Deanship of Graduate Studies

Al-Quds University

Clinical, Physical, Psychological, and Functional Impacts of a Suggested Quantified-Modeling for Progressive Core Stability Exercise in Tele-Physiotherapeutic Management of Discopathy-Low Back Pain

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MPT Thesis

Jerusalem- Palestine

1446\2024

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This thesis was submitted in partial fulfillment of the requirements for the Master's degree in Physiotherapy

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Thesis Approval

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Jerusalem- Palestine

1446\2024

Dedication

I dedicate this dissertation to my mother and my father's soul in heaven, for their inspiration and encouragement. I also dedicate this dissertation to my husband, for his unwavering support, and to my wonderful family for being my source of joy and hope for the future.

Declaration

This thesis was submitted in partial fulfillment of the requirement for the Master's degree in physiotherapy.

I declare that the content of this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Hiba Mohammad-Saadi Nimer ALFakhori

Date: 11/7/2024

Acknowledgment

My dissertation would not have been completed without the support and help that I received from many people.

My sincere gratitude goes to Dr. Abdulhamid Zeer for his constant guidance and patience, and for imparting his knowledge and experience in physiotherapy. Through various classes and projects assigned by him, I was inspired to focus my work in this area.

I would like to thank Dr. Abdulhamid for his insightful comments and for sharing his knowledge and experience in physiotherapy research. Dr. Abdulhamid Zeer is acknowledged for his support, insightful comments, and encouragement. In particular, his guidance facilitated the thesis writing and administrative processes.

I would also like to thank the MPT program coordinators, for their constant communication and encouragement to me.

I am also thankful to the internal and external examiners for examining and recommending this Master's Degree thesis.

I would also express my acknowledgement to the teaching staff members in the master's program of physiotherapy at Al-Quds University

My gratitude also goes to my colleagues in my work and physiotherapy Students for their advice and help in my journey.

Last, but not least, I thank my family for being with me throughout this journey and for providing support in every aspect of this endeavor.

Abstract

Background: Low back pain (LBP) caused by Discopathy is a frequent problem that harms how people live and function. Core stability exercises in physical therapy help to enhance muscular strength, proprioception, and function. Tele-physiotherapy with mobile apps provides remote, full rehabilitation programs. These technologies offer effective LBP care through easily available, supervised activities, possibly enhancing results and adherence without requiring in-person visits.

Purpose: The study aimed to enhance functional performance and overall patient care in the region by investigating the efficaciousness of core stability exercises as Tele-physiotherapeutic intervention delivered through WhatsApp technology to manage Discopathy- low back pain in Palestine.

Method: In a quasi-experimental study, 30 women with disc herniation-related lower back pain (DP-LBP) were non-randomly chosen from Hebron's Tariq Bin Ziyad Community Center to participate in one group therapy intervention using a suggested Tele-physiotherapy protocol of progressive core stability exercise PCSE. The suggested protocol was remotely delivered and monitored through WhatsApp, and continued along four weeks, with three sessions per week. Demographic, anthropometric, medical history, pain intensity, lumbar spine range of motion, level of functional activity, and psychological aspects of Discopathic low back pain in female patients were repeatedly assessed during the pre-, mid, and posttests.

Result: The study found significant reductions in pain intensity, improvement in physical function, and psychological factors using remote physical therapy through WhatsApp for patients with disc herniation-related lower back pain, proving its effectiveness across all evaluated outcomes.

Conclusion: Using WhatsApp technology to remotely deliver PCSE in the management of DP-LBP, Tele-physiotherapy was proven to be advantageous in reducing pain, improving physical aspects of muscle performance, range of motion, enhancing functional abilities among patients with DP-LBP, leading to considerable improvements in the clinical, physical, psychological, and functional domains in treating low back pain.

Keywords: Low back pain, Discopathy, core stability exercise, Tele-physiotherapy

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__Study Abbreviations and Terms:

- LBP: low back pain.
- DP-LBP: Discopathy low back pain
- (LPS) :Lumbopelvic Stability
- CSE: core stability exercise.
- CS-LET: core stability land exercise therapy.
- PCSE: Progressive core stability exercise.
- VAS: visual analog scale
- FABQ: fear-avoidance beliefs, questioner
- ODI: Oswestry disability index
- ROM: range of motion.
- AT: Autogenic Training
- LPS: lumbopelvic stability
- TEL-PT: Tele Physiotherapy
- LRPS: Lumbosacral Radiculopathy Syndrome
- AT: Autogenic Training

Sciatica Pain radiates from the back into the buttock or leg and is most commonly caused by prolapse of an intervertebral disk; the term may also be used to describe pain anywhere along the course of the sciatic nerve.

Oswestry Disability Index Back-specific, self-reported questionnaire measuring pain and function in completing physical and social activities. The scale score ranges from 0 (no disability) to 100 (maximum disability).

Low back pain: Low back pain is described as "pain and discomfort below the costal boundary and above the inferior gluteal folds, with or without leg pain

Chapter One: Introduction

1.1 Background
1.2 Problem Statement
1.3 Study Rationale
1.4 Study Objectives
1.5. Study Hypothesis

Chapter One: Introduction

1.1 Background

World Health Organization (WHO) reports, that low back pain (LBP) is the biggest cause of disability globally, impacting an estimated 619 million people in 2020, a 60% increase from 1990. This figure is estimated to climb to 843 million by 2050, owing to population growth and aging, mainly in low- and middle-income nations, with Africa and Asia experiencing the highest increases. LBP is more common in women, peaking between the ages of 50 and 55. The majority of persistent low back pain patients treated in primary care have pain that lasts more than three months and is not caused by an underlying condition. (WHO - World Health Organization, 2023) The WHO emphasizes non-surgical interventions to manage chronic LBP effectively, including education, exercise, physical therapies, psychological therapies, and appropriate medications. Recently, the WHO issued its first recommendations for treating chronic LBP in primary and community care settings, outlining measures that health professionals should employ and avoid during regular care.. (WHO - World Health Organization, 2023)

Low back pain is described as "pain and discomfort below the costal boundary and above the inferior gluteal folds, with or without leg pain." One of the most prevalent forms of pain worldwide is lower back pain. Low back pain (LBP) is a frequent discomfort in communities, a crippling illness that affects people and the community, resulting in lost work and higher medical expenses(Hoy et al., 2014).

Discopathy is a prevalent form of neuropathic pain that causes pain in one or more dermatomes of the lower back, often known as lumbar radiculopathy. While these names are sometimes used interchangeably, they might refer to the same ailment. Other types of neuropathic pain are commonly referred to as radiculopathy. Sciatica, on the other hand, is a symptom corresponding to the location of the sciatic nerve in the body. Although the lower back may not directly cause sciatica, spinal discs are typically the major reason.(Kuligowski et al., 2021)

The most frequent form of lower back pain is mechanical pain, which is caused by spinal muscular tension or stress on the facet or sacroiliac joints. It occurs as unidirectional pain that does not extend below the knee. Physical activities such as heavy lifting and prolonged

sitting pose risks, as can physiological difficulties such as poor fitness and weak trunk muscles, as well as psychological variables such as stress, anxiety, and low work satisfaction, which are related to mechanical low back pain (Rizvi et al., 2019)

Surgery or conservative therapy can be used to treat DP-LBP, Surgery has a high risk of producing trauma, on the other hand, conservative analgesic medication is merely symptomatic, which means that patients must take it continuously for a long time, which might result in adverse effects such as gastrointestinal bleeding, liver, and kidney damage, therapeutic exercise which can be done on land (land-based core stability exercise) or in water (Aquatic exercise therapy), is another conservative therapy that can be provided to DP-LBP patients (aquatic exercise therapy and land-based core stability have a decreased risk of injury.(Rahmadhani et al., 2019), one of the most popular conservative exercise therapies is Core Stability Exercises.

Related to core stability, there are various treatment options for low back pain, some studies suggest that exercise therapy can help improve the quality of life for people with this condition, this type of exercise involves training the muscles that are responsible for supporting and regulating the spinal system (Wang et al., 2012), It can also maintain a moderate contraction rate during activities, Clinically, it is thought that lumbopelvic stability (LPS) is a key component of injury prevention, and that training LPS will aid in injury recovery and performance. (M. B. Shamsi et al., 2015)

Most people around the world are familiar with exercise therapy as a conservative treatment for low back pain (LBP), It is commonly used to treat patients with multiple conditions such as spinal disorders and musculoskeletal pain, Although it's generally advised to perform these exercises as part of a rehabilitation program, physiotherapists have different approaches, for people with low back pain, core stability exercises are often performed as part of their rehabilitation program, they can help improve the stability of the lower back and prevent it from returning. LBP patients are also advised to perform inter-segmental stability exercises to maintain their mobility and neuromuscular control. (Wang et al., 2012)

Core stability exercises are extremely efficient in assessing and treating lower back pain caused by ruptured discs. Initial examinations, which include posture, range of motion, and strength tests such as the plank and pelvic bridge, reveal imbalances and deficits. Based on these evaluations, a specific fitness program is developed, beginning with basic activities

and progressing as the patient improves(Akhtar et al., 2017). To prevent injuries and increase effectiveness, appropriate workout performance and daily integration are given. Regular monitoring and changes are done to optimize recuperation, alleviate discomfort, and increase functioning(Akuthota et al., 2008). The plank, pelvic bridge, and Swiss ball exercises are essential for improving spinal stability and lowering the chance of future injury(Akuthota et al., 2008). Recent research confirms the advantages of core stability exercises for low back pain, concentrating on muscular strength and function (M. B. Shamsi et al., 2016).

Recent studies have shown that core stability exercise can benefit people with low back pain,(B. Kim & Yim, 2020) this research will focus on the effects of this type of therapy on various aspects of the condition, such as the strength and function of the muscles. (Bayraktar et al., 2016)

Autogenic self-relaxation techniques with Breathing exercises are highly important. Some applications include particular workouts to help patients decrease stress and enhance their psychological condition autogenic self-relaxation techniques mixed with breathing exercises include strategies for inducing a state of relaxation and calmness by self-directed mental images and regulated breathing. These techniques try to relieve tension and promote relaxation by instructing practitioners to concentrate on feelings of warmth, heaviness, and peacefulness in various places of their bodies. The addition of breathing exercises improves relaxation by controlling respiratory patterns, encouraging deep diaphragmatic breathing, and creating a physiological state favorable to stress reduction. These activities work together to help people manage anxiety, improve emotional well-being, and increase general relaxation responses(Toussaint et al., 2021).

Tele-physiotherapy is beneficial in increasing the quality of life for patients with chronic low back pain, with considerable biopsychosocial advantages (Dario et al., 2017). WhatsApp (WhatsApp Inc., Mountain View, CA) is a smartphone software used by over 700 million people worldwide. It allows users to send text messages and other material, including videos, to their contacts. As a social network, it also makes it easier to create groups, which allow various people to engage in and monitor the discourse, using WhatsApp to provide the therapeutic program allows women to commit to practicing therapeutic exercises regularly, following a training plan that specifies the duration, number of repetitions, and number of rounds. Following this paradigm and physiological muscle training increases the likelihood of benefiting from the workout(Muntaner-Mas et al., 2017).

Using smartphone applications to treat and follow up on patients with lower back pain caused by herniated discs can be quite effective. These applications provide novel and effective solutions for patients to control their disease and improve their treatment outcomes(Machado et al., 2016). Here's how these applications and programs function, the features of Smartphone Applications for Treating and Monitoring Patients with Herniated Discs Through Customized Exercise Programs and Personalized Exercise Design Based on the patient's examination, the software can provide specific workouts to help strengthen the muscles that support the spine and improve flexibility. Video Instructions through the apps demonstrate how to perform exercises appropriately, reducing the risk of injury or aggravating the condition. The last one Reminders and Follow-Up Appointment reminders give consumers frequent reminders to exercise or take their medications. Patients can enter information about their health and exercise performance, allowing physicians to monitor therapy progress and adjust the plan as needed. Communication with Specialists, Instant Chat, and Consultations, some applications enable users to interact with physical therapists or treating doctors over chat or video, offering urgent assistance, Sending Reports means that apps may provide comprehensive progress reports to doctors, allowing for more accurate and consistent monitoring. Education and Awareness with Educational Articles and Videos on Smartphone Apps give credible information on herniated discs, their causes, and treatment options(Rs et al., 2020).

Apps help patients stick to treatment programs by providing ongoing reminders and advice, ensuring successful treatment outcomes. Second point: interaction and support. Continuous connection with therapists and experts allows patients to obtain the required assistance and make timely revisions to treatment programs as needed. They had one self-monitoring system. Tracking progress helps patients to observe their success over time, which encourages them to stick with their treatment plan. Preventing Relapses, Patients benefit from educational and awareness initiatives that help them avoid practices that might aggravate their disease or cause new ailments (Fjeldsoe et al., 2009).

The purpose of this study is to evaluate the overall effect of core stability exercises (CSE) on several aspects of Discopathy-related low back pain (DP-LBP). The study focuses on strengthening core muscles such as the pelvic floor, transversus abdominis, multifidus, gluteal, and paraspinal. It also investigates the efficacy of a CSE procedure provided remotely using the WhatsApp application for follow-up and therapy. It will investigate the

clinical, physical, functional, and psychological impact caused by DP-LBP. In summary, the study aims to present a complete physiotherapeutic approach to assist patients in effectively managing and coping with DP-LBP.

1.2 Problem Statement

Even though (DP-LBP) is taking an important space in physiotherapy research, many patients with various levels of pain still find it difficult to alleviate the harshness of the symptoms as well as struggle with mobile and functional restrictions. This study attempts to conduct further and more thorough approaches and research in the management of (DP-LBP). The study will professionally deal with technical programming integrating the therapeutic values of core stability exercises in the treatment of (DP-LBP). using the remote follow-up and treatment via the WhatsApp application.

Following medication and treatment, people with persistent low back pain (DP-LBP) typically avoid surgery due to worries about infection, nerve damage, anesthesia complications, and long recovery durations. Patients choose non-surgical options that allow them to resume their normal activities, as surgery may not always give pain relief and might be costly with limited insurance coverage. Non-surgical therapies such as physical therapy and exercise are more enticing, as they provide considerable comfort and better function without the dangers associated with surgery. Those who have had a bad surgical experience or have other health problems are more likely to pursue conservative therapies.

In Palestine, there is a lack of systematic and efficient use of smartphone applications to treat disc herniation-related lower back pain (DP_LBP), making it difficult to create and apply appropriate treatment strategies.

This work proposes a strategy for progressive core stability exercises via WhatsApp to help patients manage DP-LBP. The approach offers personalized regimens, progress tracking, and real-time expert feedback, promoting adherence, self-management, and community support. Additionally, educational content on posture, ergonomics, and lifestyle changes enhances the program's effectiveness

1.3 Study Rationale

1. The focus of Researchers on LBP is based on the fact that LBP is a very problematic issue in health management and physiotherapeutic management, which plays an important role in living up to this problem.
2. Using the WhatsApp application Most recent interventions of CS-LET will be integrated into the suggested treatment protocol for DP-LBP management.
3. Comprehensive physical, re-education, and ergonomic (general pt. education control method) interventions were therapeutically integrated into the suggested program of (DP-LBP) Therapy.
4. A wide range of outcome measure parameters in physical therapy including, clinical, physical, functional, and psychological, were used in the assessment and treatment of patients with low back pain.
5. Patients with specific Discopathy LBP symptoms were recruited into the study sample.

1.4 Study Objectives

1. To assess the clinical, physical, proprioceptive, functional, and psychological impacts of DP-LBP among female patients
2. To construct a suggested exercise therapy program, based on PCS for treatment patients with (DP-LBP).
3. To identify and use the applied communication technologies to deliver the suggested tele-physiotherapy program in the management of DP-LBP.
4. To identify the effect of the suggested Tele physiotherapeutic protocol on the clinical, physical proprioceptive, functional, and psychological aspects of patients with (DP-LBP).
5. To identify the relationship between the anthropometric, clinical, physical, proprioceptive, functional, and psychological aspects among patients with (DP-LBP)

1.5 Study Hypothesis

1. DP-LBP has negative impacts on the physical, proprioceptive, functional, and psychological aspects of patients with (DP-LBP).
2. The suggested PCS protocol will significantly reduce clinical, physical proprioceptive, functional, and psychological symptoms among patients with Discopathy low back pain.
3. The communication technologies of WhatsApp is valid to deliver the suggested tele-physiotherapy program in the management of DP-LBP.
4. There is a significant relationship between the anthropometric, clinical, physical, proprioceptive, functional, and psychological aspects among patients with (DP-LBP).

Chapter Two: Literature Review

Chapter Two

2.1 Theoretical Framework

2.1.1 Low back pain:

Low back pain (LBP) is defined as discomfort, muscular tension, or stiffness located below the costal border and above the inferior gluteal folds. This illness can occur with or without sciatica, which is characterized by pain spreading down the sciatic nerve down the leg (Delitto et al., 2012). LBP gets classed as chronic when the pain persists for 12 weeks or longer. Chronic low back pain can have a substantial influence on a person's quality of life, including physical limits, psychological discomfort, and increased healthcare usage. It is frequently caused by a combination of mechanical concerns such as muscle tension, disc degeneration, and structural abnormalities, as well as non-mechanical factors such as infections or inflammation(Alfalogy et al., 2023).

Low back pain (LBP) is a common ailment that affects a large proportion of the population at some time during their life. It is the second most prevalent reason for medical visits and a major source of work-related impairment. LBP is thought to be caused by a complex combination of biological, psychological, social, and environmental variables. Biomechanically, LBP is frequently caused by excessive or recurrent mechanical stress on the spine, inadequate lifting skills, extended sitting or standing, and bad posture. Structural problems such as disc bulges, spinal stenosis, and degenerative disc degeneration can also cause biomechanical instability and nerve compression, resulting in discomfort (R A Deyo & Weinstein, 2001).Stress, anxiousness, sadness, and fear-avoidance attitudes can all exacerbate pain perception and contribute to chronicity(Pakkir Mohamed & Seyed, 2021)

Lower back pain can be categorized into three categories: Acute low back pain lasts less than six weeks, sub-acute low back pain lasts six to twelve weeks, and chronic low back pain lasts twelve weeks or more. The degree of pain and the functional disability that it causes are the factors that are considered when assessing its severity. The first step in diagnosing and treating this condition is to determine the severity of the pain. Four grades are used to describe the degree of disability that a person has associated with the pain, the severity of the pain and the functional disability that it causes are the factors that are considered when

assessing its severity, they can then help determine the appropriate treatment methods. (Rahmadhani et al., 2019)

Specific back pain and non-specific back pain are the two main types of back pain. Specific back pain is classified into three types. Discogenic back pain is characterized by back and/or leg pain in the absence of radiologically significant nerve root compression, non-disc nociceptive back pain, such as myofascial back pain, which incorporates back sprains and spasms, arthritic back pain, which includes synovial joints such as facet joints, vertebral fractures, and osteoporosis neural leg pain, such as radicular pain, is caused by nerve root compression. Non-specific back pain can arise in the absence of anatomical abnormalities, and while the exact cause is unknown, biopsychosocial factors play a crucial impact.

The term "lumbosacral radiculopathy" LRPS relates to a pain syndrome caused by nerve root compression or irritation in the lower back, LBP can be caused by a lumbar herniated disc, spinal vertebral degeneration, or constriction of the foramen where the nerves exit the spinal canal(Alexander et al., 2024).

As a symptom, low back ache spreads in a dermatomal pattern into the lower limbs, Additional signs that may accompany lumbosacral radiculopathy include numbness, weakness, and loss of reflexes, the conduction of one or more spinal nerves being blocked, which can lead to a loss of motor function and sensation, Some of the symptoms of this condition include a feeling of a numb or weak sensation, weakness, and muscle wasting, The absence of these complaints, however, does not exclude a diagnosis of lumbosacral radiculopathy. Lumbar radicular pain is typically felt as a narrow band of pain running down the length of the leg, both superficially and deeply. It is sometimes associated with radiculopathy (objective sensory and/or motor dysfunction caused by conduction block) and can coexist with spinal or somatic referred pain. In more than half of the cases, LRP is satisfied with simple analgesics. (M. B. Shamsi et al., 2015)

Pain intensity and impairment are influenced by cognitive variables such as maladaptive pain beliefs and exaggeration, whereas social factors such as support networks, work environment, and socioeconomic position influence how people experience and manage their pain (Foster et al., 2018) DP-LBP is a neurophysiologic ally connected to both central sensitization, in which continuous nociceptive input sensitizes the central nervous system, and peripheral sensitization, which involves inflammation and nerve damage at the peripheral level (Giesecke et al., 2004).

Mechanical low back pain, which refers to any sort of back pain caused by strain on the muscles of the spinal column and excessive stress, is the most prevalent type of lower back pain. It's characterized as unidirectional pain that doesn't refer to below the knee and is produced by an injury to the muscles or ligaments, the facet joint, or the sacroiliac joints. Physical, physiological, and psychological variables are common risk factors for mechanical low back pain. Physical issues include heavy manual work and weight lifting. Physical causes include twisting, sitting for longer durations, driving, and whole-body vibrations. Physiological causes include a lack of physical fitness and weak trunk muscles, The important factors to consider in the case of chronic pain are psychosocial issues such as social influence, low job satisfaction, stress, anxiety, fear, and depression. (Rizvi et al., 2019)

2.1.2 Prevalence of LBP:

Low back pain (LBP) is a frequent disorder internationally, affecting a considerable section of the population at some time in their life. Studies estimate that up to 84% of persons will suffer LBP over their lifetime, with roughly 38% reporting LBP yearly and around 18% feeling it at any one moment (Braeuninger-Weimer, 2019) LBP is most frequent in adults aged 30 to 50 years, however, it affects all age groups, with frequency increasing with age due to degenerative changes in the spine. Women seem to report LBP more frequently than males, presumably due to biological variations, occupational exposures, and differences in health-seeking behaviors(Hoy et al., 2012)(Braeuninger-Weimer, 2019).

The frequency of LBP is similar throughout high-income and low-income countries, demonstrating it is a universal health concern, while its effect and management vary due to disparities in healthcare access and resources (Hoy et al., 2014) Chronic LBP, where pain continues for 12 weeks or more time, affects roughly 20% of patients with acute LBP, leading to severe impairment and impaired quality of life (R A Deyo & Weinstein, 2001)

Furthermore, LBP tends to reoccur, with 24-80% of patients enduring numerous bouts throughout their lives(Braeuninger-Weimer, 2019). LBP is the largest cause of activity restriction and job absence, and it contributes considerably to the global illness burden, accounting for the majority of years lived with disability globally (Vos et al. 2012). The economic impact includes direct healthcare expenditures, lost productivity, and disability compensation, with yearly costs in the United States ranging from $100 billion to $200 billion (Katz, 2006).

LBP appears to be a "20th-century healthcare puzzle" based on its frequency and prevalence. Incidence and prevalence are descriptive epidemiological words, while accident rate is the total number of occurrences within a population that are at risk of occurring during a certain time. Diffusion is defined as the status of a population impacted by a condition at a certain point in time. It is also possible that the incidence and prevalence of LBP may change depending on the population under research and the time in which the data are gathered. It is proposed that the number of events documented and the total population considered at risk originate from the same data source (Kent & Keating, 2005)

2.1.3 Etiology of low back pain:

Low back pain (LBP) is a complicated disorder with several contributing variables. Mechanical problems are widespread, sometimes caused by muscle or ligament injuries from inappropriate lifting, rapid motions, or bad posture(Andersson, 1999).
Osteoarthritis, spondylosis, and spinal stenosis are all degenerative disorders that cause cartilage degradation and narrowing of the spinal canal, respectively. Traumatic occurrences, such as fractures or acute injuries from accidents or excessive lifting, can produce sudden and severe back pain. Chronic pain can result from inflammatory disorders such as ankylosing spondylitis and rheumatoid arthritis, as well as infections such as osteomyelitis or discitis (Hartvigsen et al., 2018).

Furthermore, tumors in or around the spine, whether benign or malignant, can cause pain and neurological problems. Psychosocial variables such as stress, worry, and depression can worsen pain perception and contribute to persistent LBP. Sedentary lifestyles, lack of physical exercise, and professions that require heavy lifting or extended sitting all contribute to an increased risk. Finally, congenital or developmental disorders such as scoliosis and spina bifida might contribute to the cause of LBP(Baradaran Mahdavi et al., 2021).

The etiology of low back pain (LBP) is often described in terms of incidence or prevalence, with wide variations. According to more current educated perspectives, the illness affects one-third of individuals annually (Mohseni-Bandpei et al., 2011).

Low back pain (LBP) is commonly caused by mechanical causes affecting the musculoskeletal system.

Muscle or ligament strain is a typical cause, generally the consequence of inappropriate lifting practices, abrupt uncomfortable motions, or long-term bad posture. These activities can cause overstretching or tears in the muscles and ligaments that support the spine, resulting in severe pain and discomfort. Furthermore, herniated or degenerative discs play an important role; these disorders arise when the intervertebral discs bulge or burst, placing pressure on the surrounding nerves and generating pain. Facet joint dysfunction, which includes the little stabilizing joints positioned between and behind neighboring vertebrae, and sacroiliac joint dysfunction, where the joints linking the spine to the pelvis become inflamed or move abnormally, are also major mechanical factors to LBP (Balagué et al., 2012).

Degenerative diseases are another prominent cause of LBP, especially in elderly persons. Osteoarthritis, a degenerative joint condition, causes cartilage degradation in the spine's joints, resulting in pain, stiffness, and diminished flexibility. Spondylosis, a broad term encompassing age-related changes in the spine including bone spurs and degenerative disc degeneration, exacerbates these symptoms. Spinal stenosis, defined as a narrowing of the spinal canal, can compress the spinal cord and nerves, resulting in severe pain and neurological impairments. These disorders deteriorate over time, thus management and therapy are critical for sustaining quality of life (Andersson, 1999).

Lumbosacral radiculopathy is a pain condition caused by the compression or irritation of nerve roots in the lumbosacral area of the spine. This compression is commonly caused by degenerative changes such as disc herniation, Ligamentum Flavum modifications, facet hypertrophy, and spondylolisthesis, ending in the compression of one or more lumbosacral nerve roots(Alexander et al., 2024).

Traumatic situations can induce both acute and severe lower back pain. Vertebral fractures, which are commonly caused by high-impact incidents, falls, or illnesses such as osteoporosis, can cause immediate discomfort and long-term consequences if not treated effectively. Injuries from sports, hard lifting, or other physically demanding activities can also cause acute mechanical pain due to muscle tears, ligament sprains, or disc injuries. Prompt medical care and adequate management are required to prevent these injuries from progressing to chronic pain(Hartvigsen et al., 2018).

Low back pain (LBP) has several causes, including inflammatory, viral, psychological, lifestyle, and congenital factors. Inflammatory disorders such as ankylosing spondylitis and rheumatoid arthritis induce persistent LBP through spinal inflammation and joint involvement, whereas infections such as osteomyelitis and discitis, while less prevalent, require immediate medical attention owing to intense pain. Tumors, whether benign or malignant, can press on spinal nerves or the cord, causing pain and neurological symptoms, emphasizing the importance of a complete diagnostic assessment. Psychosocial variables such as stress, anxiety, and depression have a substantial impact on pain perception and healing, whereas lifestyle components such as sedentary behavior and job hazards exacerbate LBP risks (Mohseni-Bandpei et al., 2011)(Kent & Keating, 2005).

2.1.5 Diagnosis and Assessment of LBP

Low back pain (LBP) is a common condition that impairs people's quality of life and functional performance. A thorough patient history and physical examination are needed to differentiate nonspecific LBP from instances with significant underlying diseases such as cancer, infection, or fractures. The patient's history must include the start, duration, and type of the pain, as well as any combined symptoms such as weight loss, fever, or neurological abnormalities. The history should also include any past trauma, surgeries, or systemic disorders since they are critical in directing the diagnosis procedure(Chou et al., 2007).

The physical examination for LBP consists of inspection, palpation, range of motion tests, and neurological evaluation. Inspection may relate to irregularities or deformities, whereas probing might reveal pain or muscular spasms. Range of motion testing can assist in determining the functional effect of LBP and identify particular motions that aggravate the pain. Neurological evaluations are critical for detecting motor, sensory, or reflex deficits that might suggest nerve root compression or other neuropathic involvement. Provocative tests, such as the straight leg lift, are frequently performed to determine the existence of radiculopathy(Chou et al., 2007)(Modic & Ross, 2007).

Imaging techniques, such as X-rays, MRIs, and CT scans, are typically reserved for instances with red flags or persistent LBP despite conservative therapy. Severe or increasing neurological impairments, as well as the possibility of cancer, infection, or fracture, are all warning signs. MRI is especially good for assessing soft tissue features such as intervertebral discs and nerve roots, whereas CT scans provide a better view of bone anatomy.

However, it is important to link imaging findings with clinical complaints, as incidental findings are prevalent and may not always represent the source of pain (Modic & Ross, 2007)(Koes et al., 2006).

In addition to scans, various diagnostic methods can be used to assess LBP. If an infection or systemic illness is suspected, laboratory testing may be ordered. Electromyography (EMG) and nerve conduction investigations can help identify peripheral nerve involvement. Psychosocial variables frequently play a considerable role in persistent LBP, consequently psychological examination is particularly necessary. The Oswestry Disability Index (ODI) and the Roland-Morris Disability Questionnaire (RMDQ) are often used to assess the impact of LBP on everyday activities and track treatment outcomes(Koes et al., 2006)(Roland & Morris, 1983).

A reliable diagnosis, obtained through a complete diagnostic technique, is essential for effective LBP health care. Clinicians can establish a suggested treatment plan that targets the underlying causes of LBP and improves patient outcomes by using patient history, physical examination, suitable imaging, and adjunct diagnostics. To get the best outcomes in LBP care, multidisciplinary techniques such as physical therapy, pharmaceutical therapies, and psychological support are frequently required(Petersen et al., 2017).

2.1.6 Treatment of LBP

2.1.6.1 Home care:

Home care is an essential component of addressing low back pain (LBP), especially in the early stages. Encourage patients to stay moving, as extended bed rest can aggravate symptoms and slow healing. Patients should participate in mild exercises like walking and stretching to preserve mobility and avoid muscular tightness. Heat and cold treatment can give symptomatic relief; heat relaxes tight muscles and improves blood flow, whilst cold reduces inflammation and numbs severe pain(Schoenfeld & Weiner, 2010).
Alignment modification and ergonomic changes at home and work are also important aspects of home care. Educating patients on safe lifting techniques, as well as encouraging them to utilize supportive chairs and beds, can help to prevent additional damage and discomfort.

Simple exercises that target core strength and flexibility, such as those based on yoga or Pilates principles, may be done at home to support the spine and enhance general functionality(Fronczyk & Kuliński, 2017). These home care methods are intended to empower individuals, alleviate pain, and improve functional recovery, setting the framework for additional therapy interventions if necessary (Hildebrandt et al., 1997).

2.1.6.2 Medications:

Medications are essential in the treatment of low back pain (LBP), notably in relieving pain and inflammation. Medication is chosen based on the intensity of the pain, underlying disorders, and the patient's general health. Nonsteroidal anti-inflammatory drugs (NSAIDs): NSAIDs, such as ibuprofen and naproxen, are often used to treat LBP due to their ability to reduce inflammation and discomfort. These drugs suppress cyclooxygenase (COX) enzymes, which play an important role in the inflammatory response. NSAIDs are commonly used as first-line treatment for acute LBP and help provide short-term pain relief. However, its usage must be closely watched due to potential adverse effects such as gastrointestinal discomfort, cardiovascular risks, and renal impairment(van Tulder et al., 2000).

Acetaminophen: Acetaminophen (paracetamol) is a very regularly advised drug for LBP, especially when NSAIDs are contraindicated. It is preferred because of its analgesic characteristics and few side effects when used at prescribed levels. However, current research shows that acetaminophen may be less effective than NSAIDs in treating LBP, and its function in the treatment of LBP is being questioned. Nonetheless, it remains a viable alternative for those with NSAID contraindications(Chou & Huffman, 2007).

Muscle Relaxants: muscular medications for relaxation, such as cyclobenzaprine and methocarbamol, can provide short-term relief from acute LBP caused by muscular spasms. These drugs act by lowering the central nervous system, which reduces muscular tone and discomfort. However, they are normally only indicated for short-term usage because of potential adverse effects such as sleepiness, dizziness, and dependence(van Tulder et al., 2003).

Opioids: Opioids, including oxycodone and hydrocodone, are used to treat severe LBP that does not respond to other therapies. These potent analgesics are useful for both acute and chronic pain, but they come with a significant risk of reliance, tolerance, and side effects such as constipation, nausea, and drowsiness. Opioids are normally reserved for short-term usage in severe instances and should be recommended with discretion, especially considering the opioid crisis(Martell et al., 2007).

Adjuvant medications: Adjuvant drugs, such as antidepressants such as amitriptyline and duloxetine, as well as anticonvulsants like gabapentin and pregabalin, are utilized for treating chronic LBP, especially when it has a neuropathic component. These drugs can assist modify pain circuits and are frequently used in combination with other therapies. Antidepressants may also help individuals who have concomitant anxiety or depression, both of which can aggravate LBP(Moore et al., 2009).

Pharmaceuticals are an important part of LBP care since they provide pain relief while also increasing patient function. Medication selection and use should be tailored to the patient's unique condition, treatment response, and probable adverse effects.

2.1.6.3 Surgeries and Other Procedures:

Low back pain (DP-LBP) is a common medical condition that has significant effects on people's quality of life and performance. While many individuals with LBP may be treated conservatively, a percentage of them require surgery or other treatments to relieve their symptoms and enhance their functional results.

- Surgical Interventions:

Surgical procedures to treat LBP are often explored when conservative therapy fails to offer relief and the patient's quality of life suffers considerably. Spinal fusion, laminectomy, and discectomy are three common surgical treatments.

Spinal fusion is a procedure used to reduce mobility between vertebrae that may be causing discomfort. Spinal fusion has been found in studies to significantly reduce pain and improve functional results in patients with persistent LBP caused by degenerative disc degeneration or spinal instability(Richard A Deyo et al., 2005)(Schizas et al., 2010)

Laminectomy is the removal of a portion of the vertebra, known as the lamina, to alleviate pressure on the spinal cord or nerves. This technique is very beneficial in patients with spinal stenosis, resulting in considerable pain alleviation and increased mobility (Atlas et al., 2005) Discectomy is the surgical removal of a herniated disc that is compressing a nerve root or the spinal cord. It is particularly useful in people suffering from radiculopathy caused by a bulging disc. The positive outcome of discectomy in alleviating pain and enhancing function has been widely reported in the literature(Peul et al., 2007).

- Minimally invasive procedures:

Technological advancements have resulted in the creation of minimally invasive treatments, which attempt to reduce recovery durations and tissue damage when compared to conventional open operations. Endoscopic discectomy: This surgery uses an endoscope to remove herniated disc material through a tiny incision. It has been found to have a reduced complication rate and a quicker recovery time than standard discectomy(Asano et al., 2020) Percutaneous Vertebroplasty and Kyphoplasty are treatments for treating vertebral compression fractures that include injecting bone cement into the spine. They have been demonstrated to significantly reduce pain and improve functional results in individuals with osteoporosis-related fractures (Wijayathunga et al., 2013).

- Other Procedures can be used in low back pain treatment:

there are other non-surgical methods available to treat LBP. Epidural Steroid Injections: These types of injections provide corticosteroids directly to the epidural region, reducing inflammation and discomfort. While the effectiveness of these injections is debatable, they can give short-term pain relief in certain individuals (Cohen et al., 2013). Radiofrequency Ablation: This technique uses radiofrequency radiation to alter nerve function and relieve pain. It is especially useful for facet joint pain and has been connected with improved pain ratings and functional results (Nath et al., 2008).

Conclusion Surgical and other procedural procedures are crucial in the therapy of LBP, especially for patients who do not respond to conservative therapies. The technique is chosen based on the underlying disease, patient characteristics, and the possible risks and advantages of each intervention. Future research should focus on refining surgical procedures and discovering less invasive alternatives to improve patient outcomes.

2.1.6.4 Physical therapy:

Discopathy, or degenerative changes in the intervertebral discs, is a major cause of low back pain (LBP). Physical therapy (PT) is frequently indicated as a conservative treatment for those suffering from Discopathy-related LBP to control symptoms, improve function, and improve quality of life. This research review looks at several physical therapy techniques and their efficacy in treating Discopathy-related LBP.

- Exercise therapy is an essential component of physical therapy for Discopathy-related low back pain, intending to increase spinal stability, range of motion, and general physical fitness.

- Core Stabilization Exercises: Strengthening the core muscles, especially the transversus abdominis and multifidus, can help stabilize the spine, reduce discomfort, and prevent future deterioration. Core stability exercises have been shown in studies to dramatically improve pain and impairment in individuals with Discopathy (Bhadauria & Gurudut, 2017)(Koumantakis et al., 2005).
- flexibility Exercises: stretching techniques for the lumbar spine and hamstrings enhance range of motion and reduce muscular stiffness. Flexibility training has proved to lessen pain and enhance function in people with persistent LBP(*Motor-Control-Exercise-for-Persistent-No-2009*, n.d.).
- Aerobic Exercise: Low-impact exercises like walking, swimming, and cycling can improve cardiovascular fitness without putting too much stress on the spine. Studies have shown that aerobic exercise can help decrease pain and improve functional results in LBP patients(*Motor-Control-Exercise-for-Persistent-No-2009*, n.d.).

-Manual therapy (MT) is a purposeful act in which a therapist applies force, usually with their hands, to a patient's joints or soft tissues. Non-specific lower back pain (LBP) is typically treated with MT, which involves manipulation (a thrust method linked with joint cavitation), mobilization (a non-thrust approach), and lower back massage. Historically, MT has been linked with a biological approach, in which physical abnormalities during evaluation, such as spinal joint stiffness, are targeted for therapy, with the expectation of biomechanical responses such as a better range of motion(Evans

& Lucas, 2010). A frequent criticism of MT is that it is based on old biological beliefs that govern how it is understood and administered to patients, which may not completely accord with current knowledge of its processes(Rushton et al., 2016).

- Spinal manipulation: High-velocity, low-amplitude thrusts to the spine can relieve rapid pain while improving mobility. Spinal manipulation appears to be useful in treating Discopathy-related LBP, especially when paired with exercise therapy(Rubinstein et al., 2013)
- *Mobilization* involves low-velocity, passive motions of the spine to restore joint function and relieve discomfort. Mobilization strategies are useful in reducing pain and increasing function in individuals with Discopathy(Balthazard et al., 2012)

- Electro-Physical Agents Modalities Several physical techniques are utilized in conjunction with other PT therapies to treat DP-LBP.

- Heat Therapy: Applying heat can improve blood flow, reduce muscular tension, and relieve pain. Heat treatment has been proven to help manage persistent LBP, including Discopathy (Simon D French et al., 2006) (S D French et al., 2006)
- Electrical Stimulation: Transcutaneous Electrical Nerve Stimulation (TENS) modulates pain impulses and provides relief. According to (Khadilkar et al., 2005), TENS can be useful in relieving pain in patients suffering from DP-LBP.
- Ultrasound Therapy: Improves tissue repair and reduces inflammation. Ultrasound treatment is effective as part of a comprehensive physical therapy program for DP-LBP (Ebadi et al., 2012).

-Education & Self-Management: Educating patients about DP-LBP, good body mechanics, and self-management measures is critical for long-term LBP treatment and prevention. Informing patients on the consequences of DP, pain management measures, and the need to maintain physical activity might empower them and enhance treatment adherence(Airaksinen et al., 2006)

- Ergonomic Advice: Learning patients about good posture, lifting methods, and workstation biomechanics can avoid exacerbations and improve symptom management (Burdorf & Sorock, 1997).

-Multidisciplinary approaches Combining PT with other therapeutic modalities, such as cognitive behavioral treatment (CBT), can help with both the physical and psychological components of DP-LBP. Cognitive Behavioral Therapy: Integrating cognitive behavioral therapy with physical therapy can help patients manage chronic pain, reduce fear-avoidance attitudes, and enhance functional results (Morley et al., 1999)

-The biopsychosocial approach combines these elements, focusing on the interplay of biological, psychological, and social variables in the development and maintenance of LBP. This concept promotes a comprehensive therapy strategy that addresses physical disabilities, psychological anxiety, and social problems. Understanding these multifaceted theories helps to develop comprehensive, individualized treatment plans that include physical therapy, cognitive-behavioral therapy, medication, and lifestyle changes aimed at improving patient outcomes and quality of life (Qaseem et al., 2017).

- **Conclusion**

  Physical therapy takes a multimodal approach to treating DP- LBP, including manual therapy, exercise therapy, physical modalities, and patient education. The data suggests that physical therapy can help people with Discopathy reduce pain, improve function, and improve their quality of life. Continuous research is required to modify PT therapies and improve patient outcomes.

2.1.7 Core stability exercises:

DP- LBP is a prevalent musculoskeletal ailment that affects millions of people worldwide. Effective management of LBP is critical for increasing the level of life and minimizing the economic burden associated with the medical condition. Core muscle strengthening and stability exercises have emerged as significant therapeutic options. This literature review looks at the evidence for various techniques in the management of LBP.

Definition and Importance: The core muscles of the body offer stability to the spine, pelvis, and shoulders. The transversus abdominis, multifidus, pelvic floor muscles, diaphragm, and obliques are all important muscle groups. These muscles are essential for maintaining proper posture, balance, and functional movement. these muscles collaborate to provide optimal stability in the abdomen and lumbar (lower) back regions, as well as to coordinate movement

of the arms, legs, and spine. To execute successful rehabilitation exercises, it's vital to understand how to co-contract these muscles, which are often unconsciously engaged.

Mode of Action: Building core muscles strengthens spine stability, minimizes excessive motion, and distributes stresses uniformly across the vertebrae. This stability can help to minimize discomfort and avoid LBP recurrence.

- Hodges & Richardson (1996) This basic study showed that people with LBP have delayed activation of the transversus abdominis, implying that strengthening this muscle might improve spinal stability and decrease pain(Hodges & Richardson, 1996).
- Hides et al. (2001) found that focused training of the multifidus muscle decreased LBP recurrence rates, highlighting the role of this muscle in the stability of the spine.
- Marshall and Murphy (2005) investigated the successful effects of core stability exercises in individuals with persistent LBP. These exercises were found to significantly improve the level of pain and functional ability in those with DP-LBP. It was emphasized that core stability exercises should be included in DP-LBP treatment protocols(Marshall & Murphy, 2005).
- Ferreira et al. (2006) conducted a randomized controlled experiment to assess the efficacy of core stability exercises vs general exercise in individuals with chronic LBP. According to reports, the group that performed core stability exercises had a higher reduction in pain and impairment. Core stability exercises are particularly designed to target the deep stabilizing muscles, which are frequently weak in people with DP. (Ferreira et al., 2006).
- Standaert et al. (2008) reviewed the role of core stability in dealing with and avoiding LBP, specifically Discopathy. They concluded that core stability exercises can improve spinal stability, reduce pain, and improve overall function. They suggested these exercises as part of a comprehensive treatment plan for DP-LBP.
- Karahan & Albayrak, 2018 and Nwodo et al., 2022 investigated the effects of a 12-week core stability training program on patients with lumbar disc herniation. there were noticeable improvements in pain, disability, and quality of life as compared to the control group. Core stability exercises may assist reduce the impact on intervertebral discs (Karahan & Albayrak, 2018)(Nwodo et al., 2022).

- Cho et al., 2014 discussed the theoretical foundation of core stability training and its application to LBP therapy. Core stability exercises have been shown to improve muscular function and spinal alignment, both of which are important in the management of DP-LBP. Emphasized the significance of developing exercise routines to match individual requirements and grow gradually(Cho et al., 2014).

Core stability exercises including planks, bridges, bird-dogs, and pelvic tilts are vital for stimulating deep stabilizing muscles and strengthening neuromuscular control. Effective programs should start with low-intensity exercises and progressively increase in difficulty and intensity, including functional motions and balance training to improve results. Educating patients on the significance of core stability and correct exercise practices is essential for avoiding injury and maximizing benefits. Furthermore, integrating core stability exercises with additional therapeutic modalities, including manual therapy and aerobic exercise, can provide comprehensive treatment for DP-LBP.

Utilizing core stability exercises within a therapeutic program is highly effective both as an assessment tool and a treatment method for patients with lower back pain due to herniated discs(Akhtar et al., 2017). Initially, posture and range of motion analyses, along with strength and stability tests such as the plank and pelvic bridge, are conducted to identify imbalances and weaknesses(Akuthota et al., 2008). Based on these assessments, a personalized exercise program is designed to enhance core muscle strength and stability, starting with simple exercises and progressing in difficulty as the patient improves (Hlaing et al., 2021).

Education on proper exercise performance and the effectiveness of integrating these exercises into daily routines is provided to avoid injuries and ensure effectiveness. Regular monitoring and adjustments to the program are made to facilitate faster recovery, reduce pain, and improve overall functional capacity(M. B. Shamsi et al., 2016). Examples of key exercises include the plank, pelvic bridge, and Swiss ball exercises, all aimed at promoting spinal stability and reducing the risk of future injuries, thereby enhancing the quality of life for patients(Akuthota et al., 2008)

Recent studies have shown that core stability exercise can benefit people with low back pain,(B. Kim & Yim, 2020) this research will focus on the effects of this type of therapy on

various aspects of the condition, such as the strength and function of the muscles. (Bayraktar et al., 2016)

Core stability exercises are essential in the treatment of DP-LBP. These exercises increase core muscle strength, coordination, and endurance, resulting in improved spinal stability and less discomfort. Patients with Discopathy benefit from an integrated strategy that includes core stability exercises as well as other therapy techniques. More research is required to improve exercise methods and personalize programs to particular patient demands.

2.1.8 Autogenic “hold-relax” self-relaxation training:

Autogenic training offers a new approach to controlling and reducing numerous elements of human pain, making it a potentially useful tool for physiotherapy. Known as AT, this self-administered relaxation method employs passive focus and certain mental and physical stimulation pairings. AT, medically described as a psycho-physiological method of psychotherapy, was invented by Johannes Schultz in 1932 and further modified by Wolfgang Luthe(D. K. Kim et al., 2014). It consists of a set of simple mental exercises designed to deactivate stress mechanisms in the body and activate the restorative cycles associated with profound psychophysical relaxation. Autogenic Training, as the name implies, is self-generated, promoting a gradual increase in energy and serenity. AT, which is a relatively simple method to master, may be practiced for the rest of one's life. When practiced consistently and appropriately, it can produce outcomes equivalent to long-established Eastern meditation approaches. Autogenic Training appeals to Westerners because it is contemporary and without cultural, religious, or metaphysical connections. Furthermore, it does not need any unique clothes, positions, or traditions(Kanji, 2000).

Autogenic Training (AT) is a revolutionary technique for controlling and reducing human pain, with tremendous therapeutic potential for healthcare workers, notably nurses. is a self-administered relaxation method that involves passive attention in combination with certain mental and physical stimulation (Schultz & Luthe, 1969). AT, a psycho-physiological kind of psychotherapy, consists of a series of mental exercises intended to deactivate the body's stress mechanisms and activate restorative cycles associated with profound relaxation (Stetter & Kupper, 2002).

The technique consists of six standard exercises developed to elicit specific sensations or states in the body: heaviness ("My arms and legs are heavy"), warmth ("My arms and legs are warm"), heartbeat regulation ("My heartbeat is calm and regular"), breathing regulation ("My breathing is calm and regular"), solar plexus warmth ("My solar plexus is warm"), and forehead cooling ("My forehead is cool"). These exercises are typically performed in a quiet, comfortable setting, encouraging a shift from the sympathetic nervous system's fight-or-flight response to the parasympathetic nervous system's rest-and-digest state, which reduces stress, lowers blood pressure, and improves overall well-being(Sergeant, 1971).

AT has been shown in studies to be effective in treating anxiety, hypertension, and certain forms of chronic pain (Nakao & Yoshizawa, 2012; Aman & Singh, 2014). Given its simplicity, accessibility, and dramatic influence on mental and physical health, AT is an important complement to pain treatment and relaxation methods in professional settings.

2.1.9 Tele-physiotherapy and Smartphone Apps in Physiotherapy

The rise of tele-physiotherapy and smartphone apps has transformed the profession of physiotherapy, opening up new possibilities for treating DP-LBP. These technologies make treatment more accessible, cost-effective, and individualized, with the potential to improve patient outcomes. This literature review investigates the efficacy of tele-physiotherapy and smartphone applications in controlling LBP.

Tele-communication in physiotherapy refers to the delivery of rehabilitation treatments using telecommunications technology. This method enables remote evaluation, monitoring, and supervision of treatment regimens.

Mechanism of Action: Tele-physiotherapy uses video chats, web platforms, and digital monitoring systems to improve interactions between patients and physiotherapists. This strategy assures continuity of service and allows for real-time feedback and treatment plan modifications.

- Cottrell et al. (2017) examined the feasibility and efficacy of tele-physiotherapy for chronic LBP. Tele-physiotherapy was shown to be just as efficient as in-person physiotherapy in lowering pain and impairment. Emphasized the advantages of enhanced accessibility and convenience for patients (Cottrell et al., 2017).

- Chen, et al. (2018) and Motahari-Nezhad et al.,(2024) A comprehensive review and meta-analysis were conducted on tele-physiotherapy for musculoskeletal diseases, including LBP. Conclusion: Tele-physiotherapy resulted in considerable improvements in pain, function, and quality of life. Emphasized the significance of an organized and participatory approach to distant care(Motahari-Nezhad et al., 2024).
- Dario et al. (2017) investigated the role of telemedicine treatments in LBP therapy. Positive outcomes were reported in terms of alleviating pain and functional improvement.

  Tele-physiotherapy has the potential to minimize healthcare expenses and patient travel time(Dario et al., 2017).

2.1.9.1 Using Smartphone Apps in Physiotherapy:

Definition and Importance Smartphone applications created for physiotherapy include various features such as workout demos, progress tracking, reminders, and virtual consultations.

Mechanism of Action: These applications provide customers personalized fitness plans, instructional videos, and real-time feedback. Many applications also include tools for recording pain levels and functional improvement, aiding self-management.

- Molina-Garcia et al. (2018) and Liu et al., 2021examined the efficacy of a smartphone app for LBP self-management. Users reported substantial decreases in pain intensity and improved physical function. App-based treatments have been highlighted for their significance in increasing exercise regimen adherence(Liu et al., 2021).
- Hwang et al. (2017) conducted a randomized controlled experiment on the use of a physiotherapy app to treat persistent LBP. According to the report, app users had superior pain alleviation and functional results than the control group. Apps may supplement traditional physiotherapy by offering continual support and inspiration(Hwang et al., 2017).
- Machado et al., (2016) and Zhou et al., (2024) conducted a systematic study of Health apps for controlling LBP. Conclusion: Health applications are beneficial in lowering pain and disability, especially when they incorporate interactive and customized

elements. It is recommended that these applications be integrated into everyday care to improve patient involvement and results(Machado et al., 2016)(Zhou et al., 2024).

- Comparative Analysis: Both tele-physiotherapy and smartphone apps effectively reduce pain and improve function in LBP patients' Tele-physiotherapy allows patients to engage directly with physiotherapists, which is excellent for real-time feedback and individualized modifications. Smartphone applications provide convenience, ongoing assistance, and the opportunity to track progress independently.
- Accessibility and costs: Tele-physiotherapy improves access to care for those in distant or underserved locations while decreasing the need for travel. Smartphone applications are often inexpensive or free, making them a viable alternative for many patients.
- Patient Engagement: Tele-physiotherapy can help to build a strong therapeutic connection through regular virtual exchanges. Apps improve patient engagement by offering interactive information, reminders, and progress monitoring capabilities.

1.2 Similar studies

- Bayraktar et al., 2016 incorporate a study to determine the effects of trunk stabilization exercises on the lower back pain of patients. They were performed in two different mediums: on the ground and in water. The results of the study indicated that the water exercises had a positive effect on the quality of life and the intensity of the pain. (Bayraktar et al., 2016)
- Baena-Beato et al., 2013, were analyzed the effects of the various aspects of the program on the back pain of the patients. It was also conducted to determine the number of sessions that the patients would receive per week. The results of the study revealed that the treatment dose that was administered through three meetings per week had the most positive effect on the multiple measures. (Baena-Beato et al., 2013)
- Fronczyk & Kuliński, 2017, have revealed that rehabilitation and physical therapy can help patients with low back pain. They noted that these two types of activities can improve the quality of life for individuals who suffer from this condition. (Fronczyk & Kuliński, 2017)
- 'Seyed & 'Seyedsina, 2022, were demonstrated the most important benefit of using core stability training in hydrotherapy is "to reduce the weight-bearing forces on the back", which can lead to muscle relaxation and decrease the severity of pain. In a

study, the results of the treatment revealed that it significantly improved the patients' vitality and decreased their pain levels. (’Seyed & ’Seyedsina, 2022)

- Kuligowski et al., 2021, were analyzed the effects of trunk stabilization exercises on the lower back pain of patients. It was done to determine if this type of exercise can improve the function and quality of the patients' lives. The study used various assessment tools to analyze the effects of the exercise on the patients' conditions. Some of these included the pain intensity, range of motion, and functional ability. The study was conducted to analyze the effects of trunk stabilization exercises on the lower back pain of patients. It was divided into two groups, one of which was for patients with a type of herniated disc. The researcher noted that the exercise had a positive effect on the various aspects of the condition. (Kuligowski et al., 2021)
- Nilay Comuk et al., 2020, conducted a study to compare the effects of different types of treatment on the back pain of patients. It involved the use of floor exercises and water exercises. After four weeks, the results of the study revealed that the water exercises did not improve the quality of the patients' lives.(Nilay Comuk et al., 2020)
- Carvalho et al., 2020, worked to evaluate the effects of both water exercises and aerobic training on the pain intensity and functional status of patients with chronic back pain. The participants were randomly assigned to receive either water exercises or aerobic training. After four weeks, the researchers found that the combination of water exercises and running significantly improved the side effects of the pain block. (Carvalho et al., 2020)
- Wang et al., 2012 compared the effectiveness of core stability exercises to general exercise regimens for managing chronic low back pain. The study demonstrated that core stability exercises significantly increase muscular strength, balance, and functional mobility in individuals with persistent low back pain compared to general exercises. These activities were very effective in decreasing pain intensity and improving overall quality of life (Wang et al., 2012).
- Gorji et al., 2022 examined the effect of core stability exercises on balance and stability in persons with persistent low back pain. It found that core stability workouts increase both muscle endurance and postural control, leading to better balance and stability. These gains were linked to less pain and better physical function in regular activities(Gorji et al., 2022).

- Shamsi et al., 2016 conducted a systematic review and meta-analysis to evaluate the effectiveness of core stability exercises for treating chronic low back pain. The meta-analysis found that core stability exercises can considerably reduce pain intensity and improve functional outcomes for people with persistent low back pain. These exercises were especially praised for their potential to strengthen core muscles, improve spinal stability, and boost overall physical performance. Published in "European Spine Journal" in 2020(M. B. Shamsi et al., 2016).
- **In conclusion**, these studies collectively underscore the significant benefits of incorporating core stability exercises into rehabilitation programs for chronic low back pain. They highlight improvements in muscle strength, balance, pain reduction, and functional abilities, supporting the effectiveness of targeted core stability interventions in managing and alleviating symptoms of chronic low back pain.

Chapter 3: Methods and Procedures

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1.3 Study Method and Design

The Quasi-experimental design in a single-group pre/mid/post-test design was used to assess the effect of the suggested treatment protocol and record changes in core stability and functional performance at various times. The baseline (pre-test) measures were obtained one week before the intervention began. Mid-test measures were measured at the end of the second week, whereas post-test measurements were taken one week after the intervention ended. The assessments covered both static and dynamic factors related to core stability.
The therapy program was only provided via WhatsApp to ensure flexibility of access and consistent involvement. Participants were joined to a WhatsApp group where they could get therapeutic programs, video demonstrations, and motivating remarks. The program had been developed progressively to increase intensity throughout the treatment course.

The study design allowed high participation among participants by providing full monitoring and assistance via WhatsApp. Pre-test, mid-test, and post-test evaluations were used to collect reliable data on the efficacy of the therapy program in increasing core stability and functional performance in women with DP-LBP. This allowed for a thorough examination of the intervention's impact over time. The researcher monitored the WhatsApp group daily, responding to asks, encouraging, and giving quick responses. We performed check-ins to monitor development and resolve any problems.

1.4 Study sample

Thirty women aged 25 to 60 with clinically confirmed low back pain (DP-LBP) were recruited through the Tareq Ben Ziad Community Center -Physiotherapy dept. The following inclusion and exclusion criteria were considered in the sample selection. The institutional review board approved the study, and all subjects gave their informed permission, the whole study objectives and procedures were explained to each study subject before giving her consent to participate in the study. Detailed physical musculoskeletal evaluation and quality of life functional assessment have been performed to screen the level of participant’s physical and functional health before and after the application of the suggested program, to assess its effectiveness.

1.4.1 Inclusion criteria:

- Subjects clinically diagnosed with Discopathy low back pain.
- Lumber disc herniation or bulge with non-operative procedure.
- Female patient.
- Age group (25 to 60) years old
- MRI showed evidence of mild to moderate disc bulging (sciatica nerve root level)
- Participants who are willing to participate in the study
- Participants can read, write, and utilize the WhatsApp program on smartphones.
- Patients with chronic (12 weeks or more) DP-LBP.

1.4.2 Exclusion criteria:

- Individuals with nonspecific causes of low back pain.
- Cervical or thoracic level Discopathy LBP
- Subject with systemic illness: Neurological disorders like ataxia.
- Respiratory disorders and Cardiac disorders.
- Patients with diseases that can cause functional disability other than lumber disc herniation.
- Patient with a verbal and non-verbal communication disorder.
- Neuromuscular disorders, spine or other joint deformities
- Recent lower extremity injuries (within 6 months)
- Brain injury
- Pregnancy
- Conditions that affect balance (drugs, alcohol consumption, visual and vestibular disorders), or compromised exercise performance (hypertension, ischemic heart disease).
- Rheumatic, neurological, and congenital disorders, as well as problems of the cognitive and neural systems

3.3 Study fields

3.3.1 Humanitarian field:

Female Patients with Discopathy low back pain.

3.3.2 Time field:

February, March and April 2024

3.3.3 Place field:

Tariq ben Ziad Community Center- Physiotherapy Department at Hebron

3.4 Study variables:

3.4.1 The independent factors of the study:

3.4.1.1 Manipulative independent variables:

- Progressive core stability exercise protocol. (PCSE)
- Quantified modeling of PCSE

3.4.1.2 Non-Manipulative Independent Variables:

- **Demographic variables:** Personal demographic data: marital status, number of children, Number of births.
- **Anthropometric variables:** gender, Age, Total body Height, weight, BMI.
- **Social habits**: smoking status
- **Ergonomic variables:** Type of work, duration of daily work, and age of work

3.5 Dependent variables:

1. Clinical variables: Pain intensity
2. Physical variables:
   - ROM in Lumbar spine flexion, extension, and lateral bending
   - Static and dynamic muscle endurance Cardiorespiratory endurance
3. Functional disability
4. Psychological Status “patient perception of low back”

3.6 Tools of data collection: Tests and measurements

initial assessment might involve measuring the patient's range of motion in degrees, muscle strength using standardized scales (e.g., Manual Muscle Testing), pain levels using a Visual Analog Scale (VAS), and functional capacity with specific physical tests (e.g., the Oswestry Disability Index). These metrics are recorded at baseline, in the middle of the study duration, and after the treatment.

1. Clinical tests:

Pain assessment by the Visual Analogue Scale (VAS) for pain assessment ***see Appendix (3)*** VAS in which "0" is defined as no pain and "10" is defined as the worst pain ever felt. It has been appraised to be a valid, reliable, and responsive technique for assessing pain.(Rahmadhani et al., 2019)

Improvement percentages are then calculated by comparing pre- and post-treatment values. For instance, if the patient's range of motion increased from 60 degrees to 90 degrees, this would represent a 50% improvement. Similarly, a reduction in pain levels from 8 to 4 on the VAS would indicate a 50% decrease in pain.

2. Physical variables Tests:

ROM of lumbar spine flexion, extension, and lateral bending:

The types of tests were selected in this study based on 2 factors: first, the tests should provide an adequate index of muscle performance (strength, endurance, and flexibility), and second, all subjects can perform the tests reliably and without difficulties. In particular, outcome measures included lumbar sagittal mobility (extension and flexion range of motion), static trunk extension and flexion endurance (in seconds), dynamic trunk extension and flexion endurance (number of repetitions), functional impairment, and low back pain symptom scale measures

1. MicroFET 3 Dynamometer and Inclinometer. Dual-Function Medical Device to Scientifically Measure Muscle Strength and Range of Motion, Category: MicroFET3, Tags: digital dynamometer, dynamometer, inclinometer. In the study used as an inclinometer for ROM in lumber-area.

See Appendix (3) about the MicroFET 3 inclinometer:

The MicroFET3 dynamometer is most recognized for its ability to evaluate muscular strength, but it may also be used in concert with other equipment to measure range of motion (ROM). Here's a summary of how it may be used for ROM evaluation and its advantages:
Using MicroFET3 Dynamometer and inclinometer for Range of Motion. While the MicroFET3 is primarily developed for muscular strength testing, it can help with ROM evaluation in the following ways: Evaluation of Joint Function: The tool can assist measure the strength of muscles around a joint, which has an indirect effect on its range of motion. For example, weak muscles might restrict the range of motion caused by instability or discomfort. The MicroFET3 may be utilized alongside typical ROM measurement equipment such as goniometers and inclinometers to fully view joint performance. While the ROM instruments measure the amount of movement, the dynamometer measures the strength of the muscles that allow or restrict that movement(*MicroFET3-Data-Sheet-Updated-06-25-2019.Pdf*, n.d.).
Dynamic Range of Motion (ROM) Testing: Using a dynamometer and inclinometer, therapists may measure resistance and strength during specific movements, showing insights into muscle function.
Benefits of Using MicroFET3 Dynamometer for ROM Assessment Comprehensive Evaluation: Combining muscle strength data with ROM measurements provides a more complete picture of joint health and function. Objective Data Provides quantifiable data that can be used to track progress over time and adjust treatment plans accordingly. Improved Treatment Plans through Understanding the interplay between muscle strength and ROM can lead to more effective rehabilitation strategies. Enhanced Patient Outcomes By addressing both strength and mobility issues, patients are more likely to achieve better functional outcomes (Hogrel, 2015).

2. Sit and Reach Test

The sit and reach test is a popular way to examine the flexibility of the hamstrings and lower back. During the test, participants sit on the floor with their legs outstretched and try to reach as far forward as possible along a measuring scale or box. This exercise primarily stretches the hamstrings and evaluates the capacity to bend the lower back. The test is useful for determining overall flexibility, which is necessary for many physical activities and might suggest a risk of injury owing to tight muscles. It is widely used in fitness testing procedures,

physical education classes, and clinical evaluations to track changes in flexibility over time or in response to rehabilitation treatments(Wells & Dillon, 2013). The test's reliability has been proved in studies when performed under standardized settings, and findings are normally interpreted by comparing them to known norms based on age and gender. Individuals with musculoskeletal restrictions or injuries may require modifications to assure their safety and accuracy. Overall, the sit and reach test gives important information into hamstring and lower back flexibility, assisting in the formulation of focused flexibility training programs and influencing fitness and rehabilitation plans(Zanevskyy & Zanevska, 2017)

3. Static and dynamic muscle endurance within the quantified modeling of the Suggested protocol

The suggested treatment program for women with DP-LBP consists of 12 therapeutic sessions spread over four weeks, including pre-, mid-, and post-tests. Before the treatment sessions began, the pre-test was completed, followed by the mid-test after the second week of the program, and the post-test after the fourth week. A form was created with an image of each CS exercise and a note next to it indicating the time duration of each set of each exercise and the rest interval between sets to make it easier for participants to document the duration of each exercise set. At the end of each therapeutic session, the participants used WhatsApp to provide a photo of the holding time and the number of sets of each CS exercise within the three sessions of the three static levels of the suggested protocol, and the number of repetitions along the three sessions of the dynamic-fourth level of that protocol. The sent image includes the participant’s achieved results in each session, which are then entered an Excel sheet in a separate file to preserve the data and ensure its correctness "See appendix 13 and Table (3.1) .

People with DP-LBP often demonstrate reduced muscle strength and endurance levels and altered flexibility accompanied by high-intensity pain and decreased functional abilities. Therefore, the effectiveness of any exercise program could be tested against the occurrence of each (or some) of these symptoms

Summarizing clinical test results to provide a clear indication of a patient's progress and the effectiveness of the treatment plan in physical therapy can be achieved using transformed scores-based percentage improvements. Here’s how to do it in a scientifically sound manner, At the end of the treatment, clinical test results are summarized and transformed to quantify the patient's improvement as a percentage. This approach provides a clear, understandable metric for patients to gauge their progress. Key performance indicators such as range of motion, muscle strength, pain levels, and functional capacity are assessed at the beginning, middle, and end of the treatment period.

Table 3.1 Modes of Quantification & progression in the four of the suggested Protocol of Core Stability Exercises

#	Core stability exercises		Level 1: 2 Sets X 3S.sessions		Level 2 3 Sets X 3S.sessions			Level 3 3 Sets X 3S.sessions s			Level 4: 3 sets X 3D.sessions		Achieved sum and percent of hold time	
			S1T	S2T	S1T	S2T	S3T	S1T	S2T	S3T	S1R	S2R	THE	AHT%
1	Back Bridge		15	15	20	20	20	25	25	25	10	10	165 X 3= 495	A% = AT/495
2 & 3	Crcounch: R&L		15	15	20	20	20	25	25	25	10	10	165 X 3= 495 X 2 = 990	A% = AT/495
4&5	Side Bridge: R&L		15	15	20	20	20	25	25	25	10	10	165 X 3= 495 X 2 = 990	A% = AT/495
6&7	Side Bridge: R&L		15	15	20	20	20	25	25	25	10	10	165 X 3= 495 X 2 = 990	A% = AT/495

8&9	**Spine twist: R&L**		**15**	**15**	**20**	**20**	**20**	**25**	**25**	**25**	**10**	**10**	**165 X 3= 495 X 2 = 990**	**A% = AT/495**
10	**Front Bridge**		**15**	**15**	**20**	**20**	**20**	**25**	**25**	**25**	**10**	**10**	**165 X 3= 495**	**A% = AT/495**
11	**Dart**		**15**	**15**	**20**	**20**	**20**	**25**	**25**	**25**	**10**	**10**	**165 X 3= 495**	**A% = AT/495**
12&13	**Quadruped: up & down**		**15**	**15**	**20**	**20**	**20**	**25**	**25**	**25**	**10**	**10**	**165 X 3= 495**	**A% = AT/495**
14&15	**Air planking: R&L**		**15**	**15**	**20**	**20**	**20**	**25**	**25**	**25**	**10**	**10**	**165 X 3= 495 X 2 = 990**	**A% = AT/495**
Total and average scores			**225**	**225**	**300**	**300**	**300**	**375**	**375**	**375**	**150**	**150**	**7425**	**A% = THT/7425**

4. **Cardiorespiratory endurance through the Six-Minutes' Walk Test (6MWT)**

A practical and commonly utilized clinical assessment tool for determining an individual's exercise tolerance and functional ability. During the test, participants are required to walk on a level, hard surface for six minutes, covering as much distance as possible in that time limit. This test is useful in evaluating cardiopulmonary disorders including heart failure, chronic obstructive pulmonary disease (COPD), and pulmonary hypertension, where endurance and physical ability are important indications of health and recovery (Sciurba et al., 2003). The 6MWT is also useful for evaluating people with degenerative disc-related low back pain (DP LBP). In this context, the test is an effective instrument for assessing the functional ability and endurance of individuals suffering from chronic LBP caused by degenerative disc disease. Patients with degenerative DP-LBP frequently have limited physical activity and functional mobility. The 6MWT enables doctors to objectively test how far these patients can walk in six minutes, giving information on their exercise tolerance and general physical performance. This examination assists in understanding how pain and mobility difficulties affect daily activities and quality of life (Solway et al., 2001).

The 6MWT can track changes in endurance and functional capacity over time in individuals receiving rehabilitation or therapy for DP LBP. It serves as a standard for evaluating the efficacy of therapeutic health care such as physical therapy, pain management techniques, and surgical procedures targeted at relieving pain and improving mobility. Furthermore, the 6MWT may be used with other measures like as VAS, ODI, and imaging investigations to form a comprehensive evaluation strategy for DP-LBP. This comprehensive approach enables doctors to create adapted treatment plans and track progress toward functional goals, eventually assisting patients in managing their disease and improving their overall health outcomes(Solway et al., 2001).

Clinically, the 6MWT gives useful information on an individual's response to therapy, development through rehabilitation programs, and general fitness level. It can also be used to track changes in functional status over time and evaluate the effectiveness of therapies designed to improve cardiovascular or pulmonary function. The test findings are interpreted by measuring the total distance walked, which may be compared to established standards or prior measures to assess progress or deterioration. This exam not only assists physicians in evaluating physical performance, but it also informs decisions on exercise prescriptions and treatment regimens designed to improve patients' functional ability and quality of life (Britto et al., 2013).

5. Saharman Core Stability Test "**see Appendix (5)"**

The Saharman five-level core stability test, which is often used in physical therapy and movement science, evaluates core stability via a series of leg-lowering exercises. This test is named after Shirley Saharman, a well-known physical therapist and researcher who focused on mobility disability disorders. The Saharman five-level core stability test is a systematic evaluation process designed by Shirley Saharman, a well-known expert in physical therapy and movement research. This test assesses core stability using a series of increasingly difficult leg-lowering exercises. The test, which begins with fundamental bilateral motions and progresses to unilateral actions mixed with upper extremity activities in various planes, seeks to measure and enhance core stability and movement control in people with musculoskeletal illnesses or movement dysfunctions(Chan et al., 2020)

The Saharman test levels give a systematic technique to assessing individuals' capacity to maintain trunk alignment and pelvic stability during controlled movements. This examination is critical for recognizing and treating core muscle abnormalities, which are frequently connected with a variety of musculoskeletal problems. Furthermore, the test can serve as a baseline assessment for establishing targeted rehabilitation programs that aim to enhance core stability through gradual exercises suited to individual needs(Dekart & Virginia, 2014).

In clinical practice, physical therapists and rehabilitation experts commonly employ the Saharman five-level core stability test to evaluate movement abnormalities and construct successful treatment regimens aimed at restoring optimal movement patterns and functional capability(Aggarwal et al., 2011).

The research combines qualitative measures of pain and functional ability with quantitative measures of trunk muscle endurance and flexibility. In this way, the effectiveness of the suggested protocol can be examined not only based on self-reported indices of pain but also more quantifiable measurements, thereby providing a more complete profile of the effectiveness of training.

3. **Functional assessment of LBP patients by Oswestry Disability Index "*See Appendix (2)":***

The Oswestry Disability Index (ODI) was evaluated for its practicability and clinometric quality in evaluating physical activity. The ODI is based on validity, repeatability, and responsiveness and is highly beneficial for both the patient and the therapist. ODI Output or feedback measures mild, moderate, and severe disability for low back pain, see figure below, The Oswestry Disability Questionnaire (ODI) will be used to measure the limitation in everyday life activities, there is evidence supporting its validity and reproducibility.

The ODIQ is based on 10 sections with six levels each, assessing the limitations of various activities of daily living. The values range from 0 (the best health state) to 100 (the worst health state). For each section of the questionnaire, the total possible score is 5. The first statement was scored 0, and consecutive statements were scored from 1 to 5. The total score was then divided by the total possible score and expressed as a percentage to produce the Oswestry Disability Index (ODI). The ODI is interpreted as follows: 0–20%, minimal disability; 21–40%, moderate disability; 41–60%, severe disability; 61–80%, crippled; 81–100%, patients are either bed-bound exaggerated their symptoms.(Alcántara-Bumbiedro et al., 2006)

The final summary might look like this: "Throughout your treatment, you have shown significant improvements in various key areas. Your range of motion increased by 50%, muscle strength improved by 40%, pain levels decreased by 50%, and your overall functional capacity improved by 45%. These improvements highlight the effectiveness of the treatment plan and your dedication to the rehabilitation process."

This scientific approach provides a clear, quantitative summary of the patient's progress, reinforcing the value of the therapeutic interventions and encouraging continued adherence to prescribed exercises and lifestyle modifications

4. **Psychological impact of DP-LBP through the Fear-Avoidance Beliefs Questionnaire (FABQ)** ***see appendix (4):***

The Fear-Avoidance Model of Exaggerated patient perception of low back pain, or FABQ, is a questionnaire based on the Fear-Avoidance Model of Exaggerated Pain Perception, which was developed to explain why some patients with acute painful conditions recover

while others develop chronic pain as a result of those conditions. The FABQ assesses patients' fear of pain and, as a result, their avoidance of physical activity. ADLs, behavior, functional mobility, general health, life participation, mental health, motivation, occupational performance, pain, personality, quality of life, self-efficacy, stress, and coping can be assessed.

The Fear Avoidance Beliefs Questionnaire was developed by Waddell et al (1993) in response to the emergence of the biopsychosocial model of low back pain (LBP) (FABQ). The FABQ (Federal Agency for Business and Consumer Regulation examines the patient's perceptions of the impact of physical activity They should engage in physical activity and work on their LBP. There are 16 items in total. On a scale of one to seven, patients score their agreement with each statement. Point on a scale of one to ten, (0 = totally disagree, 6 = totally agree). Two subscales emerged from the initial factor analysis: 7 questions (maximum) on the work subscale (FABQW) with (total score = 42) and the subscale of physical activity (FABQPH)with four questions (total score = 24) A better grade implies that fear avoidance ideas are held more strongly. It necessitates It takes about 10 minutes to finish.(Tousignant et al., 2005)

3.7 Suggested Program of Progressive Core Stability Exercise PCSE

The prescribed protocol for progressive core stability exercises (PCSE) to treat chronic DPLBP involves a one-month regimen of 12 sessions, three per week, each lasting one hour. This planned strategy assures regular involvement and appropriate time for core-strength workouts. The regimen is intended to gradually increase core stability, relieve pain, and improve functional capability in individuals with DP-LBP.

The rehabilitation protocol for core stability muscles addressing DP-LBP incorporates diaphragmatic breathing, progressive muscular relaxation (PMR), and autogenic self-relaxation (AT) into an organized routine. Diaphragmatic breathing, done at the beginning of each session, entails taking deep, controlled breaths to activate the diaphragm, increase oxygen flow, and induce relaxation. After that, PMR relieves muscular tension by tensing certain muscle groups for 5-10 seconds and then gradually relaxing them, working from the toes to the head. AT also uses verbal cues to generate a state of relaxation, with sentences focused on feelings of heaviness and warmth throughout the body. These relaxation methods

are smoothly interwoven with core stability exercises, such as pelvic tilts, bridges, planks, bird-dog, and dead bug, done for 20 to 30 minutes to strengthen the muscles that support the spine. This comprehensive treatment treats both the physical and psychological components of LBP, improving muscular strength, lowering pain, and boosting general well-being.

To restore lumbar spine neutrality and stability, the suggested study protocol's core stability exercises (CSEs) were designed using movements such as lumbar spine flexion, extension, lateral bending, and rotation, as well as flexion, extension, adduction, and internal and external rotation of the upper and lower extremities' proximal joints. These motions serve as the foundation for the workouts, resulting in a complete strategy for improving core stability and dealing with chronic low back pain. This routine is designed to methodically target and develop the necessary muscle groups, encouraging proper alignment of the spine and functional stability.

The technical complexity of each (CSEs) is gradually increased to meet participants' increasing strength and stability. In the early stages, the emphasis is on basic exercises to promote core activation and stability, which are simple yet essential for laying a firm foundation. During the intermediate stages, changes and additional challenges, such as single-leg motions or increasing limb involvement, are added to gradually improve core strength and stability. In the advanced levels, dynamic elements and advanced movement patterns are introduced, necessitating a higher level of coordination and control to simulate functional and daily motions.

The proposed regimen for core stability exercises (CSEs) includes both static and dynamic modalities. The static mode is administered throughout the first three weeks, separated into three tiers, each lasting one week. The dynamic level is introduced during the fourth and final week of the therapeutic protocol. The physical burden for each exercise is quantified as follows: The first level has two sets each, while the second, third, and fourth levels have three sets. The static levels have hold periods of 15 seconds, 20 seconds, and 25 seconds, respectively, while the dynamic fourth level has 10 repeats every set. Additionally, the technical difficulty of each CSE is gradually increased.

The static mode of the procedure is implemented during the first three weeks, with each week reflecting a different degree of increasing difficulty and intensity. This program is intended to gradually elevate the strength and endurance of the core muscles while keeping the lumbar spine neutral and stable. In 1st Week (Level 1), participants do two sets of each exercise with a 15-second hold duration, concentrating on basic static movements that stress proper technique and beginning muscle engagement. In 2nd Week (Level 2), the program includes three sets of each exercise with a 20-second hold duration, as well as intermediate static exercises to improve muscular endurance and stability. By 3rd Week (Level 3), Participants perform three sets of each exercise, with a 25-second hold period for each set, focusing on advanced static exercises that stress the core muscles and prepare them for dynamic activities.

The dynamic level is introduced in the fourth week and marks the program's final level. This phase focuses on adding movement patterns that simulate functional tasks, hence improving dynamic stability and motor control. In the fourth level of the suggested protocol, participants do three sets of each exercise, with ten repetitions in each set. The goal of the 4th level is to apply dynamic exercises that simulate functional tasks, enhancing dynamic stability and motor coordination. This level incorporates movement into the workouts, challenging the core muscles in new capacities while improving general strength and coordination.

The (PCSE) program devised for this study takes an organized and gradual approach to treating DP-LBP. The intervention lasts one month and consists of 12 sessions scheduled three times each week, each lasting one hour. The program is organized into two sections: static and dynamic exercises, which ensure a thorough and graded approach to core stabilization.

Implementation and Monitoring Throughout the training, participants are given extensive instructions and video examples via WhatsApp to ensure clarity and perfect technique. Weekly virtual check-ins allow for real-time feedback and modifications, creating a dynamic and encouraging rehabilitation environment.

The training program includes videos of the exercises, a picture of the activity, and an audio description of the exercise from the therapist for people who attend therapy sessions. The Arabic audio file describes how to do the exercise, the duration of the holding time in the basic exercises, the number of sets, and the rest times between sets.

A treatment group was formed on WhatsApp, and all participants joined it. Dates and times for the session, and the researcher confirmed participants' availability by regularly calling them to confirm their participation in the treatment program. Participation in the therapeutic sessions was certified by downloading the video indicating the exercise and setting a sign that shows a willingness to continue the exercises after seeing the film, as well as recording the holding time for the static exercise. The participants will complete the four levels of the core stability training program in four weeks, with three sessions each week. The duration of the therapeutic session will be approximately sixty to ninety minutes.

Static exercises assist participants by teaching them optimal muscular activation and posture, whilst gradually increasing hold periods increases muscle endurance and prepares the core for dynamic activities. Transitioning to a dynamic level involves functional motions that imitate real-life tasks, which improves neuromuscular control and functional stability. Incorporating movement into the workouts increases the challenge for the core muscles, enhancing overall strength and coordination. The progressive loading method promotes safety and efficacy by organizing the increase in sets, hold periods, and technical complexity, allowing participants to grow strength without exhausting their muscles too rapidly. Furthermore, the curriculum may be modified depending on individual development, making sure each participant is suitably moved based on their ability.

This carefully planned core stability training protocol seeks to restore lumbar spine symmetry and stability in DP-LBP patients. By including both static and dynamic levels and gradually increasing the physical and technical challenges, the program provides a comprehensive and effective approach to core strength. Using digital technologies via WhatsApp for education and monitoring improves accessibility and ongoing assistance, making this intervention novel and practical in modern physiotherapy practices.

See Appendix 7 **for the full presentation and schedule of the suggested study protocol.**

During the first sessions, patient practice and physical participation in Progressive Core Stability Exercises (PCSE) were continuously watched and documented via online video recordings. An auditory timer was also used throughout these sessions to highlight the rhythm and progression of each exercise's active and rest phases. As patients advanced and their understanding increased, they attained a level of competency that allowed them to do the exercises simply on the auditory time cues.

This minimized the requirement for the physiotherapist to provide continual direct monitoring while also ensuring that patients maintained proper timing and form during their workouts. Monitoring and supporting patients' performance of core stability exercises.

- **Initial Sessions were monitored** by
  - Video Recording and Controlling: During the initial sessions, patients' practice and physical achievement of core stability exercises (CSE) were closely observed. Each session was documented via online video recordings, which allowed the physiotherapist to evaluate the patient's form, technique, and compliance with the recommended exercises.
  - Audio Timer: An audio timer was employed to control the rhythm and progression of each workout. This timer gave indications for both the active (on time) and rest phases (off time) of each CSE. The continuous voice instructions helped patients maintain perfect time, ensuring that they completed each exercise correctly and successfully.
  - Physiotherapist Review: The recorded films allowed the physiotherapist to thoroughly review each session. Following these reviews, the physiotherapist offered patients specific comments, adjustments, and encouragement. This input was critical in teaching patients the proper form and technique for each exercise.
- **Later Sessions:**
  - Improved Patient Education: As patients progressed through their sessions, they obtained a greater comprehension of the exercises due to comprehensive feedback and continuous practice. Their education and performance with the CSEs improved dramatically.
  - Reduced Need for Direct Monitoring: As their knowledge and skill level grew, patients were able to depend more on the audible timer for guidance. The audio timer's rhythm and timing cues were enough to help patients complete the exercises correctly.
  - Autonomous Practice: Patients were able to execute their exercise sessions independently, eliminating the requirement for ongoing direct supervision by the physiotherapist. They followed the auditory timing cues to ensure they kept the proper intervals for each exercise.
  - Periodic Check-ins: Even if continuous monitoring was no longer required, periodic check-ins were still planned. During these check-ins, the physiotherapist examined

the patients' progress, made any required changes to their exercise programs, and answered any questions or concerns they had.

This full report gives a complete picture of how patient performance and progress were tracked and encouraged throughout the suggested progressive core stability exercise protocol and **Benefits:**

- Improved Patient Confidence: The shift to more independent practice helped patients gain trust in their ability to complete the exercises properly.
- Effectively Use of Resources: This technique allowed the physiotherapist to better spend their time, focusing on patients who needed more direct help while still assisting those who had made progress.
- regular Exercise Adherence: Using an auditory timer ensured that patients followed regular exercise regimens, which promoted adherence and maximized the positive effects of the core stability exercises

Adopted Modes of progression through the four levels of the Progressive Core Stability Protocol PCSP.

The (PCSP) for DP-LBP is divided into four levels, each with increasing complexity and severity. Level 1 focuses on fundamental activation and awareness through exercises such as diaphragmatic breathing and pelvic tilts, progressively increasing time as control improves. Level 2 improves stability in static positions with bridges and modified planks, gradually increasing hold periods and introducing minor resistance. Level 3 exercises, such as planks and side planks, are designed to improve static stability by gradually increasing ROM, speed, and resistance. Finally, Level 4 incorporates core stability into functional and advanced motions such as advanced plank variants and rotational exercises, highlighting complexity and resistance while keeping the core engaged. Progression is done by moderate increases in intensity, persistent practice, tailored modifications depending on discomfort and ability, and continual form monitoring and correction to optimize benefits and avoid damage.

The (PCSP) for DP- LBP progresses in an organized manner across various dimensions. Clinically, progression is measured by reducing pain from severe to normal and utilizing the

(VAS) from higher to lower values. To prioritize safety and stability, static workouts are performed first, followed by dynamic activities. The rehabilitation goals transition from clinical management of pain to physical enhancement, psychological and eventually functional activities. Exercises get more complicated as they go from unilateral to bilateral motions, uni-joint to multi-joint exercises, and basic to multi-planar movements. The physical dose of workouts is gradually modified, beginning with fewer degrees of motion (ROM), shorter hold durations, less resistance, shorter moment arms, and slower motions, advancing. then progressing to larger ROM, longer hold times, more resistance, longer moment arms, faster movements, and increased sets and repetitions. Proprioceptive control is established by switching from a broader to a smaller base of support, stable to unstable surfaces, free body weight to more difficult equipment, same-level to different-level bases of support, and lowering the number of supporting points. This holistic approach guarantees that core stability is developed comprehensively while also improving general functional performance.

The Quantified modeling of Discopathy Pain Behavior DPPB as clinical guidelines or Parameters/aspects of mechanical pain MP for the application of the suggested protocol of PCSE.

In the context of the (PCSE) technique, including quantified modeling of DP-LBP Behavior in clinical practice necessitates a systematic approach to multiple elements influencing pain and movement. Each characteristic is important in developing successful rehabilitation programs for illnesses such as low back pain (LBP) and Discopathy.

To begin, recognizing the type of motion associated with pain, such as flexion or extension, helps guide workout selection and adjustment to prevent increasing discomfort. By emphasizing pain-free ranges of motion and minimizing irritating motions, PCSE can progressively restore mobility and function. Second, the type of motion, whether passive (e.g., joint mobility), active (e.g., voluntary muscle contraction), or active resistive (e.g., resistance training), determines how workouts are designed to improve neuromuscular control and minimize discomfort. Integrating these modalities correctly ensures that exercises are tough yet achievable.

Assessing (ROM) and mobility, as well as tissue elasticity and plasticity, aids in creating attainable objectives for enhancing flexibility and movement. This progressive development is critical for avoiding stiffness and improving functional movement patterns.

The intensity of strength or load, as well as the resistance or moment arm of motion, are regulated by pain tolerance, ensuring increasing loading without exacerbating symptoms. Similarly, setting the hold length of static postures as well as the number of repetitions and sets for dynamic workouts allows for the regulated development of endurance and stability. In addition, focusing on the direction of motion and sequence of movement ensures that physical activity emphasizes smooth, controlled movements, which reduce joint tension and discomfort. Incorporating multi-planar motions and functional task analysis improves functional capacity and decreases discomfort during daily activities.

Overall, by systematically applying these parameters within the PCSE methodology, clinicians can tailor rehabilitation programs to effectively manage DPPB, enhance core stability, and promote functional recovery in individuals with DP-LBP. Regular assessment and adjustment based on individual progress and feedback are crucial for optimizing outcomes and ensuring personalized care throughout the protocol process. Regular evaluation and modification based on patient advancement and feedback are critical for improving results and providing particular care throughout the therapeutic process.

3.8 Ethical Approval

Ethical approval was obtained from the Central Research Ethical Committee (REC) at Al-Quds University, and a consent form was signed by each participant in the study sample before formal participation in the study. See Appendix V for the REC letter from AQU. See Appendix 17.

3.9 Challenges and limitations

The following are the most important challenges and limitations that impacting both the research design and its practical application, while studying and implementing the core stability interventions for this specific population of DP.LBP.

- **Challenges:**

Participant heterogeneity, the complexity of low back pain, adherence issues to exercise programs, and difficulties in measuring core stability muscle endurance during the suggested PCSE protocol sessions, in addition to the large amount of data collected from each core stability exercise along the 12 sessions of the suggested protocol.

- **Limitations:**

Limited generalizability of findings due to relatively small number of study sample. Short duration of the suggested protocol, and the resource-intensive nature of conducting robust research.

3.9 Statistical Analysis

Statistical Package for Social Science (IBM SPSS Statistics 23.0 for Windows) was used to examine the data.

Nonparametric Descriptive statistical tests “frequencies and ratios” and charts were used to describe the qualitative - demographic, medical history, and working variables of the study sample, Central tendency measures “means” and dispersion measures “standard deviation” of parametric descriptive statistics were used to describe the level of anthropometric measurements, physical variables and the summated functional variables in pre mid and posttests of the intervention group. Inferential statistical tests of repeated measure ANOVA and its parallel nonparametric K-related test were used to test the t hypothesis concerning the mean and the rank differences between the pre-, mid, and posttests, respectively in clinical, physical functional, and psychological data of the study. Finally, simple Pearson correlation was used to study the established correlation between the anthropometric, clinical, physical, and averaged functional parameters in the pre-mid and posttests of the study group.

Chapter Four: Results Presentation, Analysis, and Discussion

4.1 Results presentation and analysis

4.1.1 Descriptive statistics of study sample:

4.1.1.1 Descriptive statistics of identifying variables for the study sample

4.1.1.2 Descriptive statistics of anthropometric measurements

4.1.2 Descriptive & Comparative results of pre-mid-posttest results

4.1.2.1: Descriptive Results of pre-mid, and posttests of Clinical and Physical Variables

4.1.2.2 Frequency distribution of low back pain patients' responses in OSWESTRY questionnaire

4.1.2.3 Descriptive Statistics of Sum and Percent Scores of OSWESTRY Test items:

4.1.3 Descriptive Statistics Summary for the four levels of PCSP sessions

4.1.3.1 Descriptive Statistics Summary for the Psychological Variables at Pre, Mid, and Post Tests.

4.1.3.2 Established correlation between clinical, anthropometric, physical, and functional variables among LBP patients at pre-posttest results

4.2 Results Discussion

Chapter Four

4.1 Results presentation and analysis

4.1.1 Descriptive statistics of study sample:

4.1.1.1 Descriptive statistics of identifying variables for the study sample

Table 4.1 Frequency distribution of study sample by types of Work, Working Hours, Marital Status, Number of Births, Smoking, Marital Status, and Weight Bearing:

Number	**Variables**	**Categories / Ranks**	**Frequency**	**Percent**
1	Types of Work	House Wife	19	63.3%,
		Worker (teacher, cleaner, etc	11	**36.7%**
	Variable	**Description**	**Percent**	**Cumulative Percent**
2	Working hours	Varying daily working hours /Frequency		
	3	3	10.0%	10.0%
	4	1	3.3%	13.3%
	5	2	6.7%	20.0%
	6	9	30.0%	50.0%
	7	4	13.3%	63.3%
	8	9	30.0%	93.3%
	10	1	3.3%	96.7%
	12	1	3.3%	100.0%
3	Number of Births	Frequency	Percent	Cumulative Percent
	0 births	4	13.3%	13.3%
	1 birth	4	13.3%	26.7%
	3 births	3	10.0%	36.7%
	4 births	1	3.3%	40.0%
	5 births	3	10.0%	50.0%
	6 births	4	13.3%	63.3%
	7 births	5	16.7%	80.0%
	8 births	2	6.7%	86.7%
	9 births	1	3.3%	90.0%
	10 births	2	6.7%	96.7%
	12 births	1	3.3%	100.0%
	Variables		**Frequency**	**Percent**
4	Social habits “Smoking”	Yes,	20	66.7%,
		No	10	33.3%
5	Marital Status	Single,	4	13.3%
		Married,	24	80.0%
		Divorced	2	6.7%
6	Weight-bearing	Right,	20	66.7%
		Left	7	**23.3%,**
		Equal	3	10.0%

Type of Work (4.1) shows that 63.3% of the participants are housewives, whereas 36.7% are workers (e.g., teachers and cleaners).

Working Hours (4.2) shows varying daily working hours ranging between 3 and 12 hours/day, most of the participants' working hours range between 6-8 hours each day (30%).

The number of Births (4.3) above shows that the number of births (0/1/6) is 4 with a percentage of 13.3%, while 7 is the most with a percentage of 16.7%, (10/8) is the same by a percentage of 6.7 %, and (1) is the least by a percent of 3.3%,

Social habits "Smoking" (4.4) above shows that the highest percent of the study sample are smokers, representing 66.7%, while 36% are non-smokers.

Marital Status (4.5) indicates that 80% of the sample subjects are married,13.3% are single, and 6.7% are divorced

Weight-bearing (4.6) indicates the concentration of weight placement relative to the balancing base between the subjects of the study sample, 66.7% of patients placed the most weight on the right lower limb, whereas 10% distributed it equally on the right and left sides.

Table 4.2 Frequency Distribution of Sample's Past Medical History.

Conditions of past medical history	Frequency	Percent	Cumulative P.
Asthma	2	6.7	6.7
Breast Cancer	1	3.3	10.0
CDH, Cesarian 2 time	1	3.3	13.3
Cesarian 1 time	1	3.3	16.7
cesarian 2 time	2	6.7	23.3
Cholecystectomy	1	3.3	26.7
Cholecystectomy, Cesarian 2	1	3.3	30.0
Diabetic	3	10.0	40.0
Diabetic, Asthma	1	3.3	43.3
Discectomy	2	6.7	50.0
Free	8	26.7	76.7
Knees Pain	2	6.7	83.3
Middle ear infection	1	3.3	86.7
Neck pain	3	10.0	96.7
Neck Pain, Cesarian 1 time	1	3.3	100.0
Total	30	100.0	

According to the statistics in Table (4.2), around 10% of patients have diabetes, 13.3% of patients in the group complain of neck pain, 13.3% of women have had a cesarean section once or twice, and 26.7% of participants had no prior surgery or accidence in varying degrees.

4.1.1 Descriptive statistics of anthropometric measurements

Table 4.3 Descriptive Statistics of Anthropometric Measurements.

4.8	**Variables of Anthropometric measurements**	**N**	**Mean**	**Std. Deviation**
	Age	30	44.33	8.860
	Height	30	159.87	5.211
	Weight	30	74.17	10.436
	Body Mass Index	30	29.0078	3.58033
4.9	**Body Mass Index Categories**	**Frequency**	**Percent**	**Accumulative percent**
	Normal weight (18.5-25.49)	4	13.3%	13.3%
	Overweight (25.5-30)	17	56.7%	70.0%
	Obesity Grade 1 (30.1-35)	7	23.3%	93.3%
	Obesity Grade 2 (35.1-40)	2	6.7%	100.0%
	Total	30	100.0%	

Anthropometric Measurements **(4.8)** Indicate that the mean age of the participants is 44.33%, the mean weight is 74.17 %, the mean height is 159.87 cm, and the mean value for the Calculated BMI is approximately 29.00.

Body Mass Index Categories **(4.9)** The study sample included 30 women. The percentage of body mass index was distributed throughout the study sample in descending order: overweight high percentage 56.7%, first-degree obesity 23.5%, Normal weight 13.3%, and second-degree obesity 6.7%.

4.1.2 Descriptive & Comparative results of pre, mid, & posttest results

4.1.2.1: Descriptive Results of pre-mid, and posttests of Clinical and Physical Variables

Table 4.4 Descriptive and Inferential Statistical results of RM.ANOVA & K Related test between Pre, Mid, and Post-tests of clinical, and physical variables.

physical variables	Study tests	descriptives		Used inferential statistical Test & P value		Pairwise comparisons	Mean Difference (I-J)	Sig
		Mean	SD					
VAS	**Pretest**	8.85	1.321	RM-ANOVA F score	228.16	**Pre-mid tests**	3.417*	.000
	Mid test	5.43	1.165	sig	.000	**Pre-post tests**	5.817*	.000
	Post-test	3.03	1.520			**Mid-post tests**	2.400*	.000
LF-ROM	**pre**	37.23	9.179	KRT	60.000	**Pre-mid tests**	-12.933-*	.000
	mid	50.17	7.711	sig	.000	**Pre-post tests**	-35.367-*	.000
	post	72.60	11.082			**Mid-post tests**	-22.433-*	.000
LE-ROM	**pre**	9.03	4.004	KRT	45.554	**Pre-mid tests**	-5.433-*	.000
	mid	14.47	2.623	sig	.000	**Pre-post tests**	-9.133-*	.000
	Post	18.17	3.797			**Mid-post tests**	-3.700-*	.000
RT-SB- ROM	**pre**	16.17	2.422	KRT	57.630	**Pre-mid tests**	-13.133-*	.000
	mid	29.30	5.712	sig	.000	**Pre-post tests**	-19.033-*	.000
	post	35.20	7.378			**Mid-post tests**	-5.900-*	.000
LT-SB-ROM	**pre**	16.60	3.212	KRT	55.580	**Pre-mid tests**	-12.900-*	.000
	mid	29.50	6.202	sig	.000	**Pre-post tests**	-19.567-*	.000
	Post	36.17	7.235			**Mid-post tests**	-6.667-*	.000
SART	**pre**	-8.50-	6.715	KRT	56.530	**Pre-mid tests**	-4.567-*	.000
	mid	-3.93-	5.759	sig	.000	**Pre-post tests**	-9.433-*	.000
	Post	.93	4.242			**Mid-post tests**	-4.867-*	.000

THYExT	**pre**	11.90	6.155	KRT	59.513	**Pre-mid tests**	-9.000-*	.000
	mid	20.90	6.504			**Pre-post tests**	-18.567-*	.000
	post	30.47	8.390	sig	.000	**Mid-post tests**	-9.567-*	.000
6MWT	**pre**	223.23	125.238	sig	.000	**Pre-mid tests**	-93.400-*	.000
	mid	316.63	129.018	f	64.467	**Pre-post tests**	-213.633-*	.000
	post	436.87	106.358	score		**Mid-post tests**	-120.233-*	.000

VAS: visual analog scale, SB: side Bending ,LF: lumber flexion ,LE: lumber extention,6MWT:6minute walking test

SART: sit and reach and Test

The table (4.10) displays descriptive statistics for different clinical and physical factors that were measured PRE, MID, and POST as suggested intervention, as shown by pre-test, mid-tests, and post-test results. The sample size (N) for each variable is 30.

The mean score on the VAS of Pain reduced from 8.85 (SD = 1.321) pre-test to 3.03 (SD = 1.520) post-test, indicating a substantial reduction in pain levels.

In table (4.10) Physical endurance was significantly improved in the 6-MWT, as evidenced by the mean distance rising from 223.23 meters (SD = 125.238) to 436.87 meters (SD = 106.358). there was a noticeable improvement in the mean score of the Trunk Hyper Extension Test, which went from 11.90 degrees (SD = 6.646) before in the mid-test 20.90(SD=6.504) and the post-test to 30.47 degrees (SD = 8.390) after it.

Overall, these results demonstrate significant increases in pain relief, physical endurance, and range of motion, indicating that the intervention was very successful across all examined clinical and physical variables.

The descriptive statistics "mean and standard deviation" of clinical and physical variables "pain intensity, trunk flexibility, and static muscle endurance" at pre, mid, and post-testing. The mean values for pain, lumbar flexion, lumbar extension, lumbar right lateral flexion, lumbar left lateral flexion, lumbar right rotation, and static muscle endurance in trunk hyperextension, 6MWT, were larger than the standard deviation.

Pairwise comparisons in the pain scale revealed a decrease in the pain index based on the differences in the Mean Difference (I-J) for the study sample between the pre-mid 3.417(p value <0.005), pre-post, and mid-post exams.

Table 4.5 Frequency distribution of study sample subjects by Saharman Core Stability level.

Saharman Core Stability level	Pre Test		Mid Test		Post Test	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Level 0	2	6.7	0	0	0	0
Level 1	10	33.3	1	3.3	0	0
Level 2	14	46.7	17	56.7	0	0
Level 3	3	10.0	8	26.7	4	13.3
Level 4	1	3.3	4	13.3	26	86.7
Total	30	100.0	30	100.0	30	100.0

Table (4.5) Core Stability Level: The many degrees of core stability, which range from Level one (lowest) to Level four (highest)., Pre-Test Frequency: Level two had the highest frequency of 14 participants, while Level 4 had one, Mid-Test Frequency: The number of participants at core stability level two was 17, and level four became 4, Post-Test Frequency: The number of participants at stability level 4 = 26, and level two was reduced to 0.

Table 4.6 Statistical results of K Related test between Pre, Mid, and Post-tests in Saharman **Core Stability Test.**

Physical variable	**Study test**	**descriptives**		**Study tests**	**Used Test & P value**	**Pairwise comparison**	**Mean Difference (I-J)**	**Sig**
		Mean	**SD**					
Sharman Core Stability Test	Pre	1.70	.877	Sig	.000	Pre-mid tests	-.800-*	.000
	Mid	2.50	.777	F score	120.653	Pre-post tests	-2.167-*	.000
	Post	3.87	.346			Mid-post tests	-1.367-*	.000

Table (4.6) and Chart (4.1) show RM ANOVA Given the p-value= 0.000, which is less than the 0.05 level of significance, we reject the null hypothesis. This suggests that core stability levels change significantly between the three time intervals (pre-test, mid-test, and post-test).

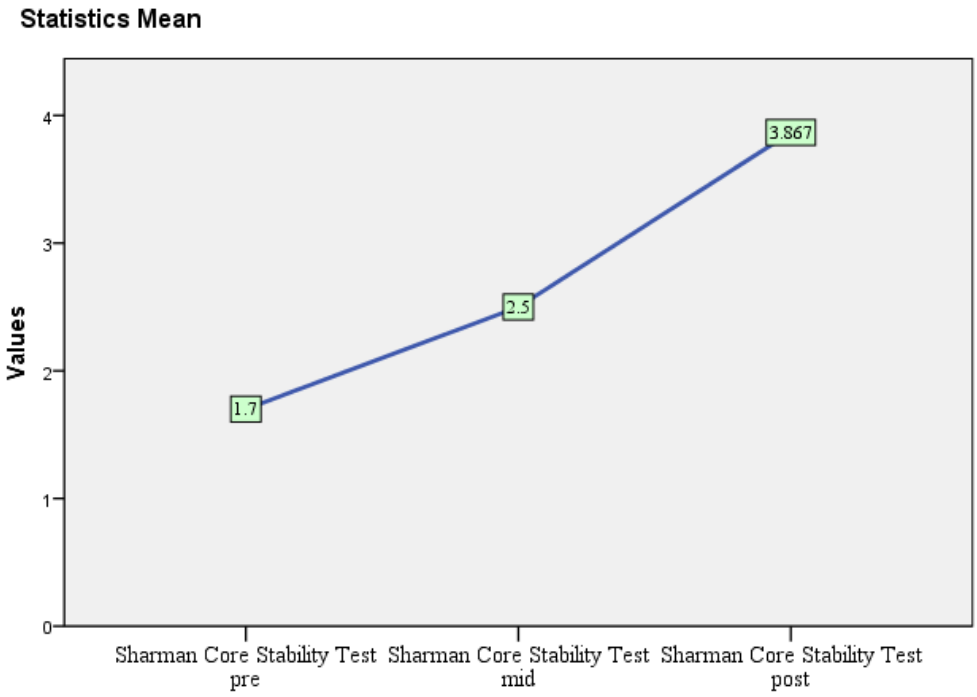


Chart (4.1): The mean difference between Pre, Mid, and Post of the Saharman Core Stability test.

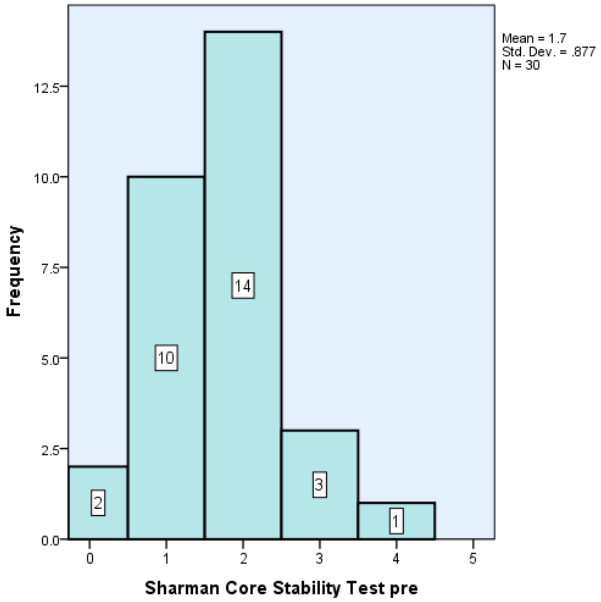


Chart (4.2): The frequency distribution for five levels of the Saharman Core Stability Test (Pre).

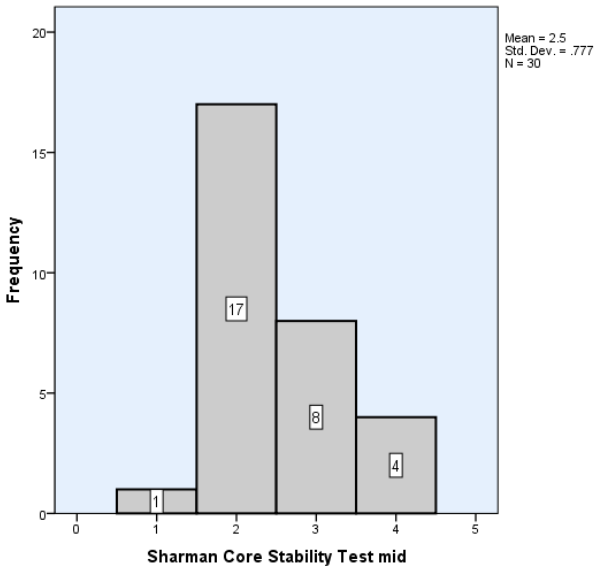


Chart (4.3): The frequency distribution for five levels of the Saharman Core Stability Test (Mid).

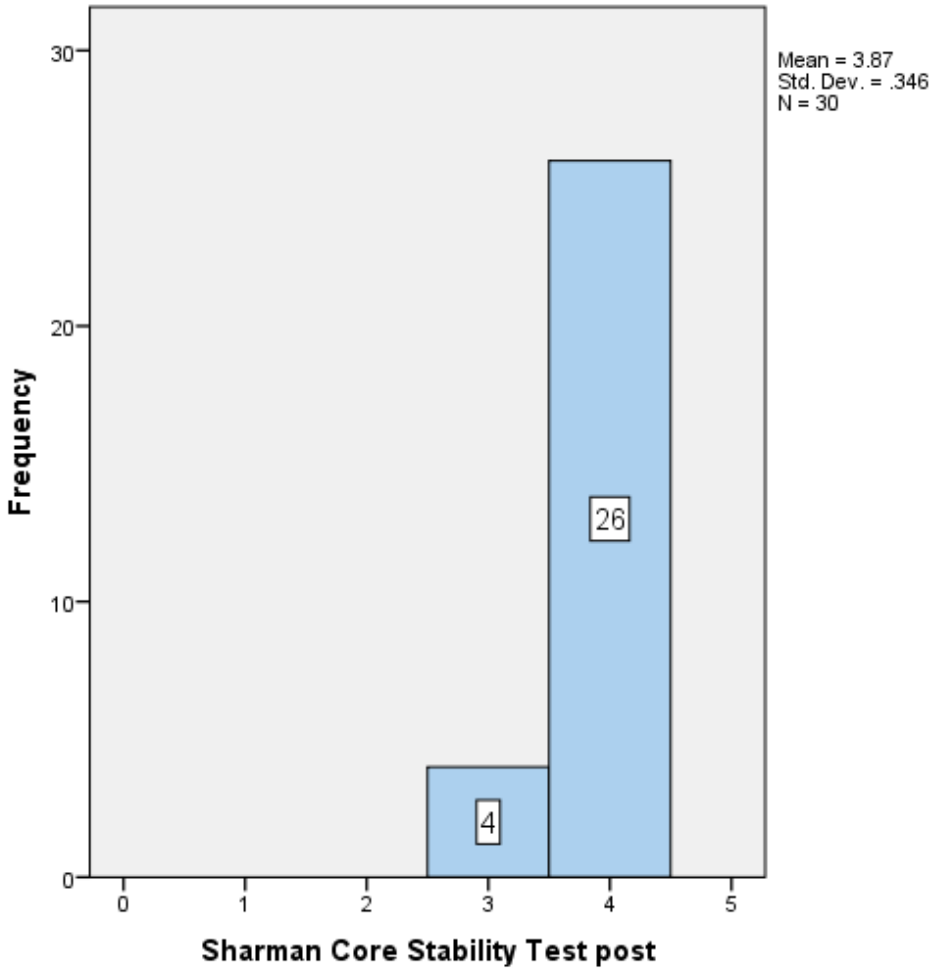


Chart (4.4) The frequency distribution for five levels of the Saharman Core Stability Test (Post)

4.1.2.2 Frequency distribution of low back pain patients' responses in OSWESTRY questionnaire

Table 4.7 Frequency distribution of sample subjects by response to the OSWESRY questionnaire in pre, mid, and posttests of each question.

10 test Items	Questions of test items	Pre-test		Mid test		Post-test	
		Count	Column N %	Count	Column N %	Count	Column N %
Pain Intensity	I have no pain at the moment	0	0.0%	2	6.7	7	23.3
	The pain is very mild at the moment	0	0.0%	11	36.7	11	36.7
	The pain is moderate at the moment	11	36.7	15	50.0	10	33.3
	The pain is fairly severe at the moment	12	40.0	1	3.3	2	6.7
	The pain is very severe at the moment	4	13.3	1	3.3	0	0.0%
	The pain is the worst imaginable at the moment	3	10.0	0	0.0%	0	0.0%
personal Care (e.g. Washing, Dressing)	I can look after myself normally without causing extra pain	2	6.7	14	46.7	22	73.3
	I can look after myself normally but it causes extra pain	8	26.7	11	36.7	6	20.0
	It is painful to look after myself and I am slow and careful	11	36.7	4	13.3	2	6.7
	I need some help but manage most of my personal care	8	26.7	1	3.3	0	0.0%
	I need help every day in most aspects of self-care	1	3.3	0	0.0%	0	0.0%
	I do not get dressed, I wash with difficulty and stay in bed	0	0.0%	0	0.0%	0	0.0%
Lifting	I can lift heavy weights without extra pain	1	3.3	1	3.3	6	20.0
	I can lift heavy weights but it gives extra pain	8	26.7	15	50.0	17	56.7
	Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently placed	2	6.7	1	3.3	3	10.0
	Pain prevents me from lifting heavy weights, but I can manage light to medium weights	4	13.3	8	26.7	1	3.3
	I can lift very light weights	4	13.3	5	16.7	3	10.0

	I cannot lift or carry anything at all	11	36.7	0	0.0%	0	0.0%0.0%
Walking	Pain does not prevent me from walking any distance	1	3.3	10	33.3	17	56.7
	Pain prevents me from walking more than 2 kilometers	2	6.7	8	26.7	10	33.3
	Pain prevents me from walking more than 1 kilometer	4	13.3	8	26.7	1	3.3
	Pain prevents me from walking more than 500 meters	8	26.7	4	13.3	2	6.7
	I can only walk using a stick or crutches	13	43.3	0	0.0%	0	0.0%
	I am in bed most of the time	2	6.7	0	0.0%	0	0.0%
Sitting	I can sit in any chair as long as I like	0	0.0%	6	20.0	8	26.7
	I can only sit in my favorite chair as long as I like	0	0.0%	9	30.0	14	46.7
	Pain prevents me sitting more than one hour	2	6.7	9	30.0	5	16.7
	Pain prevents me from sitting more than 30 minutes	8	26.7	2	6.7	2	6.7
	Pain prevents me from sitting more than 10 minutes	15	50.0	4	13.3	1	3.3
	Pain prevents me from sitting at all	5	16.7	0	0.0%	0	0.0%
Standing	I can stand as long as I want without extra pain	0	0.0%	5	16.7	4	13.3
	I can stand as long as I want but it gives me extra pain	1	3.3	12	40.0	18	60.0
	Pain prevents me from standing for more than 1 hour	7	23.3	8	26.7	7	23.3
	Pain prevents me from standing for more than 3 minutes	14	46.7	4	13.3	1	3.3
	Pain prevents me from standing for more than 10 minutes	8	26.7	1	3.3	0	0.0%
	Pain prevents me from standing at all	0	0.0%	0	0.0%	0	0.0%
Sleeping	My sleep is never disturbed by pain	1	3.3	6	20.0	16	53.3
	My sleep is occasionally disturbed by pain	8	26.7	19	63.3	12	40.0
	Because of pain, I have less than 6 hours sleep	0	0.0%	3	10.0	1	3.3

	Because of pain I have less than 4 hours sleep	7	23.3	2	6.7	1	3.3
	Because of pain I have less than 2 hours sleep	8	26.7	0	0.0%	0	0.0%
	Pain prevents me from sleeping at all	6	20.0	0	0.0%	0	0.0%
Sex life (if applicable)	My sex life is normal and causes no extra pain	3	10.0	11	36.7	14	46.7
	My sex life is normal but causes some extra pain	5	16.7	9	30.0	7	23.3
	My sex life is nearly normal but is very painful	0	0.0%	2	6.7	3	10.0
	My sex life is severely restricted by pain	3	10.0	2	6.7	0	0.0%
	My sex life is nearly absent because of pain	4	13.3	0	0.0%	0	0.0%
	Pain prevents any sex life at all	10	33.3	0	0.0%	0	0.0%
	I had never been married.	6	20.0	6	20.0	6	20.0
Social Life	My social life is normal and gives me no extra pain	2	6.7	5	16.7	12	40.0
	My social life is normal but increases the degree of pain	3	10.0	17	56.7	13	43.3
	Pain has no significant effect on my social life apart from limiting my more energetic interests e.g, sport	2	6.7	6	20.0	5	16.7
	Pain has restricted my social life and I do not go out as often	10	33.3	2	6.7	0	0.0%
	Pain has restricted my social life to my home	6	20.0	0	0.0%	0	0.0%
	I have no social life because of the pain	7	23.3	0	0.0%	0	0.0%
Traveling	I can travel anywhere without pain	2	6.7	1	3.3	12	40.0
	I can travel anywhere but it gives me extra pain	4	13.3	16	53.3	12	40.0
	Pain is bad but I manage journeys over two hours	4	13.3	5	16.7	2	6.7
	Pain restricts me to journeys of less than one hour	7	23.3	1	3.3	0	0.0%
	Pain restricts me to short necessary journeys under 30 minutes	5	16.7	0	0.0%	1	3.3
	Pain prevents me from traveling except to receive treatment	5	16.7	1	3.3	0	0.0%
	6	3	10.0	6	20.0	3	10.0

Regarding the results in table (4.13) Qualitative Descriptive statistics of functional data "OSWESRRY" at pretest, Pain Intensity indicated that the mean of "The pain is fairly severe at the moment" answer has the highest mean comparing other answers as 40% , The pain is moderate at the moment 50% has the highest mean comparing other answers in mid test, "The pain is very mild at the moment" has the highest mean comparing other answers in post as 36% ,and Personal Care recorded that the mean of "It is painful to look after myself and I am slow and careful" answer has highest mean comparing other answer as 36.7% in posttest answer of "I can look after myself normally without causing extra pain" was 73.3 %, then for Lifting again pretest recorded that the mean of "I cannot lift or carry anything at all" answer has the highest mean comparing other answers as 36.7 %, for mid and posttest respectively in answer" I can lift heavy weights but it gives extra pain" as 50% ,56.7 % ,after that Walking study sample recorded highest mean for "I can only walk using a stick or crutches" answer in the pretest but in the mid test there are two answers has the same mean as 26.7 % that are "Pain prevents me from walking more than 2 kilometers" and "Pain prevents me from walking more than 1 kilometer", Sitting functional "Pain prevents me from sitting more than 10 minutes" answer recorded 50 % mean in pretest ,and 46.7 % in the post test for "I can only sit in my favorite chair as long as I like" answer, then standing functional pretest recorded that the mean of "Pain prevents me from standing for more than 3 minutes" answer has the highest mean comparing other answers as 46.7 %, in posttest recorded that the mean of "I can stand as long as I want but it gives me extra pain" answer has the highest mean comparing other answers as 60 %, also sleeping question recorded that the mean of "My sleep is occasionally disturbed by pain" and" Because of pain I have less than 2 hours sleep " answer has the highest mean comparing other answers as 26.7 % in pretest and" My sleep is never disturbed by pain "53.3% in posttest , for social life therapeutic sample it recorded equal mean as 6.7 % but for different answers ,the answer is "My social life is normal and gives me no extra pain" and "Pain has no significant effect on my social life apart from limiting my more energetic interests e.g, sport", in posttest therapeutic sample it recorded highest mean as 43.3 % "My social life is normal but increases the degree of pain ".

"Pain restricts me to short necessary journeys under 30 minutes" and "Pain restricts me to short necessary journeys under 30 minutes" answers in the traveling pre-test recorded the same and highest mean comparing other answers as 16.7 %.

Finally, the total scores from 50 research samples recorded the highest mean in the pre-test for "severe Disability". However, in the mid-and post-test, two tests were "moderate Disability" and "low disability" respectively.

4.1.2.3 Descriptive Statistics of Sum and Percent Scores of OSWESTRY Test items:

Table 4.8 Descriptive and Statistical results of RM. ANOVA between pre-mid and post-tests in functional variables of ODI.LBP**.**

functional variables	Study tests	descriptives		RM-ANOVA		Pairwise comparisons	Mean Difference (I-J)	Sig
		Mean	SD					
OSWESRY Score ratio / 100	Pre test	64.60	14.829	136.360	.000	Pre-mid tests	37.600*	.000
	Mid test	27.00	11.516			Pre-post tests	44.667*	.000
	Post test	19.93	9.634			Mid-post tests	7.067*	.001

The results of the total scores from 50 indicated that the subjects of the study samples recorded the highest mean in the pre-test for "severe Disability" mean =32.3000, compared to moderate Disability results in the mid-test and low disability mean post-test 13.5, and 9.96.

Scores are categorized based on severity: 0-20 for low disability, 21-40 for moderate disability, 41-60 for severe disability, and 61-80 for painful back pain. 81-100 individuals are either bed-bound or experiencing exaggerated symptoms. (Table 4.8) displays the percentage of function scale for individuals suffering from back pain caused by disc herniation. The initial assessment revealed a functional impairment of 64%, which is classified as more than severe.

Participants' core stability exercise protocol for 4 weeks. Their OSWES was measured before the 1st session, after 2 weeks, and after 4 weeks. Normality checks were carried out on the OSWES Tests which were approximately normally distributed. A repeated measures ANOVA with the assumption of Sphericity has been met correction showed that mean OSWES differed significantly between time points [F)= 136.360, $p < 0.005$]. Post hoc tests using the Bonferroni correction revealed that the OSWES Test reduced by an average of 37.667 after 2 weeks ($p < 0.005$) and then reduced by an additional 7.067 between 2 and 4 weeks ($p = 0.001$)

4.1.3 Descriptive Statistics Summary for the four levels of PCSP sessions

Table 4.9 Descriptive Statistics Summary for the four levels of the PCS Protocol.

Variables of levels 1-4 of PCS assessment and interventional protocols	N	Mean	Std. Deviation
L1. Session1.Average/100	30	88.2026	11.26044
L1. Session2.Average/100	30	92.6536	7.20728
L1. Session3, Average/100	30	97.0523	4.88570
Level1, Session1+2+3, Average /100	30	92.6362	7.06465
Level 2Session1.Average/100	30	87.2188	9.68668
Level 2, Session 2. Average/100	30	94.6632	5.53526
Level 2, Session 3. Average from100	30	98.8403	1.81965
Level 2, sessions 1+2+3, Average100	30	93.5741	5.17112
Level 3, Session 1. Average /100	30	86.7477	7.93452
Level 3, Session 2. Average / 100	30	93.8641	5.23837
Level3, Session 3. Average/ 100	30	97.7359	2.71356
Level3.Sessions. Average 100	30	92.7826	4.72544
L4. session1 Average/100	30	92.3810	6.82632
L4. session 2 Average/100	30	98.2738	5.67031
L4. session 3 Average/100	30	98.6190	2.40355
Level 4 sessions 1+2+3 Average/100	30	96.4246	4.28315

Between sessions in level:

level 1: Mean availability begins at 88.2026 in Session 1 and rises to (97.0523) by Session 3, with standard deviations ranging from 11.26044 to 4.88570, showing considerable variability and a slight decrease in performance, most likely due to tiredness and pain.

Levels 2 and 3: Means continue to increase, beginning at (87.2188) and (86.7477) in Session 1 respectively, and increasing to (98.8403) And (97.7359) by Session 4 respectively. Standard deviations indicate minor fluctuation, indicating that individuals are growing more skilled at the practice.

Level 4: Mean repetitions are highest at this level, beginning at 92.3810 in Session 1 and increasing to 98.6190 in Session 3. Set 3 has the lowest standard deviation (2.40355), showing great participant consistency, but it increases somewhat in succeeding sets, reflecting some variability as the exercises get more difficult.

Overall, the progression throughout levels demonstrates a considerable increase in performance, with increasing mean and acceptable variability, showing that individuals are responding effectively to the progressive core stability regimen.

Between levels:

Level 1: The mean average for sessions 1, 2, and 3 is 92.6362, with a standard deviation of (7.06465). At the initial level, participant performance exhibited considerable variability. Level 2: The mean has increased slightly to 93.5741, with a reduced standard deviation of (5.17112) compared to Level 1, showing greater consistency in participant performance. Level 3: The mean is 92.7826, comparable to Level 1, but with a lower standard deviation of 4.72544, indicating less variability and higher consistency in individuals' performance. Level 4 has the highest mean (96.4246) and the lowest standard deviation (4.28315). This shows that participants' performance and consistency had improved significantly by the end of the program.

The statistics indicate a gradual improvement in the mean repetitions from Level 1 to Level 4 and a decrease in standard deviation, indicating improved performance and consistency as individuals go through the levels. This pattern of improvement indicates how the gradual core stabilization procedure improves participants' core strength and endurance.

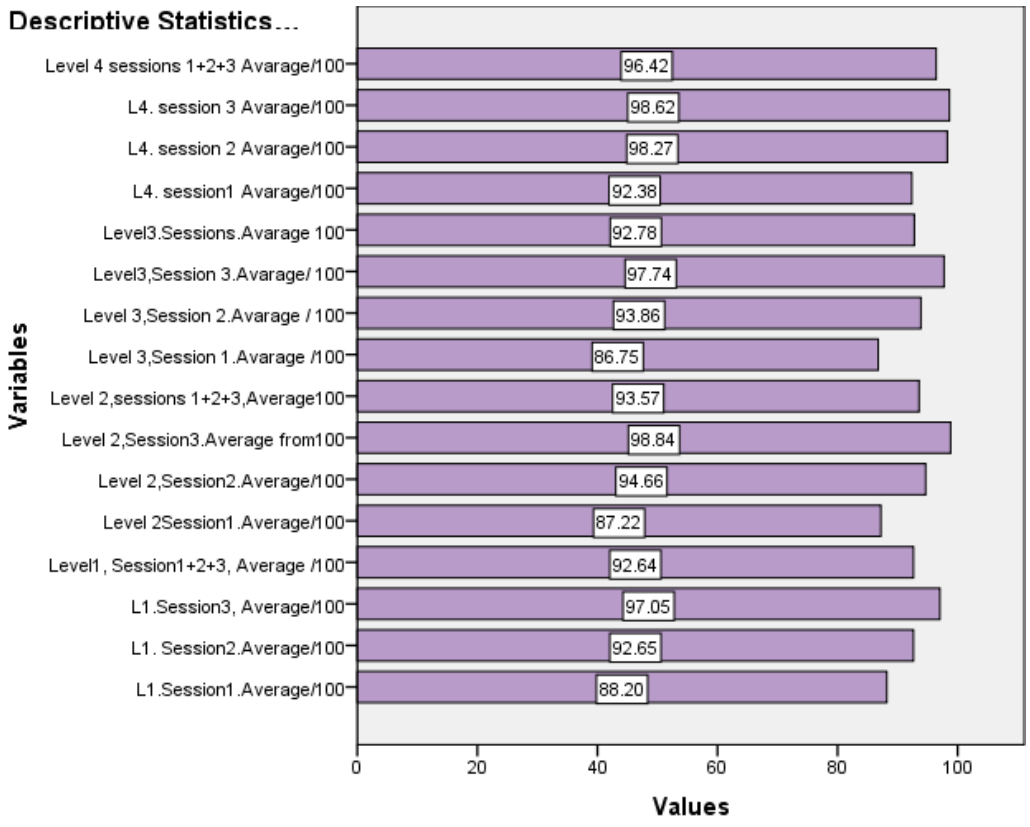


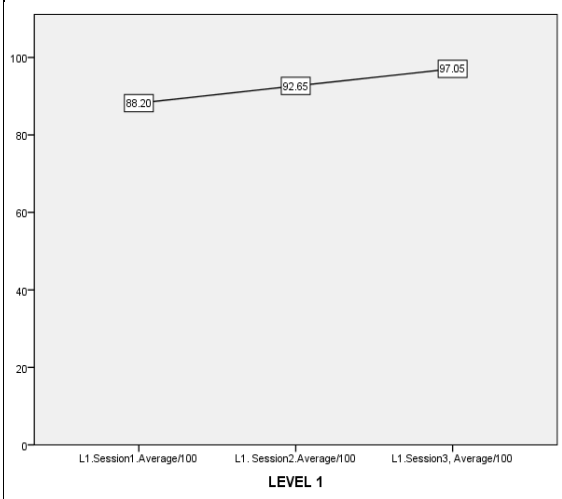
Chart 4.5 Mean Progressions Summary along the four levels of PCS Protocol

Table 4.10 Statistical results of k-related test between pre-mid and post-tests in the four levels of PCS Protocol.

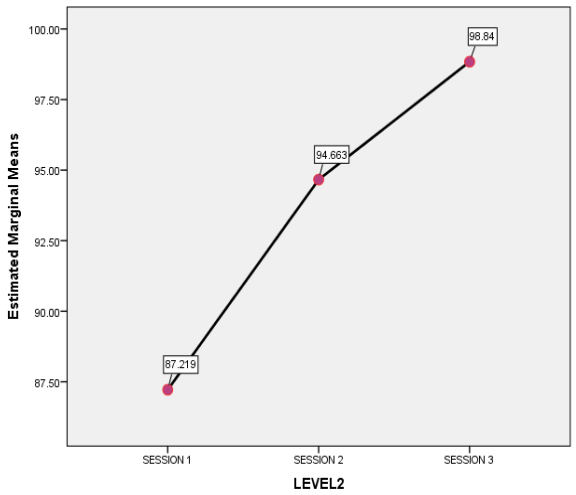
List of Dependent variables	Study tests	Mean	SD	K Related		Pairwise comparisons	Mean Difference (I-J)	Sig
LEVEL1	Session1	88.2026	11.26044	**sig**	000	S1-S2	-4.451-*	.001
	Session2	92.6536	7.20728			S1-S3	-8.850-*	.000
	Session3	97.0523	4.88570			S2-S3	-4.399-*	.000
LEVEL 2	Session1	87.2188	9.68668	**sig**	.000	S1-S2	-7.444-*	.000
	Session2	94.6632	5.53526			S1-S3	-11.622-*	.000
	Session3	98.8403	1.81965			S2-S3	-4.177-*	.000
LEVEL 3	Session1	86.7477	7.93452	**sig**	**.000**	S1-S2	-7.116-*	.000
	Session2	93.8641	5.23837			S1-S3	-10.988-*	.000
	Session3	97.7359	2.71356			S2-S3	-3.872-*	.000
LEVEL4	Session1	92.3810	6.82632	**sig**	**.000**	S1-S2	-5.893-*	.000
	Session2	98.2738	5.67031			S1-S3	-6.238-*	.000
	Session3	98.6190	2.40355			S2-S3	-.345-	.717

We accept the null hypothesis at P = 0.000 < 0.05. We find that the scores of the first, second, and third sessions in the four levels of the treatment protocol differ, as does the total percentage of the three sessions for the four levels. Post hoc tests using the Bonferroni correction revealed that the sessions in each level increased by an average of 4.451 Difference between the second session and the first at the first level (p =0.001) Based on the findings of the table above scenario applied to all sessions in the four levels, except the difference between the second and third sessions in the fourth level (p-value =0.717>0.005).

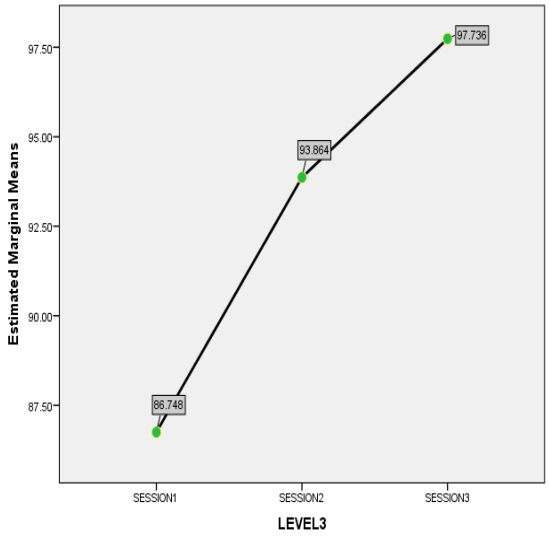
Mean progressions of study subjects along three sessions of study protocol-level 1.2.3.4



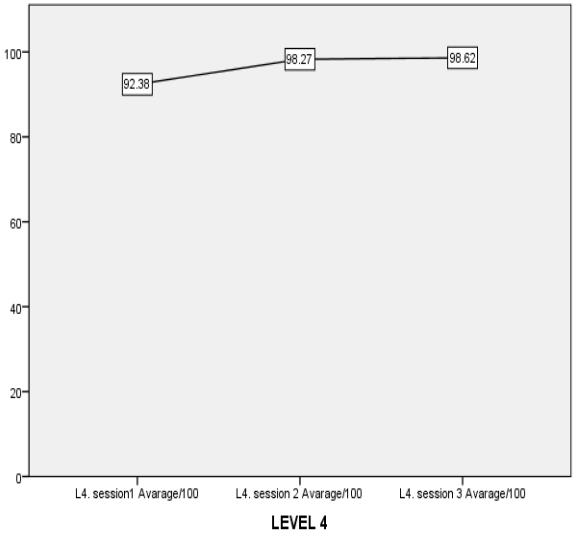
(4.6) LEVEL 1



(4.7) LEVEL2



(4.8) LEVEL 3



(4.9) LEVEL 4

4.1.3.1 Descriptive Statistics Summary for the Psychological Variables at Pre, Mid, and Post Tests.

Table 4.11 Descriptive Statistics of the Psychological variables at pre-mid-posttests.

The FABQ questionnaire		Pre-test		Mid test		Post-test	
		Mean	Std. D	Mean	Std. D	Mean	Std. D
Q1	My pain was caused by physical activity	4.37	2.456	2.67	1.863	.27	.583
Q2	Physical activity makes my pain worse	4.50	2.460	2.50	1.889	.33	1.124
Q3	physical activity might harm my back	4.47	2.446	2.50	1.717	.73	1.363
Q4	I should not do physical activities that (might) make my pain worse	3.93	2.625	1.57	1.547	.47	.730
Q5	I cannot do physical activities which (might) make my pain worse	3.37	2.646	2.73	2.180	.73	.868
Q6	My pain was caused by my work or by an accident at work	3.07	2.651	3.03	2.632	2.93	2.599
Q7	My work aggravated my pain	3.27	2.766	2.90	2.057	2.20	1.827
Q8	I have a claim for compensation for my pain	1.13	2.315	1.13	2.315	1.13	2.315
Q9	My work is too heavy for me	4.77	2.029	3.47	1.717	3.13	1.776
Q10	My work makes or would make my pain worse	3.63	2.773	2.97	2.157	2.17	1.931
Q11	My work might harm my back	3.07	2.728	2.43	2.144	.97	1.520
Q12	I should not do my normal work with my present pain	4.07	2.273	2.50	1.815	1.67	1.863
Q13	I cannot do my normal work with my present pain	2.43	2.674	1.60	1.940	.47	.973
Q14	I cannot do my normal work till my pain is treated	2.43	2.750	2.00	2.546	2.00	2.665
Q15	I do not think that I will be back to my normal work within 3 months	1.73	2.392	1.13	1.548	.13	.730
Q16	I do not think that I will ever be able to go back to that work	2.07	2.690	.60	1.276	.00	.000

The first question on the Fear Avoidance Beliefs Questionnaire (FABQ) asks individuals about whether they believe that physical activity is the source of their suffering. Notable change in participant replies is seen when this question is analyzed at three different time points: the pretest, mid test, and posttest.

With some variation in answers, participants' pretest average score of 4.37 with a SD = 2.456 indicated a moderate conviction that physical exercise affects their pain. At the midtest, the mean score dropped to 2.67, indicating a tendency toward less confidence in the causative

relationship between pain and physical activity and somewhat less variability (SD = 1.863). The posttest stage saw a final fall in the mean score to .27 with a SD= 0.583, indicating a tighter clustering of answers around this lower mean and a continuous decline in the perception that physical exercise causes pain.

The three tests ' mean scores and standard deviations gradually decreased, indicating that the suggested intervention have had a positive impact on participants' perceptions of the connection between pain and physical activity. The results suggest that there may be a beneficial effect on lowering fear-avoidance beliefs related to pain brought on by physical activity, which may improve participants' capacity to partake in physical activities without undue fear that their pain may increase.

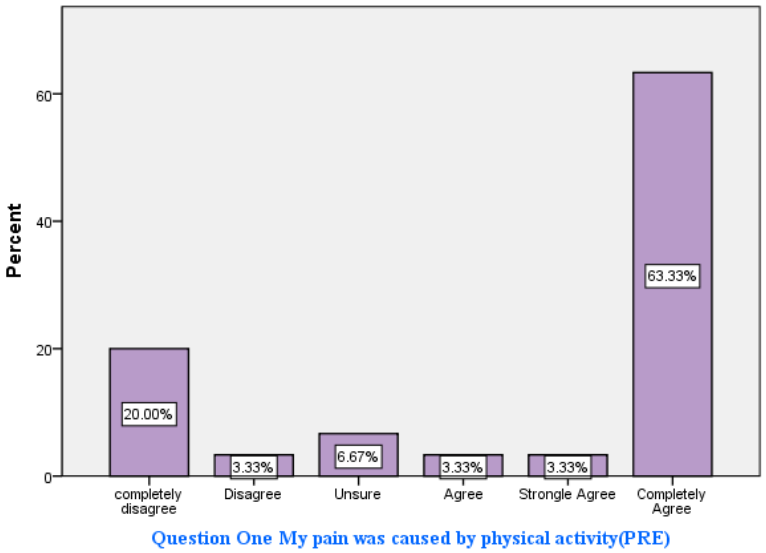
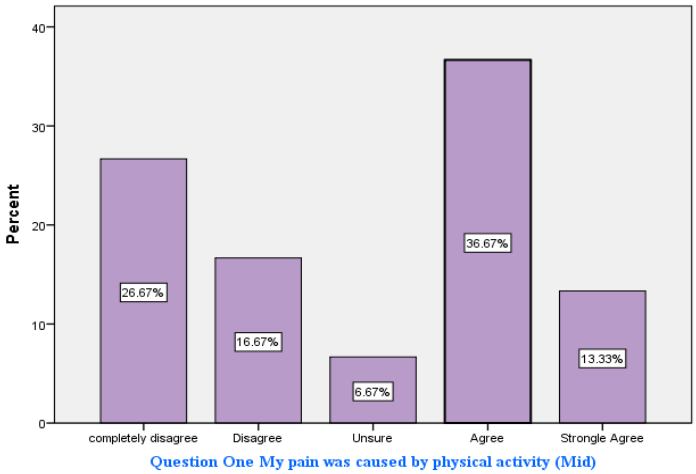


Chart 4.10 : Frequency distribution of sample subjects by their response in the FABQ



Question One (pretest).

Chart 4.11: Frequency distribution of subjects response in the FABQ Question One (Mid test).

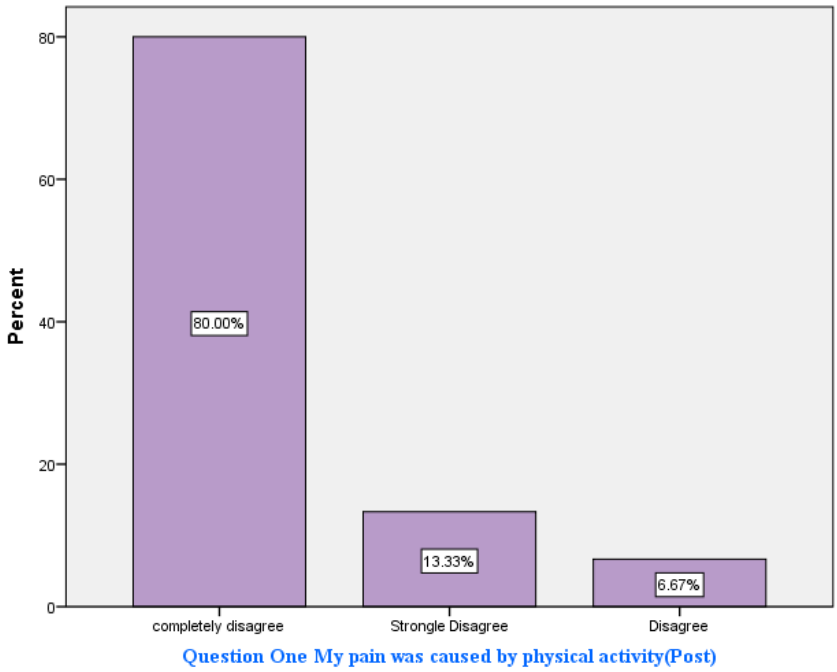


Chart 4.12: Frequency distribution of sample subjects by their response in the FABQ Question One (Post-test).

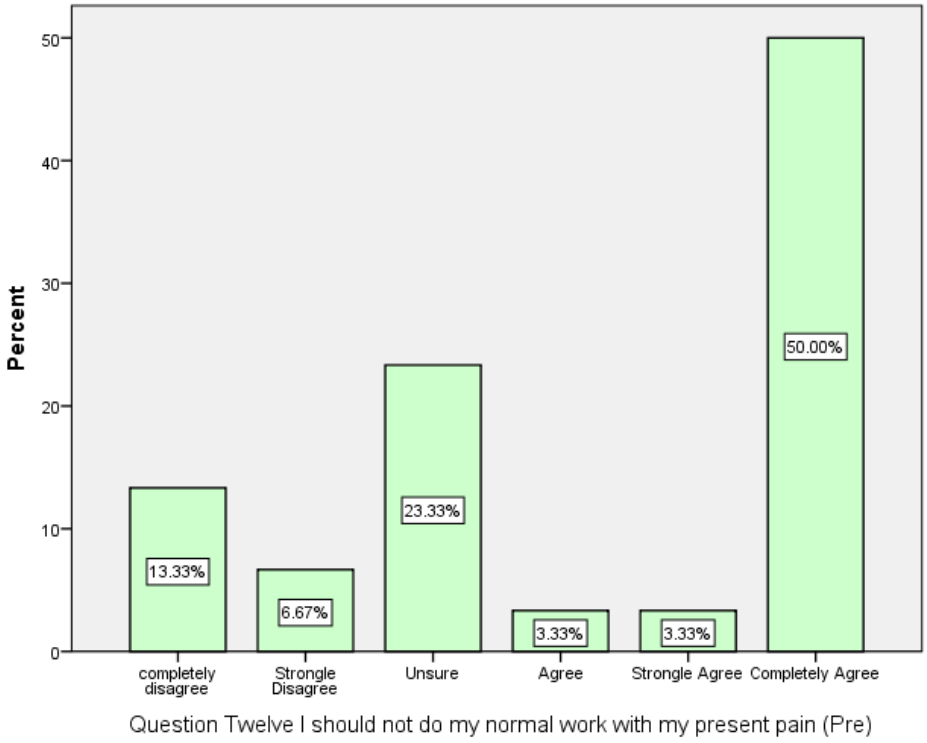


Chart 4.13: Frequency distribution of sample subjects by their response in the FABQ Question Twelve (Pretest).

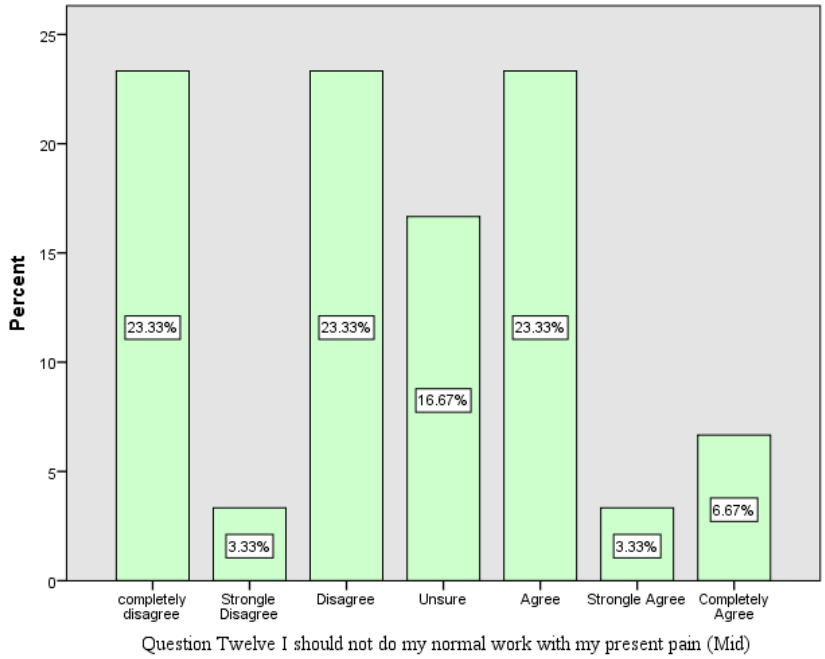


Chart 4.14: Frequency distribution of sample subjects by their response in the FABQ Question Twelve (Mid test).

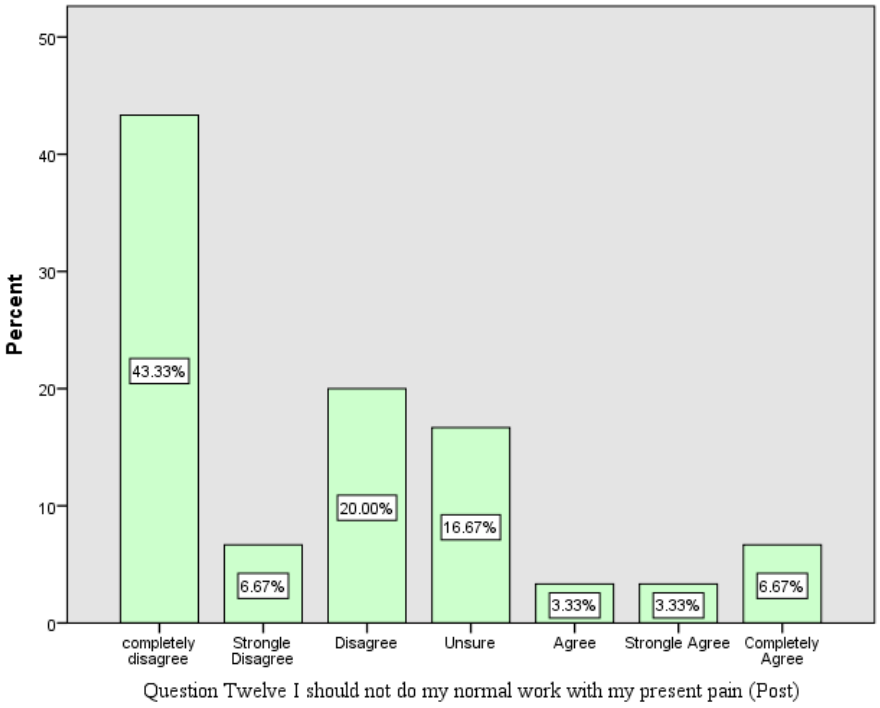


Chart 4.15 Frequency distribution of sample subjects by their response in the FABQ Question Twelve (Post-test)

Table 4.12 Statistical results of Descriptive, RM.ANOVA and pairwise comparisons between pre-, mid, and posttests of the Psychological variables.

Dependent variables	Study tests	Descriptives		RM. ANOVA		Pairwise comparisons	Mean Difference (I-J)	sig
		Mean	SD	F	Sig			
Fear Avoidance Belief Questioner	Pre	52.3000	25.19325	103.047	.000	Pre-mid tests	16.567*	.000
	Mid	35.7333	17.62430			Pre-post tests	32.967*	.000
	Post	19.3333	10.36683			Mid-post tests	16.400*	.000

Three tests were used for the statistical analysis of the Fear Avoidance Belief Questionnaire (FABQ) scores: the pretest, mid-test, and post-test. According to descriptive statistics, there has been a gradual decline in fear-avoidance beliefs. The mean FABQ scores have dropped from 52.3000 at the pretest to 35.7333 at the mid-test and 19.3333 at the posttest. The corresponding standard deviations over time showed a decrease in variability: 25.19325, 17.62430, and 10.36683, respectively.

A Repeated Measures ANOVA showed that time had a significant impact on FABQ scores ($F= 103.047$, $p <.001$), indicating the statistical significance of the changes in scores over the three time periods. Bonferroni-corrected pairwise comparisons were carried out to investigate these changes in further detail. The comparisons between the pretest and mid test (mean difference = 16.567, $p <.05$), the pretest and posttest (mean difference = 32.967, $p <.05$), and the mid test and posttest (mean difference = 16.400, $p <.05$) revealed significant differences.

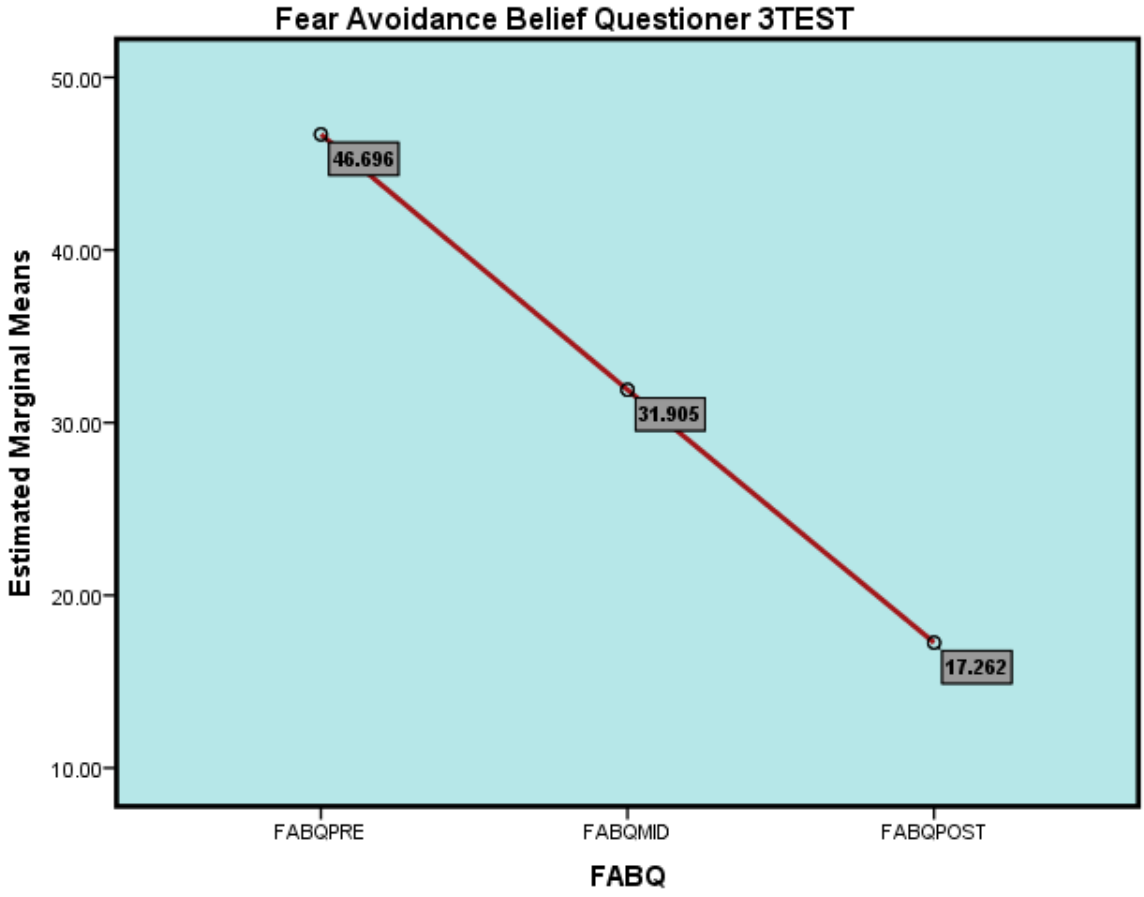


Chart (4.16) Mean progression along three test Pre, Mid, Post in FABQ.

4.1.3.2 Established correlation between anthropometric, clinical, physical, and functional variables among LBP patients at pre, mid, and posttest results

Table 4.13: Pearson correlation between anthropometric, clinical, physical, psychological, and functional variables among LBP patients at pre, mid, & posttests.

Pairs variable		**PRE-TEST**		**MID TEST**		**POST-TEST**	
		Person correlation	sig	Person correlation	sig	Person correlation	sig
WEIGHT	Hight	.468**	.009	.468**	.009	.468**	.009
	BMI	.884**	.000	.884**	.000	.884**	.000
	VAS	.172	.363	-.352-	.056	-.253-	.178
	6MWT	-.0172-	.708	-.142-	.454	-.059-	.759
	LF-ROM	.113	.552	-.033	.861	.028	.882
	LE-ROM	-.067-	.725	.137	.471	.186	.324
	RTSB-ROM -	-.161-	.396	.039	.838	.095	.616
	LTSB-ROM	-.028-	.884	.372*	.043	.315	.090
	SCST	-.220-	.242	-.125-	.509	-.185-	.328
	SART	-.007-	.970	-.098-	.607	-.194-	.303
	THYExT	.328	.077	.011	.954	.056	.770
	L1-S(1+2+3)A/100	-.054-	.779	-.054-	.779	-.054-	.779
	L2-S(1+2+3)A/100	-.283-	.130	-.283-	.130	-.283-	.130
	L3-S(1+2+3)A/100	-.055-	.773	-.055-	.773	-.055-	.773
	L4-S(1+2+3)A/100	-.224-	.234	-.224-	.234	-.224-	.234
	OSWERY	.169	.372	-.039-	.839	-.116-	.540
	FABQ A/100	.096	.614	.043	.823	.169	.372
HIGHT	BMI	.005	.981	.005	.981	.005	.981
	VAS	.320	.082	-.058-	.760	-.217-	.249
	6MWT	.132	.485	.081	.672	.283	.129
	LF-ROM	.012	.949	-.090-	.635	.087	.648
	LE-ROM	-.020-	.918	.108	.569	.144	.448
	RTSB-ROM -	-.069-	.716	-.140-	.461	-.173-	.360
	LTSB-ROM	.343	.064	.010	.960	-.090-	.636
	SCST	.059	.757	.026	.893	.085	.653
	SART	-.009-	.963	-.063-	.741	-.166-	.381
	THYExT	.217	.250	-.091-	.633	-.159-	.402
	L1-S(1+2+3)A/100	-.274-	.142	-.274-	.142	-.274-	.142
	L2-S(1+2+3)A/100	-.097-	.611	-.097-	.611	-.097-	.611
	L3-S(1+2+3)A/100	.010	.960	.010	.960	.010	.960
	L4-S(1+2+3)A/100	-.089-	.640	-.089-	.640	-.089-	.640
	OSWERY	.100	.599	-.068-	.722	-.242-	.198
	FABQ A/100	.090	.637	.133	.484	.244	.194
BMI	VAS	-.028-	.885	-.388*	.034	-.187-	.322
	6MWT	-.168-	.375	-.204-	.279	-.190-	.315
	LF-ROM	.112	.556	.020	.918	-.019-	.919
	LE-ROM	-.075-	.694	.122	.520	.145	.443
	RTSB-ROM -	-.134-	.481	.120	.526	.204	.279
	LTSB-ROM	-.206-	.274	.420*	.021	.416*	.022
	SCST	-.302-	.105	-.184-	.330	-.239-	.203
	SART	.018	.923	-.050-	.795	-.115-	.547
	THYExT	.246	.190	.69	.718	.162	.394
	L1-S(1+2+3)A/100	.087	.647	.087	.647	.087	.647
	L2-S(1+2+3)A/100	-.266-	.155	-.266-	.155	-.266-	.155
	L3-S(1+2+3)A/100	-.048-	.802	-.048-	.802	-.048-	.802
	L4-S(1+2+3)A/100	-.191-	.311	-.191-	.311	-.191-	.311
	OSWERY	.159	.400	-.001-	.997	-.001-	.997
	FABQ A/100	.058	.761	-.027-	.887	.048	.802
VAS	6MWT	-.209-	.269	-.193-	.306	-.437-*	.016
	LF-ROM	-.365-*	.047	-.361-*	.050	-.308-	.097

	LE-ROM	-.10.0-	.599	-.136-	.473	-.025-	.896
	RTSB-ROM -	.116	.542	-.062-	.746	-.176-	.352
	LTSB-ROM	.079	.679	-.236-	.209	-.289-	.121
	SCST	-.189-	.317	-.019-	.920	-.319-	.085
	SART	-.252-	.180	-.076-	.688	-.101-	.594
	THYExT	.009	.964	-.199-	.292	-.326-	.079
	L1-S(1+2+3)A/100	-.185-	.320	-.285-	.127	-.211-	.264
	L2-S(1+2+3)A/100	-.177-	.350	-.022-	.908	-.382-*	.037
	L3-S(1+2+3)A/100	.046	.807	-.362-*	.050	-.488-**	.006
	L4-S(1+2+3)A/100	-.206-	.274	-.194	.305	-.023-	.903
	OSWERY	.239	.203	-.188-	.321	.184	.331
	FABQ A/100	.109.	.566	.051	.788	-.018-	.924
6MWT	LF-ROM	.381*	.038	.526**	.003	.258	.168
	LE-ROM	.503**	.005	.156	.412	.263	.160
	RTSB-ROM -	.170	.368	.244	.194	-.192-	.309
	LTSB-ROM	.061	.749	.171	.367	-.088-	.643
	SCST	.429*	.018	.271	.147	.588**	.001
	SART	.175	.356	.103	.588	.376*	.041
	THYExT	.420*	.021	.216	.251	.291	.118
	L1-S(1+2+3)A/100	.247	.189	.413*	.023	.260	.165
	L2-S(1+2+3)A/100	.425**	.019	.496**	.005	.401*	.028
	L3-S(1+2+3)A/100	.280	.135	.476**	.008	.362*	.049
	L4-S(1+2+3)A/100	.184	.330	.282	.131	.380*	.038
	OSWERY	-.697-**	.000	.252	.180	-.060-	.754
	FABQ A/100	-.369-*	.045	-.303-	.103	-.120-	.527
LF-ROM	LE-ROM	.361	.050	.277	.138	.141	.458
	RTSB-ROM -	.121	.525	.230	.222	.136	.475
	LTSB-ROM	.035	.855	.277	.138	.078	.681
	SCST	.335	.071	.417*	.022	.202	.285
	SART	.476**	.008	.306	.100	.401*	.028
	THYExT	.423*	.020	.321	.083	.075	.693
	L1-S(1+2+3)A/100	-.325-	.080	.393*	.032	.587**	.001
	L2-S(1+2+3)A/100	.283	.130	.391*	.032	.309	.097
	L3-S(1+2+3)A/100	.379*	.039	.222	.239	.282	.131
	L4-S(1+2+3)A/100	.034	.859	.067	.724	.361*	.050
	OSWERY	.115	.544	.108	.572	-.215-	.253
	FABQ A/100	-.026-	.890	-.253-	.177	-.093-	.458
LEx-ROM	RTSB-ROM -	.163	.390	.448*	.013	-.060-	.752
	LTSB-ROM	.325	.079	.490**	.006	.187	.322
	SCST	.317	.088	.034	.859	.044	.818
	SART	.466**	.009	.327	.078	-.072-	.705
	THYExT	.279	.136	.407*	.026	-.017-	.931
	L1-S(1+2+3)A/100	.316	.089	.206	.275	-.083-	.661
	L2-S(1+2+3)A/100	.258	.169	.099	.601	-.378-*	.039
	L3-S(1+2+3)A/100	.144	.447	.335	.071	-.227-	.228
	L4-S(1+2+3)A/100	.369*	.045	.052	.785	.130	.495
	OSWERY	-.696-**	.000	-.002-	.990	-.115-	.546
	FABQ A/100	-.158-	.403	-.239-	.204	.033	.864
RTSB-ROM	LTSB-ROM	.146	.441	.823**	.000	.890**	.000
	SCST	.300	.107	.082	.668	.078	.680
	SART	.192	.310	.159	.402	.083	.663
	THYExT	-.034-	.860	.296	.112	.281	.132
	L1-S(1+2+3)A/100	-.028-	.885	.469**	.009	.386*	.035
	L2-S(1+2+3)A/100	.271	.148	.331	.074	.255	.174
	L3-S(1+2+3)A/100	.174	.357	.520**	.003	.370*	.044
	L4-S(1+2+3)A/100	-.260-	.165	-.055-	.771	.063	.743
	OSWERY	-.034-	.860	-.236-	.208	-.403-*	.027
	FABQ A/100	-.023-	.904	-.296-	.112	-.077-	.686
LTSB- ROM	SCST	.323	.081	-.054-	.778	.119	.529
	SART	.424*	.020	.112	.556	-.016-	.931
	THYExT	-.060-	.754	.186	.325	.305	.101

	L1-S(1+2+3)A/100	-.081-	.669	.255	.174	.272	.146
	L2-S(1+2+3)A/100	-.059-	.757	.095	.616	.153	.421
	L3-S(1+2+3)A/100	-.044-	.819	.345	.062	.284	.129
	L4-S(1+2+3)A/100	.421*	.021	-.156-	.411	-.008-	.966
	OSWERY	-.131-	.491	-.236-	.209	-.459-*	.011
	FABQ A/100	.091	.634	-.295-	.113	-.103-	.589
SCST	SART	.143	.449	.031	.872	.323	.082
	THYExT	.135	.478	.304	.103	.129	.496
	L1-S(1+2+3)A/100	.169	.373	.103	.589	.304	.103
	L2-S(1+2+3)A/100	.237	.207	.207	.271	.584**	.001
	L3-S(1+2+3)A/100	.182	.335	.056	.771	.408*	.025
	L4-S(1+2+3)A/100	.193	.307	.093	.624	.088	.643
	OSWERY	-.405-*	.027	.235	.211	-.189-	.317
	FABQ A/100	.098	.607	.108	.569	.176	.351
SART	THYExT	.398*.	.030	.596**	.001	.373	.042
	L1-S(1+2+3)A/100	.309	.097	.372*	.043	.539	.002
	L2-S(1+2+3)A/100	.307	.099	.382*	.037	.359	.051
	L3-S(1+2+3)A/100	.241	.200	.250	.183	.359	.051
	L4-S(1+2+3)A/100	.377*	.040	.442*	.015	.584	.001
	OSWERY	-.426-*	.019	.045	.815	-.015-	.936
	FABQ A/100	-.200-	.290	-.079-	.680	-.226-	.230
THYExT	L1-S(1+2+3)A/100	.261	.163	.393*	.032	.333	.072
	L2-S(1+2+3)A/100	.291	.118	.394*	.031	.378	.039
	L3-S(1+2+3)A/100	.204	.280	.295	.113	.379	.039
	L4-S(1+2+3)A/100	-.021-	.911	.148	.435	.081	.669
	OSWERY	-.386-*	.035	.248	.186	-.103-	.589
	FABQ A/100	-.318-	.087	-.302-	.105	-.219-	.244
L1-S(1+2+3)	L2-S(1+2+3)A/100	.599**	.000	.599**	.000	.599	.000
	L3-S(1+2+3)A/100	.653**	.000	.653**	.000	.653	.000
A/100	L4-S(1+2+3)A/100	.515**	.004	.515**	.004	.515	.004
	OSWERY	-.354-	.055	.095	.616	.998	.000
	FABQ A/100	-.246-	.189	-.274-	.143	-.168-	.376
L2-S(1+2+3)	L3-S(1+2+3)A/100	.628**	.000	.628**	.000	.628	.000
	L4-S(1+2+3)A/100	.208	.269	.208	.269	.208	.269
A/100	OSWERY	-.325-	.080	.175	.356	-.018-	.924
	FABQ A/100	-.183-	.333	-.172-	.365	-.045-	.812
L3-S(1+2+3)	L4-S(1+2+3)A/100	.206	.275	.206	.275	.206	.275
	OSWERY	-.175-	.356	.159	.400	-.038-	.844
A/100	FABQ A/100	-.259-	.167	-.277-	.138	-.192-	.309
L4-S(1+2+3)	OSWERY	-.273-	.145	.196	.300	.018	.927
	FABQ A/100	-.168-	.376	-.130-	.493	-.110-	.562
OSWES	FABQ A/100	.510**	.004	-.067-	727	.047	.804

The purpose of this study is to determine the connections between clinical, anthropometric, physical, and functional factors in patients with low back pain (LBP) before, during, and after testing. Understanding these relationships throughout treatment stages can help to predict patient recovery and advise therapy tactics.

The correlation analysis across the pre-, mid-, and post-test stages revealed strong interrelationships between clinical, anthropometric, physical, and functional characteristics in LBP patients. As treatment advances, increases in flexibility, strength, and mobility are closely linked to lower pain intensity and impairment, as well as higher quality of life. These findings emphasize the dynamic nature of patient recovery and the significance of

continuous monitoring and adjustment of therapy measures to improve outcomes for LBP patients.

The correlation analysis conducted in this study delves into the relationships among various variables, as depicted in the provided table. Each variable was examined independently, with its correlation to other variables measured using the significance of Pearson correlation coefficients. The left part of the table displays the variables between which the correlation was examined, and the right part of the table displays the results of the correlation between the first and second variables. The results were divided into three parts, the pre-test, mid test, and the post-test.

As shown in the table above, there is a good positive significant correlation between the variables shaded in grey, while the negative numbers represent an inverse correlation between the variables and there was no significant correlation in the remaining results.

4.2 Results Discussion

4.2.1 Discussion of Demographic data, medical history, and Anthropometrics, as Nonmanipulative independent Variables in the study of the Therapeutic Effect of Progressive Core Stability Exercises on DP.LBP.

The dataset included demographic information such as employment type, marital status, parity (number of births), daily working hours, smoking status, and past medical history. These demographic characteristics were recorded for a study sample of thirty women. Below is a thorough discussion of these variables:

In statistics, discussing marital status and its connection to reported low back pain cases may provide important insights into potential correlations or patterns in the data. In this example, the results show a considerable difference in the prevalence of low back pain across marital statuses: married people reported the most (80%), followed by single people (13.3%) and divorced people (6.7%).

Such data show that marital status may influence the prevalence of low back pain, however, this fails to demonstrate causality, only association. Married people may experience higher levels of stress or have other lifestyle characteristics that lead to a higher prevalence of low back pain than single or divorced people. However, further study is needed to identify any causal linkages or underlying processes.

From the perspective of statistical analysis, these statistics demonstrate the necessity of taking into account demographic characteristics such as marital status when studying health outcomes like low back pain. They emphasize the possible effect of marital status on health issues and the necessity for specialized therapies or additional research into the individual components leading to these gaps. In statistical terms, the distribution of employment of different types among participants and their daily working hours might give useful information about potential connections with reported incidents of DP-LBP.

In terms of employment type, over 63.3% of participants were classified as housewives, with the remaining 36.7% working in occupations such as teaching, cleaning, and other nonspecific tasks. This distribution implies a majority of people who may face varied physical demands and ergonomic circumstances in their everyday activities, which might impact the prevalence of low back pain.

Daily working hours: A review of the research data revealed that 60% of the total patients evaluated reported working between 6 and 8 hours a day. This data emphasizes the importance of this specific range of daily work hours within the research population, emphasizing its potential relevance in understanding patterns and relationships related to health outcomes, including low back pain.

This research emphasizes the possible influence of extended work hours on the prevalence of low back pain by showing a range in which a significant number of cases are reported. These statistical findings indicate that both the type of the job and the length of daily work hours may play important roles in the development or worsening of low back pain. More research into particular occupational variables, ergonomic circumstances, and individual characteristics may give greater insights into the association between work-related factors and the incidence of low back pain among divorced, these are overviews of a few research papers that look at the connection between working hours and low back pain(Lee et al., 2018),(Nihei et al., 2022).

Statistical analysis showed a significant scattering in smoking behaviors among participants, with smokers accounting for 66.7% of the total and nonsmokers accounting for 33.3%. This gap indicates a high smoking prevalence within the research population, which is important when assessing possible links with health outcomes, This study (Scott et al., 1999) looked at the relationship between smoking, nicotine dependency, and back discomfort in people. It was discovered that both current and previous smokers had a greater prevalence of back pain, with a larger association among people with higher nicotine dependency.

Statistically, these data show that a significant percentage of the study population smokes. Such findings are critical for further investigating the possible influence of smoking on a variety of health issues, including its link to variables such as Discopathy and low back pain. Understanding these distributions aids in developing focused treatments and health management strategies that address particular risk factors linked with smoking in terms of health outcomes.

In statistical analysis, the distribution of the number of births among participants, as given in Table (4.3), yields the following percentages: Participants reporting (zero, one, or six) births account for 13.3% of the total, The group with 7 births has the highest prevalence, accounting for 16.7%. Categories reporting ten or eight births each account for 6.7%. The group reporting one birth has the lowest occurrence, at 3.3%. These data demonstrate the

diverse distribution of parity in the research group. The data gives information about the demographic profile of individuals depending on the number of births they have had. They provide as a framework for future research on how parity may link with health outcomes, such as low back pain. Such assessments can help to guide healthcare interventions and policies that address health concerns related to varied degrees of number of births.

The anthropometric measurements and comprehensive medical history data of the participants were included in the dataset collected for this study, which provided information about their health profiles. The individuals' prior medical histories were analyzed, and the results showed a varied distribution. Notably, 13.3% of respondents said they felt neck pain, while 26.7% of participants had no significant prior medical issues ("Free" group). Asthma, breast cancer, chronic obstructive pulmonary disease (CDH), cholecystectomy, diabetes, knee pain, middle ear infection, and additional cesarean sections were among the other medical conditions that were noted in varying percentages, ranging from 3.3 % to 10%.

Anthropometric measures helped to better describe the individuals' characteristics. The cohort's mean age was 44.33 years (SD = 8.860). Height averaged 159.87 cm (SD = 5.211), with weight averaging 74.17 kg (SD = 10.436). The average body mass index (BMI), a key indication of health, was 29.0078 (SD =3.58033), Body mass index (BMI) is one of the many variables that might impact the common ailment known as low back pain (LBP). Based on the relationship between an individual's weight and height, the BMI assigns grades to normal weight, overweight, and obesity. Of the 30 people in the sample, 56.7% were overweight, 13.3% were normal weight, and 30% were obese.

This distribution shows a strong correlation between the prevalence of LBP and greater BMI. Research suggests that obesity and being overweight increase the incidence of low back pain (LBP) by putting more mechanical strain on the spine and associated tissues. Chronic low back pain (LBP) is more likely to occur with every unit rise in BMI, especially in obese people. This is in line with results from other cohort studies that show a correlation between growing BMI and an increase in back pain symptoms(Shiri et al., 2010)(Zhang et al., 2016). The incidence of low back pain (LBP) can be considerably decreased by addressing this condition through public health programs that emphasize weight control, ergonomic treatments, and educational campaigns. This would enhance overall quality of life and save healthcare expenses.

These findings give a more detailed view of the research population's health demographics and physical qualities, emphasizing the prevalence of certain medical histories and the usual anthropometric characteristics noted among the participants.

4.2.2 Discussion of Clinical, Physical, Psychological, and Functional Impacts of DP-LBP, and it's Response as Dependent Variables to the Therapeutic Effect of Progressive Core Stability Exercises.

The study stands out for its innovative use of a therapeutic exercise instruction program based on WhatsApp to address the functional, psychological, clinical, and physical aspects of low back pain (LBP) brought on by degenerative disc degeneration. This creative strategy takes advantage of WhatsApp's popular user base to provide constant, easily available support, encouraging patient participation and commitment to treatment activities. The design of the software is to improve overall patient outcomes by combining interactive support with instructional information to effectively treat symptoms of low back pain.
This technique takes advantage of mobile technology's accessibility and convenience to give treatment protocols, which is especially beneficial for groups that would find it difficult to access traditional in-person physiotherapy.

The statistical findings show that participant performance significantly improved over the Level 1 sessions. The mean total scores gradually rose from Session 1 to Session 3, demonstrating participants' ongoing ability development. The average score rose from 449.83 in Session 1 to 494.97 in Session 3, indicating a significant improvement in overall performance and skill development. According to Table (4.13), an observed general trend of increased mean from Static Level 1 to Static Level 3 across all sets indicates improved exercise performance and presumably strength and endurance.

Mean and SD in level 1= (92.6362, 7.06465), mean and SD in Level 4 = (96.4246, 4.28315)
The statistical analysis of mean and standard deviations amongst levels demonstrates a strong pattern of increase in participants' core strength and endurance. Specifically, the statistics indicate a progressive rise in mean from Level 1 to 4. This increasing trend suggests that as people go through the stages, their core strength and endurance increase gradually.
The study's objectives were varied, with a focus on numerous critical components of DP-LBP therapy in female patients. First, the study attempted to analyze the clinical, physical, psychological, and functional effects of DP-LBP on female patients, to gain a thorough

picture of how this illness impacts their everyday life. Second, the study sought to design a proposed home-based exercise rehabilitation program for individuals with LBP, with an emphasis on core stability exercises. This technique was intended to be practical and successful enough for patients to execute on their own. Third, the study investigated the use of free communication technologies to provide the suggested exercise program to the target group of DP-LBP patients while maintaining accessibility and convenience. Finally, the study aimed to assess the effectiveness of the proposed program in improving clinical, physical, and functional outcomes for DP-LBP patients, providing useful insights into the management and treatment of this common ailment.

Clinically, strategic planning and administration of core stability exercises are critical for effectively lowering symptoms of DP-LBP, which is defined by pain aggravation caused by nerve compression during mechanical stress. This happens throughout a variety of activities, including body posture, changes in direction, range of motion (ROM), resistance, and variations in the pace of body segment motions. These pain sensations usually appear during functional tasks including (ADLs), employment, and sports. Neuropathy pain caused by Discopathy disrupts physical features of bodily movement, resulting in considerable losses in joint mobility, stability, postural alignment, muscular strength, endurance, and power.

The results shown in Table (4.11) have important therapeutic ramifications and point to a very successful intervention for enhancing patients' physical function and pain. The significant decrease in the VAS of Pain from a mean of 8.85 pre-tests to 3.03 post-tests suggests a significant reduction in pain, which is essential for improving patients' quality of life and functional ability. The mean distance in the 6-Minute Walk Test nearly doubled from 223.23 meters to 436.87, indicating a significant improvement in the patient's physical endurance and general mobility. More freedom and improved everyday functioning are probably benefits of this development.

Pain Management and Physical Enhancements as a result of Physical performance tests like the 6-Minute Walk Test and lumbar range of motion show significant improvements in correlation with the significant decline in the Visual Analog Scale of Pain. Clinically speaking, this implies that patients' physical function and mobility significantly improve as their pain decreases.

Additionally, there appears to have been a notable improvement in spinal strength and flexibility based on the improvements in Lt, Rt Side bending ROM, LF, and LEx. Increases in lumber flexion from 37.23 to 72.60 degrees and extension from 9.03 to 18.17 degrees show that patients' lumbar stiffness has decreased and their mobility has increased. The lateral flexibility that is required for carrying out everyday activities and lowering the risk of injury is demonstrated by the improvements in the RT and LT side bending range of motion (ROM), which increased from about 16 degrees to over 35.5 degrees.

The finding that the intervention successfully strengthened the core muscles and increased trunk stability is further supported by the significant rise in the trunk hyperextension test, from 11.90 to20.90 in the mid-test to 31.40 degrees. Clinically, these benefits are noteworthy because they imply that the intervention improves overall physical performance, spinal mobility, and functional ability in addition to reducing pain. This extensive improvement in both clinical and physical parameters suggests that patients with pain and mobility-impairing illnesses may benefit greatly from the intervention, which might eventually result in better health outcomes and enhanced functional performance. This research((USWR), 2014) verifies that treatment plans centered around core stabilization exercises increase patients' spine's range of motion when they suffer from lower back discomfort.

Table (4.10) The findings show a substantial variation in VAS scale pain scores between the pre-, mid-, and post-tests. This finding is supported by the Oswestry Disability Index results in Table (4.13), which show a significant decrease in Discopathy pain intensity during a variety of activities such as rest, sitting, standing, walking, lifting, traveling, sleeping, sexual activity, and other personal care and social activities. The significant improvement in pain intensity is related to the favorable effects of core stability exercises, as well as the gradual technical development and loading of these exercises throughout the static and dynamic levels of the suggested protocol. Several studies have previously shown that core stability exercises can reduce the degree of pain in people with low back pain caused by ruptured discs(M. Shamsi et al., 2016).

All specified PCSEs were performed within pain-free criteria for resistance, range of motion, and speed of movement. This meticulous technique allowed for cumulative gains throughout subsequent sets and at various levels of the study procedure. Previous studies have shown that tele-physiotherapy exercises can successfully manage pain, boost physical function, and

improve quality of life in persons with physical impairments, making it a viable alternative to standard therapies.

Physically, the diagnosed significant improvement in lumbar ROM in table (4.113), was significantly supported by the diagnosed significant improvement in static and dynamic muscle endurance in tables (4.10) and (4.13), as well as in charts (4.6-4.9), which characterize the positive impact at levels of core stability exercises, sets, sessions, and levels. These improvements are also attributed to the positive effect of the selected core stability exercises and the technical progression and comfortable loading of those exercises along the static and dynamic levels of the suggested protocol.

The fast improvement in physical parameters of health among low back pain patients is mostly due to the positive impact of PCSEs in the management of the negative effect of LBP on the adverse or inhibitory neural action while performing physical activities, consequently, patients are more able to stimulate and to recruit stronger, longer, and repetitive muscle actions without experiencing the previous levels of mechanical pain. The late improvement in joint mobility and strength is expected to be a long-term adaptation with the selected PCSEs, and the progressive loading of those exercises during the four levels of the study protocol. As previous studies have shown the agreement between experts and smartphone accelerometer data to determine the appropriate training intensity level for core stability exercises. The results show a high level of agreement, with similar acceleration thresholds for bridging exercises and bird-dog exercises. This information can help in individualized training and dose-response analysis in core stability programs

Table (4.12) The Saharman Core Stability Test findings show significant gains in core stability across participants at the pre-test, mid-test, and post-test assessments. The percentage of level 4 is the highest level improved considerably from the pre-test (3.3%) to the post-test (86.7%), showing a consistent and considerable improvement in core stability throughout the intervention.

Dynamic workouts are essential for improving flexibility and functional strength, whilst static exercises are ideal for increasing endurance and muscular stability. Research suggests that a combined strategy to managing DPLBP, addressing both stability and mobility demands, is most beneficial.

Table (4.19) shows Pearson correlation coefficients and significance levels for several clinical psychological and functional characteristics in patients with low back pain (LBP) at the pre-test mid-test and post-test evaluations. The variables include the Visual Analog Scale (VAS) for pain, FABQ psychological measurement, clinical measurements like sit and reach, SAHARMAN core stability test anthropometric measurements (height, weight, and BMI), trunk range of motion (ROM) in various directions, and the Oswestry Disability Index. In previous research, the link between the efficacy of a particular exercise and the overall success of the treatment program throughout the treatment period has not been investigated.

This is what sets the suggested program apart: it concentrates on the quantitative influence of a specific activity on the whole treatment routine. The suggested program is unique in that it investigates the efficacy of each exercise and its cumulative effects on the general effectiveness of the treatment program for individuals with lower back pain. It takes into account a wide variety of characteristics, involving physical, psychological, functional, and therapeutic elements, to completely analyze how each exercise affect the overall therapy process.

Significant pre-test correlations: The substantial negative connection between VAS and trunk flexion ROM ($r = -.365^{-*}$, $p = 0.047$) suggests that more pain is linked with decreased trunk flexion. Clinically, increasing trunk flexion may help relieve pain in LBP patients. Physical therapy and exercises that improve trunk flexion might be effective.

The negative connection between ODI and functional levels (Level 1 and Level 2 sessions) indicates that lower disability scores are linked with improved functional performance. Clinicians might increase functional performance in early sessions to lower impairment levels.

Non-significant post-test correlations: Most post-test correlations are not significant, showing that the variables' connections have changed as a result of the intervention. This might be attributed to the intervention's ability to reduce pain or modify the patient's physical and psychological state.

The post-test showed a significant negative association between VAS and Level 3 session average ($r = -0.488$, $p = 0.006$), suggesting that increasing pain reduction is related to

improved functional performance in these sessions. This emphasizes the need to focus on functional exercises in pain management.

Functionally, the recommended home program of core stability-based exercises focuses on selecting and integrating particular physical approaches for pain management, physical improvement, and ergonomic rehabilitation for patients with DP-LBP. The study's evaluation and intervention procedures focused on a variety of therapeutic measures, including pain management, range of motion (ROM), muscular endurance, cardiorespiratory endurance, and functional activity. The diagnosed functional improvement in the Oswestry Disability Index (ODI) for LBP is a direct result of the core stability exercises (CSEs) utilized in the suggested study protocol. As shown by the correlation data Table (4.25), this functional improvement is the indirect outcome of CSE exercises' good influence on clinical and physical indicators of lumbar spine health in LBP patients.

According to research on the relationship between static and dynamic exercises for managing Dynamic Progressive Low Back Pain (DPLBP), while static exercises like planks and wall sits improve muscle endurance and pain relief by stabilizing the core muscles, they do not improve flexibility or range of motion. Dynamic exercises, such as leg lifts and bridges, promote flexibility and functional strength by working numerous muscle groups and simulating daily activities. According to studies, a combination approach that includes both static and dynamic exercises provides the most substantial long-term advantages in terms of pain reduction and functional improvement, resulting in a successful DPLBP management plan.

All indications indicate that pain (VAS) and disability (ODI) are closely related to functional performance. Interventions that improve functional capacities can significantly reduce pain and impairment. The lack of significant associations with anthropometric measurements (height, weight, BMI) shows that these parameters are less relevant in determining pain and disability in LBP patients than functional and range of motion tests. In earlier research, the association between pain and impairment in Low Back Pain (LBP) has been thoroughly documented. According to research, there is frequently a bidirectional link between pain severity and impairment: higher pain can result in more disability, and the opposite is true(Dagenais et al., 2008).

Clinically, these changes indicate that the intervention was highly successful at improving physical performance, endurance, and exercise competence. The decrease in variability over time suggests that individuals not only improved but also grew more regular in their performance. These findings provide hope for comparable therapies aiming at enhancing physical abilities and overall functional ability and performance in patients who are referred to physiotherapy to complain of DP-LBP.

Suggested Protocol Benefits to Function and Psychology Improved functional ability in day-to-day living is probably correlated with improved performance on physical examinations. For example, patients can walk farther in the 6-Minute Walk Test and have better lumbar flexibility, which makes it easier and less painful for them to complete daily duties. The psychological advantages of this functional independence include enhanced self-esteem, less stress, and general well-being. Resulting in a holistic improvement in overall gains in clinical, functional, and physical indicators points to a comprehensive improvement in patient health. The intervention leads to full therapeutic successes by improving functional performance and psychological well-being in addition to relieving the physical symptoms of low back pain.

These results highlight the value of comprehensive treatment plans that take into account the functional, psychological, and physical components of low back pain. When physical capacity-building activities are paired with effective pain treatment, there can be substantial functional and psychological advantages that enhance patients' outcomes and achievement in ADL.

Several major findings emerge from research on the relationship between static and dynamic workouts in the management of low back pain (LBP) in obese female patients aged 25-60 with diverse birth histories and job backgrounds. Static activities, including as planks and wall sits, have been demonstrated to improve core stability and muscular endurance, which is especially useful for lowering LBP in obese persons. These exercises aid in maintaining appropriate posture and reducing stress on the lower back, which is frequently aggravated by extra body weight. Furthermore, static workouts are practical for women with limited time or mobility, making them an ideal choice for those with hectic work schedules or numerous childbirths, which might impair their physical capacities and time availability.

Dynamic activities, such as leg lifts and bridges, are important for developing elasticity and functional strength, both of which are required for efficient LBP management. These exercises work many muscle groups and imitate daily activities, improving general mobility and reducing stiffness. Dynamic workouts can be especially useful for women who have sedentary professions or have had numerous babies, since they treat the resulting physical deconditioning and muscular imbalances. The combination method of including both static and dynamic workouts is advised for attaining the best results in pain reduction and functional enhancement since it targets both muscular endurance and flexibility requirements. This comprehensive method is critical for addressing LBP in the context of overweight and obesity, childbearing history, and various employment responsibilities in female patients aged

Strong associations have been found, according to the data, between lower pain levels, higher physical performance, increased functional ability, and improved psychological well-being. This integrated improvement underlines the necessity for comprehensive treatment plans that take into account a variety of patient health factors and shows how well the intervention worked to manage low back pain.

The study indicated that the WhatsApp-based exercise providing instruction and monitoring program adequately addressed deficiencies highlighted in earlier exercise education research. This protocol gave patients easy access to the prescribed core stability exercises at each stage of the program. Furthermore, it enabled patients to get both direct and indirect feedback from their therapists regarding the manner and dosage of exercises, as well as the direct and indirect impacts of such methods. The WhatsApp platform's ease and accessibility ensured that patients could successfully and consistently do the core stability exercises, enhancing overall adherence to the training plan and improving results. This unique technique has enormous potential for enhancing exercise education and patient involvement, ultimately leading to better management and reduction of low back pain.

The study found that regular contact, engagement, and feedback between patients and therapists greatly improve patient results in core stability exercise treatment. Patients displayed a greater grasp of the significance and advantages of core stability exercises by communicating consistently with their therapists. Furthermore, continued assistance and

feedback from therapists improved patients' adherence to and dedication to regular exercise regimens, whether at home, the workplace, or other work locations. This telecommunication-based approach to treatment provides important insights for community health promotion and patient education.

This strategy reduces the prevalence of low back pain (LBP) among female workers and housewives by encouraging higher participation in exercise programs. Furthermore, the findings encourage the integration of telecommunication procedures into broader health promotion activities, making effective therapy more accessible to a wider community. Implementing telecommunications can save healthcare expenses by eliminating the need for frequent in-person visits while maintaining high levels of patient care and involvement. Finally, the study highlights the efficacy of incorporating telecommunication, interaction, and feedback into core stability exercise treatment.

This strategy not only improves patient adherence and awareness but also offers an adaptable and cost-effective alternative for community health promotion. Telecommunication-based treatment has the potential to significantly improve public health outcomes by lowering the incidence of LBP among female workers and housewives.
Comparative Analysis: Both tele-physiotherapy and smartphone apps effectively reduce pain and improve function in LBP patients and allow patients to engage directly with physiotherapists, which is excellent for real-time feedback and individualized modifications. Certainly! The study (Machado et al., 2016) found that using a smartphone app to provide home exercise regimens, particularly core stability exercises, significantly improved participant adherence. The findings demonstrated that the app's ease and user-friendly layout contributed to higher adherence rates when compared to older techniques. Remote monitoring capabilities provide continual engagement and individualized feedback, promoting long-term adherence to the suggested workout plan. This demonstrates the efficacy of smartphone applications in encouraging regular engagement and increasing results in home-based exercise regimens, particularly in terms of core stability and overall treatment compliance.

Smartphone applications provide convenience, ongoing assistance, and the opportunity to track progress independently on the other hand Accessibility and costs: Tele-physiotherapy

improves access to care for those in distant or underserved locations while decreasing the need for travel. Smartphone applications are often inexpensive or free, making them a viable alternative for many patients. Finally Patient Engagement: Tele-physiotherapy can help to build a strong therapeutic connection through regular virtual exchanges. Apps improve patient engagement by offering interactive information, reminders, and progress monitoring capabilities.

Thus, the study objectives for the tele-physiotherapeutic care of low back pain (LBP) have been met, and the study hypotheses have been validated.

Chapter five:

Conclusions and Recommendations

5.1 Conclusions

5.2 Recommendations

5.2.1 Technical recommendations for physiotherapists

5.2.2 Applied Research recommendations

Chapter Five

Conclusions and Recommendations

5.1 Conclusions

1. Low back pain is characterized as mechanical pain, worsened by physical loading during static and dynamic positions, directional changes, range of motion, resistance, holding, speed, and repetition in lumbar spine movements.
2. Progressive, pain-free core stability exercises (PCSEs) are effective in managing the aggravating factors of mechanical low back pain.
3. PCSEs improve muscle endurance, strength, lumbar range of motion, and cardiorespiratory endurance during locomotion in Discopathy low back pain patients.
4. Quick improvement in physical abilities and physical functioning among low back pain patients is likely due to the therapeutic control of adverse neural actions associated with mechanical pain.
5. PCSEs are crucial for the direct management of mechanical pain in DP-LBP patients and long-term core muscle conditioning.
6. Tele-physiotherapy through smartphone applications is a promising solution for managing LBP and providing effective, accessible, and patient-centered therapy.
7. There is a significant relationship between Clinical, physical, psychological, and functional aspects among patients with Discopathy low back pain, and this relationship improves with the effect of PCSEs.

5.2 Recommendations

5.2.1 Technical recommendations for physiotherapists

1. Physiotherapists should view low back pain (LBP) as mechanical pain, noting how physical activity affects the patient.
2. Thorough assessment and design of core stability exercises are essential for managing mechanical low back pain, with a focus on progression.
3. Core stability exercises must target all relevant muscles across the lumbar spine's three axes: flexors, extensors, lateral bending, and rotators.
4. Ensure the core stability protocol accounts for varying degrees of obesity by customizing exercises that minimize spinal loading while enhancing muscular support, thereby reducing the risk of exacerbating low back pain."
5. Preparation for core stability exercises (CSE) should include diaphragmatic breathing, relaxation techniques, dynamic warm-ups, lumbar stretching, and end with a cool down with gentle movements and variable patterns of gait training.
6. Static core stability exercises should be introduced before dynamic ones in any core stability program.
7. static and dynamic core stability exercises must be performed within a pain-free range, ensuring that mechanical pain does not exceed mild discomfort.
8. Progressive, pain-free core stability exercises should be used to address the aggravating factors of mechanical LBP.
9. PCSEs should focus on managing mechanical pain and long-term conditioning through core muscle training.
10. PCSEs could be used to enhance physical functioning for LBP patients.
11. Progression in core stability training should consider starting position difficulty, resistance levels, static hold times, and repetitions in dynamic exercises.
12. Telecommunication technologies like WhatsApp can effectively deliver core stability protocols for LBP management

5.2.2 Applied Research recommendations

1. Investigate the impact of body weight and BMI on DP-LBP: Conduct prospective research to investigate how weight reduction therapies (such as nutrition, exercise, and behavioral therapy) impact the course and symptoms of discopathy in obese people.

2. Develop and evaluate multidisciplinary treatment protocols: Create and test multimodal treatment regimens that integrate obesity management with specific treatments for Discopathy, such as physical therapy, chiropractic care, and pain management. Research should focus on the efficacy, cost-effectiveness, and patient adherence to these integrated treatments, to provide complete care that tackles obesity and Discopathy at the same time.
3. Evaluate the effect of smoking and smoking cessation in reducing low back pain: Conduct randomized controlled studies to determine the efficacy of smoking cessation programs in lowering the frequency and severity of low back pain.
4. Conduct predictive research with regression analysis to discover critical variables influencing the start, development, and other possible low back pain (LBP) therapeutic interventions.

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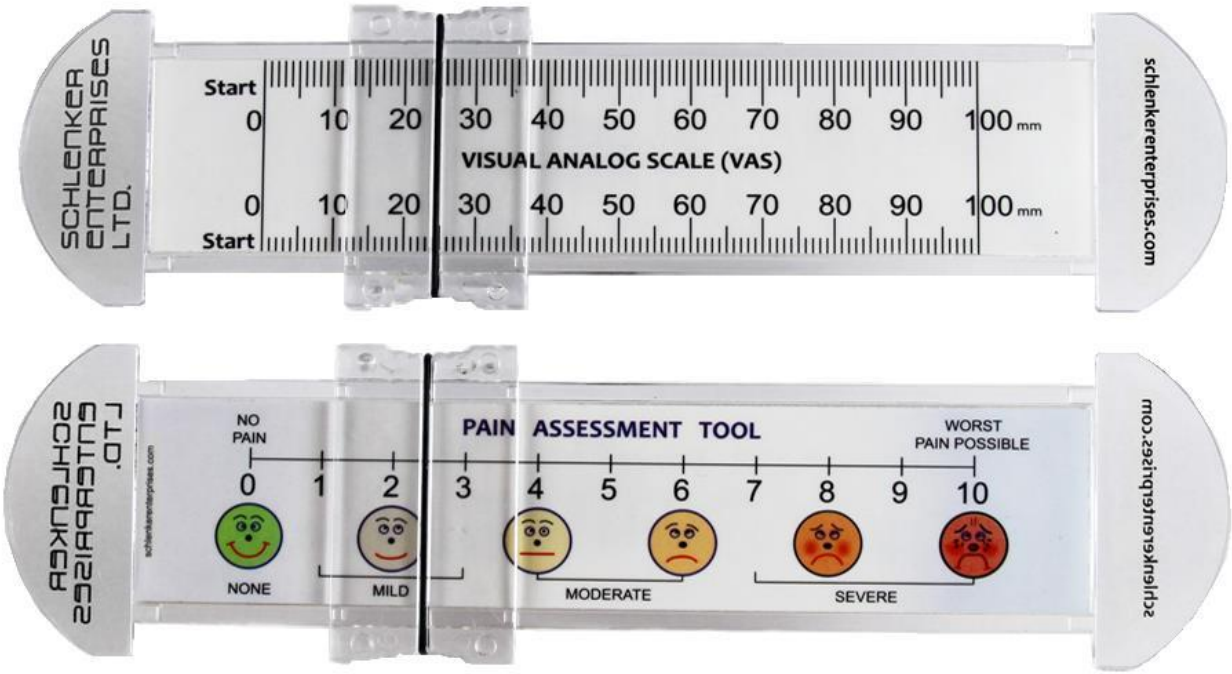
Appendices

I. Appendix 1: Visual analog scale



II. Appendix 2: Oswestry Low Back Bain Disability Questionnaire

OSWESTRY LOW BACK DISABILITY QUESTIONNAIRE

Instructions: this questionnaire has been designed to give us information as to how your back pain has affected your ability to manage everyday life. Please answer every section and mark in each section only the ONE box which applies to you at this time. We realize you may consider 2 of the statements in any section may relate to you, but please mark the box which most closely describes your current condition.

1. PAIN INTENSITY
- ☐ I can tolerate the pain I have without having to use pain killers
- ☐ The pain is bad but I manage without taking pain killers
- ☐ Pain killers give complete relief from pain
- ☐ Pain killers give moderate relief from pain
- ☐ Pain killers give very little relief from pain
- ☐ Pain killers have no effect on the pain and I do not use them

2. PERSONAL CARE (e.g. Washing, Dressing)
- ☐ I can look after myself normally without causing extra pain
- ☐ I can look after myself normally but it causes extra pain
- ☐ It is painful to look after myself and I am slow and careful
- ☐ I need some help but manage most of my personal care
- ☐ I need help every day in most aspects of self care
- ☐ I don't get dressed, I wash with difficulty and stay in bed

3. LIFTING
- ☐ I can lift heavy weights without extra pain
- ☐ I can lift heavy weights but it gives extra pain
- ☐ Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned, i.e. on a table
- ☐ Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned
- ☐ I can lift very light weights
- ☐ I cannot lift or carry anything at all

4. WALKING
- ☐ Pain does not prevent me walking any distance
- ☐ Pain prevents me walking more than one mile
- ☐ Pain prevents me walking more than ½ mile
- ☐ Pain prevents me walking more than ¼ mile
- ☐ I can only walk using a stick or crutches
- ☐ I am in bed most of the time and have to crawl to the toilet

5. SITTING
- ☐ I can sit in any chair as long as I like
- ☐ I can only sit in my favorite chair as long as I like
- ☐ Pain prevents me from sitting more than one hour
- ☐ Pain prevents me from sitting more than ½ hour
- ☐ Pain prevents me from sitting more than 10 minutes
- ☐ Pain prevents me from sitting at all

6. STANDING
- ☐ I can stand as long as I want without extra pain
- ☐ I can stand as long as I want but it gives me extra pain
- ☐ Pain prevents me from standing for more than one hour
- ☐ Pain prevents me from standing for more than 30 minutes
- ☐ Pain prevents me from standing for more than 10 minutes
- ☐ Pain prevents me from standing at all

7. SLEEPING
- ☐ Pain does not prevent me from sleeping well
- ☐ I can sleep well only by using medication
- ☐ Even when I take medication, I have less than 6 hrs sleep
- ☐ Even when I take medication, I have less than 4 hrs sleep
- ☐ Even when I take medication, I have less than 2 hrs sleep
- ☐ Pain prevents me from sleeping at all

8. SOCIAL LIFE
- ☐ My social life is normal and gives me no extra pain
- ☐ My social life is normal but increases the degree of pain
- ☐ Pain has no significant effect on my social life apart from limiting my more energetic interests, i.e. dancing, etc.
- ☐ Pain has restricted my social life and I do not go out as often
- ☐ Pain has restricted my social life to my home
- ☐ I have no social life because of pain

9. TRAVELLING
- ☐ I can travel anywhere without extra pain
- ☐ I can travel anywhere but it gives me extra pain
- ☐ Pain is bad, but I manage journeys over 2 hours
- ☐ Pain restricts me to journeys of less than 1 hour
- ☐ Pain restricts me to short necessary journeys under 30 minutes
- ☐ Pain prevents me from traveling except to the doctor or hospital

10. EMPLOYMENT/ HOMEMAKING
- ☐ My normal homemaking/ job activities do not cause pain.
- ☐ My normal homemaking/ job activities increase my pain, but I can still perform all that is required of me.
- ☐ I can perform most of my homemaking/ job duties, but pain prevents me from performing more physically stressful activities (e.g. lifting, vacuuming)
- ☐ Pain prevents me from doing anything but light duties.
- ☐ Pain prevents me from doing even light duties.
- ☐ Pain prevents me from performing any job or homemaking chores.

الفقرة 1:شدة الألام:

0-□ ليس لدي الألام في أسفل ظهري حاليا .
1-□ أشعر حاليا بالألام خفيفة في أسفل ظهري .
2-□ أشعر حاليا بالألام متوسطة في أسفل ظهري .
3-□ أشعر حاليا بألألام شديدة الى حد ما في أسفل ظهري.
4-□ أشعر حاليا بالألام شديدة جدا في أسفل ظهري.
5-□ أشعر حاليا بالألام في اسفل ظهري أكثر مما يمكن تصورها .

الفقرة 2:العناية الشخصية – كالإغتسال ولبس الثياب:

0-□ - يمكنني أن أعتني بنفسي واهتم بأموري الخاصة بشكل طبيعي دون أن يزيد ذلك في الألام أسفل ظهري.
1-□ - يمكنني أن أعتني بنفسي واهتم بأموري الخاصة ولكن ذلك يزيد في الألام اسفل ظهري.
2-□ - يمكنني أن أعتني بنفسي واهتم بأموري الخاصة ولكن يأخذ ذلك مني وقتا أطول من المعتاد.
3-□ - أحتاج إلى بعض المساعدة ولكن يمكنني القيام بمعظم أموري الخاصة بنفسي .
4-□ - أحتاج إلى المساعدة بشكل يومي للقيام بأموري الخاصة .
5-□ - أبقى في سريري وأفضل بصعوبة ولا أستطيع أن ألبس ثيابي .

الفقرة 3:رفع الأشياء ونقلها:

0-□ - أستطيع أن أرفع الأشياء الثقيلة من غير أن يزيد ذلك في الألام أسفل ظهري.
1-□ - أستطيع أن أرفع الأشياء الثقيلة ولكن ذلك يزيد في الألام أسفل ظهري .
2-□ -الألام أسفل ظهري تمنعني من رفع الأشياء الثقيلة إذا كانت على الأرض، لكن يمكنني رفعها إذا كانت في مكان مرتفع،على- كالطاولة مثلا.
3-□ -الألام أسفل ظهري تمنعني من رفع الأشياء الثقيلة، لكن بإمكاني رفع الأشياء الخفيفة ومتوسطة الوزن إذا كانت في مكان مرتفع،على.
4-□ -أستطيع رفع الأشياء خفيفة الوزن فقط .
5-□ - لا أستطيع رفع أو حمل أي شيء على الإطلاق.

الفقرة 4:المشي:

0-□ -لاتمنعني الألام أسفل ظهري من المشي لأي مسافة (كالمشي بجوار المنزل).
1-□ - الألام أسفل ظهري تمنعني من المشي أكثر من ألف وخمسمئة متر (كيلو ونصف) .
2-□ - الألام أسفل ظهري تمنعني من المشي أكثر من ألف متر (كيلومتر واحد).
3-□ - الألام أسفل ظهري تمنعني من المشي أكثر من أربعمئة متر.
4-□ - لا أستطيع المشي دون الاستعانة بعصا أو عكاز.
5-□ - أبقى في الفراش معظم الوقت وازحف للوصول الى المرحاض (دورة المياه).

الفقرة 5:الجلوس :

0-□ -يمكنني الجلوس على أي كرسي المدة التي أريدها.
1-□ -يمكنني الجلوس فقط على كرسي مريح المدة التي أريدها.
2-□ - الألام أسفل ظهري تمنعني من البقاء جالسا على أي كرسي أكثر من ساعة .
3-□ -الألام أسفل ظهري تمنعني من البقاء جالسا على أي كرسي أكثر من نصف ساعة.
4-□ -الألام أسفل ظهري تمنعني من الجلوس لأكثر من عشر دقائق .
5-□ -الألام أسفل ظهري تمنعني من الجلوس مطلقا.

الفقرة 6:الوقوف:

0-□ - أستطيع البقاء واقفا المدة التي أريد ها دون أن يزيد ذلك في الألام أسفل ظهري.
1-□ - أستطيع البقاء واقفا المدة التي أريدها ولكن ذلك يزيد في الألام أسفل ظهري.
2-□ -الألام أسفل ظهري تمنعني من الوقوف لأكثر من ساعة.
3-□ - الألام أسفل ظهري تمنعني من الوقوف لأكثر من نصف ساعة.
4-□ - الألام أسفل ظهري تمنعني من الوقوف لأكثر من عشر دقائق.
5-□ - الألام أسفل ظهري تمنعني من الوقوف مطلقا.

الفقرة 7:النوم :

0-□ - نومي لايضطرب أبدا بسبب الألام أسفل ظهري.
1-□ - يضطرب نومي احيانا بسبب الألام أسفل ظهري .
2-□ - أنام أقل من6 ساعات يوميا بسبب الألام أسفل ظهري.
3-□ - أنام أقل من4 ساعات يوميا بسبب الألام أسفل ظهري .
4-□ - أنام أقل من ساعتين يوميا بسبب الألام أسفل ظهري.
5-□ - لا أستطيع النوم مطلقا بسبب الالام أسفل ظهري.

الفقرة 8:الحياة الجنسية (هذه الفقرة للمتزوجين أو من سبق لهم الزواج ومارسوا الحياة الجنسية , إذا لم ينطبق عليك هذا الشرط الرجاء الانتقال للفقرة رقم 9):

0-□ - حياتي الجنسية عادية ولا تسبب زيادة في الألام أسفل ظهري.
1-□ - حياتي الجنسية عادية ولكنها تسبب زيادة في بعض الألام أسفل ظهري .
2-□ - حياتي الجنسية تكاد تكون عادية ولكنها تسبب لي الألاما شديدة في أسفل ظهري
3-□ - حياتي الجنسية نادرة جدا بسبب الألام أسفل ظهري.
4-□ - حياتي الجنسية تقريبا مقطوعة بسبب الألام أسفل ظهري.
5-□ - الألام أسفل ظهري تمنعني من الحياة الجنسية مطلقا.
6-□ لم يسبق لي الزواج ولم امارس الحياة الجنسية.

الفقرة 9:الحياةالاجتماعية (زيارة و استقبال الأقارب والأصحاب،الخروج مع الاصدقاء، المشاركة في الاحتفالات أو الأنشطة الإجتماعية ...):

0-□ - حياتي الإجتماعية عادية ولا تزيد في الألام أسفل ظهري.
1-□ - حياتي الإجتماعية عادية ولكنها تزيد من حدة الألام في أسفل ظهري.
2-□ - الألام أسفل ظهري لا تؤثر على حياتي الاجتماعية ولكنها تقلل من أنشطتي التي تتطلب مجهودا كبيرا.
3-□ - تأثرت حياتي الاجتماعية وتقلصت علاقاتي مع الأخرين بسبب الألام أسفل ظهري.
4-□ - بسبب الألام أسفل ظهري أصبحت حياتي الاجتماعية منحصرة في المنزل .
5 □ - حياتي الإجتماعية انقطعت بسبب الألام أسفل ظهري.

الفقرة 10:السفر:

0-□ - استطيع السفر إلى أي مكان من غير أن يزيد ذلك في الألام أسفل ظهري.
1-□ - استطيع السفر إلى أي مكان ولكنه يزيد في الألام أسفل ظهري.
2-□ - الألام أسفل ظهري شديدة ولكني استطيع تحمل السفر في حدود الساعتين.
3-□ - الألام أسفل ظهري تقيد رحلاتي (سفري) لأقل من ساعة.
4-□ - الألام أسفل ظهري تقيد رحلاتي القصيرة الضرورية (سفري القصير) لأقل من نصف ساعة.
5-□ - الألام أسفل ظهري تمنعني من السفر لأي مكان إلا لتلقي العلاج.
6-□ لم أسافر يوما ما (لم أفعل ذلك).

Oswestry low back pain disability questionnaire (Life, 2014)(Alcántara-Bumbiedro et al., 2006)

III. Appendix 3 Range Of Motion for lumber spine movements by microfit3 incline-dynamometer :

Microfit3 manual (*MicroFET3-Data-Sheet-Updated-06-25-2019.Pdf*, n.d.)

(Flexion et al., 1987)

#	Tests	First trial	Second trial	Third trial	Average
I.	Lumbar flexion				
II.	Lumbar extension				
III.	Lumbar RB				
IV.	Lumbar LB				
V.	Muscle endurance “Modified setups”				
VI.	Muscle power “Lumbar Hyperextension”				

IV. Appendix 4: Fear Avoidance Beliefs Questionnaire

	Completely disagree			Unsure			Completely agree
1. My pain was caused by physical activity	0	1	2	3	4	5	6
2. Physical activity makes my pain worse	0	1	2	3	4	5	6
3. Physical activity might harm my back	0	1	2	3	4	5	6
4. I should not do physical activities which (might) make my pain worse	0	1	2	3	4	5	6
5. I cannot do physical activities which (might) make my pain worse	0	1	2	3	4	5	6

The following statements are about how your normal work affects or would affect your back pain.

	Completely disagree			Unsure			Completely agree
6. My pain was caused by my work or by an accident at work	0	1	2	3	4	5	6
7. My work aggravated my pain	0	1	2	3	4	5	6
8. I have a claim for compensation for my pain	0	1	2	3	4	5	6
9. My work is too heavy for me	0	1	2	3	4	5	6
10. My work makes or would make my pain worse	0	1	2	3	4	5	6
11. My work might harm my back	0	1	2	3	4	5	6
12. I should not do my normal work with my present pain	0	1	2	3	4	5	6
13. I cannot do my normal work with my present pain	0	1	2	3	4	5	6
14. I cannot do my normal work till my pain is treated	0	1	2	3	4	5	6
15. I do not think that I will be back to my normal work within 3 months	0	1	2	3	4	5	6
16. I do not think that I will ever be able to go back to that work	0	1	2	3	4	5	6

Scoring

Scale 1: fear-avoidance beliefs about work – items 6, 7, 9, 10, 11, 12, 15.

Scale 2: fear-avoidance beliefs about physical activity – items 2, 3, 4, 5.

(Waddell et al., 1993)

V. Appandix(5) Sahrmann Core Stability test

Sahrmann Core Stability Test

Level 0	Unable to achieve level 1 position
Level 1	Begin in supine, hook-lying position while abdominal hollowing. Slowly raise 1 leg to 100 deg of hip flexion with comfortable knee flexion. Bring opposite leg to same position.
Level 2	From hip flexed position, slowly lower 1 leg until heel contacts surface. Slide heel out to fully extend the knee. Return to starting flexed position.
Level 3	From hip flexed position, slowly lower 1 leg until heel is 12 cm above surface. Slide heel out to fully extend the knee. Return to starting flexed position.
Level 4	From hip flexed position, slowly lower both legs until heel contacts surface. Slide heel out to fully extend knees. Return to starting flexed position.
Level 5	From hip flexed position, slowly lower both legs until heels are 12 cm above surface. Slide heel out to fully extend knees. Return to starting flexed position.

*Must maintain Functional Neutral Position (abdominal hallowing / pelvic neutral) to progress to next level. This is most accurately done with use of a blood pressure cuff but can also be accomplished with therapist hand placement or use of exercise band for feedback.

*Functional Neutral Position: Activate TA by drawing naval down toward spine. Complete APT / PPT to end range. Functional Neutral Position is half-way between these end ranges.

*Information in table courtesy of: https://orthowellpt.com/low-back-pain-part-2-getting-down-to-the-core

(辰村正紀 et al., 2019)**,**(*Shrman Descreption*, n.d.)

VI. Appendix (6) Active lumbar ROM by the back extension test (BET; distance of sternal notch and floor at active lumbar extension)

VII. Appendix (7) Therapeutic intervention protocol

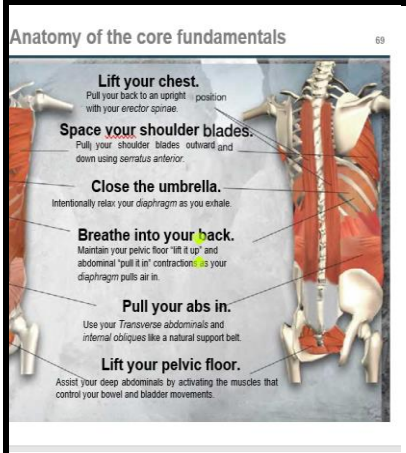
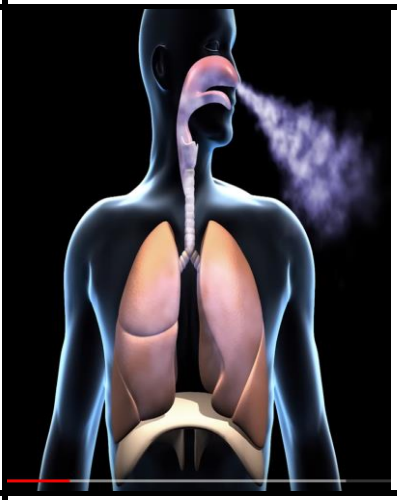
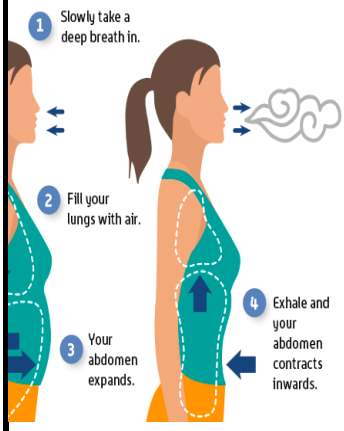
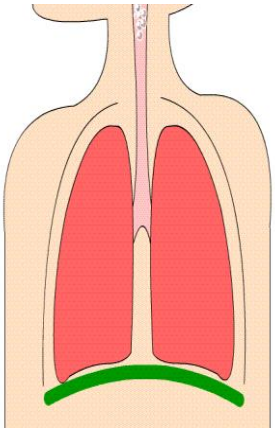
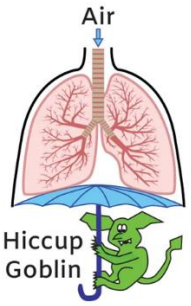
The quantified protocol for Rehabilitation of Core stability muscles

1. Applied Diaphragmatic Breathing
2. Applied Autogenic hold-relax techniques
   Applied warmup
3. Applied stretching of core muscles
4. Progressive Core Stability Exercises |"3 static levels +1 dynamic level = 4 levels"
    1. Clinical / Static: Core Bracing: Progressive & Regressive isometric Holding
    2. Dynamic – Physical: concentric-Eccentric: Progressive & Regressive lifting/antigravity movements

5. Technical applications
    1) Supine CSE
    2) Right-side lying Core Exercise
    3) Left-side lying Core Exercise
    4) Prone Core Exercise
    5) Kneeling PCSE

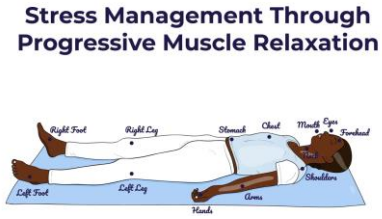
Applied cool down: Standing: Breathing, stretching, and sway movements

VIII. Appendix (8) Diaphragmatic Breathing in activation of core muscles

Breathing muscles and six steps	Inhale by nose & exhale by mouth	Breath through "4-5-5" Rhythm
		
Repeat 2-3 times every time before start, whenever you can do daily	**Right hand stable over chest, left hand up and down over Abdomen**	**Breath in during lifting & out during lowering**
		 

IX. Appendix (9) Autogenic distal to proximal hold-relax techniques

https://www.youtube.com/watch?v=3OJgX3ECVNA

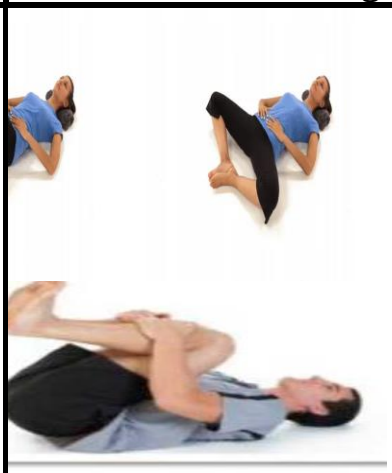
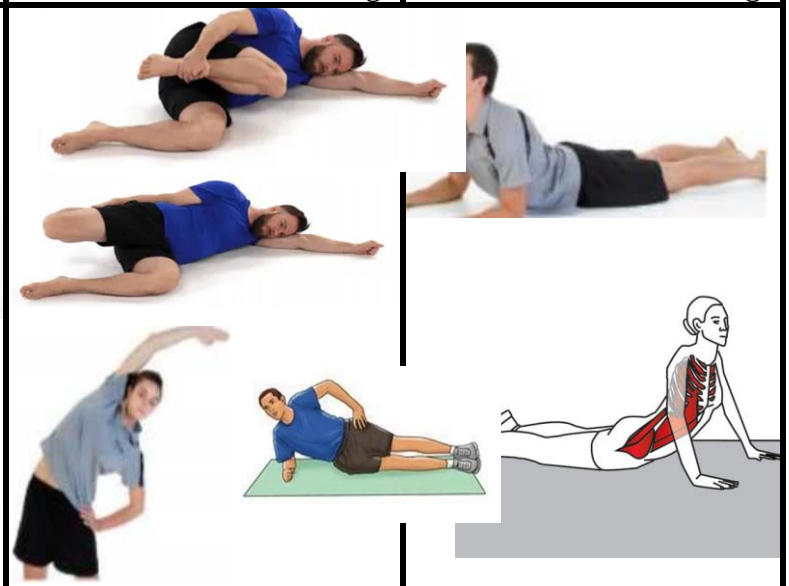
	**Start by lying or sitting down. Relax your entire body. Take five deep, slow breaths.** 1. **Lift your toes upward. Hold, then let go.** 2. **Pull your toes downward. Hold, then let go.** 3. **Next, tense your calf muscles, then let go.** 4. **Move your knees toward each other. Hold, then let go.** 5. **Squeeze your thigh muscles. Hold, then let go.**	6. **Clench your hands. Pause, then let go.** 7. **Tense your arms. Hold, then let go.** 8. **Squeeze your buttocks. Pause, then let go.** 9. **Contract your abdominal muscles. Pause, then let go.** 10. **Inhale and tighten your chest. Hold, then exhale and let go.**
Level 1: 10 seconds hold X 1-2 Sets (R&L)	**Level 2: 15 seconds hold X 2-3 Sets (R&L)**	**Level 3: 20 seconds hold X 3-4 Sets (R&L)**
Dynamic Side Bridge – one leg raie	Dynamic Side Bridge – 2 legs Raise	Dynamic Side Bridge –Pelvis Raise
11. **Raise your shoulders to your ears. Pause, then let go.** 12. **Purse your lips together. Hold, then release.** 13. **Open your mouth wide. Hold, then let go.** 14. **Close your eyes tightly. Pause, then release.** 15. **Lift your eyebrows. Hold, then release.**	**If you're new to relaxation techniques or PMR, consider these helpful tips:** • **Set aside 15 to 20 minutes for PMR. Do it in a quiet, comfortable area.** • **Turn off your phone to avoid distractions.** • **Avoid holding your breath, which can cause more tension. Inhale deeply when you tense your muscles and exhale fully when you relax.**	• **Move in a sequence that works for you. For example, you can start at your head if you want to, and move down your body.** • **Wear loose, lightweight clothing.** • **Practice PMR even when you're feeling calm, especially in the beginning. This will make it easier to learn the method.**

X. Apandix (10) Applied warmup in Core muscles Rehabilitation “5 minutes”

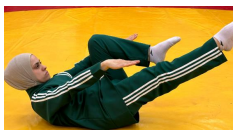
Supine Cycling	**Supine alternating hip rotation**
	
Continuous slow to moderate speed for 2 minutes	Continuous slow to moderate speed for 2 minutes

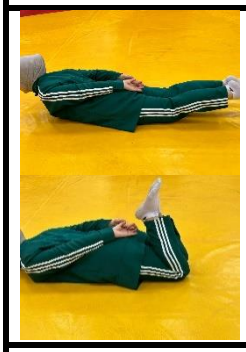
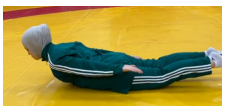
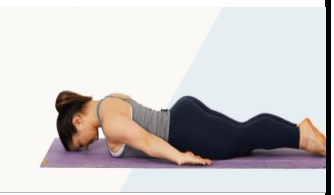
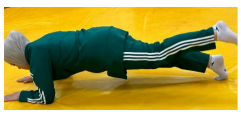
XI. Appendix (11) Applied stretching for Core muscle rehabilitation

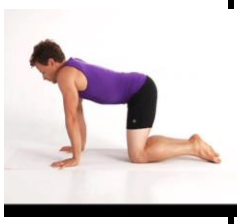
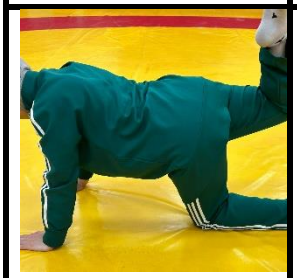
Supine, side, and prone stretching, for Back, abdomen, and Hip muscles

Static Alternating Gluteal stretching	Static bilateral Gluteal stretching	Static Alternating hip stretching
		
10-15 seconds hold with 10s rest 2-3 Sets	**10-15 seconds hold with 10s rest 2-3 Sets**	**10-15 seconds hold with 10s rest 2-3 Sets**
Static sitting spine & hip stretching	Static side, hip & knee stretching	Static prone abdominal stretching
		
10-15 seconds hold with 10s rest 2-3 Sets	10-15 seconds hold with 10s rest 2-3 Sets	10-15 seconds hold with 10s rest 2-3 Sets

XII. Appendix (12) The four levels of Progressive Core Stability Exercises PCSE

Recovery phase: Levels 1-3			Dynamic-strengthening Level 4
Static back bridge	**static back bridge, pillow knee press**	**Static back bridge R&L Leg Raise**	**Dynamic back bridge**
			
Level 1: 15 seconds hold X 2 Sets	**Level 2: 20 seconds hold X 3 Sets**	**Level 3: 25s hold X 3 Sets (R&L)**	**Level 4: 10 REPs X 2 Sets**
Static crunch: Alternating extension	**Static crunch: upper trunk raise**	**Static crunch: head-legs Raise**	**Modified setups**
			
Level 1: 15 seconds hold X 2 Sets (R&L)	**Level 2: 20s hold X 3 Sets (R&L)**	**Level 3: 25s hold X 3 Sets (R&L)**	**Level 4: 10 REPs X 2 Sets**
Static Simplified side bridge	**Static Side Bridge**	**Static Side Bridge –Leg Raise**	**Dynamic Side Bridge – one leg raise**
			
Level 1: 15 seconds hold X 2 Sets (R&L)	**Level 2: 20s hold X 3 Sets (R&L)**	**Level 3: 25s hold X 3 Sets (R&L)**	**Level 4: 10 REPs X 2 Sets R&L**

Static quadruped, side rotation	Static Side lying – Knee Raise	Static Side lying Thoracic rotation	Dynamic Side lying– both knees up
			
Level 1: 15 seconds hold X 2 Sets (R&L)	**Level 2: 20s hold X 3 Sets (R&L)**	**Level 3: 25s hold X 3 Sets (R&L)**	**Level 4: 10 REPs X 2 Sets R&L**
Dart|: Static single hand foot touch	**Dart: Static bilateral leg raise**	**Dart: Static bilateral leg & head raise**	**Dart: Dynamic head-shoulder raise**
			
Level 1: 15 seconds hold X 2 Sets (R&L)	**Level 2: 20s hold X 3 Sets (R&L)**	**Level 3: 25s hold X 3 Sets (R&L)**	**Level 4: 10 REPs X 2 Sets R&L**
Static Simplified Forearm Bridge on knees	**Static Forearm Bridge on toes**	**Static Forearm Bridge on knees–Leg Raise**	**Dynamic forearm Bridge – leg raise**
			
Level 1: 15 seconds hold X 2 Sets R&L)	**Level 2: 20s hold X 3 Sets (R&L)**	**Level 3: 25s hold X 3 Sets (R&L)**	**Level 4: 10 REPs X 2 Sets**

Static cat camel hold	Kneel sitting: Fully lumbar and bilateral shoulder flexion		Dynamic kneeling, lumbar shoul. fl .
 	 		
Level 1: 20 seconds hold X 2 Sets	**Level 2: 20s hold X 3 Sets**	**Level 3: 25s hold X 3 Sets (R&L)**	**Level 5: 12 REPs X 2 Sets (R&L)**
Static Air planking: flexed knee hold	**Static Air planking arm – Leg Raise**	**Static Air planking: same are-leg raise**	**Dynamic Air planking arm–legs Raise**
			
Level 1: 20 seconds hold X 2 Sets (R&L)	**Level 2: 20s hold X 3 Sets (R&L)**	**Level 3: 25s hold X 3 Sets (R&L)**	**Level 5: 12 REPs X 2 Sets (R&L)**

XIII. Appendix (13) Adopted Modes of Progression through the four levels of the Progressive Core Stability Protocol PCSP

1. By clinical progression

- Self-awareness of pain: Severe, to moderate, to mild, to normal
- More pain to less pain in the subjective scale of 0-10 scale of VAS

2. By safety and stability

- Static to dynamic

3. By rehabilitative objective
    - Clinical to Physical to "proprioceptive" neuromotor, to functional
4. By complexity of CS exercise
    - Movement in Body sides: From unilateral to bilateral
    - Joints: From uni joint to multi joints
    - Movements: From uni "simple" to multi-planer "combined movements"

5. By physical dose of CS Exercise

- Less ROM to larger ROM: Flexibility
- Less to longer hold time, static muscle endurance
- Less to more resistance/ intensity of muscle strength
- Shorter to longer moment arm/intensity
- Slower to faster dynamic movements /power
- Less to a greater number of sets / Muscle endurance
- Less to greater Reps / Dynamic Muscle endurance
- From longer rest between exercises and sets to less to off rest time / cardiorespiratory Endurance

6. By proprioceptive control

- Wider Base of Support to narrower BOS
- Stable to sway BOS
- Free body weight to more resistive and more challenging equipment "roller foam to BULSU to physioball.
- From the same level to different levels of BOS
- From many supporting points to less supporting points in BOS

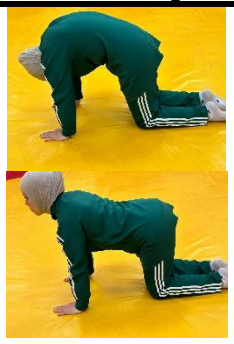
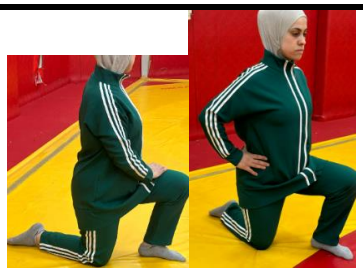
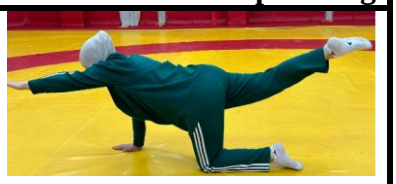
XIV. Appendix (14) The Quantified Modeling of Mechanical Pain Behavior MPB as clinical guidelines or Parameters/aspects of MP for the application of the suggested protocol of PCSE.

1. Functionality of movement / a given functional task causes the pain, we need motion analysis of that task
2. Type of motion associated with pain “flexion, extension….”
3. Mode of motion “Passive –joint-, active active resistive - Neuromuscular”
4. ROM of motion / Mobility & flexibility, Elasticity, and plasticity
5. Resistance or/and moment arm of motion/intensity of strength or load
6. Hold time of static positions / static muscle endurance – work duration or volume
7. Speed of motion/power as difficulty or intensity of load
8. Reps of motion / dynamic muscle endurance as the volume of physical load
9. Sets of motion/muscle endurance, as volume of physical load
10. Direction of motion “lifting concentric vs. lowering eccentric”, or as holding, or moving horizontally
11. Body position and positioning/ stabilizing & neutralizing roles of the painful muscle
12. Pattern of movement “smooth, jerky, shaking”
13. Complexity of motion / multi-planer motions

XIV Apaandix (15) PCS Protocol by the 4 levels of PCSE

Phase I: Static Recovery "Levels 1-3"

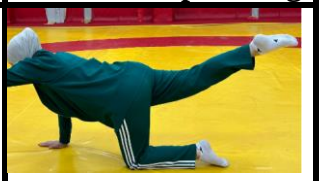
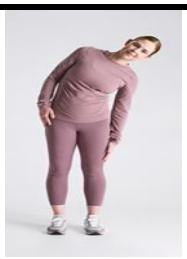
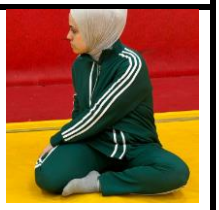
Level one: Initial Static Core Stability Exercises for 3 weeks "inter set rest = 15 seconds"

1. Static back bridge	**2. Static supine – straight Leg Raise**	**3. Static half Side Bridge – Pelvis Raise**
		
15 seconds hold with 10s rest 2 Sets	**15 seconds hold, 2 Sets. R&L**	**15 seconds hold, 2 Sets. R&L**
4. Side lying: straight leg lifting	5. Prone, alternating knees flexion- head raise	6. Prone, holding simplified Forearm bridge:
		
15 seconds hold, 2 Sets. R&L	**15 seconds hold, 2 Sets. H&K**	**15 seconds hold, 2 Sets**
7. Quadruped: Head–Abdomen up-down	**8. Half kneeling, static lateral rotation**	**9. Quadruped: Static Airplanking**
		
15 seconds hold, 2 Sets.	**15 seconds hold, 2 Sets.**	**15 seconds hold, 2 Sets. R&L**

Phase I: Static Recovery "Levels 1-3"

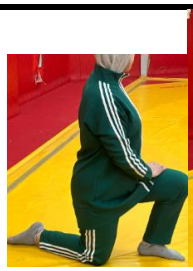
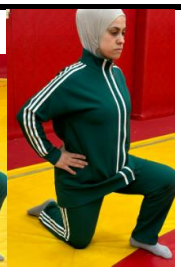
Level one: Initial Static Core Stability Exercises for one week "inter set rest = 15 seconds" with the applied stretching techniques in each CSE by body positions

Applied stretching by body positions	**Applied CSE by body positions**	
Supine back and hip muscle stretching	**1. Static back bridge strengthening**	**2. Static supine –Leg Raise strengthening**
  		
10 seconds hold with 10s rest 2 Sets R&L	**15 seconds hold, 2 Sets.**	**15 seconds hold, 2 Sets. R&L**
Sidelying, passive-static stretching	3. Simplified side bridge strengthening	**4.** Simplified side bridge, leg raise strengthening
 		
10 seconds hold with 10s rest 2 Sets. R&L	**15 seconds hold, 2 Sets. H&K**	**15seconds hold, 2 Sets**
prone, passive-static stretching	5. Prone, alternating knees flexion- head raise	6. Prone, holding simplified Forearm bridge:
		
10 seconds hold with 10s rest 2 Sets.	**15 seconds hold, 2 Sets.**	**15 seconds hold, 2 Sets.**

Quadruped-hip abduction stretching	7.Quadruped, back up and down	8. Quadruped, airplanking
		
10 seconds hold with 10s rest 2 Sets	15 seconds hold, 2 Sets. R&L	15 seconds hold, 2 Sets. R&L
Half kneeling, passive static stretching	**9.Supine- active static lateral hip bending**	**10. Half kneeling, active static spine bending**
		
10 seconds hold, 2 Sets. R&L	15 seconds hold, 2 Sets. H&K	15 seconds hold, 2 Sets
Supine passive static rotation stretching	**Supine active static hips rotation**	**11. kneeling, static lumbar rotation**
		
10 seconds hold with 10s rest 2 Sets. R&L	15 seconds hold, 2 Sets.	15 seconds hold, 2 Sets. R&L

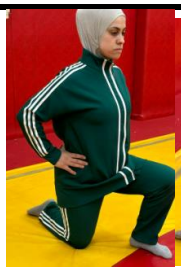
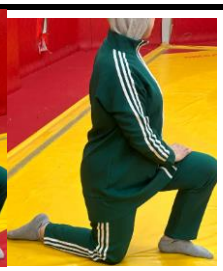
Phase I: Static Recovery "Levels 1-3"

Level Two: Static Core Stability Exercises "hold time 20 seconds, inter set rest = 15 seconds"

Static back bridge -hip adduction	**Static supine: Head, leg crunch**	**Static half-Side Bridge: leg Raise**
		
20 seconds hold, 3 Sets.	**20 seconds hold, 3 Sets.**	**20 seconds hold, 3 Sets. R&L**
Static sidelying, up then down leg raise		**Static Forearm front bridge**
		
20 seconds hold, 3 Sets. R&L		**20 seconds hold, 3 Sets.**
Static sit kneeling: forward-backward trunk bending, with arms support	**Half kneeling, waste grasping, lateral rotation**	**Static alternating Airplanking**
 	 	
20 seconds hold, 3 Sets.	**20 seconds hold, 3 Sets. R&L**	**20 seconds hold, 3 Sets.**

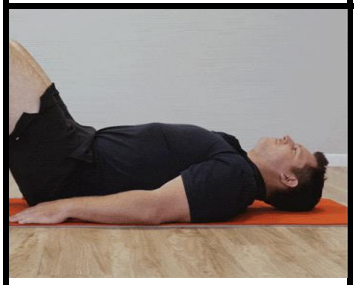
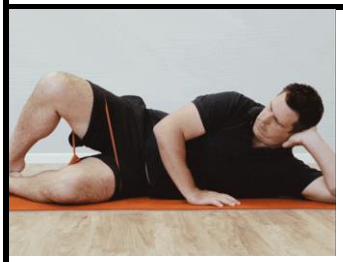
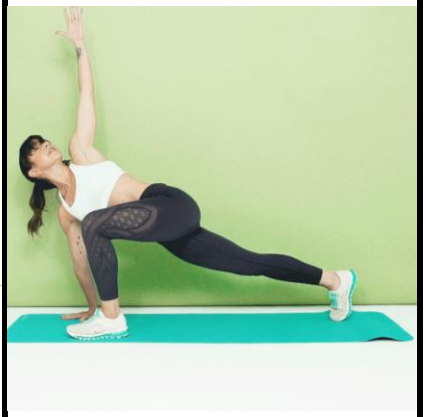
Phase I: Static Recovery "Levels 1-3"

Level Three: Static Core Stability Exercises "hold time = 25 seconds , inter set rest = 15 seconds"

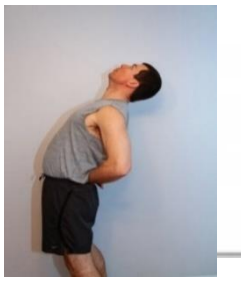
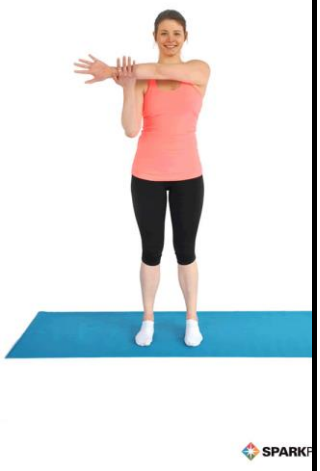
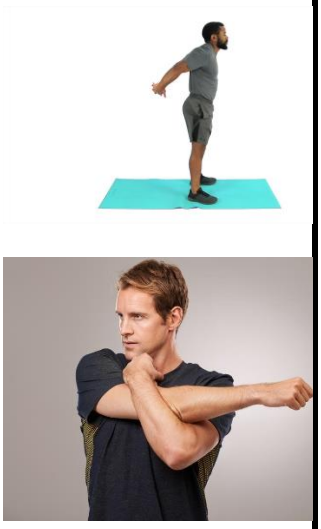
Static back bri. Alternating leg raise	**Alternating Head, arms, leg raise**	**Sidelying, Static bilateral leg raise**
		
25 seconds hold, 3 Sets. R&L	**25 seconds hold, 3 Sets. R&L**	**25 seconds hold, 3 Sets. R&L**
Half kneeling, spine side bending	**Static Dart, head leg raise**	**Static forearm front bridge, leg raise**
		
25 seconds hold, 3 Sets. R&L	**25 seconds hold, 3 Sets. R&L**	**25 seconds hold, 3 Sets.**
Static sit kneeling: forward-backward trunk bending, with arms support	**Half kneeling, waste grasping, lateral rotation**	**Static alternating Airplanking**
 	 	
25 seconds hold, 3 Sets.	**25 seconds hold, 3 Sets. R&L**	**25 seconds hold, 3 Sets. R&L**

Phase II: Dynamic Strengthening "Levels 4-6".

Level Four: Initial Dynamic Core Stability Exercises. 1 Weeks "inter set rest = 20 seconds"

Dynamic back bridge	**Dynamic flexed knee semi setups**	**Side lying: Dyn. Alternating leg raise**
		
10 REPs, 2 sets	**10 REPs, 2 sets**	**10 REPs, 2 sets. R&L**
Dynamic Side Lying, one knee raise	Prone: Dynamic chest-leg Raise	Prone, alternating dynamic leg Raise
		
10 REPs, 2 sets	**10 REPs, 2 sets**	**10 REPs, 2 sets. R&L**
Quadruped, Dynamic cat-camel pose	**Dynamic Air planking, Alternating leg raise**	**Dynamic prone hands, alternating knee flexion-lumbar rotation**
		
10 REPs, 2 sets	**10 REPs, 2 sets R&L**	**EPs, 2 sets. R&L**

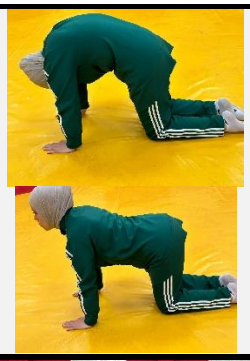
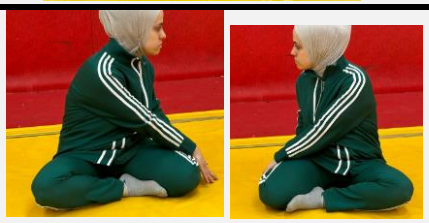
XV. Apandix (16) Applied cool down for Core rehabilitation. Standing: stretching, breathing, & sway movements

1. Static front & back stretching	**2. Static twist stretching**	**3. Static Alternating side stretching**
		
15 seconds hold X 2-3 Sets	**15 seconds hold X 2-3 Sets**	**15 seconds hold X 2-3 Sets**
4.Dynamic sway stretching	5.Static alternating shoulder stretching	6.Static alternating shoulder stretching
		
15 seconds hold X 2-3 Sets R&L	**15 seconds hold X 2-3 Sets R&L**	**15 seconds hold X 2-3 Sets R&L**

XVI Appandix (17) Assessment sheet for session documentation in the four levels of the suggested PCSP

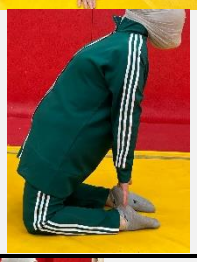
نموذج استمارة المرضي لتطبيق وتوثيق المستوى الأول من تمارين ثبات محور الجذع.

الاسم:		الجلسة رقم:	عمل كافة التمارين نعم _____ لا_____	
عدد ثواني الجولة الثانية	عدد ثواني الجولة الأولى	عدد جولات التمرين وزمن كل جولة	صورة التمرين	التمارين	رقم التمرين
		تثبيت 15 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =جولتين		الجسر الخلفي	1
		تثبيت 15 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =جولتين		الاستلقاء على الظهر: تناوب ثني الورك والركبة من جهة ومد الكاحل والركبة مع ثني الورك قليلا من الجهة الاخرى	2
				الجهة الاخرى	
		تثبيت 15 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =جولتين		الجسر الجانبي الايمن	3
				الجسر الجانبي الايسر مسهلا	
		تثبيت 15 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =جولتين		الجسر الجانبي الأيمن مع ثني الركبة السلفى ومد العليا اثناء تبعيد الرجل العليا	4
				الجهة الاخرى	
		تثبيت 15 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =جولتين		الانبطاح على البطن تناوب ثني الركبتين ومد الذراعين خلفا	5
		تثبيت 15 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =جولتين		الجسر الامامي المسهل	6

7	الجثو على أربعة، تناوب تحدب وتقعر الظهر للاعلى والاسفل		تثبيت 15 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =جولتين		
8	الجثو على أربعة وتبادل الثبات في وضع رفع الرجل والذراع المعاكسة		تثبيت 15 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =جولتين		
	الجهة الاخرى				
9	الجثو نصف الكامل مع مسك الخصر وتدويره للجانبين		تثبيت 15 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =جولتين		
	الجهة الاخرى				
10	الجثو الكامل على الركب مع ثني الجذع للجهتين		تثبيت 15 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =جولتين		
	الجهة الاخرى				

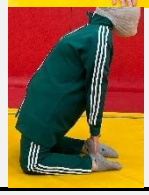
.نموذج استمارة المرضي لتطبيق وتوثيق المستوى الثاني من تمارين ثبات محور الجذع

عمل كافة التمارين نعم --------- لا----------	المستوى 2 الجلسة رقم: 3 2 1	الاسم :			
رقم التمرين	اسم التمرين	التمرينات الأساسية		عدد الثواني بالجولة الأولى	عدد الثواني بالجولة الثانية	عدد الثواني بالجولة الثالثة
1	1. الجسر الخلفي مع ضغط الركبتين		تثبيت 20 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			
2	2. الاستلقاء على الظهر: ثني الورك والركبتين بزوايا قائمة 3.		تثبيت 20 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			
3	الجسر الجانبي الايمن الجسر الجانبي الايسر		تثبيت 20 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			
4	الجسر الجانبي الأيمن تبعيد الرجل العليا الجسر الجانبي الأيسر تبعيد الرجل العليا		تثبيت 20 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			
5	الانبطاح على البطن المد الزائد للوركين معا		تثبيت 20 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			

6	**الجسر الامامي**		تثبيت 20 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			
7	**الجثو على أربعة، تناوب تحدب وتقعر الظهر للاعلى والاسفل**	 	تثبيت 20 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			
8	**الجثو نصف الكامل مع مسك الخصر وتدويره للجانبين** **الجهة الاخرى**		تثبيت 20 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			
9	**الجثو على أربعة وتبادل الثبات في وضع رفع الرجل والذراع المعاكسة** **الجهة الاخرى**		تثبيت 20 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			
10	**الجثو الكامل على الركب مع تناوب ثني الجذع للجهتين** **الجهة الاخرى**		تثبيت 20 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			

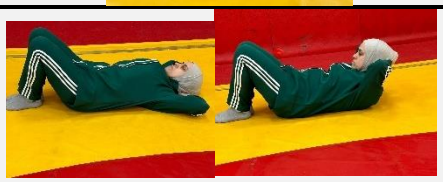
نموذج استمارة المرضي لتطبيق وتوثيق المستوى الثالث من تمارين ثبات محور الجذع

الاسم :				المستوى3 الجلسة رقم:			عمل كافة التمارين نعم ---------_____ لا----------
				1	2	3	
عدد ثواني الجولة الثالثة	عدد ثواني الجولة الثانية	عدد ثواني الجولة الأولى		التمرينات الأساسية			اسم التمرين	رقم التمرين
			تثبيت 25 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات				1. الجسر الخلفمع تناوب الثبات في رفع الرجل اليمنى ثم اليسرى ممتدة الى الاعلى	1
			تثبيت 25 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات				2. الاستلقاء على الظهر: تناوب الثبات في وضع ثني الورك والركبتين بزوايا قائمة	2
			تثبيت 25 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات				3. الجسر الجانبي الأيمن مع الرجلين عاليا الجسر الجانبي الايسر مع رفع الرجلين عاليا	3
			تثبيت 25 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات				الجثو على أربعة مع مسك اليدين خلف الرأس: تناوب الثني الجانبي للجذع	4

5	**الانبطاح على البطن المد الزائد للذراعين والرقبة والجذع لرفعها للاعلى**		تثبت 25 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			
6	**الجسر الامامي: تناوب المد الزائد للورك الأيمن ثم الايسر مع الثبات ضد وزن الجسم**		تثبيت 25 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			
7	**الجثو على أربعة، تناوب الثني والمد الزائد للجذع**	 	تثبيت 25 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			
8	**الجثو نصف الكامل مع مسك الخصر وتدويره للجانبين**	 	تثبيت 20 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			
9	**الجثو على أربعة وتبادل الثبات في وضع رفع الرجل والذراع المعاكسة** **الجهة الاخرى**		تثبيت 20 ثانية راحة بعد التمرين 15 ثانية عدد الجولات =3جولات			

نموذج استمارة المرضي لتطبيق وتوثيق المستوى الرابع من تمارين ثبات محور الجذع

الاسم :	المستوى4 الجلسة رقم:			عمل كافة التمارين نعم ---------_____ لا----------
	1	2	3	

عدد الثواني بالجولة الثانية	عدد الثواني بالجولة الأولى		التمرينات الأساسية	اسم التمرين	رقم التمرين
		تكرار 10 مرات راحة بعد التمرين 20 ثانية عدد الجولات =2 جولة		1. **الجسر الخلفي مع تكرار رفع وخفض الحوض**	1
		تكرار 10 مرات راحة بعد التمرين 20 ثانية عدد الجولات =2 جولة		2. **الاستلقاء على الظهر: ثني الورك والركبتين بزوايا قائمة: تكرار ثني الجذع للمس المرافق للركبتين**	2
		تكرار 10 مرات راحة بعد التمرين 20 ثانية عدد الجولات =2 جولة		3. الاستلقاء على الجانب الأيمن: تبعيد الرجل العليا وتقريب السفلى من الوركين لرفع الرجلين عاليا الجهة الاخرى	3
		تكرار 10 مرات راحة بعد التمرين 20 ثانية عدد الجولات =2 جولة		**الاستلقاء الجانبي مع ثني الركبة العليا: تكرار تدوير الوركين للاعلى والاسفل** **الاستلقاء الجانبي مع ثني الركبة العليا: تكرار تدوير الوركين للاعلى والاسفل**	4

5	**الانبطاح على البطن رفع الرجلين واعلى الجذع من خلال المد الزائد للوركين والجذع**	 	تكرار 10 مرات راحة بعد التمرين 20 ثانية عدد الجولات =2 جولة		
6	**الجسر الامامي: تناوب رفع الرجل عاليا من خلال المد الزائد للورك الأيمن ثم الايسر**	 	تكرار 10 مرات راحة بعد التمرين 20 ثانية عدد الجولات =2 جولة		
7	**الجثو على أربعة، تناوب تحدب وتقعر الظهر للأعلى والاسفل**	 	تكرار 10 مرات راحة بعد التمرين 20 ثانية عدد الجولات =2 جولة		
8	**الجثو نصف الكامل مع مسك اليدين خلف الرأس وتناوب ثني الجذع للجانبين**	 	تكرار 10 مرات راحة بعد التمرين 20 ثانية عدد الجولات =2 \جولة		

		تكرار 10 مرات راحة بعد التمرين 20 ثانية عدد الجولات =2	 	**الجثو على أربعة وتبادل تدوير الجذع للجانبين مع رفع الذراع عاليا**	9

XVII Appendix (18) Ethical approval

Al-Quds University
Jerusalem
Deanship of Scientific Research

بسم الله الرحمن الرحيم

جامعة القدس
القدس
عمادة البحث العلمي

Research Ethics Committee
Committee's Decision Letter

Date: September 13, 2022
Ref No: 246/REC/2022

Dears Dr. Abdulhamid Zeer, Ms. Hiba Alfakhori,

Thank you for submitting your application for research ethics approval. After reviewing your application entitled "The effect of suggested Combination Protocol of Aquatic and core stability Land Exercise Therapy Techniques in Management of Discopathy Low Back Pain: A randomized control trial" the Research Ethics Committee confirms that your application is in accordance with the research ethics guidelines at Al-Quds University.
We would appreciate receiving a copy of your final research report/ publication.

Thank you again and wish you a productive research that serves the best interests of your subjects.

PS: This letter will be valid for two years.

Sincerely,

Suheir Ereqat, PhD
Associate Professor of Molecular Biology

Research Ethics Committee Chair

Cc. Prof. Imad Abu Kishek - President
Cc. Members of the committee
Cc. file

Abu-Dies, Jerusalem P.O.Box 20002
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أبوديس، القدس ص.ب. 20002
تلفاكس: #970-02-2791293

الملخص باللغة العربية

التأثيرات السريرية والبدنية والإدراكية والوظيفية لنموذج كمي مقترح في التدريب المتدرج لعضلات ثبات محور الجذع ضمن العلاج الطبيعي عن بعد لإلام أسفل الظهر الناجمة عن الفتق الغضروفي.

اعداد: هبه محمد - سعدي نمر الفاخوري
إشراف الدكتور عبد الحميد الزير

مقدمة: تعد آلام أسفل الظهر الناجمة عن اعتلال القرص الغضروفي من المشاكل الرئيسية في مراكز التأهيل وفي كثير من الأحيان تودي الى اعراض سريرية مقيدة في النواحي الجسدية والنفسية والوظيفية المطلوبة لأداء انشطة الحياة اليومية. تلعب تمرينات ثبات محور الجذع المتدرجة دورا هاما في العلاج الطبيعي للام الميكانيكي في منطقة أسفل الظهر من خلال تحسين القوة العضلية والمدى الحركي والقدرة الوظيفية على أداء أنشطة الحياة اليومية. من الممكن الاستفادة من تطبيقات الهواتف الذكية وتقنيات الاتصال المعاصرة في العلاج طبيعي عن بعد لإعادة تأهيل مرضى الام أسفل الظهر الناجمة عن الفتق الغضروفي.

هدف الدراسة: التعرف على تأثير تمرينات ثبات محور الجذع عبر تطبيقات الهواتف الذكية في العلاج الطبيعي عن بعد للأعراض السريرية والبدنية والنفسية والوظيفية المصاحبة للفتق الغضروفي لدى مرضى الام أسفل الظهر في فلسطين.

منهج الدراسة: تم إجراء دراسة تجريبية على 30 مريضًة ممن تم تشخيصهن بآلام أسفل الظهر الناجمة عن الفتق الغضروفي. وقد تم تطبيق البرنامج العلاجي لتمرينات ثبات محور الجذع المتدرجة على أربعة مستويات عن بعد عبر تطبيق الوتس اب على افراد عينة الدراسة على مدى أربعة أسابيع وبواقع ثلاث جلسات أسبوعيا وتم تقييمهن في بداية ووسط ونهاية مرحلة العلاج. وقد تضمنت بيانات الدراسة شدة الألم والتحمل العضلي والمدى الحركي في المنطقة القطنية من العمود الفقري والقدرة الوظيفة للعجز الناجم عن آلام أسفل الظهر والتأثير النفسي لإلام أسفل الظهر، إضافة الى فحوصات مرونة العمور الفقري والتحمل الدوري - التنفسي وفحص التحمل العضلي الثابت والمتحرك خلال جميع جلسات تمرينات ثبات محور الجذع المستخدمة في البرنامج المقترح.

نتائج الدراسة: ظهور فروق ذات دلالة إحصائية بين الاختبارات القبلية والوسطية والبعدية لجميع المتغيرات السريرية والبدنية والوظيفية والنفسية للدراسة، بما يؤكد التأثير الإيجابي لتمرينات ثبات محور الجذع المقدمة عن بعد في علاج الفتق الغضروفي.

الاستنتاجات: تساعد تمرينات ثبات محور الجذع المقدمة عن بعد عبر الوتس اب في تخفيف الألم وتحسين القدرات البدنية والنفسية والوظيفية لدى مرضى الام أسفل الظهر الناجم عن الفتق الغضروفي

كلمات البحث: الام أسفل الظهر، الفتق الغضروفي، تمرينات ثبات محور الجذع، العلاج الطبعي عن بعد، الهاتف الذكي، الوتس اب.