrwaily, M., Timko, M. & Schneider, M. (2016). Treatment-based classification system for low back pain: revision and update. *American Physical Therapy Association*, 96(7), 1057–1066.
- American College of Rheumatology (2012). *Back pain*. <http://www.Rheumatology.org/clinicalpatients/disease-and-condition/backpain.asp>
- American Occupational Therapy Association. (2002). *Occupational therapy practice framework: Domain and process*. <https://www.aota.org/Practice/definition.aspx>.
- Brooks, P. (2005). Issues with chronic musculoskeletal pain. *British Journal of Rheumatology*, 44 (7), 831.
- Centers for Disease Control and Prevention. (2022). *Rehabilitation*. <https://www.cdc.gov/ncbddd/disabilityandhealth/rehabilitation.html>.
- Da Silva Santos, R. & Galdino, G. (2018). Does exercise increase or decrease pain? Central mechanisms underlying these two phenomena. *Journal of Physiology and Pharmacology*, 69(1), 3–13.
- Dunn, K.M., Hestback, L. & Cassidy, J.D. (2013). Low back pain across the life course. *Best Practice & Research Clinical Rheumatology*, 27(5), 591 -600.
- Endean, A., Palmer, K. T. & Coggon, D. (2011). Potential of Magnetic Resonance Imaging Findings to refine case definition of mechanical low back pain in epidemiological studies. *A systematic Review Spine (Phila Pa 1976)*, 36(2), 160.
- European guidelines for the management of chronic nonspecific low back pain (2014). On behalf of the COST B13 working group on guidelines for chronic low back pain.
- Fang, N., Jiang, M. & Fan, Y. (2016). Association between psoriasis and subclinical atherosclerosis: a metaanalysis. *Medicine*. 95 (20), 3576.
- Fernando, A. R., Pereira, J. D., Oliviera, J. V., Santos, J. N., Dos Santos, L. F. & Simoes, T. R. (2021). The effects of posture on low back pain: a systematic review and meta- analysis. *Journal of Physical Therapy Science*, 33(5), 1572–1580.
- Fritz, J. M., Cleland, J. A., Brennan, P. F., Hancock, M. J., Maher, C. G., McAuley, J. H. & Nijs, J. (2011). Physical therapy for low back pain: An updated systematic review and metaanalysis. *Cochrane Database of Systematic Reviews*, 10, (9), 13.
- Iro, P. C. E. (2008). *Dictionary of physiology of exercise and related terms*. Port Harcourt: University of Port Harcourt Press.
- Kim, W., Jin, Y. S., Lee, C. S., Hwang, C. S., Lee, S. Y., Chung, S. G. & Choi, K. H. (2014). Relationship between the type and amount of physical activity and low back pain in

- Koreans aged 50 years and older. *Journal of the American Academy of Physical Medicine and Rehabilitation*. 6 (10), 893 – 899.
- Klonoff, A. S. (2005). *The role of the occupational therapist in physical rehabilitation. American Journal of Occupational Therapy*, 59(6), 566–575.
- Maher, C. G., McAuley, P. H. D., Koes, R. P., O'Keeffe, R. D. J., Lamb, J. H., Williams, E. I., & Denvir, M. J. (2014). Effectiveness of physical therapy for chronic low back pain: A systematic review and meta-analysis of randomized controlled trials. *Journal of Pain Research*, 7, 139–148.
- Massage techniques (2017). *Massage technique, effleurage, and petrissage*. www.martingetkov.com/youroppportunity/massage-techniques-effleurage-and-petrissage
- Matheson, S., Henschke, N., Woodhouse, L. & De Souza, M. (2013). The role of physiotherapists in low back pain education: A systematic review. *Physiotherapy*, 99(3), 193.
- Medline Plus. (2022). *Rehabilitation*. <https://medlineplus.gov/rehabilitation.html>.
- Merck & Co., Inc., Rahway, NJ, USA. (2022). *Rehabilitation*. In: *Merck Manuals*. <https://www.merckmanuals.com/professional/geriatrics/rehabilitation>.
- Ogunleye, A. V. (2008). Rehabilitation therapy: Concepts, aims, and goals. *Journal of Physical Therapy Science*, 20(1), 13-18. <https://doi.org/10.1589/jpts.20.13>.
- Ogunleye, A. V. (2015). *Fundamentals of biomechanics for physical activities*. Port Harcourt: Cewil Publishers.
- Patrick, N., Emansik, E. & Knaub, M. A. (2014). Acute and Chronic low back pain. *Medical Clinics of North America*, 98(4), 777.
- Pinheiro, R. C. Uchida, R. R., Mathias, L. A., Perez, M. V. & Cordeiro, Q. (2014). Prevalence of depressive and anxious symptoms in chronic disease patients. *Journal of Brasileiro de Psiquiatria*, 63(3), 213.
- Plouvier, S., Chastang, J. F. Ggr. S., Descatha, A., Glodger, M. & Lec Lere, A. (2015). Occupational biomechanical exposure predicts low back pain in older age among men in Gazel Cohort. *International Arc of Occupation and Health*, 88, 501.
- Stephen, K. (2017). *Lumbar spine anatomy*. <https://emedicine.medscape.com/article/1899031-overview>.
- The Royal College of Surgeons of England. (2004). *Royal college of surgeons' working group on rehabilitation*. <https://www.rcseng.ac.uk/publications/docs/rehabilitation2004.pdf>
- Traeger, A. C., Mostey, G. L., Hubs Cher, M., Lee, H., Skinner, I. W., Nicholas, M. K. & Mc Auley, J. H. (2014). Pain education to prevent chronic low back pain: a study protocol for randomized control trial. A study protocol for randomized control trial. *BMJ Open*, 4(6), 005505.
- Weiner, J. M., Cherkin, D. C., Deyo, R. A., Coulter, D. L. & Heng, N. L. H. (2018). Effectiveness of chiropractic spinal manipulation vs. standard medical care for acute

and subacute low back pain: A randomized controlled trial. *Journal of General Internal Medicine*, 33(3), 320-328.

- Williams, J. S. Ng, N., Peltzer, K., Yawson, A., Biritwunm, R., Maximova, T. & Charatter, J. S. (2015). Risk factors associated with low back pain in older adults in low and middle-income countries. Results from the WHO study on Global Ageing and Adult health (SAGE) *PLOS ONE*, 10(0), e0127880.
- Wong, A. Y., Karppinen, J. & Samartizis, D. (2017). Low back pain in older adults: risk factors, management options and future directions. *Scoliosis and Spinal Disorders* 12, 14.
- Wong, A. Y., Kawchuk, G., Parent, E. & Parasad, N. (2013). Within-and-between-day reliability of spinal stiffness measurements obtained using a computer controlled mechanical indenter in individuals with or without low back pain. *Journal of Manual and Manipulative Therapy*. 18, 395-402
- Woolf, A. D. & Fleger, B. (2003). Burden of major musculoskeletal conditions. *Bulletin of the World Health Organization*, 81(9), 646 – 656.