

**Deanship of Graduate Studies  
Al-Quds University**



**The effect of Myofascial Release Technique combined with  
Core Stability Exercises versus Core Stability Exercises  
among adult males with non-specific chronic low back pain**

**Al-Tayeb Mahammad Saber Shehada**

**M.Sc. Thesis**

**Jerusalem- Palestine**

**1445\2023**

**The effect of Myofascial Release Technique combined with  
Core Stability Exercises versus Core Stability Exercises  
among adult males with non-specific chronic low back pain**

**Prepared by:**

**Al-Tayeb Mohammad Saber Shehada**

**B.Sc. Physiotherapy, An-Najah National University**

**Nablus-Palestine**

**Supervisor**

**Dr. Hadeel Halaweh**

**A thesis submitted in partial fulfillment of the requirements  
for the degree of Master of Physiotherapy-Deanship of  
Graduate Studies- Al-Quds University**

**1445\2023**

**Al-Quds University**

**Deanship of Graduate Studies**



## **Thesis Approval**

**The effect of Myofascial Release Technique combined with Core Stability Exercises versus Core Stability Exercises among adult males with non-specific chronic low back pain.**

**Prepared by:** Al-Tayeb Mohammad Saber Shehada

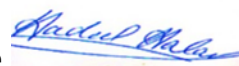
**Registration Number:** 22011952

**Supervisor:** Dr. Hadeel Halaweh

Master thesis submitted and accepted date: 17\12\2023 and approved by:

Committee members:

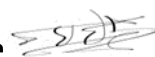
**Head of the committee:** Dr. Hadeel Halaweh

**Signature** 

**Internal Examiner:** Dr. Esra' Hamdan

**Signature** 

**External Examiner:** Mohamammad Talahmeh

**Signature** 

**Jerusalem- Palestine**

**1445\2023**

## **Dedication**

First of all, I would like to express my sincere gratitude and thanks to Allah, who inspired me to accomplish this human work and who recommended us with knowledge by his prophet Mohammad, and I quote" Whoever takes a path in which he seeks knowledge, God has made it easy for him a path to heaven".

Then I start, with all love I thank my dear beloved wife Roba, for her understanding, patience, and support throughout the research and study phase so thank you for what you have given and I love you.

And to my dear parents, who are keen to continue my life with all the passion, hope, and acknowledgment, I do not forget you from my prayers, and to you have my full appreciation and gratitude for your financial and moral support for me throughout my life, until I became the state today, continuing to seek and ask for knowledge, and to all my sisters, Ola, Abeer, Aisha, Areen and Marah, much love.

Special thanks to my supervisor Dr. Hadeel Halaweh for her patience, support and guidance.

## **Declaration**

I certify that this thesis is submitted for the Master's degree in Physiotherapy, with all the results of my own research, except where it has been pointed at as it was adapted from previous studies.

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.

**Signed:** 

**Date:** 17\12\2023

## **Acknowledgement**

To my dear supervisor Dr. Hadeel Halaweh during the journey of research and learning, at the hard work stage in the master's thesis, you have all my thanks, respect, and appreciation for your quick responses and your welcome acceptance of my many questions, answer to all of it, and your preview of progress in the research thesis step by step until it becomes what it is.

And to all my dear doctors at the university, Dr. Esraa Hamdan, Dr. Abdelhameed Alzeer, Dr. Akram Amro, and Dr. Hekmat Hadoosh, those who have given and continue to get the best of us out of us, to create a generation of its prophets open to the best scientific research methods; you have all respect and gratitude from us. Then to my colleagues in the master class especially Moaz and Bishara, it was a fun period with you.

# **The effect of myofascial release technique combined with core stability exercises versus core stability exercises among adult males with non-specific chronic low back pain.**

**Prepared by:** Altayeb Mohammad Shehada

**Supervisor:** Dr. Hadeel Halaweh

## **Abstract**

**Background:** Low back pain (LBP) is a frequent ailment that may interfere with daily activities. It can manifest as either non-specific or specific reason of condition. Myofascial release (MR) is a manual therapeutic technique with a stretch for the fascia in particular. Core Stability Exercises (CSE) is a kind of strengthening exercises for the lower trunk area from the lower rib to the buttocks area.

**Objective:** To investigate the effectiveness of MR and CSE in contrast with CSE alone on pain, back mobility, lumbar Range of Motion (ROM), and the Quality Of Life (QOL) among males with Non-Specific Chronic Low Back Pain (NSCLBP).

**Methods:** A single-blinded randomized control trial (RCT) with a SHAM group, with sixty-four adult male participants, randomly divided into an MR with a CSE Experimental group and a Control group consisting of SHAM (Superficial Massage (SM)) combined with CSE, by three sessions per week for eight weeks. The participants of both groups were assessed with Short-Form McGill Pain Questionnaire (SF-MPQ) to measure pain severity, Oswestry Disability Index (ODI) for back disability, TiltMeter advance app for flexion and extension ROM, and EQ-5D-5L

for the QOL pre and post-intervention. All participants were blinded and knew nothing about whether they got into experimental or control groups.

**Results:** There was a significant improvement among both experimental and control groups at post-test ( $p=.00$ ) for all the following measures: - pain intensity, back disability, ROM, and QOL, moreover, statistical analysis revealed based on the effect size between groups at post-test, that the experimental group had a larger effect than the control group also at all four measures (Cohen's  $d > .97$ ).

**Conclusion:** The MR combined with CSE is considered effective with pain intensity, ROM, back disability, and QOL. Even when the Control group (CSE & SHAM) had also a significant improvement in the post-test, the experimental group (CSE & MR) had quite better-improved results with a large effect size for all four outcome measures. Finally, CSE combined with MR can be considered an effective therapy for CLBP.

**Keywords:** MyoFascial Release, Core Stability Exercises, Non-Specific Low Back Pain, Chronic Low Back Pain.



تأثير تقنية العلاج باسترخاء اللفافة العضلية وتمارين الثبات المركزي لعضلات الجذع على آلام الظهر

المزمنة لدى البالغين

الإعداد: الطيب محمد شحادة

إشراف: د. هديل حلاوة

ملخص الدراسة باللغة العربية:

**المقدمة:** يعدُّ العلاج بتقنية استرخاء اللفافة العضلية تدخلاً يقوم على استخدام الأيدي من المعالج على وجه الخصوص، حيث يبنى مبدؤه على شدِّ اللفافة المحيطة بالعضلات عن بعضها، كما و تعد تمارين ثبات الجذع المركزي تمارين تقوية عضلية لمنطقة الجذع السفلي، الذي ينحصر من آخر ضلع من أضلاع القفص الصدري لأعلى المؤخرة.

**الأهداف:** التحقق فيما ان كان أيُّ من العلاج بتقنية استرخاء اللفافة العضلية مقروناً بتمارين زيادة ثبات الجذع المركزي أو في المجموعة الأخرى تمارين الثبات مع المساج السطحي لوحدهما، له أفضلية في التأثير على مستوى الألم، والمدى الحركي للظهر، إعاقه الظهر، وأخيراً جودة الحياة.

**المنهج المتبع للدراسة:** دراسة محجوبٌ فيها المشاركون عن معرفة فيما اذا كان من المجموعة التجريبية حيث العلاج باسترخاء اللفافة العضلية أو اذا كان من المجموعة الأخرى، تحوي أربعاً وستين (64) مريضاً، اثنان وثلاثون (32) مريضاً لكل مجموعة، يقدم العلاج على ثلاث جلساتٍ أسبوعياً و لمدة ثمانٍ أسابيع، بواقع نصف ساعة لكل جلسة، وقد خضع جميع المشاركين لقراءتين سابقة ولاحقة للتدخلات العلاجية وهي الألم والمدى الحركي لانحناء الظهر للأمام والخلف وإعاقه الظهر وجودة الحياة بواسطة مقاييس معتمدة عالمياً و مترجمة للعربية وهي صالحة وموثوق بها كما أثبتت في دراساتٍ سابقة لكلٍ منها.

**نتائج الدراسة:** بعد انتهاء التدخلات المقدمة للمشاركين أظهرت القراءات اللاحقة والنتائج أنَّ كلا المجموعتين حصدتا تحسناً ملحوظاً لحالة المشاركين، حيث اشارت القراءات اللاحقة أن ( $P=.00$ ). كما وأظهرت النتائج أن هناك تقدماً معنوياً لصالح

المجموعة التجريبية، حيث كان حجم التأثير الذي يدرس قوة العلاقة كبيراً في القياسات الأربعة لصالح المجموعة التجريبية أكبر (Cohen's  $d > .97$ ).

**الإستنتاج:** العلاج بتقنية استرخاء اللفافة العضلية مقرونًا بتمارين ثبات الجذع، يعدُّ علاجاً فعالاً ويساهم في التحسّن بتقليل الألم وزيادة المدى الحركي لانحناء الظهر للأمام والخلف وتقليل إعاقة الظهر وتحسين جودة الحياة.

**الكلمات المفتاحية:** آلام أسفل الظهر غير محددة الأسباب، العلاج باسترخاء اللفافة العضلية، تمارين الثبات المركزي لعضلات الجذع، آلام مزمنة أسفل الظهر.

## Table of contents

|                                   |     |
|-----------------------------------|-----|
| Dedication .....                  | IV  |
| Declaration.....                  | I   |
| Acknowledgement .....             | II  |
| Abstract.....                     | III |
| ملخص الدراسة باللغة العربية:..... | V   |
| Table of contents .....           | VII |
| List of Figures.....              | XI  |
| List of Tables .....              | XII |
| List of Abbreviations .....       | XIV |
| List of Appendixes.....           | XV  |
| Chapter one: Introduction.....    | 1   |
| 1. 1 Background .....             | 2   |
| 1.2 Problem Statement .....       | 4   |
| 1.3 Study justification.....      | 4   |
| 1.4 Research Hypothesis.....      | 5   |
| 1.5 Research Aims.....            | 5   |
| 1.6 Research Questions.....       | 5   |

|                                                 |           |
|-------------------------------------------------|-----------|
| 1.7 Terminology .....                           | 6         |
| <b>Chapter 2: Literature Review .....</b>       | <b>7</b>  |
| 2.1 Theoretical studies .....                   | 8         |
| 2.1.1 Anatomy and physiology .....              | 8         |
| 2.1.2 Incidence and prevalence .....            | 9         |
| 2.1.3 Types of CLBP .....                       | 9         |
| 2.1.4 Physical Therapy role with LBP .....      | 10        |
| 2.1.5 Core Stability Exercises .....            | 10        |
| 2.1.6 MyoFascial Release.....                   | 11        |
| 2.2 Similar studies.....                        | 11        |
| <b>Chapter 3: Methods &amp; Procedures.....</b> | <b>14</b> |
| 3.1 Study design .....                          | 15        |
| 3.2 Study Setting .....                         | 15        |
| 3.3 Study sample .....                          | 15        |
| 3.3.1 Sampling methods.....                     | 15        |
| 3.3.2 Sample size .....                         | 15        |
| 3.3.3 Inclusion criteria.....                   | 16        |
| 3.3.4 Exclusion criteria.....                   | 16        |
| 3.4 Data collection.....                        | 16        |

|                                                                     |    |
|---------------------------------------------------------------------|----|
| 3.4.1 Tools of data collection.....                                 | 16 |
| 3.5 Study procedures .....                                          | 18 |
| 3.6 Suggested program .....                                         | 20 |
| 3.7 Statistical analysis.....                                       | 23 |
| 3.8 Ethical considerations .....                                    | 23 |
| Chapter 4: Result Presentation, Analysis & Discussion. ....         | 24 |
| 4.1 Results presentation and analysis .....                         | 25 |
| 4.1.1 Recruitment.....                                              | 25 |
| 4.1.2 Descriptive statistics of variables .....                     | 26 |
| 4.1.2.1 BMI of participants. ....                                   | 27 |
| 4.1.2.2 Profession categories of participants. ....                 | 28 |
| 4.1.2.3 Smoking Habits.....                                         | 28 |
| 4.1.2.4 Pain assessment measure .....                               | 29 |
| 4.1.2.5 Range of motion (ROM) measure .....                         | 31 |
| 4.1.2.6Back disability measure: .....                               | 31 |
| 4.1.2.7 Quality of Life measure.....                                | 34 |
| 4.1.3 Normality test for data .....                                 | 35 |
| 4.1.4 Inferential statistical analysis of the tested variables..... | 36 |
| 4.2 Discussion .....                                                | 41 |

|                                                            |    |
|------------------------------------------------------------|----|
| 4.3 Study Limitations .....                                | 44 |
| Chapter 5: Conclusion and recommendation .....             | 45 |
| 5.1 Conclusion .....                                       | 46 |
| 5.2 Recommendations.....                                   | 47 |
| References .....                                           | 48 |
| Data collection Tools and Questionnaire (Appendixes) ..... | 54 |

## List of Figures

|                                                                                              |    |
|----------------------------------------------------------------------------------------------|----|
| Figure 2.1 Core muscles deep & superficial (anterior & posterior view).....                  | 9  |
| Figure 4.1 Recruitment of participants' flow chart .....                                     | 25 |
| Figure 4.2 BMI of the Participants.....                                                      | 27 |
| Figure 4.3 Participants profession.....                                                      | 28 |
| Figure 4.4 Smoking habits.....                                                               | 29 |
| Figure 4.5 Max Flex and Ext mean values for both groups (pre & post) .....                   | 31 |
| Figure 4.6 VAS medians' values of McGill questionnaire (pre & post) for<br>both groups. .... | 36 |
| Figure 4.7 ODI total score median differences.....                                           | 39 |
| Figure 4.8 EQ5D5L median values for health of the day .....                                  | 40 |

## List of Tables

|                                                                                                              |    |
|--------------------------------------------------------------------------------------------------------------|----|
| Table 3.1 Experimental-group intervention program (week 1&2) .....                                           | 20 |
| Table 3.2 Experimental-group intervention program (week 3, 4 &5) .....                                       | 21 |
| Table 3.3 Experimental-group intervention program (week 6, 7 &8) .....                                       | 22 |
| Table 4.1 Demographic and clinical characteristics of the participants.....                                  | 26 |
| Table 4.2 Anthropometric characteristics of the participants.....                                            | 27 |
| Table 4.3 McGill Pain (types) Questionnaire. ....                                                            | 30 |
| Table 4.4 Frequency distribution of ODI categories for both groups.....                                      | 32 |
| Table 4.5 The EQ-5D-5L categories' frequency distribution for each<br>participant's QOL in both groups. .... | 34 |
| Table 4.6 The Results of Kolmogorov-Smirnov Normality Test for<br>outcome measures. ....                     | 35 |
| Table 4.7 VAS values of mean, SD, median and P-value for both groups<br>(pre & post).....                    | 36 |
| Table 4.8 Profession type & pain means and SD at pre and post-tests.....                                     | 37 |
| Table 4.9 Profession type & pain correlation.....                                                            | 37 |
| Table 4.10 Max flexion and extension values of mean, SD, and P-value for<br>both groups (pre & post) .....   | 38 |



|                                                                                |           |
|--------------------------------------------------------------------------------|-----------|
| <b>Table 4.11 ODI values mean, SD, median and P-value for both groups</b>      |           |
| <b>(pre &amp; post).....</b>                                                   | <b>39</b> |
| <b>Table 4.12 EQ.5D.5L scale of health for the day mean, SD, m difference,</b> |           |
| <b>median and P-value for both groups (pre &amp; post) .....</b>               | <b>40</b> |

## List of Abbreviations

| <b>Acronyms</b> | <b>Definition</b>                             |
|-----------------|-----------------------------------------------|
| <b>ASFMPQ</b>   | Arabic Short Form McGill Pain Questionnaire   |
| <b>BMI</b>      | Body Mass Index                               |
| <b>CLBP</b>     | Chronic Low Back Pain                         |
| <b>CSE</b>      | Core Stability Exercises                      |
| <b>EQ5D5L</b>   | Euroqol group's 5 domain 5level questionnaire |
| <b>GBD</b>      | Global Burden Diseases                        |
| <b>MR</b>       | Myofascial Release                            |
| <b>NSCLBP</b>   | Non-Specific Chronic Low Back Pain            |
| <b>NSLBP</b>    | Non-Specific Low Back Pain                    |
| <b>ODI</b>      | Oswestry Disability Index                     |
| <b>QOL</b>      | Quality Of Life                               |
| <b>RCT</b>      | Randomize Control Trial                       |
| <b>ROM</b>      | Range Of Motion                               |
| <b>SD</b>       | Stander Deviation                             |
| <b>SFMPQ</b>    | Short Form McGill Pain Questionnaire          |
| <b>SHAM</b>     | Superficial Massage                           |
| <b>SLBP</b>     | Specific Low Back Pain                        |
| <b>SM</b>       | Superficial Massage                           |
| <b>SPSS</b>     | Statistical Package for the Social Sciences   |
| <b>VAS</b>      | Visual Analog Scale                           |
| <b>WHO</b>      | World Health Organization                     |
| <b>YLDS</b>     | Years Lived With Disability                   |
| <b>Flex</b>     | Flexion                                       |
| <b>Ext</b>      | Extension                                     |

## List of Appendixes

|                                                                                    |    |
|------------------------------------------------------------------------------------|----|
| Appendix 1. Participants survey form .....                                         | 54 |
| Appendix 2. Arabic Short-Form McGill Pain Questionnaire (ASF-MPQ).....             | 56 |
| Appendix 3. TiltMeter-advance level and inclinometer app.....                      | 57 |
| Appendix 4. Arabic Oswestry Disability Index (AODI).....                           | 58 |
| Appendix 5. Arabic Euroqol group's 5-domain 5-level questionnaire (EQ-5D-5L) ..... | 61 |
| Appendix 6 Ethical Approval from Research Ethical Committee .....                  | 63 |

## **Chapter one: Introduction**

### **1.1 Background**

### **1.2 Problem statement**

### **1.3 Study Justification**

### **1.4 Research Hypothesis**

### **1.5 Research Aims**

### **1.6 Research questions**

### **1.7 Terminology**

## 1. 1 Background

Musculoskeletal disorders are common among adults, back problems might be the most prominent (Golob & Wipf, 2014). About 80% of any population could experience low back pain (LBP) once in their lifetime (Balasuburamaniam, 2013). Nowadays, there are several musculoskeletal back disorders known, but still, there are some more common than others, especially those caused by overuse, wrong daily positions, and other causes (Overaas et al., 2017). According to the World Health Organization Global Burden of Disease (WHO-GBD), “The most common reason of years lived with disability (YLDs) in the world was lower back pain, followed by neck pain and other musculoskeletal disorders” (Overaas et al., 2017).

Low back pain (LBP) is known as any kind of pain located in the back, between the rib cage and buttocks, with or without referring to lower limbs. There are two major types of LBP Specific Low Back Pain (SLBP) with a known reason for condition and Non Specific Low Back Pain (NSLBP) without recognizing the reason. One of the most common low back pain conditions is NSLBP (Chen et al., 2021), which was considered LBP pain without identifying the main cause of pain (Ozsoy et al., 2019). NSLBP indeed can limit the activity of daily living, and any kind of discomfort will affect the quality of our lives (Hasan et al., 2020). Low Back Pain could extend from a short acute phase to a long chronic phase (Overaas et al., 2017). A variety of causes may lead to CLBP, muscle malfunction or malposition in fascia structures could be the most(Ozsoy et al., 2019).

The layer that connects muscles is known as the fascia, meaning that as muscles expand, the fascia correspondingly expands. In contrast, the fascia will also get tight when the muscles get tight (Barnes & Barnes, 1997). Where the fascia covers all muscles and connects them all

over the body, there are some of them located posterior-inferiorly of the skull to the posterior portion of the foot, connecting the entire area in between plantar fascia, sacrolumbar fascia, and epicranial fascia all are forming the superficial back muscles line. On the other hand, there is also thoracolumbar fascia located in between the superficial and deep muscles. Deeply, there is a system formed by the deep muscles and fascia called the continuous musculofascial corset-like system (Ozsoy et al., 2019). If the fascia gets tight, several therapeutic methods physical therapists could use to treat the fascial structure such as massage, myofascial release, stretching, and other techniques.

Myofascial release (MR) is a technique that gives pressure to tight soft tissue by manipulation and stretching, which in turn leads to an increase in the extensibility of the tight fascia and muscular tissue and enhances the first release to be felt, moreover, after several repetitions in a new tissue barrier, the tissue will become more elastic and pliable. Consequently, the painful tissues will get released as nerves and vessels, and joints mobility will increase as well (Barnes & Barnes, 1997). In chronic low back pain, the MR technique has a significant positive effect on pain and disability (Arguisuelas et al., 2017b). In addition to MR, there are several other therapeutic techniques used to decrease LBP or improve mobility, such as exercises, electrotherapy, hydrotherapy, Core Stability Exercises (CSE), and others.

Evidence identified the exercises therapy as an effective treatment for CLBP; the CSE considered static, dynamic, and functional exercises for specific local trunk area that contributes to increased muscle strength, endurance, movement ability and capability, and neuromuscular coordination. Moreover, CSE appears to be more effective in decreasing pain and improving functional mobility among CLBP patients, compared with general exercises (Wang et al., 2012).

Although the effect of each therapeutic method of CSE and MR is known based on previous studies, few previous studies took both therapeutic methods when applied together or in comparison. To enrich our information, especially in Palestine where there is no mention of these therapeutic models, in this Randomize Control Trial study in the area, there will be a comparison between CSE and MR therapeutic interventions when MR is applied with CSE, and when CSE is applied with superficial massage to illustrate all possible effects, and that will be the aim of the current study.

## **1.2 Problem Statement**

There is a notable increase in LBP disorder among adults, which might be related to mal-positioning, poor postural alignments, careless attitude, or others. LBP whether it's in the acute or the chronic stage, if it's not a reason to stop doing work, it will at least lead to inaction in its performance, which in turn leads to the weakness of the individual output of the employee, and the completion of his tasks, as it will cause decline of the general output of the institution as a whole. Consequently, this problem could be serious, cost much, and affect the adults more, hardening the activity of daily living and as a result poor Quality Of Life (QOL).

## **1.3 Study justification**

Where there is a huge focus on LBP's widespread condition nearly all over the world, there is limited literature related to this serious condition in Palestine and Arabic society. This research will shed light on the problem of LBP that is widespread in Palestine, its causes and repercussions, and the consequent economic and social effects, then raise awareness of ways to

avoid it and the best methods of treating it. This study may provide a starting point for further studies on MR and CSE treatment methods in Palestine.

#### **1.4 Research Hypothesis**

- A combined treatment of MR and CSE is more effective than CSE alone on 1.Pain intensity, 2.Back disability, 3.Lumber Range Of Motion, 4.The quality of life among adult males with NSCLBP
- There is no significant difference between a combined treatment of MR and CSE and CSE alone on 1.Pain intensity, 2.Back disability, 3.Lumber Range of Motion, 4.the quality of life among adult males with NSCLBP.

#### **1.5 Research Aims**

- To investigate the effectiveness of a combined treatment of MR and CSE compared with CSE alone on 1.Pain intensity, 2.Back disability, 3.Lumber Range of Motion, 4.The quality of life among adult males with NSCLBP.

#### **1.6 Research Questions**

- Is a combined treatment of MR and CSE more effective than CSE alone on pain intensity among adult males with NSLBP?
- Is a combined treatment of MR and CSE more effective than CSE alone on back disability?
- Is a combined treatment of MR and CSE more effective than CSE alone on lumber ROM?
- Is a combined treatment of MR and CSE more effective than CSE alone in the QOL?



## 1.7 Terminology

**Effleurage** is a relaxing massage method that increases blood and lymph flow, and it is considered a preparing massage technique for other vigorous massage techniques (Cartlidge, 2014).

**The MR** is applied continually and slowly to the restricted area by direct or indirect techniques, the direct method works directly on restricted fascia by putting more weight than the indirect way, which uses less pressure on the restricted fascia. Elbows, hands, or other tools could use to give the slow pressure on adhesion fascia, the stretch by the therapist directed toward the restricted area (Ajimsha et al., 2014; Barnes & Barnes, 1997; Chen et al., 2021).

**CSE** types of strengthening exercises for the lower trunk muscles from both sides, anteriorly and posteriorly, which contain beginner, intermediate and advanced ones (Ozsoy et al., 2019).

**The cross-handed MR method** performed by both hands of the therapist gives gentle pressure on the superior and inferior in the cross direction of the affected area, stretching the tissue, and holding for up to 90 sec, then moving to the near area and so on (Ajimsha et al., 2014; Barnes & Barnes, 1997; Chen et al., 2021).

## **Chapter 2: Literature Review**

### **2.1 Theoretical studies**

### **2.2 Similar studies**

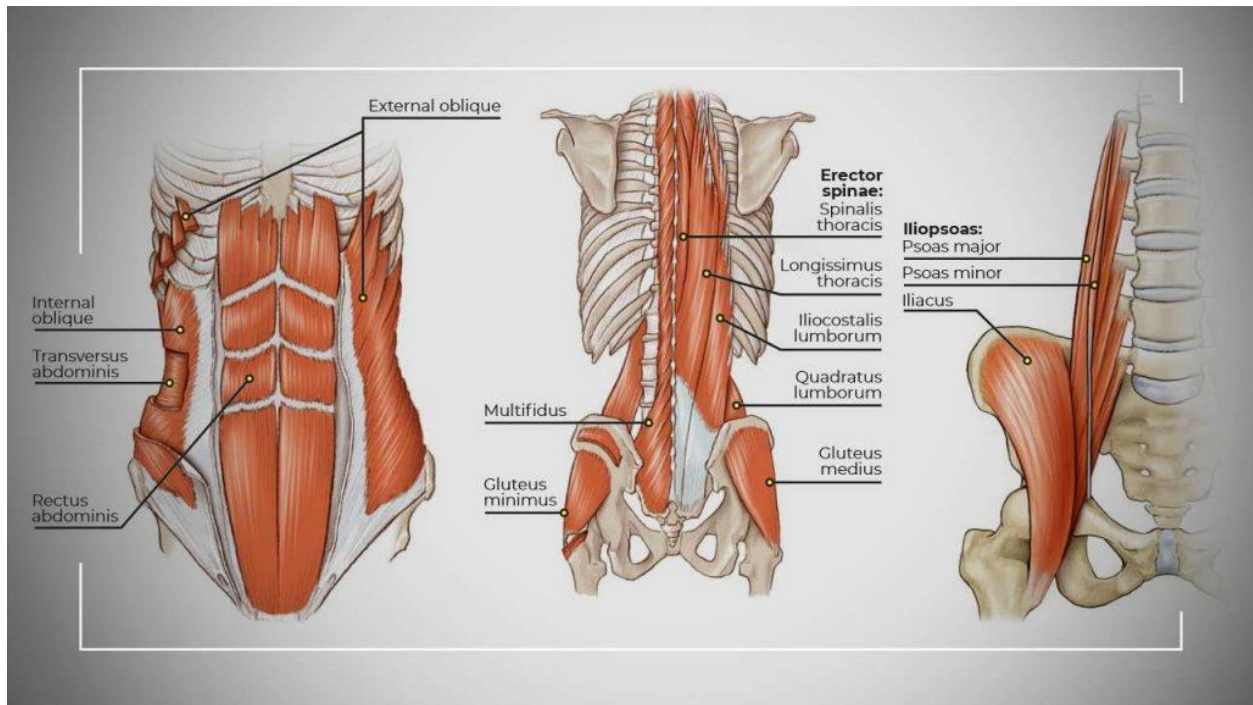
## **2.1 Theoretical studies**

### **2.1.1 Anatomy and physiology**

The back vertebrae were divided into four groups: cervical, thoracic, lumbar, and sacrum. The lumbar vertebrae consist of five vertebrae L1-15, with no bony stabilizers like ribs in thoracic vertebrae, which give it more movement ability in flexion, extension, lateral bending, and rotation (Sharafudeen, 2018; Vos et al., 2017; Wang et al., 2012; Wood, n.d.).

The core muscles are primarily responsible for lumbar vertebral stability and spinal stability in general (Aluko et al., 2013). Those muscles are divided into two groups, based on function and feature: the first group is deep localized primary stabilizing muscles, which includes the transverse abdominis and internal oblique anteriorly, quadratus lumborum, and lumbar multifidus posteriorly (Chang et al., 2015a; Peng & Lin, 2012). multifidus gives a direct connection between vertebrae; also it works functionally with transverse abdominis in a mechanism called co-contraction mechanism, the contraction of those gives vertebral segments stability to stay in anatomical position (Aluko et al., 2013; Chang et al., 2015a; Wong et al., 2013).

The other core muscles group called general superficial or shallow stabilizing muscles, contains internal and external oblique muscles, erector spinae, rectus abdominis, quadratus lumborum, and hip muscles. It is called general or global because it is not attached directly to vertebrae or spine, but attached from the ribs to the hip (Chang et al., 2015a). The lack of functioning of these muscles could lead to several issues including lack of vertebral stability, intervertebral disk, and lumbar region stress (Huxel Bliven & Anderson, 2013).



**Figure 2.1 Core muscles deep & superficial (anterior & posterior view)**(*What Are Core Muscles and How to Strengthen Them | Fitpage, n.d.*).

### 2.1.2 Incidence and prevalence

LBP is identified as one of the two highest causes of disability worldwide(Vos et al., 2017; Wang et al., 2012; Wood, n.d.). However, there are no precise reports about chronic lower back pain prevalence in Palestine.

### 2.1.3 Types of CLBP

Back disorders are various, for example, muscle spasms, vertebral instability, and back pain that could progress to chronic conditions such as Chronic Low Back Pain. LBP is divided into chronic or acute conditions: the acute phase starts from the first day up to three months, and then the chronic phase begins (Sharafudeen, 2018).

There are several therapeutic approaches as medical, pharmacological, or physical interventions for releasing the effect of LBP whether it is acute or chronic (Ozsoy et al., 2019). Physical interventions are diverse, such as manual therapy, physical modalities, exercises, and other physical therapy techniques (Jorgensen et al., 2018; Maher et al., 2017; O'Connell et al., 2016; Wood, n.d.).

#### **2.1.4 Physical Therapy role with LBP**

The more knowledge gained from the previous studies, data, and evidence-based about the physiotherapy effect on CLBP was a powerful tool that indeed would affect the therapist's interventional results on the patient's medical condition (Kim et al., 2018; Nascimento et al., 2019; Ozsoy et al., 2019; Reid et al., 2005). The varieties of physiotherapy methods like manual therapy or modalities, are giving varied results on different back disorders. The physical therapy interventions with LBP were confirmed to have positive effects on pain, activity of daily life, and quality of life (Gardner et al., 2017).

#### **2.1.5 Core Stability Exercises**

When the lack of functioning of core muscles leads to a lack of vertebral stability, intervertebral disk, and lumbar region stress, the strengthening of core muscles will affect exactly the opposite (Huxel Bliven & Anderson, 2013). CSE is differentiated from beginner exercises to intermediate to advanced ones (Ozsoy et al., 2019). CSE is strengthening exercises that work on specific muscles (core muscles) by regime fortifying all those muscle fibers (Hasan et al., 2020). A similar study indicated that precise exercises for core muscles are better with specific lower back than general exercises (Hasan et al., 2020).

### **2.1.6 Myofascial Release**

Evidence suggests specific methods that separate the adhesion and fibers to release them as MR (Barnes & Barnes, 1997), and it demonstrated that MR could be better than any SHAM treatment or no treatment for low back pain (Sharafudeen, 2018). Other evidence considered the MR an adjuvant therapy when apply it with conventional therapy, but still, whether it is an assisted treatment or better than no treatment, it was found to be effective for LBP release. This technique consists of slow and long-duration holding and stretching of a particular tissue, that was all it takes to release the adhesion of those fibers and its fascia (Wood, n.d.).

## **2.2 Similar studies**

Evidence that studied the effect of MR has found it effective with adhesive tissue, whether it was associated with low back pain or other musculoskeletal disorders. Several interventional and RCT studies discuss the MR technique and the good final result of it, especially with non-specific chronic low back pain, and it better results when it was related to CSE or other manual therapy like cupping or roll massage, with pain severity, fear avoidance, back mobility, disability, and quality of life, even more with other conditions (Ajimsha et al., 2014; Arguisuelas et al., 2017b; Hasan et al., 2020; Ozsoy et al., 2019; Rodríguez-Fuentes et al., 2016; Sığlan & Çolak, 2022; Tamartash et al., 2022).

Several related studies including experimental and RCT, have considered the effects of CSE compared with general exercises on chronic low back pain, and the results demonstrated that CSE is more effective than general exercises. On the other hand, the CSE in contrast with

MR in the treatment of NSCLBP, the CSE is better when used with MR not by itself, but still it's used with core muscles more effectively than general exercises (Aluko et al., 2013; Ekstrom et al., 2007; Hodges, 2003; Huxel Bliven & Anderson, 2013; Jorgensen et al., 2018; Wong et al., 2013).

A previous study was conducted in Turkey back in 2019, by Ozsoy and his colleagues investigated the differences between CSE and CSE combined with MR in addition to roller massager, with a total of 45 participants divided into two interventional groups, with three sessions of intervention per week up to 6 weeks, several variables such as pain, lower body flexibility, core stability endurance, kinesiophobia, and others, were checked in pre and post-testing measures. After all, it was found that just core stability endurance and spinal mobility had a better improvement in the MR+CSE group (both  $p < .05$ ). In other words, the researchers of this study had found MR+CSE combined with Roller Massager a better treatment for NSCLBP (Ozsoy et al., 2019).

Furthermore, several systematic reviews and meta-analyses studied the MR and CSE in treating the NSCLBP. It is now well-established from a variety of studies that MR is considered a successful treatment of CLBP that decreases pain severity and improves the quality of life (Ajimsha et al., 2015; Jorgensen et al., 2018; López-Torres et al., 2021; Sharafudeen, 2018; Wong et al., 2013; Wu et al., 2021). For example, a systematic review conducted by Chen and his partners (2021) investigated the MR differential impact on pain intensity, lumbar ROM, back disability, and QOL among patients with LBP by a meta-analytic review. The articles of this study were collected from PubMed, Scopus, Web of Science, Wanfang, and China National Knowledge Infrastructure. The researchers found that the MR intervention comparison with

other controlled interventions had a significant improvement effect on back disability ( $p < .05$ ). In conclusion, MR can promote the effect of exercises or general physiotherapy (Chen et al., 2021).

Lastly, our study will offer a new evidence for LBP and the interventions of releasing it by CSE and MR in Palestine, and it follows the similar pattern of interventions as some previous studies.



## **Chapter 3: Methods & Procedures**

### **3.1 Study design**

### **3.2 Study Setting**

### **3.3 Study sample**

### **3.4 Data collection**

### **3.5 Study procedures**

### **3.6 Suggested program**

### **3.7 Statistical analysis**

### **3.8 Ethical considerations**

### **3.1 Study design**

An experimental randomized single blinded controlled trial (RCT) design was used to compare the interventions' results on lumbar ROM, back disability, pain intensity, and QOL life among NSCLBP patients.

### **3.2 Study Setting**

The study was conducted in Moath private physiotherapy center which located in Tulkarm from March 2023, until August 2023, with participants from different cities in the West-Bank / Palestine including Tulkarm, Nablus, Jenin, etc..., who agreed to participate in the study.

### **3.3 Study sample**

#### **3.3.1 Sampling methods**

At baseline, a convenient sample of 67 NSCLBP male patients age 20-45 years old were recruited in this study. Then a systematic sample was used for distributing the participants randomly into the experimental and control groups, participants with odd numbers were assigned to the control group (n=32), and participants with even numbers allocated to the experiment group (n=32).

#### **3.3.2 Sample size**

A total of 67 NSCLBP male patients, age 20-45 years old were recruited in this study, the number is expected to be adequate to achieve the study objectives.

### **3.3.3 Inclusion criteria**

- Males.
- 20-45 years old.
- Participants with Chronic Low Back Pain.
- Non-Specific Low Back Pain.
- Approved informed consent.

### **3.3.4 Exclusion criteria**

- Having severe cardiac or respiratory diseases that could not allow the patient from continuing the session.
- Acute Low Back Pain.
- Age 19 or below and above age 45.
- Having pain killers during all intervention period.
- If the participant have referral pain to lower limbs.

## **3.4 Data collection**

### **3.4.1 Tools of data collection**

At baseline, the therapist conducted an initial assessment for the participants and identified if there's acute or chronic LBP. However, to verify if there were known causes of LBP or not (Specific\Non-Specific LBP), clinical assessment, specific and relevant physical examinations all were applied to participants (Bickley & Szilagyi, 2012). And a specified history also was taken from the participants as revealed on Appendix 1(Participants survey form).

**Pain assessment measures:**

For measuring pain intensity, quality, duration---etc. The Arabic Short-Form McGill Pain Questionnaire (SF-MPQ) outcome measure was used (Appendix 2), which is considered valid and reliable measure (Terkawi et al., 2017). The SF-MPQ consists of 3 sections the first one is a checklist containing 15 items with two dimensions describing the pain experience, the sensory dimension which is from 1-11 items, and the affective dimension which from 12-15 items, the second section is visual analog scale (VAS) like question, the third section is present pain intensity index which distributed from 1= no pain up to 6= excruciating pain(Melzack, 1987). Also, as advocated by Terkawi et al. the participants described “whether their pain was brief, intermittent, or continuous”, higher score indicates higher severity of pain.

**Range of motion (ROM) measure:**

For ROM as displayed on (Appendix 3) the lumbar ROM was measured by TiltMeter-advance level and inclinometer app. The participant was asked to relax and in a standing position, which the iPhone placed at T<sub>12</sub>-L<sub>1</sub>, then the participant was asked to perform maximum flexion and extension bending. The second position of the iPhone was stabilized at S<sub>1</sub>-S<sub>2</sub>, the participant was also asked to do the same as before, the value of degrees on S<sub>1</sub>-S<sub>2</sub> position was subtracted from the T<sub>12</sub>-L<sub>1</sub> value (Pourahmadi et al., 2016).

**Back disability measure**

Back disability was measured by Arabic Oswestry Disability Index (ODI) (Appendix 4), which contains 10 sections including:- pain intensity, self-caring, lifting, walking, sitting,

standing, sleeping, traveling, sexual and social lives, each one contains 5 answers' options, except the sexual life section it had 6 options, all demonstrate the effectiveness of pain on these activities (Algarni et al., 2014).

### **Quality Of Life measure**

The Quality Of Life was measured by the Arabic Euroqol group's 5-domain 5-level questionnaire (EQ-5D-5L) as demonstrated in (

Appendix 5) which was considered a valid and reliable measure (Aburuz et al.). EQ-5D-5L contains five dimensions: - mobility, self-care, usual activities, pain or discomfort, and anxiety or depression, with five items to answer the problem or type of pain being found. Several prior studies used EQ-5D-5L, as it was considered a convenient scale to measure the QOL improvement (Chen et al., 2021; Halaweh et al., 2015; Kamstra et al., 2022; Verbunt et al., 2001).

### **3.5 Study procedures**

We conducted our study in 8 weeks duration with pre and post-test procedures; the first session of each participant was for familiarization, the researcher clearly explained the methods of the interventions, pre-testing, physical examination, and history taking. All participants were blinded and knew nothing about whether they got into experimental or control groups.

For both groups, the researcher applied the intervention in 3 sessions per week, a 30-minute session, and for 8 weeks of intervention, by the completion of the intervention program of each participant, the post-test was performed.

### **Experimental group (MR+CSE)**

- ✓ The intervention program consisted of a cross-handed MR method and CSE, the MR approach of submission based on previous studies (Barnes & Barnes, 1997). Likewise, the CSE sequence (beginner, intermediate, advance) was relied on the previously mentioned arrangement in similar studies (Ozsoy et al., 2019).
- ✓ The MR technique applied within the first 12-18 min of the session, the timing of the intervention was based on the progression of the interference program phase with the cross-handed method for the adhesive tissue.
- ✓ The next 12-18 min of the session was with CSE, the timing of the exercises' intervention was also based on their progression phase (beginner, intermediate, and advance).
- ✓ The sequence of phases was divided as follows: - at the first 2 weeks, the sessions were started with beginner section of exercise program, followed by the intermediate up to the 5<sup>th</sup> week, at the last 3 weeks, the advance exercises were performed by the participant until the end of 8<sup>th</sup> week of intervention, which it also was applied the same to the control group, all demonstrated in (Table 3.1, Table 3.2, Table 3.3).

### **Control group (CSE & SHAM (Superficial Massage))**

- ✓ The control group therapeutic program was began and lasted for around 8 weeks of CSE exactly the way it was applied to experimental group participants combined with SHAM (superficial massage(SM)) therapy.

- ✓ The first 12-18 min of the session was consumed with the SHAM intervention (SM) in this case, with just simple effleurage technique.
- ✓ The next 12-18 min of the session were used the same exercises with the exact same repetition in the experimental group.

### 3.6 Suggested program

**The Experimental-group** intervention program was demonstrated in the tables below (Table 3.1, Table 3.2, Table 3.3)

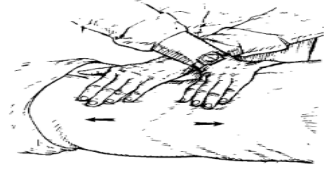
**The Control-group** received the same exercises that were used with the experimental-group participants, as illustrated in tables below (Table 3.1, Table 3.2, Table 3.3) but without applying the MR techniques.

**Table 3.1 Experimental-group intervention program (week 1&2)** (Barnes & Barnes, 1997; Ozsoy et al., 2019).

| Method | Type            | Name                                                       | Duration                                                      | Rest          | The Exercise                                                                                                                      |
|--------|-----------------|------------------------------------------------------------|---------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------|
| MR     | <b>Beginner</b> | <b>Cross-handed</b>                                        | <b>90 sec</b><br><b>3 repetition</b><br><b>2 rounds</b>       | <b>30 sec</b> | <br>Cross-hand release to the lumbar region. |
| CSE    | <b>Beginner</b> | <b>supine hook</b>                                         | <b>5 sec hold</b><br><b>12 repetitions</b><br><b>3 rounds</b> | <b>1 min</b>  |                                              |
| CSE    | <b>Beginner</b> | <b>Crawling-position</b><br>with upper and lower extremity | <b>5 sec hold</b><br><b>12 repetitions</b><br><b>3 rounds</b> | <b>1 min</b>  |                                              |

|     |                 |                      |                                            |       |                                                                                     |
|-----|-----------------|----------------------|--------------------------------------------|-------|-------------------------------------------------------------------------------------|
| CSE | <b>Beginner</b> | <b>supine bridge</b> | 5 sec hold<br>12 repetitions<br>2-3 rounds | 1 min |  |
|-----|-----------------|----------------------|--------------------------------------------|-------|-------------------------------------------------------------------------------------|

**Table 3.2 Experimental-group intervention program (week 3, 4 &5) (Barnes & Barnes, 1997; Ozsoy et al., 2019).**

| Method | Type                | Name                | Duration                                 | Rest   | The Exercise                                                                                                                    |
|--------|---------------------|---------------------|------------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------|
| MR     | <b>Intermediate</b> | <b>Cross-Handed</b> | 90 sec<br>4 repetition<br>2 rounds       | 30 sec | <br>Cross-hand release to the lumbar region. |
| CSE    | <b>Intermediate</b> | <b>Blank</b>        | 40 sec hold<br>2 repetitions<br>2 rounds | 30 sec |                                              |
| CSE    | <b>Intermediate</b> | <b>Side blank</b>   | 40 sec hold<br>2 repetitions<br>2 rounds | 30 sec |                                             |
| CSE    | <b>Intermediate</b> | <b>Curl up</b>      | 5 sec hold<br>12 repetitions<br>3 rounds | 30 sec |                                            |



**Table 3.3 Experimental-group intervention program (week 6, 7 &8) (Barnes & Barnes, 1997; Ozsoy et al., 2019).**

| Method | Type           | Name                                                                                                     | Duration                                                      | Rest          | The Exercise                                                                                                                        |
|--------|----------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------|
| MR     | <b>Advance</b> | <b>Cross-Handed</b>                                                                                      | <b>90 sec</b><br><b>5 repetition</b><br><b>2 rounds</b>       | <b>15 sec</b> |  <p>Cross-hand release to the lumbar region.</p> |
| CSE    | <b>Advance</b> | <b>Standing\</b><br><b>sitting on Swiss</b><br><b>ball</b><br>(with\without<br>upper limbs<br>elevation) | <b>6 sec hold</b><br><b>12 repetitions</b><br><b>3 rounds</b> | <b>15 sec</b> |                                                 |
| CSE    | <b>Advance</b> | <b>supine bridge</b><br>(lower limbs<br>extended on<br>Swiss ball)                                       | <b>6 sec hold</b><br><b>12 repetitions</b><br><b>3 rounds</b> | <b>15 sec</b> |                                                |
| CSE    | <b>Advance</b> | <b>sitting on Swiss</b><br><b>ball</b><br>(with one knee<br>extension)                                   | <b>6 sec hold</b><br><b>12 repetitions</b><br><b>3 rounds</b> | <b>15 sec</b> |                                                |

### **3.7 Statistical analysis**

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) package, version 23 (SPSS Inc. ‘Chicago ‘IL). Data was analyzed using descriptive statistics and inferential statistics using means and medians. Descriptive statistics were performed to characterize the sample. Parametric (T-tests) and nonparametric tests (Mann-Whitney) were used to measure the difference between groups and between pre and post-tests in inferential statistics. Pearson’s correlation coefficients were used to determine association between the scales’ study variables. Cohen’s d values were calculated to determine the effect size. Statistical significance was set at  $P < 0.05$ .

### **3.8 Ethical considerations**

Ethical approval was obtained from the Research Ethical Committee at Al-Quds University (Appendix 6) and from the participating physiotherapy centers in the study. The participants were informed about the study objectives and procedures, and the data was processed confidentially, participants had their right to refuse or to withdraw from the study at any time without any restrictions. A written consent form signed by the participants was obtained.

## **Chapter 4: Result Presentation, Analysis & Discussion.**

### **4.1 Results presentation and analysis**

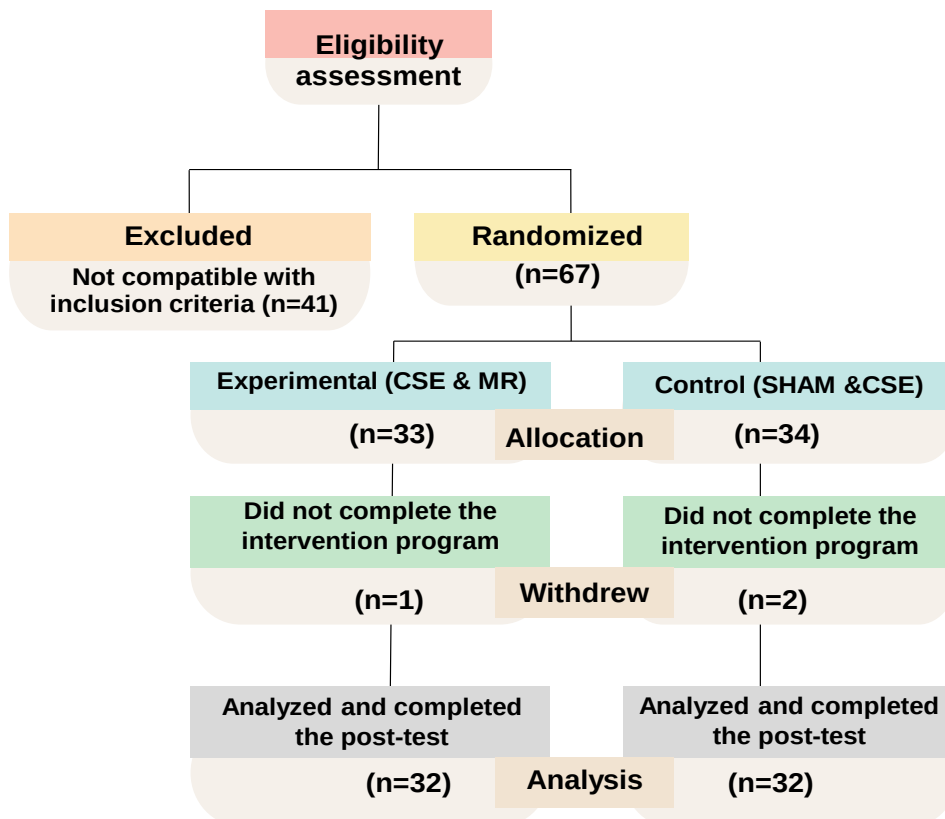
### **4.2 Results Discussion**

### **4.3 Study Limitations**

## 4.1 Results presentation and analysis

### 4.1.1 Recruitment

As shown in (Figure 4.1), out of 108 patients assessed at baseline, 41 patients were excluded because they were incompatible with the inclusion criteria. Sixty-seven participants (n=67) were randomized into two groups (the control group, n=34; the experimental group, n=33). Two participants in the control group and one participant in the experimental group dropped out. Finally, the study was completed with 32 patients in the control group and 32 patients in the experimental group.



#### Figure 4.1 Recruitment of participants' flow chart

#### 4.1.2 Descriptive statistics of variables

Table 4.1 represents an overview of frequencies and percentages of demographic and clinical variables such as (profession, address, marital status, chronic diseases, previous surgical procedures, smoking habits, and others). The majority of participants in both groups were from the North West Bank with a proportion of 62.5%. Almost half of the participants (51.2%) in both groups their occupations were manual work and office work respectively. Most of the participants (96.9 %) were free from chronic diseases.

**Table 4.1 Demographic and clinical characteristics of the participants**

| Factors / variables          | Categories      | Experimental group<br>(CSE & MR) (N=32) |           | Control group<br>(CSE & SHAM) (N=32) |           |
|------------------------------|-----------------|-----------------------------------------|-----------|--------------------------------------|-----------|
|                              |                 | Frequency                               | Percent % | Frequency                            | Percent % |
| Address                      | North West-Bank | 22                                      | 68.75     | 18                                   | 56.25     |
|                              | South West-Bank | 0                                       | 0         | 1                                    | 3.1       |
|                              | The Green line  | 10                                      | 31.25     | 13                                   | 40.62     |
| Marital status               | Married         | 25                                      | 78        | 19                                   | 59        |
|                              | Widow           | 0                                       | 0         | 1                                    | 3         |
|                              | Single          | 7                                       | 22        | 12                                   | 38        |
| Profession                   | Manual work     | 10                                      | 31.3      | 10                                   | 31.3      |
|                              | Driver          | 3                                       | 9.4       | 4                                    | 12.5      |
|                              | Office work     | 11                                      | 34.4      | 9                                    | 28.1      |
|                              | Medical field   | 7                                       | 21.9      | 6                                    | 18.8      |
|                              | Sport field     | 1                                       | 3.1       | 3                                    | 9.4       |
| Chronic disease              | Yes             | 1                                       | 3.1       | 1                                    | 3.1       |
|                              | No              | 31                                      | 96.9      | 31                                   | 96.9      |
| Previous surgical procedures | Yes             | 0                                       | 0         | 0                                    | 0         |
|                              | No              | 32                                      | 100       | 32                                   | 100       |
| Smoking habits               | Smoker          | 13                                      | 40.6      | 9                                    | 28.1      |
|                              | Non-smoker      | 18                                      | 56.3      | 23                                   | 71.9      |
|                              | Former smoker   | 1                                       | 3.1       | 0                                    | 0.0       |

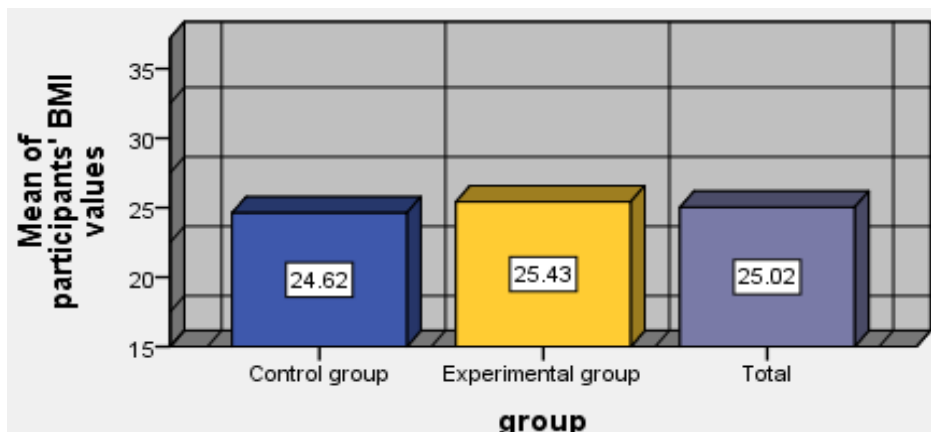
Table 4.2 provides a summary statistics for variables related to age, weight, height, BMI, and waist circumference. The age of the participants ranged between 21-45 years, our results indicated that there were no significant mean difference between the control and experimental groups for age and all other variables ( $p>0.05$ ).

**Table 4.2 Anthropometric characteristics of the participants.**

| Anthropometric variables | Experimental group<br>(CSE & MR) (N=32) | Control group<br>(CSE & SHAM) (N=32) |
|--------------------------|-----------------------------------------|--------------------------------------|
|                          | Mean $\pm$ Std. Deviation               | Mean $\pm$ Std. Deviation            |
| Age (No. of years)       | 30.81 $\pm$ 7.004                       | 31.25 $\pm$ 6.623                    |
| Weight (kilos)           | 79.84 $\pm$ 7.825                       | 78.87 $\pm$ 8.537                    |
| Height (meter)           | 1.77 $\pm$ .0649                        | 1.78 $\pm$ .0683                     |
| Body Mass Index (BMI)    | 25.42 $\pm$ 1.626                       | 24.62 $\pm$ 1.728                    |
| Waist circumference (cm) | 92.03 $\pm$ 4.842                       | 89.96 $\pm$ 5.538                    |

#### 4.1.2.1 BMI of participants.

Figure 4.2 depicts the experimental group reported a slight increase in the mean BMI values more than the control group, without a significant difference between groups ( $p>0.05$ ). Moreover, the BMI values in both groups ranged from 18 to 28, which were considered a normal to overweight range.



**Figure 4.2 BMI of the Participants**

#### 4.1.2.2 Profession categories of participants.

In (Figure 4.3) the majority of participants occupations were manual and office work in the control and experimental groups, respectively (59.4% and 65.3%) (For example: builder, farmer, accountant, banker...etc.).

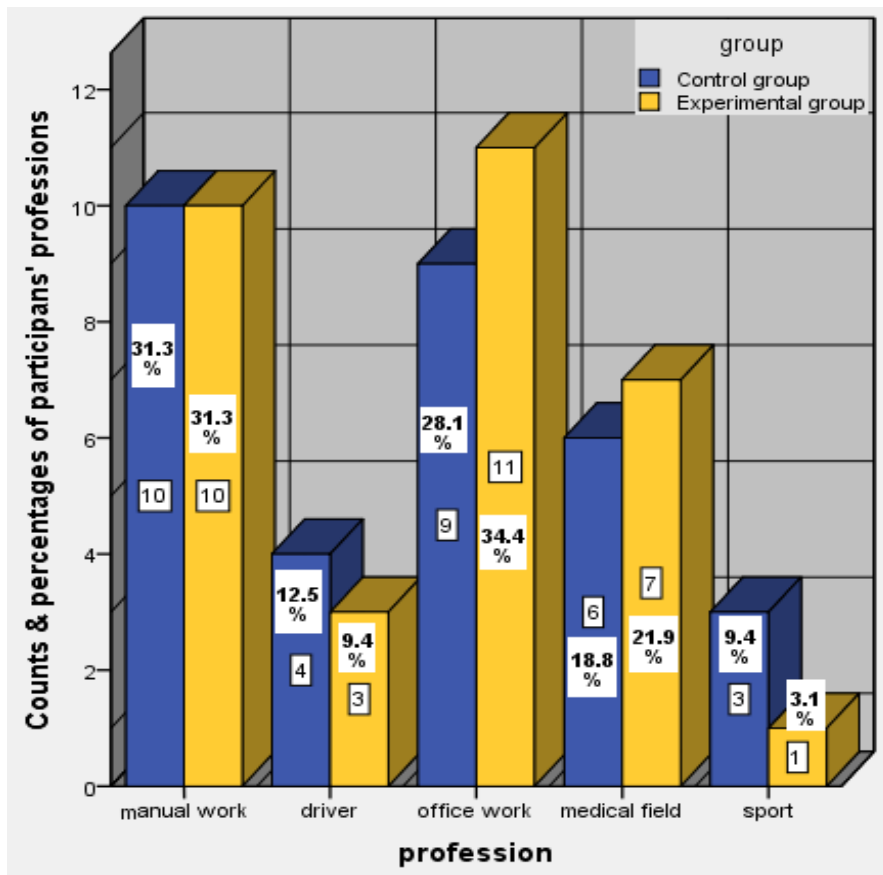
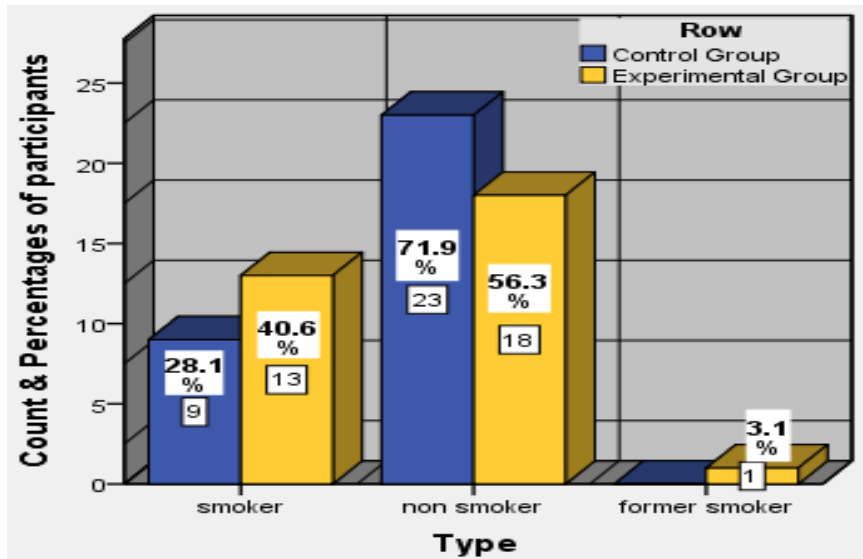


Figure 4.3 Participants profession

#### 4.1.2.3 Smoking Habits

As illustrated in (Figure 4.4), the majority of the participants from both groups were non-smokers, with about (64%) of all (64) participants.



**Figure 4.4 Smoking habits.**

#### **4.1.2.4 Pain assessment measure**

Table 4.3 shows that the participants were varied in their sense of pain types. On the other hand, some participants have different manifestations of pain. The improvements in both groups, sharp and hot-burning pain feelings from the experimental group have a noticeable decrease within participants who have severe intensities. Moreover, on hot-burning pain and other types of pain within the control group, the drop of participants was only within the moderate pain feeling.

For instance, the stabbing pain in the Control group of fourteen participants was suffering a moderate level of pain pre-intervention, while post-intervention the number of suffered participants dropped to one as highlighted in the table below. On the other hand, in the Experimental group, the effect of the intervention on participants was clear especially on severe levels of sharp and hot-burning pain types, which dropped from eight and nine, respectively to zero for both pain types.



**Table 4.3 McGill Pain (types) Questionnaire.**

| Type of Pain    |      | Control group (CSE & SHAM) (N=32) |      |          |        | Experimental group (MR&CSE) (N=32) |      |          |        |
|-----------------|------|-----------------------------------|------|----------|--------|------------------------------------|------|----------|--------|
|                 |      | None                              | Mild | moderate | severe | None                               | Mild | moderate | severe |
| Throbbing       | Pre  | 23                                | 3    | 0        | 6      | 21                                 | 6    | 3        | 2      |
|                 | Post | 27                                | 2    | 2        | 1      | 32                                 | 0    | 0        | 0      |
| Shooting        | Pre  | 15                                | 12   | 4        | 1      | 17                                 | 11   | 4        | 0      |
|                 | Post | 25                                | 7    | 0        | 0      | 32                                 | 0    | 0        | 0      |
| Stabbing        | Pre  | 7                                 | 7    | 14       | 4      | 10                                 | 6    | 11       | 5      |
|                 | Post | 22                                | 8    | 1        | 1      | 27                                 | 5    | 0        | 0      |
| Sharp           | Pre  | 10                                | 10   | 7        | 5      | 11                                 | 8    | 4        | 8      |
|                 | Post | 24                                | 7    | 1        | 0      | 28                                 | 3    | 1        | 0      |
| Cramping        | Pre  | 22                                | 4    | 4        | 2      | 19                                 | 7    | 4        | 2      |
|                 | Post | 26                                | 5    | 1        | 0      | 32                                 | 0    | 0        | 0      |
| Gnawing         | Pre  | 17                                | 12   | 3        | 0      | 15                                 | 14   | 1        | 2      |
|                 | Post | 25                                | 6    | 1        | 0      | 29                                 | 3    | 0        | 0      |
| Hot burning     | Pre  | 10                                | 7    | 12       | 3      | 11                                 | 3    | 9        | 9      |
|                 | Post | 17                                | 13   | 2        | 0      | 26                                 | 5    | 1        | 0      |
| Aching          | Pre  | 14                                | 8    | 8        | 2      | 13                                 | 5    | 8        | 6      |
|                 | Post | 20                                | 8    | 4        | 0      | 26                                 | 5    | 1        | 0      |
| Heavy           | Pre  | 14                                | 9    | 7        | 2      | 14                                 | 10   | 4        | 4      |
|                 | Post | 24                                | 7    | 1        | 0      | 24                                 | 8    | 0        | 0      |
| Tender          | Pre  | 23                                | 5    | 3        | 1      | 21                                 | 7    | 2        | 1      |
|                 | Post | 27                                | 5    | 0        | 0      | 31                                 | 1    | 0        | 0      |
| Splitting       | Pre  | 23                                | 7    | 1        | 1      | 24                                 | 4    | 3        | 1      |
|                 | Post | 29                                | 3    | 0        | 0      | 32                                 | 0    | 0        | 0      |
| Exhausting      | Pre  | 20                                | 5    | 6        | 1      | 24                                 | 2    | 3        | 3      |
|                 | Post | 25                                | 5    | 2        | 0      | 31                                 | 1    | 0        | 0      |
| Sickening       | Pre  | 20                                | 10   | 2        | 0      | 21                                 | 4    | 7        | 0      |
|                 | Post | 25                                | 7    | 0        | 0      | 29                                 | 3    | 0        | 0      |
| Fearful         | Pre  | 18                                | 4    | 8        | 2      | 12                                 | 12   | 6        | 2      |
|                 | Post | 24                                | 8    | 0        | 0      | 28                                 | 3    | 1        | 0      |
| Punishing cruel | Pre  | 23                                | 7    | 2        | 0      | 20                                 | 9    | 3        | 0      |
|                 | Post | 30                                | 1    | 1        | 0      | 30                                 | 2    | 0        | 0      |

#### 4.1.2.5 Range of motion (ROM) measure

Figure 4.5 shows the baseline and outcome of intervention on the range of motion (ROM) in both groups. It is worth noting that there were much higher ROM scores in flexion and extension within the Experimental group participants at post-test separately (difference 29.75 and 14.12), in contrast with Control group post-test measurements. However, the Control group showed a mild improvement in the mean by about 20.03 score at flexion movement, while in extension, approximately seven score difference was in the same group.

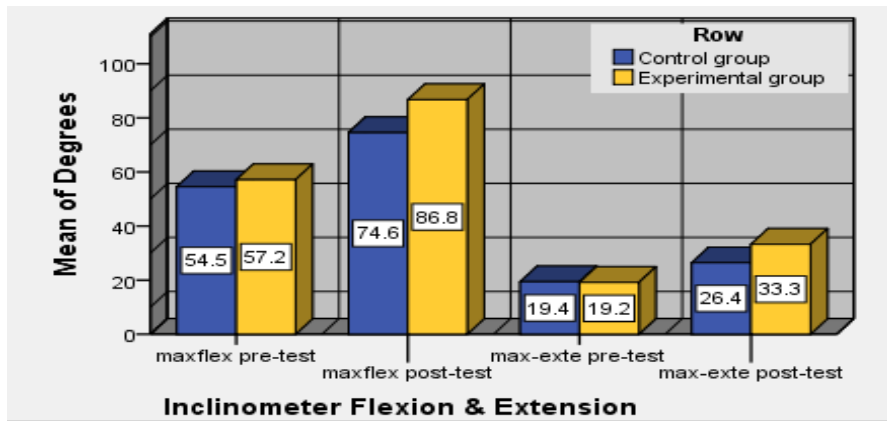


Figure 4.5 Max Flex and Ext mean values for both groups (pre & post)

#### 4.1.2.6 Back disability measure:

The figures in Table 4.4 demonstrate the remarkable increase in the participant's number who became within the normal state at the post-test values, especially for the Experimental group and nearly for all sections in the Oswestry Disability Index ODI (Table 4.4). According to homemaking section the results showed that the number of participants with nearly normal ability increases from 9 participants to 31. Nevertheless, for the Control group in the same section, the number of participants differed only by three participants pre and post-test measurement.

**Table 4.4 A. Frequency distribution of ODI categories for both groups.**

| Section               | Categories                                                                                                       | Control group (CSE & SHAM) (N=32) |      | Experimental group (CSE & MR) (N=32) |      |
|-----------------------|------------------------------------------------------------------------------------------------------------------|-----------------------------------|------|--------------------------------------|------|
|                       |                                                                                                                  | Pre                               | Post | Pre                                  | Post |
| <b>PAIN-INTENSITY</b> | I can tolerate the pain I have without having to use pain killers                                                | 0                                 | 7    | 0                                    | 21   |
|                       | The pain is bad but I manage without taking pain killers                                                         | 4                                 | 15   | 1                                    | 11   |
|                       | Pain killers give complete relief from pain                                                                      | 10                                | 6    | 6                                    | 0    |
|                       | Pain killers give moderate relief from pain                                                                      | 10                                | 3    | 14                                   | 0    |
|                       | Pain killers give very little relief from pain                                                                   | 6                                 | 1    | 7                                    | 0    |
|                       | Pain killers have no effect on the pain and I do not use them                                                    | 2                                 | 0    | 4                                    | 0    |
| <b>PERSONAL-CARE</b>  | I can look after myself normally without causing extra pain                                                      | 6                                 | 11   | 7                                    | 22   |
|                       | I can look after myself normally but it causes extra pain                                                        | 8                                 | 4    | 10                                   | 9    |
|                       | It is painful to look after myself and I am slow and careful                                                     | 10                                | 9    | 5                                    | 1    |
|                       | I need some help but manage most of my personal care                                                             | 5                                 | 5    | 5                                    | 0    |
|                       | I need help every day in most aspects of self-care                                                               | 3                                 | 3    | 3                                    | 0    |
|                       | I don't get dressed, I was with difficulty and stay in bed                                                       | 0                                 | 0    | 2                                    | 0    |
| <b>LIFTING</b>        | I can lift heavy weights without extra pain                                                                      | 1                                 | 8    | 2                                    | 25   |
|                       | I can lift heavy weights but it gives extra pain                                                                 | 7                                 | 22   | 3                                    | 7    |
|                       | Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned. | 11                                | 1    | 6                                    | 0    |
|                       | Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are positioned     | 5                                 | 0    | 11                                   | 0    |
|                       | I can lift very light weights                                                                                    | 7                                 | 1    | 6                                    | 0    |
|                       | I cannot lift or carry anything at all                                                                           | 1                                 | 0    | 4                                    | 0    |
| <b>WALKING</b>        | Pain does not prevent me walking any distance                                                                    | 3                                 | 8    | 6                                    | 26   |
|                       | Pain prevents me walking more than one mile                                                                      | 10                                | 7    | 11                                   | 6    |
|                       | Pain prevents me walking more than ½ mile                                                                        | 11                                | 9    | 8                                    | 0    |
|                       | Pain prevents me walking more than ¼ mile                                                                        | 4                                 | 7    | 2                                    | 0    |
|                       | I can only walk using a stick or crutches                                                                        | 4                                 | 1    | 4                                    | 0    |
|                       | I am in bed most of the time and have to crawl to the toilet                                                     | 0                                 | 0    | 1                                    | 0    |
| <b>SITTING</b>        | I can sit in any chair as long as I like                                                                         | 10                                | 12   | 11                                   | 27   |
|                       | I can only sit in my favorite chair as long as I like                                                            | 8                                 | 7    | 10                                   | 4    |
|                       | Pain prevents me from sitting more than one hour                                                                 | 8                                 | 8    | 4                                    | 1    |
|                       | Pain prevents me from sitting more than ½ hour                                                                   | 5                                 | 4    | 2                                    | 0    |
|                       | Pain prevents me from sitting more than 10 minutes                                                               | 1                                 | 1    | 3                                    | 0    |

**Table 4.4 B. Frequency distribution of ODI categories for both groups.**

| Section            | Categories                                                                                                          | Control |      | Experimental |      |
|--------------------|---------------------------------------------------------------------------------------------------------------------|---------|------|--------------|------|
|                    |                                                                                                                     | Pre     | Post | Pre          | Post |
| <b>SITTING</b>     | Pain prevents me from sitting at all                                                                                | 0       | 0    | 2            | 0    |
| <b>STANDING</b>    | I can stand as long as I want without extra pain                                                                    | 11      | 14   | 7            | 29   |
|                    | I can stand as long as I want but it gives me extra pain                                                            | 12      | 9    | 15           | 2    |
|                    | Pain prevents me from standing for more than one hour                                                               | 4       | 4    | 4            | 1    |
|                    | Pain prevents me from standing for more than 30 minutes                                                             | 0       | 1    | 1            | 0    |
|                    | Pain prevents me from standing for more than 10 minutes                                                             | 5       | 4    | 3            | 0    |
|                    | Pain prevents me from standing at all                                                                               | 0       | 0    | 2            | 0    |
| <b>SLEEPING</b>    | Pain does not prevent me from sleeping well                                                                         | 9       | 11   | 10           | 27   |
|                    | I can sleep well only by using medication                                                                           | 10      | 10   | 9            | 3    |
|                    | Even when I take medication, I have less than 6 hrs. sleep                                                          | 6       | 5    | 7            | 2    |
|                    | Even when I take medication, I have less than 4 hrs. sleep                                                          | 5       | 4    | 2            | 0    |
|                    | Even when I take medication, I have less than 2 hrs. sleep                                                          | 2       | 2    | 3            | 0    |
|                    | Pain prevents me from sleeping at all                                                                               | 0       | 0    | 1            | 0    |
| <b>SOCIAL-LIFE</b> | My social life is normal and gives me no extra pain                                                                 | 8       | 10   | 6            | 28   |
|                    | My social life is normal but increases the degree of pain                                                           | 9       | 8    | 9            | 4    |
|                    | Pain has no significant effect on my social life apart from limiting my more energetic interests, i.e. dancing, etc | 9       | 9    | 10           | 0    |
|                    | Pain has restricted my social life and I do not go out as often                                                     | 5       | 4    | 4            | 0    |
|                    | Pain has restricted my social life to my home                                                                       | 1       | 1    | 2            | 0    |
|                    | I have no social life because of pain                                                                               | 0       | 0    | 1            | 0    |
| <b>TRAVELLING</b>  | I can travel anywhere without extra pain                                                                            | 9       | 0    | 6            | 1    |
|                    | I can travel anywhere but it gives me extra pain                                                                    | 12      | 7    | 11           | 27   |
|                    | Pain is bad, but I manage journeys over 2 hours                                                                     | 3       | 13   | 4            | 5    |
|                    | Pain restricts me to journeys of less than 1 hour                                                                   | 7       | 9    | 6            | 0    |
|                    | Pain restricts me to short necessary journeys under 30 minutes                                                      | 1       | 2    | 3            | 0    |
|                    | Pain prevents me from traveling except to the doctor or hospital                                                    | 0       | 1    | 1            | 0    |
| <b>HOMEMAKING</b>  | My normal homemaking/ job activities do not cause pain.                                                             | 7       | 10   | 9            | 31   |
|                    | My normal homemaking/ job activities increase my pain, but I can still perform all that is required of me.          | 13      | 11   | 10           | 1    |
|                    | I can perform most of my homemaking, but pain prevents me from performing more physically stressful activities      | 10      | 9    | 5            | 0    |
|                    | Pain prevents me from doing anything but light duties                                                               | 1       | 1    | 4            | 0    |
|                    | Pain prevents me from doing even light duties.                                                                      | 0       | 0    | 2            | 0    |
|                    | Pain prevents me from performing any job or homemaking chores.                                                      | 1       | 1    | 2            | 0    |

#### 4.1.2.7 Quality of Life measure:

Table 4.5 illustrates the participants' scores of Euroqol group's 5-domain 5-level questionnaire (EQ-5D-5L). The majority of participants in both groups improved in the skill in each section as depicted in Table 4.5, basically for experimental group participants, self-care and mobility sections have achieved a clear improvement as highlighted in the table below.

**Table 4.5 A. The EQ-5D-5L categories' frequency distribution for each participant's QOL in both groups.**

| Section                      | Categories                                          | Control group<br>(CSE & SHAM)<br>(N=32) |      | Experimental<br>group (MR &<br>CSE) (N=32) |      |
|------------------------------|-----------------------------------------------------|-----------------------------------------|------|--------------------------------------------|------|
|                              |                                                     | Pre                                     | Post | Pre                                        | Post |
| <b>MOBILITY</b>              | I have no problems in walking about                 | 0                                       | 0    | 1                                          | 30   |
|                              | I have slight problems in walking about             | 1                                       | 3    | 3                                          | 2    |
|                              | I have moderate problems in walking about           | 17                                      | 24   | 12                                         | 0    |
|                              | I have severe problems in walking about             | 12                                      | 5    | 14                                         | 0    |
|                              | I am unable to walk about                           | 2                                       | 0    | 2                                          | 0    |
| <b>SELF CARE</b>             | I have no problems washing or dressing myself       | 1                                       | 2    | 6                                          | 32   |
|                              | I have slight problems washing or dressing myself   | 15                                      | 17   | 13                                         | 0    |
|                              | I have moderate problems washing or dressing myself | 13                                      | 10   | 11                                         | 0    |
|                              | I have severe problems washing or dressing myself   | 2                                       | 3    | 2                                          | 0    |
|                              | I am unable to wash or dress myself                 | 1                                       | 0    | 0                                          | 0    |
| <b>USUAL-<br/>ACTIVITIES</b> | I have no problems doing my usual activities        | 1                                       | 5    | 1                                          | 29   |
|                              | I have slight problems doing my usual activities    | 15                                      | 11   | 7                                          | 3    |
|                              | I have moderate problems doing my usual activities  | 7                                       | 9    | 17                                         | 0    |
|                              | I have severe problems doing my usual activities    | 7                                       | 6    | 6                                          | 0    |
|                              | I am unable to do my usual activities               | 2                                       | 1    | 1                                          | 0    |
| <b>PAIN \<br/>DISCOMFORT</b> | I have no pain or discomfort                        | 0                                       | 8    | 1                                          | 23   |
|                              | I have slight pain or discomfort                    | 5                                       | 9    | 3                                          | 8    |
|                              | I have moderate pain or discomfort                  | 15                                      | 15   | 10                                         | 1    |
|                              | I have severe pain or discomfort                    | 6                                       | 0    | 11                                         | 0    |
|                              | I have extreme pain or discomfort                   | 6                                       | 0    | 7                                          | 0    |

**Table 4.5 B. The EQ-5D-5L categories' frequency distribution for each participant's QOL in both groups.**

| Section | Categories                           | Control |      | Experimental |      |
|---------|--------------------------------------|---------|------|--------------|------|
|         |                                      | Pre     | Post | Pre          | Post |
| ANXIETY | I am not anxious or depressed        | 3       | 13   | 0            | 28   |
|         | I am slightly anxious or depressed   | 10      | 8    | 6            | 4    |
|         | I am moderately anxious or depressed | 14      | 10   | 6            | 0    |
|         | I am severely anxious or depressed   | 4       | 1    | 10           | 0    |
|         | I am extremely anxious or depressed  | 1       | 0    | 10           | 0    |

#### 4.1.3 Normality test for data

According to (Shapiro-Wilk\ Kolmogorov-Smirnov) testing data showed that it was not normally distributed for all variables (P-value<0.05) except Inclinator max-flex pre and Inclinator max-Ext post (P-value=0.200, .074 respectively) as demonstrates the following (Table 4.6) as a result a non-parametric test used for statistical analysis. Since the N=64 and based on the theory of central limit the parametric and nonparametric test have been used to discover if to accept or reject the alternative hypothesis.

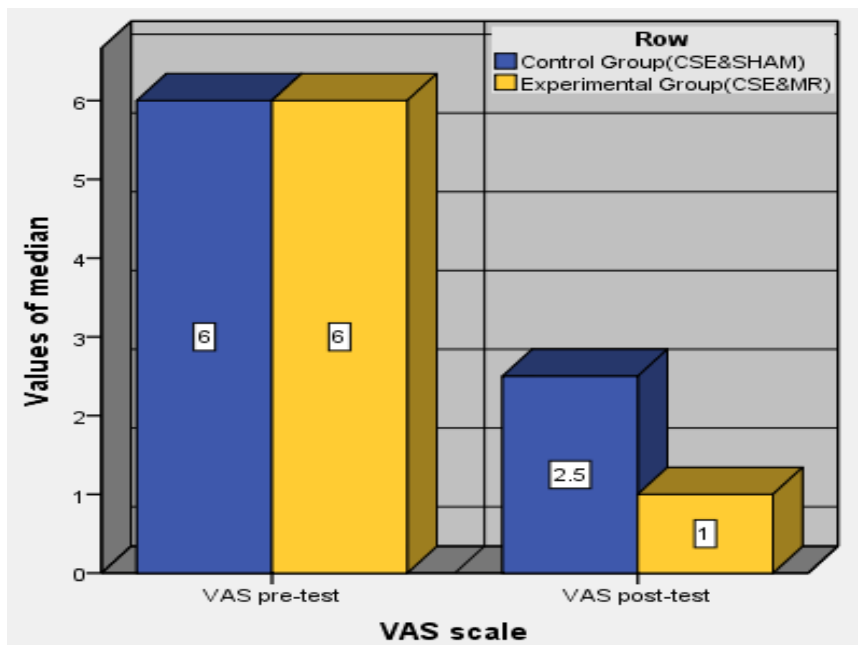
**Table 4.6 The Results of Kolmogorov-Smirnov Normality Test for outcome measures.**

| Variables                | Kolmogorov-Smirnov |    |      | Shapiro-Wilk |    |      |
|--------------------------|--------------------|----|------|--------------|----|------|
|                          | Statistic          | Df | Sig. | Statistic    | Df | Sig. |
| ODI TOTAL SCORE pre      | .197               | 64 | .000 | .844         | 64 | .000 |
| ODI TOTAL SCORE post     | .219               | 64 | .000 | .805         | 64 | .000 |
| VAS pre                  | .153               | 64 | .001 | .946         | 64 | .008 |
| VAS post                 | .202               | 64 | .000 | .910         | 64 | .000 |
| Inclinator max-flex pre  | .071               | 64 | .200 | .974         | 64 | .194 |
| Inclinator max-flex post | .144               | 64 | .002 | .900         | 64 | .000 |
| Inclinator max-Ext pre   | .115               | 64 | .035 | .937         | 64 | .003 |
| Inclinator max-Ext post  | .105               | 64 | .074 | .965         | 64 | .066 |
| EQ5D5L.Scale of Health   | .126               | 64 | .013 | .960         | 64 | .037 |
| EQ5D5L.Scale of Health   | .155               | 64 | .001 | .926         | 64 | .001 |

#### 4.1.4 Inferential statistical analysis of the tested variables.

##### Pain assessment (Visual Analogue Scale (VAS))

As shown in, Figure 4.6 and Table 4.7, our results indicated that there was no significant difference between the two groups on the VAS medians' pre-tests ( $p=0.515$ ). However, a significant difference was recorded on the post-tests ( $p=0.000$ ), where the Experimental (CSE &MR) group showed a significant improvement with large effect size (Cohen's  $d = 0.977731$ ).



**Figure 4.6** VAS medians' values of McGill questionnaire (pre & post) for both groups.

**Table 4.7** VAS values of mean, SD, median and P-value for both groups (pre & post)

| Categories | Groups (N=32)          | Mean $\pm$ SD    | Median | P-value | 95% Confidence Interval of the Difference |       |
|------------|------------------------|------------------|--------|---------|-------------------------------------------|-------|
|            |                        |                  |        |         | Lower                                     | Upper |
| VAS Pre    | Control (CSE&SM)       | 5.78 $\pm$ 1.211 | 6      | .515    | -.9464                                    | .5089 |
|            | Experimental (CSE &MR) | 6.00 $\pm$ 1.665 | 6      |         |                                           |       |
| VAS post   | Control (CSE&SM)       | 2.40 $\pm$ 1.456 | 2.5    | .000    | .5949                                     | 1.842 |
|            | Experimental (CSE &MR) | 1.18 $\pm$ .997  | 1      |         |                                           |       |

Table 4.8 and Table 4.9 demonstrate the comparison between occupation types and their effect on pain intensity which was measured by VAS at baseline and at post-test. Statistical analysis showed that office work seems to have the least mean improvement of pain sense at post-test among the other professions however, there was no significant difference on pain intensity according to occupation ( $P>0.05$ ).

**Table 4.8 Profession type & pain means and SD at pre and post-tests**

|          |               | N  | Mean±<br>Std. Deviation |
|----------|---------------|----|-------------------------|
| VAS pre  | manual work   | 20 | 6.1000±1.33377          |
|          | Driver        | 7  | 6.1429±1.21499          |
|          | office work   | 20 | 5.6000±1.63514          |
|          | medical field | 13 | 6.0769±1.55250          |
|          | Sport         | 4  | 5.2500±1.25831          |
|          | Total         | 64 | 5.8906±1.44878          |
| VAS post | manual work   | 20 | 1.7500±1.20852          |
|          | Driver        | 7  | 1.8571±1.21499          |
|          | office work   | 20 | 2.1500±1.75544          |
|          | medical field | 13 | 1.3846±1.12090          |
|          | Sport         | 4  | 1.5000±1.29099          |
|          | Total         | 64 | 1.7969±1.38220          |

**Table 4.9 Profession type & pain correlation**

|          |                | Sum of Squares | df | P-Value |
|----------|----------------|----------------|----|---------|
| VAS pre  | Between Groups | 5.104          | 4  | .670    |
|          | Within Groups  | 127.130        | 59 |         |
|          | Total          | 132.234        | 63 |         |
| VAS post | Between Groups | 5.125          | 4  | .625    |
|          | Within Groups  | 115.234        | 59 |         |
|          | Total          | 120.359        | 63 |         |



### **Range of Motion:**

Our results showed that there was no significant difference between the two groups on the ROM, particularly regarding the maximum flexion and maximum extension means in pretests, respectively ( $p=0.586$  and  $p=0.874$ ), as shown in (Table 4.10). On the contrary, the Experimental (CSE &MR) group had a significant improvement with large effect size on both flexion and extension (Cohen's  $d = 1.083719$  and  $1.865104$ ), and a significant difference was seen on the post-tests for both flexion and extension measurements ( $p=0.000$ ).

**Table 4.10 Max flexion and extension values of mean, SD, and P-value for both groups (pre & post)**

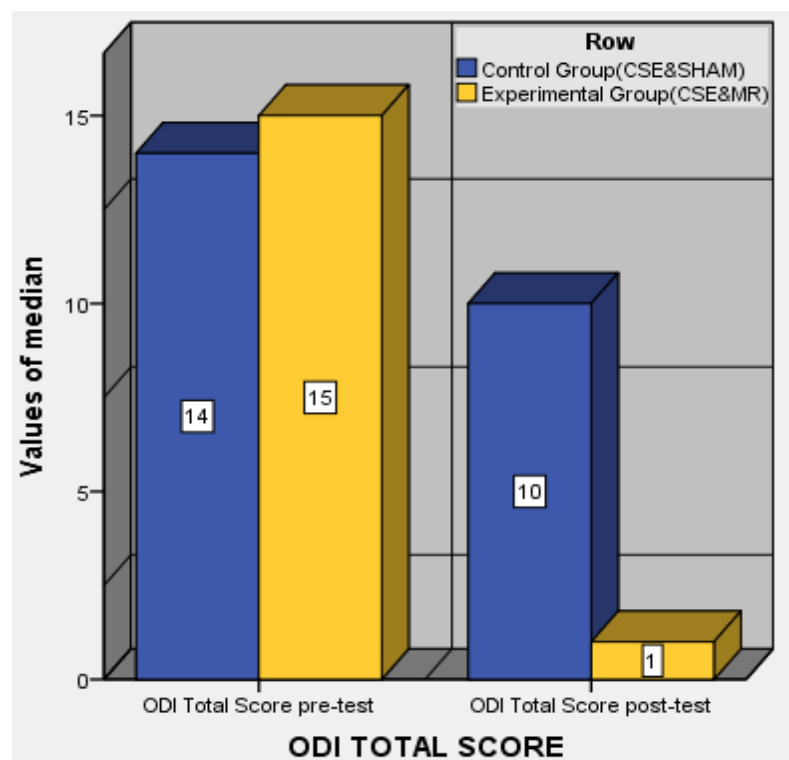
| Inclinometer categories | Group(N=32)             | Mean $\pm$ SD     | P-value | Mean difference | 95% Confidence Interval of the Difference |        |
|-------------------------|-------------------------|-------------------|---------|-----------------|-------------------------------------------|--------|
|                         |                         |                   |         |                 | Lower                                     | Upper  |
| max-flex pre            | Control (CSE & SM)      | 54.53 $\pm$ 19.60 | .586    | -2.625          | -12.210                                   | 6.960  |
|                         | Experimental (CSE & MR) | 57.15 $\pm$ 18.74 |         |                 |                                           |        |
| max-flex post           | Control (CSE & SM)      | 74.56 $\pm$ 13.83 | .000    | -12.187         | -17.810                                   | -6.565 |
|                         | Experimental (CSE & MR) | 86.75 $\pm$ 7.86  |         |                 |                                           |        |
| max-Ext pre             | Control (CSE & SM)      | 19.40 $\pm$ 6.94  | .874    | .250            | -2.876                                    | 3.376  |
|                         | Experimental (CSE & MR) | 19.15 $\pm$ 5.48  |         |                 |                                           |        |
| max-Ext post            | Control (CSE & SM)      | 26.43 $\pm$ 4.16  | .000    | -6.843          | -8.681                                    | -5.006 |
|                         | Experimental (CSE & MR) | 33.28 $\pm$ 3.11  |         |                 |                                           |        |

### **ODI results (Back Disability):**

Table 4.11 and Figure 4.7 were illustrated that ODI pre-tests medians among both groups have no significant difference ( $P\text{-value}=.418$ ). In contrast, there was a significant difference between the medians in post-test ( $P\text{-value}=.000$ ), moreover the Experimental (CSE &MR) group presented a significant improvement with large effect size on post-test (Cohen's  $d = 1.725198$ ).

**Table 4.11 ODI values mean, SD, median and P-value for both groups (pre & post).**

| Group | ODI TOTAL SCORE         | Mean $\pm$ SD     | Median | P-value | Mean difference | 95% Confidence Interval of the Difference |        |
|-------|-------------------------|-------------------|--------|---------|-----------------|-------------------------------------------|--------|
|       |                         |                   |        |         |                 | Lower                                     | upper  |
| Pre   | Control (CSE & SM)      | 16.81 $\pm$ 8.938 | 14     | .488    | -2.093          | -7.22                                     | 3.041  |
|       | Experimental (CSE & MR) | 19.50 $\pm$ 11.73 | 15     |         |                 |                                           |        |
| Post  | Control (CSE & SM)      | 12.75 $\pm$ 8.587 | 10     | .000    | 10.718          | 7.648                                     | 13.789 |
|       | Experimental (CSE & MR) | 1.937 $\pm$ 2.198 | 1      |         |                 |                                           |        |



**Figure 4.7 ODI total score median differences**

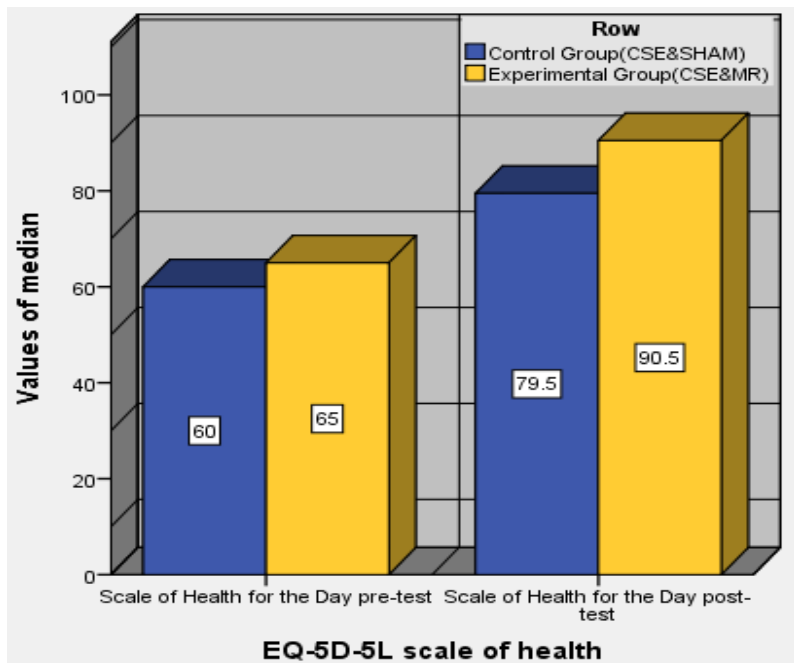
### Quality of Life:

According to EQ-5D-5L outcome measure in the pre-test, by compare the medians between groups in Figure 4.8 and Table 4.12, there was no significant difference between groups

(P-value=.984). In comparison with the pre-test measurement, the post-test medians verified a significant difference (P-value=.000). Furthermore, the Experimental (CSE &MR) group presented a significant improvement with an effect size in the post-test (Cohen's d =1.515696).

**Table 4.12 EQ.5D.5L scale of health for the day mean, SD, m difference, median and P-value for both groups (pre & post)**

| Group |                         | Mean $\pm$ SD     | Median | Mean Difference | P – value | 95% Confidence Interval of the Difference |       |
|-------|-------------------------|-------------------|--------|-----------------|-----------|-------------------------------------------|-------|
|       |                         |                   |        |                 |           | Lower                                     | Upper |
| Pre   | Control (CSE & SM)      | 62.91 $\pm$ 16.23 | 60     | .2187           | .984      | -8.312                                    | 8.75  |
|       | Experimental (CSE & MR) | 62.69 $\pm$ 17.87 | 65     |                 |           |                                           |       |
| Post  | Control (CSE & SM)      | 77.72 $\pm$ 11.15 | 79.5   | -13.500         | .000      | -17.95                                    | -9.05 |
|       | Experimental (CSE & MR) | 91.22 $\pm$ 5.868 | 90.5   |                 |           |                                           |       |



**Figure 4.8 EQ5D5L median values for health of the day**

## 4.2 Discussion

The initial objective of this study was to identify the effectiveness of MR and CSE on Pain intensity, Back disability, Lumber Range of Motion, and the quality of life among adult males with NSCLBP. We hypothesized that CSE combined with MR has more effect on pain intensity, back disability, lumber ROM, and QOL than CSE alone.

Back to the results of the pain section, several previous studies found the CSE intervention much effective on decreasing pain intensity with LBP participants after six weeks of the intervention program (Akhtar et al., 2017; Ozsoy et al., 2019). The investigation of our study found that there was a significant improvement of both the Control and Experimental groups' participants after the post-test, but still, the Experimental group (CSE+MR) recorded a significant improvement compared with the Control group based on the large effect size (Cohen's  $d=.97$ ). In pain post-test analyses results, which also confirmed by several previous studies similar to ours that also confirmed this effectiveness, after all, we can consider that the MR interference is a better intervention for pain (Arguisuelas et al., 2017c; Hasan et al., 2020; Ozsoy et al., 2019). Efficient strengthening of core muscles like multifidus and decreasing pain intensity for CLBP participants was closely related to the CSE program, as confirmed by our data.

Also, our findings indicate that there was no effect among profession (occupation) types comparison on the level of pain intensity that was measured by VAS ( $P\text{-value}=.67$  for the ANOVA test), and that was not similar to some previous studies' findings (Chowdhury et al., 2023; Inoue et al., 2020; Lis et al., 2007). This might be due to lack of the participants' numbers

as the compared to cross-sectional studies which is usually larger, and also could be attributed to the lack of occupation types in our study.

According to ROM findings, the post-test results of participants lumber flexion and extension improved, nevertheless the Experimental group (MR+CSE) had a significant improvement, according to the effect size was large on both flexion and extension (Cohen's  $d=1.08, 1.86$  respectively). These findings align with previous studies that found MR specifically effective with ROM (Arguisuelas et al., 2019; Ozsoy et al., 2019).

Likewise, the findings of the back mobility section taken by ODI results were considered to be greater in post-interventions for all participants, whereas the Experimental group results were also superior to the Control group; some previous studies also established this improvement (Hasan et al., 2020; Stuber et al., 2014). Similar to our results, prior Systematic reviews and RCTs found that the CSE program was effective on ODI among LBP participants (Chang et al., 2015b; Ozsoy et al., 2019). In other words, the better effect was in favor of CSE which has better effect on disability, and that was confirmed in previous studies. Unlike other findings in previous studies, there were significant improvements among the Experimental group (Arguisuelas et al., 2019; Ozsoy et al., 2019).

Regarding the QOL results also reaped satisfactory results for participants from both groups in post-measurements of the questionnaire comparable to the previous study (Ozsoy et al., 2019); nevertheless, the Experimental group participants recorded higher results than other group participants, unlike the earlier studies, which indicates that there was no significant

difference between Control and Experimental group regard QOL(Noor mohammad pour et al., 2018).

An earlier systematic review article that discussed the MFR effect on CLBP was collected from several RCT studies (Chen et al., 2021), and found that MFR has significant improvement in back disability, as well as our research, but there were no significant improvements in pain intensity, ROM, and QOL, which is contrary to what our study found, could be due to short period of intervention, some RCTs on this systematic review found that MFR has significant improvement on pain intensity, but it was excluded due to over heterogeneity. On the other hand, CSE was found to be an effective method of intervention by improving function and decreasing pain and disability among participants with NSLBP, some studies (RCT and systematic review) have similar results to ours (Akhtar et al., 2017; Cairns et al., 2006; Ozsoy et al., 2019).

In prior studies that have noted the importance of MR, some results found it effective on pain and disability (Hasan et al., 2020; Ozsoy et al., 2019). Additionally, several studies demonstrated the efficacy of MR in alleviating ROM(Arguisuelas et al., 2017a; Ozsoy et al., 2019). In terms of ODI, positive improvements were observed among the Control group, but still, many previous studies have investigated the effect of CSE on NSCLBP, quite a few reports have exposed that these types of exercises have a unique improvement on back disability and NSLBP (Hasan et al., 2020; Huxel Bliven & Anderson, 2013). Parallel to these findings, increasing lumbar flexion and extension, decreasing back disability, decreasing pain intensity, and affecting the quality of life, the existing results also confirmed that CSE is effective(Ajimsha

et al., 2014; Arguisuelas et al., 2017; Rodríguez-Fuentes et al., 2016; Sığlan & Çolak, 2022; Tamartash et al., 2022).

### **4.3 Study Limitations**

- It will be even better for results and measures for the pre and post-tests to be by another therapist, and the therapist that leads the interventions also a different one, as in a double-blinded randomized control trial, but all of this needs teamwork from a group of physiotherapists and institution supervisors.
- It had been hard for some participants to continue coming to our clinic as they were far from another city.
- Also, it had been a difficult time for our country because of the occupation that affected the session date.
- As it was not a group of physiotherapists, there was no ability to take large samples and different age categories.

## **Chapter 5: Conclusion and recommendation**

### **5.1 Conclusion**

### **5.2 Recommendations**



## 5.1 Conclusion

- There is a statistically significant difference between groups at post-tests according to pain ( $p=.00$ ) that measured by the McGill pain questionnaire and VAS, where the Experimental (CSE &MR) group showed a better improvement with an effect size (Cohen's  $d = 0.97$ ).
- The Experimental (CSE &MR) group demonstrated a superior improvement with an effect size (Cohen's  $d = 1.08$  for flexion and  $1.86$  for extension), indicating a statistically significant difference between groups at post-tests based on flexion and extension range of motion ( $p=.00$ ), as measured by inclinometer and TiltMeter advance app.
- Back disability, as determined by the ODI, varies statistically significantly across groups at post-tests ( $p=.00$ ). The Experimental (CSE &MR) group had a greater improvement with an effect size (Cohen's  $d = 1.72$ ).
- The EQ-5D-5L post-tests revealed a statistically significant difference between the groups in terms of QOL ( $p=.00$ ), with the Experimental (CSE &MR) group revealing a greater improvement with an effect size (Cohen's  $d = 1.51$ ).

## 5.2 Recommendations

- To consider the team work of physiotherapists in Palestine, to have larger sample and different age categories.
- To have both male and female physiotherapists so it would be able to investigate the intervention on female participants.
- Having more clinics, private hospitals, and governmental hospitals from different sites in the West Bank and Gaza to be part of these kinds of studies would make it easier for participants from different cities, villages, and camps to contribute to the intervention programs without having to travel long distances to have their sessions.
- To have long-term intervention, to compare the long interventional period effect on recurrent low back pain.
- To apply cross-sectional studies on the same LBP condition by researchers with considering as many different occupations as can be, to measure the effect of occupation types on pain intensity.
- For the therapists, to consider using this intervention (CSE & MR) with LBP patients and conducting more research for a prolonged period on this condition.

## References

- Aburuz, S., Bulatova, N., Twalbeh, M., & Gazawi, M. The validity and reliability of the Arabic version of the EQ-5D: a study from Jordan. *Annals of Saudi Medicine*, 29(4), 304–308. <https://doi.org/10.4103/0256-4947.55313>
- Ajimsha, M. S., Al-Mudahka, N. R., & Al-Madzhar, J. A. (2015). Effectiveness of myofascial release: Systematic review of randomized controlled trials. *Journal of Bodywork and Movement Therapies*, 19(1), 102–112. <https://doi.org/10.1016/J.JBMT.2014.06.001>
- Ajimsha, M. S., Daniel, B., & Chithra, S. (2014). Effectiveness of Myofascial release in the management of chronic low back pain in nursing professionals. *Journal of Bodywork and Movement Therapies*, 18(2), 273–281. <https://doi.org/10.1016/J.JBMT.2013.05.007>
- Akhtar, M. W., Karimi, H., & Gilani, S. A. (2017). Effectiveness of core stabilization exercises and routine exercise therapy in management of pain in chronic non-specific low back pain: A randomized controlled clinical trial. *Pakistan Journal of Medical Sciences*, 33(4), 1002–1006. <https://doi.org/10.12669/PJMS.334.12664>
- Algarni, A. S., Ghorbel, S., Jones, J. G., & Guermazi, M. (2014). Validation of an Arabic version of the Oswestry index in Saudi Arabia. *Annals of Physical and Rehabilitation Medicine*, 57(9–10), 653–663. <https://doi.org/10.1016/J.REHAB.2014.06.006>
- Aluko, A., DeSouza, L., & Peacock, J. (2013). The effect of core stability exercises on variations in acceleration of trunk movement, pain, and disability during an episode of acute nonspecific low back pain: a pilot clinical trial. *Journal of Manipulative and Physiological Therapeutics*, 36(8). <https://doi.org/10.1016/J.JMPT.2012.12.012>
- Arguisuelas, M. D., Lisón, J. F., Doménech-Fernández, J., Martínez-Hurtado, I., Salvador Coloma, P., & Sánchez-Zuriaga, D. (2019). Effects of myofascial release in erector spinae myoelectric activity and lumbar spine kinematics in non-specific chronic low back pain: Randomized controlled trial. *Clinical Biomechanics (Bristol, Avon)*, 63, 27–33. <https://doi.org/10.1016/J.CLINBIOMECH.2019.02.009>
- Arguisuelas, M. D., Lisón, J. F., Sánchez-Zuriaga, D., Martínez-Hurtado, I., & Doménech-Fernández, J. (2017a). Effects of Myofascial Release in Nonspecific Chronic Low Back Pain: A Randomized Clinical Trial. *Spine*, 42(9), 627–634. <https://doi.org/10.1097/BRS.0000000000001897>
- Arguisuelas, M. D., Lisón, J. F., Sánchez-Zuriaga, D., Martínez-Hurtado, I., & Doménech-Fernández, J. (2017b). Effects of Myofascial Release in Nonspecific Chronic Low Back Pain. *Spine*, 42(9), 627–634. <https://doi.org/10.1097/BRS.0000000000001897>
- Arguisuelas, M. D., Lisón, J. F., Sánchez-Zuriaga, D., Martínez-Hurtado, I., & Doménech-Fernández, J. (2017c). Effects of Myofascial Release in Nonspecific Chronic Low Back Pain. *Spine*, 42(9), 627–634. <https://doi.org/10.1097/BRS.0000000000001897>

- Balasuburamaniam, A. (2013). *Effect of Myofascial Release Therapy with Motor Control Exercises on Pain, Disability and Transversus Abdominis Muscle Activation in Chronic Low Back Pain*. <https://www.researchgate.net/publication/259657874>
- Barnes, M. F., & Barnes, M. F. (1997). The basic science of myofascial release: morphologic change in connective tissue. *Journal of Bodywork and Movement Therapies*, 1(4), 231–238.
- Bickley, L., & Szilagyi, P. G. (2012). *Bates' guide to physical examination and history-taking*. Lippincott Williams & Wilkins.
- Cairns, M. C., Foster, N. E., & Wright, C. (2006). Randomized controlled trial of specific spinal stabilization exercises and conventional physiotherapy for recurrent low back pain. *Spine*, 31(19). <https://doi.org/10.1097/01.brs.0000232787.71938.5d>
- Cartlidge, H. (2014). How to perform effleurage and passive range of motion exercises. <https://doi.org/10.12968/Vetn.2014.5.7.400>, 5(7), 400–403. <https://doi.org/10.12968/VETN.2014.5.7.400>
- Chang, W. D., Lin, H. Y., & Lai, P. T. (2015a). Core strength training for patients with chronic low backpain. *Journal of Physical Therapy Science*, 27(3), 619. <https://doi.org/10.1589/JPTS.27.619>
- Chang, W. D., Lin, H. Y., & Lai, P. T. (2015b). Core strength training for patients with chronic low back pain. *Journal of Physical Therapy Science*, 27(3), 619–622. <https://doi.org/10.1589/JPTS.27.619>
- Chen, Z., Wu, J., Wang, X., Wu, J., & Ren, Z. (2021). The effects of myofascial release technique for patients with low back pain: A systematic review and meta-analysis. *Complementary Therapies in Medicine*, 59, 102737. <https://doi.org/10.1016/J.CTIM.2021.102737>
- Chowdhury, M. O. S. A., Huda, N., Alam, M. M., Hossain, S. I., Hossain, S., Islam, S., & Khatun, M. R. (2023). Work-related risk factors and the prevalence of low back pain among low-income industrial workers in Bangladesh: results from a cross-sectional study. *Bulletin of Faculty of Physical Therapy*, 28(1). <https://doi.org/10.1186/S43161-023-00132-Z>
- Ekstrom, R. A., Donatelli, R. A., & Carp, K. C. (2007). Electromyographic analysis of core trunk, hip, and thigh muscles during 9 rehabilitation exercises. *The Journal of Orthopaedic and Sports Physical Therapy*, 37(12), 754–762. <https://doi.org/10.2519/JOSPT.2007.2471>
- Gardner, T., Refshauge, K., Smith, L., McAuley, J., Hübscher, M., & Goodall, S. (2017). Physiotherapists' beliefs and attitudes influence clinical practice in chronic low back pain: a systematic review of quantitative and qualitative studies. *Journal of Physiotherapy*, 63(3), 132–143. <https://doi.org/10.1016/J.JPHYS.2017.05.017>
- Golob, A. L., & Wipf, J. E. (2014). Low Back Pain. *Medical Clinics of North America*, 98(3), 405–428. <https://doi.org/10.1016/J.MCNA.2014.01.003>

- Halaweh, H., Willen, C., Grimby-Ekman, A., & Svantesson, U. (2015). Physical Activity and Health-Related Quality of Life Among Community Dwelling Elderly. *Journal of Clinical Medicine Research*, 7(11), 845. <https://doi.org/10.14740/JOCMR2307W>
- Hasan, A., Abid, S., Kazmi, M., & Hospital, Z. (2020). EFFECT OF CORE STABILITY EXERCISES VERSUS MYOFASCIAL RELEASE TECHNIQUE COMBINED WITH CORE STABILITY EXERCISES IN THE MANAGEMENT OF LOW BACK PAIN. *Pakistan Journal of Rehabilitation*, 9(2), 24–29. <https://doi.org/10.36283/pjr.zu.9.2/006>
- Hodges, P. W. (2003). Core stability exercise in chronic low back pain. *Orthopedic Clinics of North America*, 34(2), 245–254. [https://doi.org/10.1016/S0030-5898\(03\)00003-8](https://doi.org/10.1016/S0030-5898(03)00003-8)
- Huxel Bliven, K. C., & Anderson, B. E. (2013). Core stability training for injury prevention. *Sports Health*, 5(6), 514–522. <https://doi.org/10.1177/1941738113481200>
- Inoue, G., Uchida, K., Miyagi, M., Saito, W., Nakazawa, T., Imura, T., Shirasawa, E., Akazawa, T., Orita, S., Inage, K., Takaso, M., & Ohtori, S. (2020). Occupational Characteristics of Low Back Pain Among Standing Workers in a Japanese Manufacturing Company. *Workplace Health & Safety*, 68(1), 13–23. <https://doi.org/10.1177/2165079919853839>
- Jorgensen, J. E., Afzali, T., & Riis, A. (2018). Effect of differentiating exercise guidance based on a patient's level of low back pain in primary care: a mixed-methods systematic review protocol. *BMJ Open*, 8(1), e019742. <https://doi.org/10.1136/BMJOPEN-2017-019742>
- Kamstra, R. J. M., Boorsma, A., Krone, T., van Stokkum, R. M., Eggink, H. M., Peters, T., & Pasman, W. J. (2022). Validation of the Mobile App Version of the EQ-5D-5L Quality of Life Questionnaire Against the Gold Standard Paper-Based Version: Randomized Crossover Study. *JMIR Form Res* 2022;6(8):E37303 <https://Formative.Jmir.Org/2022/8/E37303>, 6(8), e37303. <https://doi.org/10.2196/37303>
- Kim, M., Kim, M., Oh, S., & Yoon, B. C. (2018). The Effectiveness of Hollowing and Bracing Strategies With Lumbar Stabilization Exercise in Older Adult Women With Nonspecific Low Back Pain: A Quasi-Experimental Study on a Community-based Rehabilitation. *Journal of Manipulative and Physiological Therapeutics*, 41(1), 1–9. <https://doi.org/10.1016/j.jmpt.2017.06.012>
- Lis, A. M., Black, K. M., Korn, H., & Nordin, M. (2007). Association between sitting and occupational LBP. *European Spine Journal*, 16(2), 283. <https://doi.org/10.1007/S00586-006-0143-7>
- López-Torres, O., Mon-López, D., Gomis-Marzá, C., Lorenzo, J., & Guadalupe-Grau, A. (2021). Effects of myofascial release or self-myofascial release and control position exercises on lower back pain in idiopathic scoliosis: A systematic review. *Journal of Bodywork and Movement Therapies*, 27, 16–25. <https://doi.org/10.1016/J.JBMT.2021.02.017>
- Maher, C., Underwood, M., & Buchbinder, R. (2017). Non-specific low back pain. *The Lancet*, 389(10070), 736–747. [https://doi.org/10.1016/S0140-6736\(16\)30970-9](https://doi.org/10.1016/S0140-6736(16)30970-9)

- Melzack, R. (1987). The short-form McGill Pain Questionnaire. *Pain*, 30(2), 191–197.  
[https://doi.org/10.1016/0304-3959\(87\)91074-8](https://doi.org/10.1016/0304-3959(87)91074-8)
- Nascimento, P. R. C. d., Costa, L. O. P., Araujo, A. C., Poitras, S., & Bilodeau, M. (2019). Effectiveness of interventions for non-specific low back pain in older adults. A systematic review and meta-analysis. *Physiotherapy (United Kingdom)*, 105(2), 147–162.  
<https://doi.org/10.1016/j.physio.2018.11.004>
- Noormohammadpour, P., Kordi, M., Mansournia, M. A., Akbari-Fakhrabadi, M., & Kordi, R. (2018). The Role of a Multi-Step Core Stability Exercise Program in the Treatment of Nurses with Chronic Low Back Pain: A Single-Blinded Randomized Controlled Trial. *Asian Spine Journal*, 12(3), 490–502. <https://doi.org/10.4184/ASJ.2018.12.3.490>
- O’Connell, N. E., Cook, C. E., Wand, B. M., & Ward, S. P. (2016). Clinical guidelines for low back pain: A critical review of consensus and inconsistencies across three major guidelines. *Best Practice & Research Clinical Rheumatology*, 30(6), 968–980.  
<https://doi.org/10.1016/J.BERH.2017.05.001>
- Overaas, C. K., Johansson, M. S., de Campos, T. F., Ferreira, M. L., Natvig, B., Mork, P. J., & Hartvigsen, J. (2017). Prevalence and pattern of co-occurring musculoskeletal pain and its association with back-related disability among people with persistent low back pain: protocol for a systematic review and meta-analysis. *Systematic Reviews*, 6(1).  
<https://doi.org/10.1186/S13643-017-0656-7>
- Ozsoy, G., Ilcin, N., Ozsoy, I., Gurpinar, B., Buyukturan, O., Buyukturan, B., Kararti, C., & Sas, S. (2019). The Effects Of Myofascial Release Technique Combined With Core Stabilization Exercise In Elderly With Non-Specific Low Back Pain: A Randomized Controlled, Single-Blind Study. *Clinical Interventions in Aging*, 14, 1729.  
<https://doi.org/10.2147/CIA.S223905>
- Peng, H. Y., & Lin, T. Bin. (2012). Spinal pelvic-urethra reflex potentiation. *BioMedicine*, 2(2), 64–67. <https://doi.org/10.1016/J.BIOMED.2012.03.001>
- Pourahmadi, M. R., Taghipour, M., Jannati, E., Mohseni-Bandpei, M. A., Takamjani, I. E., & Rajabzadeh, F. (2016). Reliability and validity of an iPhone® application for the measurement of lumbar spine flexion and extension range of motion. *PeerJ*, 2016(8), e2355. <https://doi.org/10.7717/PEERJ.2355/SUPP-1>
- Reid, M. C., Williams, C. S., & Gill, T. M. (2005). Back Pain and Decline in Lower Extremity Physical Function Among Community-Dwelling Older Persons. *The Journals of Gerontology: Series A*, 60(6), 793–797. <https://doi.org/10.1093/GERONA/60.6.793>
- Rodríguez-Fuentes, I., De Toro, F. J., Rodríguez-Fuentes, G., De Oliveira, I. M. H., Meijide-Faílde, R., & Fuentes-Boquete, I. M. (2016). Myofascial release therapy in the treatment of occupational mechanical neck pain: A randomized parallel group study. *American Journal of Physical Medicine and Rehabilitation*, 95(7), 507–515.  
<https://doi.org/10.1097/PHM.0000000000000425>

- Sharafudeen, A. M. (2018). *MYOFASCIAL RELEASE AS A TREATMENT CHOICE FOR NEUROMUSCULAR CONDITIONS: THREE RANDOMISED CONTROLLED TRIALS AND A SYSTEMATIC LITERATURE REVIEW*.
- Sığlan, Ü., & Çolak, S. (2022). Effects of diaphragmatic and iliopsoas myofascial release in patients with chronic low back pain: A randomized controlled study. *Journal of Bodywork and Movement Therapies*. <https://doi.org/10.1016/J.JBMT.2022.09.029>
- Stuber, K. J., Bruno, P., Sajko, S., & Hayden, J. A. (2014). Core stability exercises for low back pain in athletes: a systematic review of the literature. *Clinical Journal of Sport Medicine : Official Journal of the Canadian Academy of Sport Medicine*, 24(6), 448–456. <https://doi.org/10.1097/JSM.0000000000000081>
- Tamartash, H., Bahrpeyma, F., & Mokhtari dizaji, M. (2022). Comparative effect of lumbar myofascial release with electrotherapy on the elastic modulus of lumbar fascia and pain in patients with non-specific low back pain. *Journal of Bodywork and Movement Therapies*, 29, 174–179. <https://doi.org/10.1016/J.JBMT.2021.10.008>
- Terkawi, A., Tsang, S., Abolkhair, A., Alsharif, M., Alswiti, M., Alsadoun, A., Alzoraigi, U., Aldahri, S., Al-Zahrani, T., & Altirkawi, K. (2017). Development and validation of Arabic version of the Short-Form McGill Pain Questionnaire. *Saudi Journal of Anaesthesia*, 11(Suppl 1), S2. [https://doi.org/10.4103/SJA.SJA\\_42\\_17](https://doi.org/10.4103/SJA.SJA_42_17)
- Verbunt, J. A., Westerterp, K. R., Van Der Heijden, G. J., Seelen, H. A., Vlaeyen, J. W., & Knottnerus, J. A. (2001). Physical activity in daily life in patients with chronic low back pain. *Archives of Physical Medicine and Rehabilitation*, 82(6), 726–730. <https://doi.org/10.1053/APMR.2001.23182>
- Vos, T., Abajobir, A. A., Abbafati, C., Abbas, K. M., Abate, K. H., Abd-Allah, F., Abdulle, A. M., Abebo, T. A., Abera, S. F., Aboyans, V., Abu-Raddad, L. J., Ackerman, I. N., Adamu, A. A., Adetokunboh, O., Afarideh, M., Afshin, A., Agarwal, S. K., Aggarwal, R., Agrawal, A., ... Murray, C. J. L. (2017). Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990-2016: A systematic analysis for the Global Burden of Disease Study 2016. *The Lancet*, 390(10100), 1211–1259. [https://doi.org/10.1016/S0140-6736\(17\)32154-2](https://doi.org/10.1016/S0140-6736(17)32154-2)
- Wang, X. Q., Zheng, J. J., Yu, Z. W., Bi, X., Lou, S. J., Liu, J., Cai, B., Hua, Y. H., Wu, M., Wei, M. L., Shen, H. M., Chen, Y., Pan, Y. J., Xu, G. H., Chen, P. J., & Eldabe, S. (2012). A Meta-Analysis of Core Stability Exercise versus General Exercise for Chronic Low Back Pain. *PLOS ONE*, 7(12), e52082. <https://doi.org/10.1371/JOURNAL.PONE.0052082>
- What Are Core Muscles and How to Strengthen Them | Fitpage*. (n.d.). Retrieved January 17, 2023, from <https://fitpage.in/core-muscles-and-how-to-strengthen-them/>
- Wong, A. Y. L., Parent, E. C., Funabashi, M., Stanton, T. R., & Kawchuk, G. N. (2013). Do various baseline characteristics of transversus abdominis and lumbar multifidus predict clinical outcomes in nonspecific low back pain? A systematic review. *Pain*, 154(12), 2589–

2602. <https://doi.org/10.1016/J.PAIN.2013.07.010>

Wood, S. M. (n.d.). *EFFICACY OF MYOFASCIAL DECOMPRESSION FOR MUSCULOSKELETAL CONDITIONS*.

Wu, Z., Wang, Y., Ye, X., Chen, Z., Zhou, R., Ye, Z., Huang, J., Zhu, Y., Chen, G., & Xu, X. (2021). Myofascial Release for Chronic Low Back Pain: A Systematic Review and Meta-Analysis. *Frontiers in Medicine*, 8, 1210.  
<https://doi.org/10.3389/FMED.2021.697986/BIBTEX>



## Data collection Tools and Questionnaire (Appendixes)

### Appendix 1. Participants survey form

#### Participants Survey Form نموذج استبيان المشاركين

Name (First letters only) \ الاسم (الأحرف الأولى فقط)

[Click here to enter text.](#)

Date of Birth \ تاريخ الميلاد

[Click here to enter a date.](#)

Phone number \ رقم المحمول

[Click here to enter text.](#)

Email \ البريد الإلكتروني

[Click here to enter text.](#)

Occupation \ المهنة \ الوظيفة [Choose an item.](#)

[Click here to enter text.](#)

Address \

العنوان

[Click here to enter text.](#)

City \ مدينة

[Click here to enter text.](#)

Town \

قرية

[Click here to enter text.](#)

Floor \ طابق

[Click here to enter text.](#)

#### General information معلومات عامة

Height \ الطول

[Click here to enter text.](#)

Weight \ الوزن

[Click here to enter text.](#)

Body Mass Index (BMI) \ مقياس الطول للوزن

[Click here to enter text.](#)

Waist circumference \ محيط الخصر

[Click here to enter text.](#)

Marital status \ الحالة الاجتماعية

☐ Married \ متزوج

☐ Single \ أعزب

☐ Widowed \ أرمل

☐ Engaged \ مخطوب

Do you have children \ هل لديك أطفال

☐ Yes \ نعم

☐ No \ لا

No. of them \ عددهم

[Click here to enter text.](#)

## Pain History التاريخ الطبي

Does your Low Back Pain last more than 3 months?  
هل دام ألمك أكثر من 3 شهور؟

☐ Yes\ نعم ☐ No\ لا

If yes, please mention period.  
إذا كانت اجابتك بنعم, من فضلك اذكر المدة.

[Click here to enter text.](#)

Are you presently under medical care of any type?  
هل تخضع لاي علاج طبي او تتعاطى أي أدوية من أي نوع؟

☐ Yes\ نعم ☐ No\ لا

Name of medical care or drug.\ اسم التدخل الطبي أو الدواء؟

[Click here to enter text.](#)

Have you ever had any surgical procedure?  
هل سبق وخضعت لعملية جراحية؟

☐ Yes\ نعم ☐ No\ لا

Are you a smoker?  
هل أنت مدخن؟

☐ Yes\ نعم ☐ No\ لا ☐ Former smoker\ مدخن سابق

Do you have any type of chronic diseases?  
هل تعاني من أية أمراض مزمنة؟

☐ Yes\ نعم ☐ No\ لا

All information mentioned above will only be used of scientific researches purposes, and it will be used confidentially and carefully. Please sign  
جميع المعلومات المذكورة انفاً, ستستعمل فقط لأغراض البحث العلمي, وسيتم التعامل معها بسرية وبحرص. من فضلك وقع هنا

[Click here to enter text.](#)

## Appendix 2. Arabic Short-Form McGill Pain Questionnaire (ASF-MPQ)

| Short-Form McGill Pain Questionnaire (SF-MPQ)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                          |                          |                          |                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <p><b>عزيزي المريض:</b><br/> بما أنك قد ذكرت لنا أحد الأعراض والمشاكل المصاحبة لك وهو الألم الجسدي، فإن الغرض من هذا الاستبيان هو تقييم شعورك بهذا الألم، علماً أن كلاً من الكلمات في العمود الأيمن يصف نوعية وميزة الألم لديك. ولذلك يرجى تقييم نوع الألم الذي تشعر به بوضع علامة أمام ✓ كل نوع في العمود الأيمن وعلى حسب شدة الألم، حيث أن (0) تعني لا يوجد، (1) خفيف، (2) متوسط، (3) شديد.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                          |                          |                          |                          |
| الرجاء وضع علامة (✓) في المكان المناسب.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                          |                          |                          |
| نوع الألم                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (0) لا يوجد              | (1) خفيف                 | (2) متوسط                | (3) شديد                 |
| 1- أشعر بالألم كالنبض (خافق)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2- أشعر بالألم ضارب                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3- أشعر بالألم كالطعنات                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4- أشعر بالألم حاد                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5- أشعر بالألم كالتقلصات                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6- أشعر بالألم قارض (قضم)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7- أشعر بالألم حارق                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8- أشعر بالألم ثابت موجه                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9- أشعر بالألم الإحساس بالثقل                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10- أشعر بالألم عند الضغط أو اللمس                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11- أشعر بالألم كالتمزق (تقطيع)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12- الألم متعب و مرهق                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13- الألم ممرض (مقزز)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14- الألم مقلق (مخيف)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15- أشعر بالألم قاسي-شديد                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| الرجاء قم بوضع إشارة على الرقم الذي يعكس شدة الألم لديك:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                          |                          |                          |                          |
| <div style="display: flex; align-items: center; justify-content: space-between;"> <span>أسوأ ألم ممكن</span> <div style="text-align: center;"> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">←</div> <div style="display: flex; justify-content: space-around; width: 100%;"> <div style="text-align: center;">10</div> <div style="text-align: center;">9</div> <div style="text-align: center;">8</div> <div style="text-align: center;">7</div> <div style="text-align: center;">6</div> <div style="text-align: center;">5</div> <div style="text-align: center;">4</div> <div style="text-align: center;">3</div> <div style="text-align: center;">2</div> <div style="text-align: center;">1</div> <div style="text-align: center;">0</div> </div> <div style="display: flex; justify-content: space-around; width: 100%;"> <div style="text-align: center;"><input type="checkbox"/></div> <div style="text-align: center;"><input type="checkbox"/></div> <div style="text-align: center;"><input type="checkbox"/></div> <div style="text-align: center;"><input type="checkbox"/></div> <div style="text-align: center;"><input type="checkbox"/></div> <div style="text-align: center;"><input type="checkbox"/></div> <div style="text-align: center;"><input type="checkbox"/></div> <div style="text-align: center;"><input type="checkbox"/></div> <div style="text-align: center;"><input type="checkbox"/></div> <div style="text-align: center;"><input type="checkbox"/></div> <div style="text-align: center;"><input type="checkbox"/></div> </div> </div> </div> </div> |                          |                          |                          |                          |
| الرجاء اختيار أفضل خيار يصف الألم الذي تشعر به:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          |                          |                          |                          |
| <div style="display: flex; flex-direction: column; align-items: flex-end;"> <div>1- لا يوجد ألم <input type="checkbox"/></div> <div>2- ألم خفيف <input type="checkbox"/></div> <div>3- ألم مزعج <input type="checkbox"/></div> <div>4- ألم مقلق <input type="checkbox"/></div> <div>5- ألم فظيع <input type="checkbox"/></div> <div>6- ألم مبرح معذب جداً <input type="checkbox"/></div> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          |                          |                          |                          |
| <div style="display: flex; justify-content: space-between;"> <div>هل الألم الذي تشعر به في الوقت الحالي:</div> <div> <input type="checkbox"/> يأتي على فترات قصيرة <input type="checkbox"/> متقطع <input type="checkbox"/> متواصل </div> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          |                          |                          |                          |
| (اختر إجابة واحدة فقط)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                          |                          |                          |                          |

### Appendix 3. TiltMeter-advance level and inclinometer app



## Appendix 4. Arabic Oswestry Disability Index (AODI)

### الفقرة 6: الوقوف:

- 0- أستطيع الاستمرار في الوقوف الفترة التي أريدها دون أن يزيد ذلًا من الألم أسفل ظهري. ☐
- 1- أستطيع الاستمرار في الوقوف الفترة التي أريدها، لكن ذلك يزيد من آلام أسفل ظهري. ☐
- 2- تمنعني آلام أسفل ظهري من الوقوف ما يزيد عن ساعة. ☐
- 3- تمنعني آلام أسفل ظهري من الوقوف ما يزيد عن نصف ساعة. ☐
- 4- تمنعني آلام أسفل ظهري من الوقوف ما يزيد عن عشرة دقائق. ☐
- 5- تمنعني آلام أسفل ظهري من الوقوف قطعيا. ☐

### الفقرة 7: النوم:

- 0- لا تغيير يذكر أو اضطراب على طبيعة نومي بسبب الآلام أسفل ظهري ☐
- 1- أحيانا يحدث اضطراب في نومي بسبب الآلام أسفل ظهري ☐
- 2- معدل نومي اليومي أقل من 6 ساعات بسبب ألم أسفل ظهري ☐
- 3- معدل نومي اليومي أقل من 4 ساعات بسبب ألم أسفل ظهري. ☐
- 4- معدل نومي اليومي أقل من ساعتين بسبب ألم أسفل ظهري. ☐
- 5- ليس باستطاعتي النوم مطلقا بسبب آلام أسفل ظهري. ☐

### الفقرة 1: شدة الآلام

- 0- لا أعاني من آلام أسفل ظهري في الفترة الحالية ☐
- 1- أشعر بآلام خفيفة في أسفل ظهري في الفترة الحالية ☐
- 2- أشعر بآلام متوسطة أسفل ظهري في الفترة الحالية ☐
- 3- أشعر بآلام شديدة نوعا ما أسفل ظهري في الفترة الحالية ☐
- 4- أشعر بآلام شديدة جدا أسفل ظهري في الفترة الحالية ☐
- 5- أشعر أن الآلام في أسفل ظهري لا يمكن تحملها أو تصورها ☐

### الفقرة 2: العناية الشخصية-مثل الإغتسال ولبس الملابس

- 0- يمكنني الإعتناء بنفسى وبأموري الشخصية بشكل طبيعي، ولا يزيد ذلك من آلام أسفل ظهري. ☐
- 1- يمكنني الإعتناء بنفسى وبأموري الشخصية، ولكن يزيد ذلك من ألم أسفل ظهري. ☐
- 2- يمكنني الإعتناء بنفسى وبأموري الشخصية، ولكن ذلك يستغرق وقتاً أطول من الطبيعي أو المعتاد ☐
- 3- أحتاج القليل من المساعدة ولكن معظم أمور الخاصة أقوم بها بنفسى. ☐
- 4- أحتاج للمساعدة بتسوية أمورى الخاصة بشكل يومي. ☐
- 5- أبقي مستلقيا في سريري، لا أقدر على لبس ثيابي، وأغتسل بصعوبة. ☐

### الفقرة 3: رفع الأشياء ونقلها:

- الفقرة 8: الحياة الجنسية (هذه الفقرة للمتزوجين، أو من سبق لهم ☐

0-أستطيع رفع الأغراض الثقيلة دون زيادة على آلام أسفل ظهري.

الزواج وممارسة الحياة الجنسية، إذا لم ينطبق عليك هذا الشرط  
الرجاء الانتقال للفقرة (9):

0-حياتي الجنسية طبيعية ولا تتسبب بزيادة آلام أسفل ظهري.

1- أستطيع رفع الأغراض الثقيلة مع زيادة على آلام أسفل ظهري.

1- حياتي الجنسية طبيعية ولكنها تتسبب ببعض الزيادة في آلام أسفل ظهري

2- لا أقدر على رفع الأغراض عن الأرض، ولكن بمقدرتي رفعها من مستوى أعلى أو مرتفع كالطاولة.

2- حياتي الجنسية عادية نوعا ما ولكنها تتسبب بالزيادة الشديدة في آلام أسفل ظهري

3- لا أقدر على رفع الأغراض الثقيلة، ولكن بمقدرتي رفع الأغراض الخفيفة بشرط أن يكون مستواها عاليا أو مرتفعا كالطاولة.

3-نادرا ما أقوم بممارسة العلاقة الجنسية بسبب آلام أسفل ظهري.

4-حياتي الجنسية شبه معدومة بسبب آلام أسفل ظهري.

4-فقط أستطيع رفع الأغراض الخفيفة

5-أتمنعي الآلام عن ممارسة حياتي الجنسية مطلقا.

5-ليس بمقدوري مطلقا رفع أي غرض.

6-لم يسبق لي الزواج أو ممارسة العلاقة الجنسية.

#### الفقرة 4: المشي:

0-الآلم أسفل ظهري لا يمنعني من المشي مهما بلغت المسافة(كالمشي بالجوار)

الفقرة 9: الحياة الاجتماعية(زيارة الأقارب واستقبالهم،والخروج مع الأصدقاء، والمشاركة بالاحتفالات والأنشطة المجتمعية)

0-لا تزيد الآلام أسفل ظهري من ممارسة الأنشطة المجتمعية

1-يمنعني الألم أسفل ظهري من المشي مسافة تتجاوز 1500 متر (1.5 كيلومتر)

1- تزيد الآلام أسفل ظهري من ممارسة الأنشطة المجتمعية، ولكنها تزيد من شدة الألم

2-يمنعني الألم أسفل ظهري من المشي مسافة تتجاوز 1000 متر (1 كيلومتر)

2-لا تأثير على حياتي الاجتماعية من ألم أسفل ظهري،ولكن الألم يقلل من نشاطاتي ذات المجهود الكبير.

3-يمنعني الألم أسفل ظهري من المشي مسافة تتجاوز 400 متر

3-تأثرت أنشطتي المجتمعية وقلت علاقاتي بالآخرين نتيجة ألم أسفل ظهري.

4-أحتاج أداة كالعصا أو العكاز لمساعدتي على المشي

4-انحصرت حياتي الاجتماعية على البقاء في المنزل بسبب ألم أسفل ظهري.

☐ 5- أبقى مستلقيا غالبية الوقت بالفراش، وأقوم بالزحف وصولا للمرحاض

**الفقرة 5: الجلوس:**

☐ 0-يمكنني الجلوس بكل راحة الفترة التي أريدها، على أي كرسي

☐ 1- يمكنني الجلوس بكل راحة الفترة التي أريدها، فقط على كرسي مريح

☐ 2- يمكنني الجلوس على أي كرسي ولكن يمنعني الألم من البقاء لأكثر من ساعة.

☐ 3-- يمكنني الجلوس على أي كرسي ولكن يمنعني الألم من البقاء لأكثر من نصف ساعة.

☐ 4-لا أقدر على الجلوس لأكثر من عشر دقائق حيث يمنعني الألم.

☐ 5-لا أقدر على الجلوس مطلقا بسبب الآلام

5-حياتي الإجتماعية توقفت بسبب الآلام في أسفل ظهري.

**الفقرة 10: السفر:**

☐ 0-أقدر على السفر إلى أي مكان ولا يؤثر ذلك على الألم أسفل ظهري

☐ 1- أقدر على السفر إلى أي مكان ولكن يزيد ذلك من الألم أسفل ظهري.

☐ 2-مقدرتي على السفر لا تتعدى حدود الساعتين، مع أن آلام أسفل ظهري شديدة.

☐ 3- مقدرتي على السفر لا تتعدى حدود ساعة زمنية بسبب الآلام أسفل ظهري.

☐ 4-الآلام أسفل ظهري يعيق تحركاتي و رحلاتي، الضرورية والقصيرة والتي تقل عن نصف ساعة.

☐ 5-لا قدرة لي على السفر بتاتا الا لتلقي العلاج.

☐ 6-لم أسافر قط في أي يوم من الأيام

## Appendix 5. Arabic Euroqol group's 5-domain 5-level questionnaire (EQ-5D-5L)

انقر في المربع الخاص بكل خيار في الأسفل، لتشير إلى أفضل عبارة تصف حالتك الصحية اليوم

### القدرة على التنقل

- ☐ ليس لدي أي مشاكل عند المشي
- ☐ أعاني من مشاكل طفيفة عند المشي
- ☐ أعاني من مشاكل متوسطة عند المشي
- ☐ أعاني من مشاكل حادة عند المشي
- ☐ ليس لدي القدرة على المشي

### العناية الشخصية

- ☐ ليس لدي أي مشاكل عند الاستحمام أو ارتداء ملابسني بنفسي
- ☐ أعاني من مشاكل طفيفة عند الاستحمام أو ارتداء الملابس بنفسي
- ☐ أعاني من مشاكل متوسطة عند الاستحمام أو ارتداء الملابس بنفسي
- ☐ أعاني من مشاكل حادة عند الاستحمام أو ارتداء الملابس بنفسي
- ☐ ليس لدي القدرة على الاستحمام أو ارتداء الملابس بنفسي

### الأنشطة المعتادة (عمل، نشاطات يومية، أعمال بالمنزل، دراسة، هوايات)

- ☐ ليس لدي أي مشاكل في ممارسة نشاطاتي المعتادة
- ☐ أعاني من مشاكل طفيفة في ممارسة نشاطاتي المعتادة
- ☐ أعاني من مشاكل متوسطة في ممارسة نشاطاتي المعتادة
- ☐ أعاني من مشاكل حادة في ممارسة نشاطاتي المعتادة
- ☐ ليس لدي القدرة على ممارسة نشاطاتي المعتادة

### الألم/عدم الراحة الجسمية

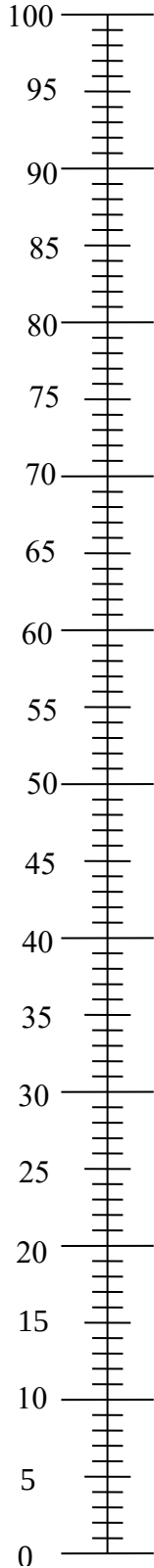
- ☐ ليس لدي أي ألم أو شعور بعدم الراحة الجسمية
- ☐ أعاني من ألم طفيف أو انزعاج طفيف
- ☐ أعاني من ألم متوسط أو انزعاج متوسط
- ☐ أعاني من ألم حاد أو انزعاج حاد
- ☐ أعاني من ألم شديد جداً أو انزعاج شديد جداً

### القلق/ الاكتئاب

- ☐ لا أعاني من أي قلق أو اكتئاب
- ☐ أعاني من قلق طفيف أو اكتئاب طفيف
- ☐ أعاني من قلق متوسط أو اكتئاب متوسط
- ☐ أعاني من قلق حاد أو اكتئاب حاد
- ☐ أعاني من قلق شديد جداً أو اكتئاب شديد جداً



أحسن حالة صحّية يُمكن  
تصوّرُها.



أسوأ حالة  
صحّية  
يُمكن  
تصوّرُها.

- نود أن نعرف مدى سوء حالتك الصحّية أو سلامتها اليوم.
- هذا المقياس مدرج من الرقم 0 حتى 100
- الرقم 100 يعني أحسن حالة صحّية يمكنك تصوّرُها.
- 0 يعني أسوأ حالة صحّية يمكنك تصوّرُها
- ضع (x) على المقياس للإشارة إلى حالتك الصحّية اليوم
- الآن، قم رجاء بكتابة الرقم الذي أشرت إليه على المقياس في المربع أدناه

حالتك الصحّية اليوم =

## Appendix 6. Ethical Approval from Research Ethical Committee

Al-Quds University  
Jerusalem  
Deanship of Scientific Research



جامعة القدس  
القدس  
عمادة البحث العلمي

### Research Ethics Committee Committee's Decision Letter

Date: March 11, 2023

Ref No: 278/REC/2023

Dears Dr. Hadeel Halaweh, Mr. Altayeb Shehada,

Thank you for submitting your application for research ethics approval. After reviewing your application entitled "The effect of the myofascial release combined with core stability exercises versus core stability exercise among adult males – with non-specific chronic low back pain.", 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  
Tel-Fax: #970-02-2791293

[research@admin.alquds.edu](mailto:research@admin.alquds.edu)

أبوديس، القدس ص.ب. 20002  
تلفاكس: #970-02-2791293