

**“DEVELOPMENT OF THERAPEUTIC MASSAGE AND
EXERCISES MODEL FOR BACK MUSCULOSKELETAL
DISORDERS REHABILITATION”**

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ABSTRACT

Back Musculoskeletal disorders commonly occur in the workplace and improper lifestyle. Back musculoskeletal therapeutics programs have been carried out, but they are still ineffective. This research aimed to develop a therapeutic massage and exercise model for back musculoskeletal disorders, to validate the developed model, and test the effectiveness of the therapeutic massage and exercise model for back musculoskeletal disorders.

The research method was Research and Development (R&D). This research has three steps: the first stage was a narrative literature review with international journals and textbooks as the research sample, a data collection technic using download documents, with thematic qualitative data analysis. The second stage was the feasibility study with expert judgement and a massage therapist. The instrument used was a questionnaire with a Likert scale from 1 to 4, data analysis using the Aiken formula. Field trials used massage therapist subjects, and the instrument used was a questionnaire and data analysis using qualitative. The third stage was the pre-experimental research with 24 subjects (5 males and 19 females), aged between 28-62, who were suffering from back musculoskeletal injuries; the instruments were a goniometer to assess the range of motion (ROM), sit-ups, and leg press to assess strength. Data analysis was conducted using paired t-tests and Wilcoxon analysis.

The results showed that the developed program had been validated with an Aiken score of more than 0.82, strong validation, and an intra-reliability of 0.84 with Cronbach's Alpha. Small and large trials showed a strong mean of 95% in terms of accuracy, safety, and feasibility of the developed program. The effectiveness test showed an enormously significant difference between the pre-test and post-test of the tested variables with a P Value<0.05.

Key words: massage, exercise, musculoskeletal disorders, rehabilitation

Abstrak

Cedera punggung umumnya terjadi di tempat kerja dan gaya hidup yang tidak benar. Program terapi sudah dilakukan namun belum efektif. Tujuan dari penelitian ini adalah untuk mengembangkan model terapi pijat dan latihan, memvalidasi model yang dikembangkan dan menguji efektivitas model terapi.

Metode yang digunakan adalah Research and Development (R&D). Penelitian ini ada tiga tahap yaitu tahap satu penelitian dokumen, subyek jurnal internasional dan teksbook, pengumpulan data menggunakan *data collection technic using download documents*, analisis datanya kualitatif tematik. Tahap kedua penelitian evaluasi, subyek penelitian ahli akademik dan ahli profesi terapis, instrument menggunakan kousioner dengan skal likert 1-4, analisis data formula Aiken. Ujicoba lapangan menggunakan subyek terapis massase, instrument menggunakan kousioner, analisis data menggunakan kualitatif. Tahap ketiga penelitian pre eksperimen, 24 parasubjek (5 laki-laki, dan 19 perempuan) umur mereka antara 28-62seorang cedera punggung, instrument menggunakan goniometer untuk mengevaluasi *range of motion*(ROM), *sit up*, and *leg press*, untuk mengevaluasi kekuatan. analisis data menggunakan paired t-test dan Wilcoxon analisis.

Hasil penelitian menunjukkan bahwa program yang dikembangkan telah divalidasi dengan nilai Aiken lebih dari 0,82 kategori tinggi, dan intra-reliabilitas 0.84 dengan Cronbach's Alpha. Uji coba kecil dan besar menunjukkan nilai rata-rata kuat 95% di sisi akurasi, keamanan, dan kelayakan program yang dikembangkan. Uji efektivitas menunjukkan perbedaan signifikan yang kuat antara pre-test dan posttest dari variabel-variabel yang diuji dengan P Value < 0,05.

Kata Kunci: *pijat, olahraga, gangguan muskuloskeletal, rehabilitasi*

APPROVAL

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I certify that this dissertation is my work and has no longer been submitted for a degree in any university. I am responsible for the contents. Other writers' opinions or findings in this dissertation are quoted or noted in the reference.

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CHAPTER I

INTRODUCTION

A. Background of The Study

Musculoskeletal disorders (MSDs) have been found as the traumas which attach the human body system. The muscles, bones, tendons, nerves, ligaments, joints, blood vessels, and spinal discs were the fundamental parties of the human locomotion (Tamene et al., 2020). The environment, and the nature of the work were found as the most causes of Musculoskeletal disorders (MSDs) (Punchihewa & Gyi, 2016). In many countries, the development of the population has been blocked by MSDs (Bevan, 2015). They have a high socio-economic effects and change the individuals' quality life. These disruptions drive workers, businesses and society (Rezaghali, 2016). One study done by Abaraogu in 2016 stated that two million female and male worldwide became slaves to the workplace. Some pathology can be cited like lumbar, degenerative disc, sciatic nerve, and chronic spine diseases, which corresponds to more than 5,480 victims daily. Globally, MSDs are often implicated as one of the main causes of employee complaints (Abaraogu et al., 2016). There are many types of musculoskeletal disorders in the lower and upper extremities: neck, spine, lower spine problems, sciatic nerve, lumbar diseases, chronic hips pain, chronic knee pain, strain, sprain, ankle injuries (NDAYISENGA, 2020). The study by Maheshwari, 2015 showed that musculoskeletal disorders prevalence among physiotherapists was distributed like 91% of 100 subjects surveyed have MSD like low back and neck (72.5% each) (Maheshwari, 2015). Aldhafian et al.'s

study showed a predominance of musculoskeletal torment among staff individuals was 77.8%. The foremost common location of musculoskeletal suffering happened at two distinctive destinations, low back and neck, with a prevalence of 38.9%(Aldhafian et al., 2021). A cross-sectional study find out that 1179 clinical attendants working in 15 vicinity clinics making use of the Standardized Nordic Survey and, the the findings carried out an excessive occurrence of MSDs within the previous 12 months (74.7%), and amid the final seven days (41.1%), with the two most frequent places were lower back problems (44.4%) and neck (44.1%), was found; 37.8% complained that MSDs indicators restrain their work (Luan et al., 2018). MSD were presented in the most agents of global disabilities, accounting of 16% occassionally lived with handicaps, and lower back problems was the principal cause (Global Burden of Disease Study 2017, 2017). In South Korea, a study done by Doherty et al. in 2014 showed that 33% of the population aged up to 50 have MSD, like back pain 30.7%, upper extremities 61.3%, and fatigue 35.6% (Doherty et al., 2014).

Epidemiological studies done by Hembecker reported the following prevalence rates of 79% of injuries in the manufacturing industry in Brazil. The most destination of injuries was spine muscle pain, low back muscle pain, and neck pain (Hembecker et al., 2017). Similar research in Iran showed a percentage of 41.5% of Iranian petrochemical industries had back muscle disorders, neck muscle disorders, and hips muscle pain (Kaltah et al., 2018). Other research done in India showed a percentage of 97.3% among textile industry workers with back muscle and spine injuries were at a high level for the textile people industry

(Angeline & Bobby, 2018). The result of the study by Singh(2011) stated that people who use vehicles suffer from hips muscle pain and spine muscle pain (Singh & Singh; G, 2018). In Malaysia, the result from the lookout in industry, 92% of injuries surveyed were distributed in this study in the low back, neck muscle, spine, or thoracic region (Tamene et al., 2020), and 77% of the MSDs surveyed in Bangladesh workers were classified in the low back, thoracic, and cervical/neck (Akter et al., 2016). From the results above, it can be concluded that MSDs are many, but this research focused only on back musculoskeletal disorders(BMSDs), in other words, BMSDs from the neck, spine to low back pain.

Length of time in the employment has been studied as the high risk of back musculoskeletal injured, but the age associated with the heavy work was sufficient to touch the human body (Mcabee & Rnc, 1988). In Indonesia, there was still a high prevalence of back musculoskeletal, and the research showed that the causes were the workplace(Afriannisyah et al., 2020, Lestari et al., 2021). BMSDs are a vary of stipulations associated to the bones, joints, muscular tissues and nerves of the back. Back issues were a big purpose of incapacity and the loss of productiveness. The findings from research done in 2017–18 showed that there were 181,000 hospitalizations from BMSDs about 4.0 million people from Australia, more than (16%) have BMSDs(Australian Institute of Health and Welfare (AIHW), 2019). Based on the above studies, the researcher concluded that low back disorders, spine disorders, and neck/cervical disorders were the most MSDs caused by the workplace. The researcher only focused on back musculoskeletal disorders (BMSDs). However, Back Musculoskeletal BMSDs

has many effects like decreasing athlete performance, the social-economic level, diminishing productivity in many work sectors, and increasing human stress. In general back MSDs need to be treated to improve human health and the country's development. The source of BMSDs was strongly related to the workplace (Gallagher & Mayton, 2007). One research with 452 competitors from 12-20 years old was screened to consider again back ache and cervical ache in 5 types physical activities, along with football, volleyball, basketball, wrestling, and other sports activities in one of the Iranian recreation Olympiads. The result confirmed that neck ache and LBP in all the competitors have been 38.8% and 42.0%, respectively. The perfect risk of neck ache at all-time factors was located among basketball gamers in contrast to other game companies ($P < 0.05$). The threat of LBP in most time factors used to be the least amongst wrestlers ($P < 0.05$). The ADI rating used to be drastically higher among basketball gamers (13.89%) in contrast to volleyball players and wrestlers ($P < 0.05$). This learn about published an excessive incidence of neck pain and LBP amongst Iranian young participants. A greater threat of neck ache and LBP amongst basketball gamers predisposes this game to an extended chance of growing backbone accidents which need similarly consideration (Farahbakhsh et al., 2018). Those results showed that the most workplace caused BMSDs.

A systematic literature reviews meta-analysis on dance confirmed that 50 full-text articles had been blanketed in the closing systematic review. There was once vast methodological heterogeneity amongst the covered studies. The intersection point, yearly, and lifetime occurrence of LBP was between 27-and

50% of employees surveyed (Swain et al., 2019). Back MSDs are the most prevalent complaints of athletes at all levels of competition (Nandlall et al., 2020). An epidemiologic study in Burundi in 2020 showed that many people were suffering from back musculoskeletal disorders. The lookup goals were to explore the link between work and human health. That was explorative lookup with qualitative and quantitative approaches. The research sampling was 131 participants taken randomly, and they were from the total party of Burundi. The subjects were aged between 16-and seventy five years, from a number of sectors jobs. The information series method was Google form, interview, and literature review. Data have been analyzed with descriptive statistics. The result confirmed that 53,43% (70 subjects) of the surveyed population have neck muscle pain. 61% (65 subjects) have top lower back muscle pain. 54,96% (72) have middle lower back muscle pain. 31,29% (41 persons) have low lower back muscle pain. 12,97% (17 participants) have hips muscle ache, and this explorative study showed how the back musculo skeletal injuries touched the posterior human parties(Ndayisenga, 2021b).

Based on the literature review about back musculoskeletal disorders related to the workplace, it can be concluded that: all the researches done have shown that back musculoskeletal disorders which affected muscles, joints, spine, ligaments, nervous were at a high level. In the whole world, most people are suffering from back musculoskeletal disorders related to the workplace and nature of the job, but also age was found as a substantial factor cause of BMSDs.

According to the severe of back MSDs, some researches have done to fix the later problem. Among the treatments proposed it can be cited: massage therapy, therapeutic exercise. Massage therapy has an important benefit on the back musculoskeletal disorder; for example, chair massage/exercise like dance has a positive impact on reducing BMSDs(Health, 2020). A conducted learn about recognized 29 eligible research recruiting 1012 participants, representing the greatest examination of the consequences of massage. The end result determined no proof that rub down improves strength, jump, sprint, staying power or fatigue measures, however the rub down used to be a statistically sizable enchancement in range of motion (Best et al., 2008, Davis et al., 2020). Massage cannot allow the fast improvement of physical fitness(Brummitt, 2008). The study by Moraska, 2005, and Trofa et al., 2020 stated that more quickly recovery of massage therapy is still unclear, but it can increase ROM and reduce pain(Moraska, 2005, Trofa et al., 2020). Low back pain was the common spine musculoskeletal disorder that affected most athletes and no athlete. A study in Asia showed that people with back MSDs could retake their previous activity level after getting a massage and therapeutic exercise. Still, there was no fix time to confirm how long people could return back to their lifestyle activities after treatment (Mortazavi et al., 2015). Academic researches compiled in the book entitled *Massage for Therapists: A guide to soft tissue therapy*, Third Edition done by Hollis and Jones in 2009 has shown that massage therapy has a very important role in restoring problem health like: improved flexibility of the skin, muscles and connective tissues. Improvements or

maintenance of good joint mobility. Improved blood and lymphatic circulation. Reduced stress. Improved quality of sleep, decreasing of the level pain (Hollis & Jones, 2009). Massage therapy has been found as a strong way to restore sports injuries, musculoskeletal disorders, strains, sprains (Ansori, 2015)

The main type of massage used to treat BMSDs is the following (1) Swedish massage: Swedish rubdown is a mild full-body rubdown this was perfect for humans with stiff joints or greater full-body pain. The Swedish rubdown utilizes 5 distinct stroke techniques to deal with moderate to severe pains throughout the total body (Gholami-Motlagh et al., 2016). A systematic review done by Elibol in 2019 about the treatment of musculoskeletal disorders with Swedish massage showed that important articles were collected based on ache, rubdown as the keywords. The researches were categorized into 3 groups: meta-analysis research, systematic reviews; randomized controlled researches. The comes out were 690175 researches for the 3 keywords: 676638 find out concerning “pain”, 10532 papers for “rubdown”, and 3005 outcomes regarding “pain and massage”. Among 3005 articles, there were 1469 (48.0%) randomized controlled ponders, 508 (17.0%) precise audits and 78 (2.6%) meta-analysis considered, individually. The Swedish rubdown has been mostly utilized rub procedure. (Elibol & Cavlak, 2019). (2) Hot stone rub, the stones have to be warmed and they can relaxing muscles. It can relax worrying muscle corporations so that the therapist can rapidly reach areas of muscle affected (Ghavami et al., 2016)(s, 20189). (3). Aromatherapy massage is used for a variety of different reasons, including relaxation, pain management, and

improved mood (Cheraghbeigi et al., 2019); (4) Deep tissue rub down is designed to relieve hectic muscles, stress, and pain in the muscles. Deep tissue rubdown has 3 steps of managing. They are effleurage, petrissage, and friction (Swain et al., 2019, Romanowski et al., 2017), (5). A combined deep tissue rubdown with strengthening and stretching exercises has been more great in restoring neck ache in seven weeks than the non-combined program, where the positive impact was found in the 26th week (Skillgate et al., 2020). Sports rubdown used designed to stop and treat injuries, decorate flexibility and improve athletic performance. Sports rubdown can be used via athletes of all skills to prepare for or get better from carrying or sporting activities (Davis et al., 2020), (6) Trigger point remedy is desired by those with very extreme and site-specific pain. Trigger factor remedy focuses on on the spot comfort of extreme joint or muscle ache by making use of direct pressure with a thumb, elbow, or some other extremity (Maistrello et al., 2018). (7) Reflexology is a proper alternative rubdown for those who searching for a temporary relieve for mild pain. Reflexology breaks the physique down into ten “zones” and makes use of pressure alerts to launch muscle tension (Smith et al., 2018). (8) Shiatsu rub down is a bodily and practical treatment designed to information and stimulate the body's herbal potential to heal and stability itself. Shiatsu rubdown dreams to decorate the health of the complete person, collectively with physical, emotional and psychological well-being (Mohaddes Ardabili et al., 2015). The manipulation of each one was specific to BMSDs, which has been determined. Every kind of massage was very beneficial for BMSDs, but it cannot be complete to allow fast recovery as soon

as possible. Many types of massage were related to decreasing the pain, improving the range of motion, decreasing the muscle tension, and decreasing the blood pressure. To improve sleeping, decrease stress, to recover BMSDs, we still find many post injured people late to go back to their daily activities. A conducted study done by Aboagye, 2022 showed that manual therapy was has been found as more effective in the case of low back pain and neck pain during 6 weeks. The later solution has been applied after surveyed that Low back pain has a prevalence of 84%, mainly striking women aged 40–80 years back MSDs was the most cause of the disability and is currently affecting around 83 million people worldwide Neck pain is also a very common health problem, especially among women. In a general population survey conducted in Stockholm, Sweden, the yearly prevalence was 25% in women and 16% in men. It peaked in individuals aged 30 to 59 years. (Aboagye et al., 2022). The result from Swedish massage with acupressure and Swedish massage alone showed that there a strong significant difference between them. The Swedish massage with acupressure was more efficient in decreasing pain, improving ROM (Boguszewski et al., 2017). From 2019 that period has been characterized by a strong lack of therapeutic massage caused by pandemic COVID 19, and great number of people suffer from musculoskeletal increased in the worldwide. Therapeutic massage was often used to restore muscle fatigue (Daneau et al., 2019). 15 longitudinal studies with at least 5-year follow up times and a total of 288,724 subjects (>500 participants in each study), aged between 18 and 85 years, were identified using digital databases. Only studies published in English,

about healthy adults at baseline, intentional physical activity and the listed NCDs were included. The results of these studies show that physical activity appears to have a positive long-term influence on all selected diseases (Reiner et al., 2013).

Based on the results from various researches, the finds showed that back MSDs constituted a significant problem in the world population. The causes linked to different human works, poor management of his body there we speak of obesity, sedentary, malnutrition were serious problems for human health. Even though back MSDs were treated, the body still very slowly recovers physical capacities such as muscle strength, muscle speed, muscle power, muscle endurance, muscle explosiveness, muscle motricity, the coordination of movements in large part the resumption of physical activities, housework, public functions, training, are much delayed for accidental jobs, obese. There was a strong need for a specific development program containing massage, and therapeutic exercise to ensure recovery.

However, some therapeutic exercises were proposed by some researchers. For example, the research done by Anggiat in 2020 showed that lumbar flexion, extension motion, lateral flexion, and rotation motion had been performed to relieve nonspecific low back pain (Anggiat, 2020). The lookout did by K Dhaliwal, Manmeet Amandeep in 2014 tasted that therapeutic exercises like stretching, strengthening, range motion exercise, and proprioceptive neuromuscular exercise were more efficient for relieving nonspecific low back pain (K Dhaliwal et al., 2014). In Chine, research has been done to assess the publication associated with low back trauma and lifestyle activities from 2000-

to 2020; the results of linear regression analysis showed that the published research about LBP and Physical Activity considerably increased with $p < 0.001$. LBP and PA study increased considerably ($p < 0.001$). The patients groups were rehabilitation (2544, 26.18%) and sports sciences (2015, 25.44%). In terms of journals, it has been assessed that spine articles contributed the most (Yan et al., 2021). The empirical factors showed that physical activity was used to treat back disorders. A conducted study on the efficient of workplace exercise in treating musculoskeletal disorders has been done by Teresa et al. in 2022 showed that stretching exercises, strengthening exercises, static neck exercises three times per week within 2-3sets of 10-15 repetitions were found to be effective for relieving neck, and low back disorders. This systematic review used random articles from the international journal published from 1 January 2010 to 31 December 2020 (Tersa-Miralles et al., 2022). The results from the above systematic review suggested that therapeutic exercise can effectively reduce back musculoskeletal disorders in different body regions such as the neck, low back, and upper limbs.

Critical research based on a systematic review of Back MSDs showed that back MSDs are still at a high level at all stages. Researchers found the therapeutic program still not adequate. Many therapeutic programs were related to non-specific low back pain. Other programs were related to neck pain. It seems that the thoracic zone has been forgotten. No research combined two types or more than two types of massage and exercise for back musculoskeletal disorders rehabilitation.

The novelty of this research was to Design a combined therapeutic massage and exercises model for back musculoskeletal disorders rehabilitation. The development was based on the systematic review of Swedish , and Soft tissue massage(Elibol & Cavlak, 2019), deep tissue massage(Skillgate et al., 2020), and therapeutic exercise(Yan et al., 2021; Tersa-Miralles et al., 2022)

Why is this topic important for research? Based on the observations and surveys, the results have shown that people were suffering from back musculoskeletal disorders like low back pain, spine pain, joint spine injuries, and upper muscles injuries. They return later to their respective functions, such as an athlete, or non-athlete, a civil servant of the state or private, and school or study. The results proved no specific combined program to restore BMSDs simultaneously. The benefits of this research were the **“Development of Therapeutic Massage and Exercises Model For Back Musculoskeletal Disorders Rehabilitation”** to (a) allow the improvement of physical fitness of athlete and non-athlete like (1) strength, (2) ROM, (3) and decreasing pain.. Based on the above issues, a scientific study entitled"Development of Therapeutic Massage and Exercises Model for Back Musculoskeletal disorders " was done to find a solution for back musculoskeletal disorders.

B. Identification of the Problems

Based on the background of the above issues, there are many various problems related to this research which are identified as follows:

1. There is a high level of back musculoskeletal disorders related to the workplace.
2. The dropping productivity in the different work sectors increased considerably (Sports, University, School, Public, private).
3. There is a non-neglect absence in the various work sectors (Sports training, service office, personal service, and Competition sports).
4. Most people injured return late to their professions (State officials, students, private employees, and peasants).
5. The effect of therapeutic massage is short cannot endure long.
6. There is a lack of combined therapeutic massage and exercise programs.
7. There is a lack of Therapeutic autonomic massage and exercise.
8. Most therapeutic exercise programs require expensive tools.

C. Delimitation of the Problems

For this research to be more focused and avoid misinterpretation, the authors view that the research problems raised need to be limited. The study's object was therapeutic massage and exercises for back musculoskeletal disorders rehabilitation. The subjects of this research were patients with back musculoskeletal disorders. This research insisted only on the development of therapeutic rubdown and exercises for back musculoskeletal disorders rehabilitation.

D. Statement of the Problem

Based on the problems identified in this research, the main research problem can be formulated as the following "How to develop a Therapeutic

Massage and Exercises Model for Back Musculoskeletal Disorders Rehabilitation " In detail, the research problem was:

1. How to design/develop the mixed model: therapeutic massage and exercises model for back musculoskeletal disorder rehabilitation?
2. How feasibility of the therapeutic and exercises models for back musculoskeletal disorders repair?
3. How effective are the therapeutic massage and exercise models for back musculoskeletal disorders rehabilitation?

E. Objectives of the Model Development

Along with the problem formulation, the aims of these study are:

1. To Desain the therapeutic massage and exercises model for back musculoskeletal injuries rehabilitation.
2. To analyze the feasibility of the therapeutic massage and exercises models for back musculoskeletal injuries rehabilitation.
3. To test the effectiveness of the therapeutic massage and exercises model for back musculoskeletal disorders rehabilitation.

F. The Developed Product Specifications

The specific product developed is manual therapeutic massage and exercises for back musculoskeletal injuries rehabilitation. The expected specifications of this research product are as the following:

1. The product contains a combined therapeutic massage and rehabilitation exercises for back musculoskeletal disorders.

2. The product implements independent learning activities containing initial information as appreciation, equipped with images to generate student interest, explains the information or material supported by the guide, has complete characteristics, can be studied anytime, anywhere, and follows effective communication.
3. The model guide has been equipped with supporting and relevant pictures for each material and question.
4. The material content was massage, therapeutic exercises for musculoskeletal disorders rehabilitation.

G. The benefit of the Model Development

Based on the research objectives, the specification of this study consists of two, theoretically and practically, as follows:

1. Theoretically

Theoretically, the findings of this study can add to the repertoire in sports health, especially in the field of rehabilitation. In addition, it will be a material reference for researching the rehabilitation of back muscle disorders and can develop ideas for further research.

2. Practically, the findings of this study can be useful

- a. As a tool to restore musculoskeletal injuries
- b. It can be used as a reference for students in developing sports and health, especially in injuries rehabilitation.
- c. It can be input for lecturers to be used as teaching materials for students.

This study was beneficial for showing a multidisciplinary innovation approach to restore and decrease back musculoskeletal disorders in private and public work related to the workplace.

H. Development Assumptions

In the development of a combined therapeutic massage and exercises for restoring back musculoskeletal disorders rehabilitation, there are several assumptions and development limitations, namely:

1. Development Assumptions

Based on several theories: therapeutic massage combined with physical exercise can restore pain (Mortazavi et al., 2015). Trauma rehabilitation workout routines intention to fix entire characteristic following injury by way of restoring muscle strength, endurance, power, and enhancing flexibility (Thompson et al., 2016, Whittaker et al., 2019). Stretching is a structure of stretching muscle groups in top contributors so that in every exercise, there is readiness and reduces the influence of injuries that are inclined to appear (Baxter et al., 2017). Researchers assume that a combined massage model, therapeutic exercise, and rehabilitation effectively restore musculoskeletal injuries.

2. Development Limitations

Content: Swedish rubdown, deep tissue rub down, soft tissue manipulation, stretching exercise, strengthening exercise. The latter

content has been applied to the new therapeutic massage and exercise model.

3. Definition of the term

To avoid the misunderstanding the, it is necessary to explain several terms in this dissertation as follows: therapeutic massage, exercise, rehabilitation, musculoskeletal injuries, nervous.

CHAPTER II

LITERATURE REVIEW

A. Theoretical Review

1. Back Musculoskeletal Disorders

a. Back Anatomy

The back of human anatomy has a complex structure (1) consisting of: the spine in its center, itself made up of 32 to 34 bones called vertebrae, intervertebral discs positioned between the vertebrae, ligaments connecting the vertebrae, the posterior part of the ribs, partly attached to the spine, many muscles, including the deep muscles connecting the vertebrae and the superficial muscles (Figure 1), tendons connecting muscles to bones, blood, and lymphatic vessels, of the spinal cord, part of the central nervous system, located in the spine (Gusetu et al., 2015, Spencer et al., 2016). More explanation was presented in Figure 1 (Ofhuman, n.d.).

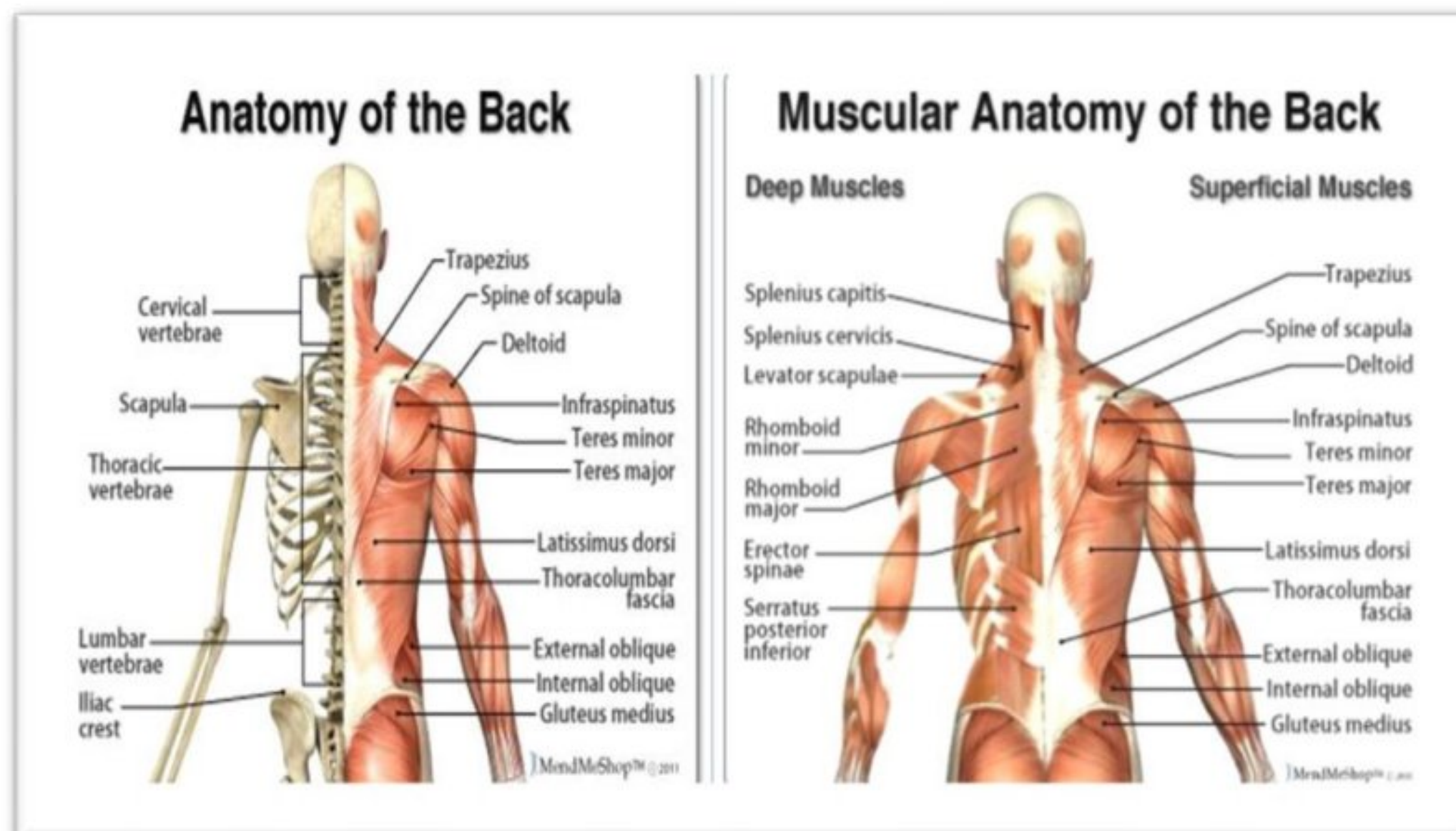


Figure 1: Back Muscular Anatomy

b. Back Functions

The spine has a vital role in supporting and protecting the upper members. The spine gives the back a part of keeping the head and protecting the spinal cord. It has a role in mobility(ROM) and posture. All the components of the back help preserve the trunk's posture and thus maintain the standing position. The structure of the back region allows many movements, such as torsion movements of the trunk, bending of the trunk, or even traction(Gordon & Bloxham, 2016).

c. Pathophysiology of the Back Musculoskeletal Disorders

The back human body has many pathologies. First back pain is defined as localized pain that begins most often in the spine and generally affects the muscle groups around it. Depending on their origin, three main forms are distinguished: neck and back pain. Sciatica is characterized by pain in the lower back and extending into the leg. They are common and are due to compression of the sciatic nerve. Different pathologies can be at the origin of this pain. Various pathologies of the back: (1) Osteoarthritis is characterized by wear of the cartilage protecting the bones of the joints. (2) The herniated disc corresponds to the expulsion at the back of the nucleus of the intervertebral disc, (3) scoliosis corresponds to a lateral displacement of the spine, (4) Kyphosis develops with an excessive curvature of the back at shoulder height. At the same time, (5) lordosis is associated with an accentuated arch in the lumbar region. (6) Lumbago and stiff neck. These pathologies are due to deformations or tears in the ligaments or muscles,

located respectively in the lumbar or cervical regions (Allegri et al., 2016, Hodges & Danneels, 2019 He et al., 2020). More information was presented in Figure 2 (Lenke, 2018).

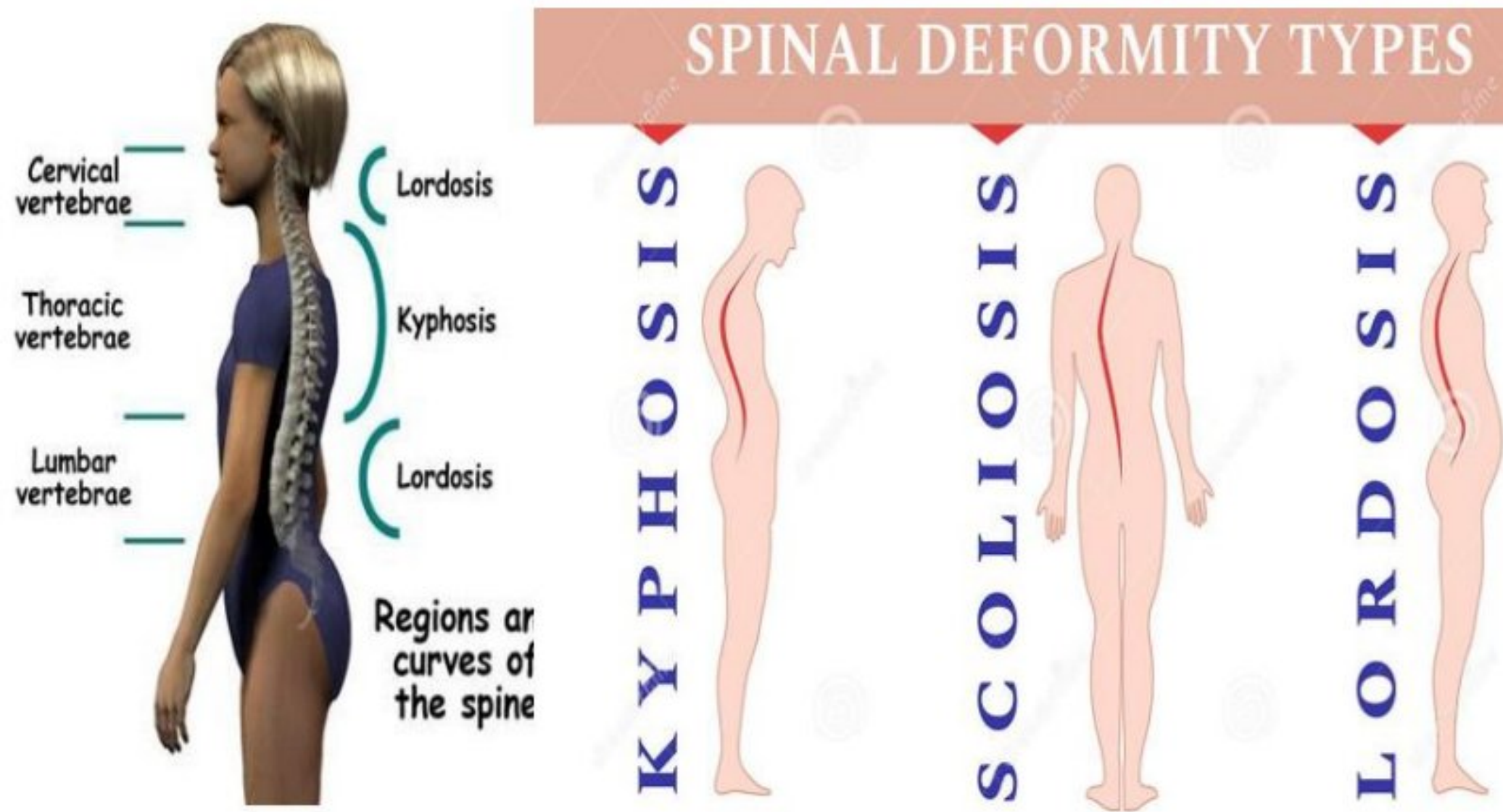


Figure 2: Spinal Deformation Types

d. Diagnostic of the Back Musculoskeletal Disorders

Physical examination: signs and symptoms accompanied with an observation of the back posture by the physiotherapist or doctor is the first step in identifying an abnormality of the back. The pressure exerted on the different muscle types can allow the doctor or the physiotherapist to know the various pathologies of the back. However, other examinations such as radiography, ultrasound, CT scan, MRI, or scintigraphy can be done to correctly identify the pathology of the back (Van Dillen et al., 2020, Goes et al., 2020). The researcher has a different methodology using muscle palpation to identify back musculoskeletal disorders. It is a very beneficial and less expensive way (Figure 3).



Figure 3: Palpation Back Musculoskeletal Disorders

How to use the palpation diagnostic? All the bouton above identify the current musculoskeletal disorders by using pressure on the specific areas. A Visual Analog Scale (VAS) graduated from 0-to ten has been used to identify the current level of the pain(Holey & Cook, 2003, Dail, 2011, Hawker et al., 2011). The pain/injuries are classified according to the different parties of the spine like cervical, thoracic, and low back pain(Geri et al., 2019, Funk & Frisina-Deyo, 2020). People with back musculoskeletal injuries may experience severe pain throughout the body, muscle spasms, and burns. Swelling, numbness, and tingling may be some of the symptoms of MSD. Symptoms of her MSD in her back vary from person to person, but some common symptoms include pain, fatigue, inflammation, limited range of motion, and muscle weakness.

e. Back Musculoskeletal Disorders

Table 1: Causes and Musculoskeletal Disorders

Causes of Back Musculoskeletal Disorders	Several Back Musculoskeletal Disorders
<ul style="list-style-type: none"> ▪ Postural strain ▪ Repetitive movements ▪ Over use ▪ Bad posture ▪ Traumatologies ▪ Uncomfortable working posture ▪ Too much force ▪ vibration ▪ Working too long without breaks ▪ Sitting in the same position for long periods of time 	<ol style="list-style-type: none"> 1. Back Muscle ache 2. Bicep Tendonitis 3. Disc Bulged 4. Tendinitis Shoulder 5. Damaged Disc 6. Facet Joint Ache 7. Fat Pad Syndrome 8. Impingement 9. Hip Arthritis 10. Hip Labral Tear 11. Hip Pointer 12. Muscle Strain 13. Peroneal Tendonitis 14. Poor Hip Core 15. Shoulder Impingement

(Vanderlei et al., 2013; perlman, 2012). The study was focused on back musculoskeletal disorders because it has been demonstrated that the prevalence of injuries related to the workplace was very high. Ache is a broken traumatology to the muscle structure, tendon, ligament, or body feature due to coercion, bodily or chemical pressure.

f. Types of Injuries/ Injuries Grade

Traumatologies are labeled into three cases: (1) minor ache; People with minor trauma do no longer trip extreme or problematic complaints however can intrude with the competitor's appearance, for example,

abrasions, bruises, and slight sprain (Harsanti & Graha, 2014). (2) reasonable problem, aches being is characterized by way of broken stated tissue. It can have an effect on individual achieve; complaints can consist of pain, swelling, impaired feature, for example, muscle width, muscle strains, and ligament tear (sprain grade II) (Harsanti & Graha, 2014), and (3) extreme disorder. Severe aches are characterised through a whole or near-complete tear of a ligament or bone fracture. At this level of traumatology, participants need extreme treatment, whole rest, and may also want surgery, there are (Kasahara, Martin, Humberstone, Yamamoto, & Nakamura, 2015)

2. Nervous System

The nervous have corresponded to an organ of the peripheral apprehensive system, composed of neurons regularly grouped in ganglia and projected their axons thru the tissues. They permit conversation between the central fearful system (brain and spinal cord) and the relaxation of the physique (Ludyga et al., 2016). For further information can be seen in figure number 4

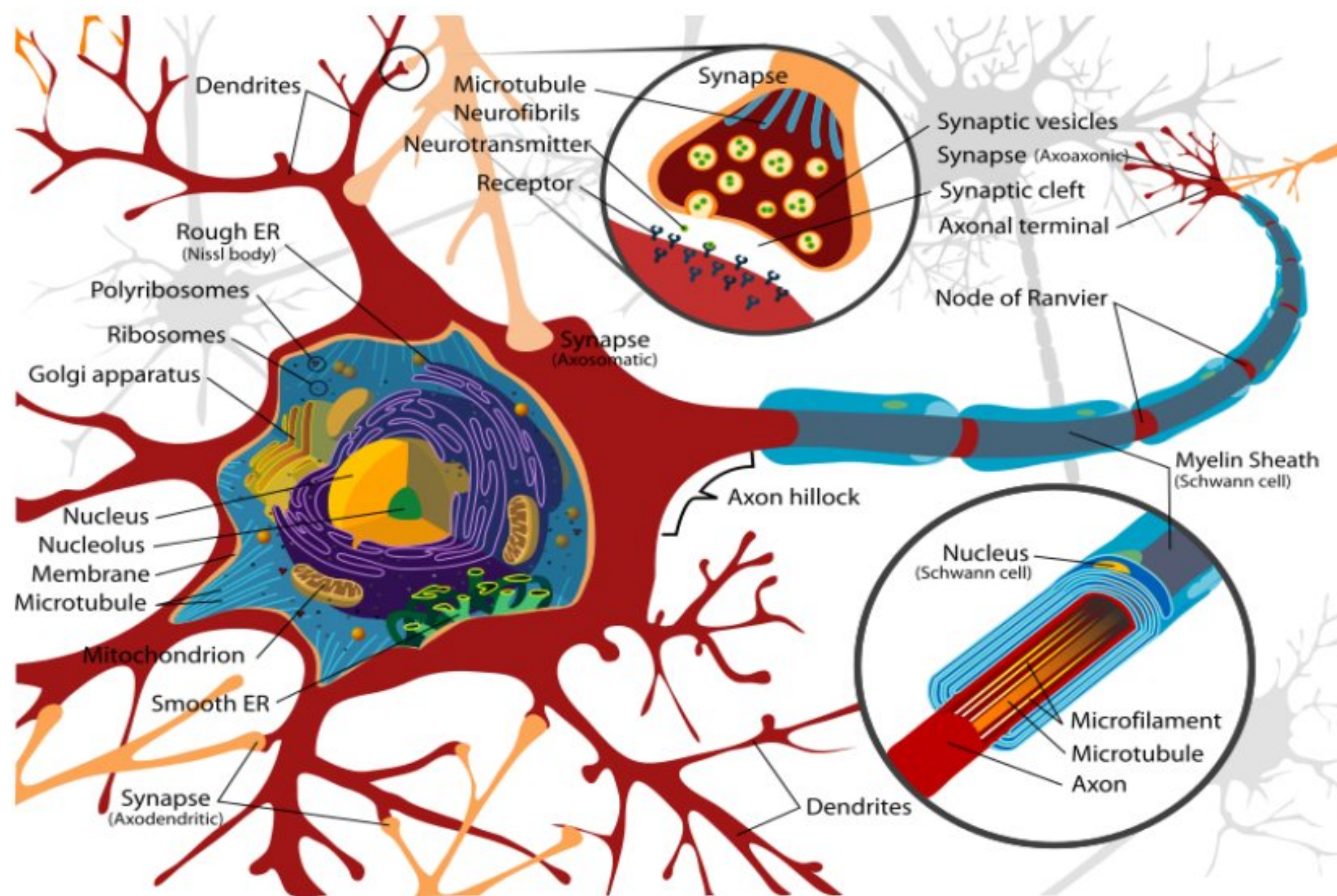


Figure 4: Neuron (Merkel & Molony, 2012)

Neurons are the main cells of the nervous system, their target was to transport the news in the whole body. The human body has a lot of neurons. They consist of of a nucleus surrounded by star-shaped structures, namely dendrites, and a long extension that can measure several tens of centimeters named the axons. Some neurons have the main goals in movement skills; the perception of sensibility has been guarented by some group of neurons , The automatic system functions are managed by vegetative nerve neurons(Merkel & Molony, 2012). In summary, orders are transmitted through nerve impulses under the influence of motor neurons of the central nervous system. Synapse carries information between neurons. A substance known as a neurotransmitter is released during neuronal communication, and this material is taken up by receptors in the

underlying neuron(Page, 2012). The effector plays an important role in nerve commands. The excitation is caused at the sensory level of a neuron, which will give the command by mechanisms similar to the motor pathway to the brain, where it will be interpreted(Brewer, 2010).

a. Sympathetic and Parasympathetic Nervous

The autonomic nervous system is made up of sympathetic and parasympathetic nerves. All authentically controlled bodies are regulated by the nervous system (blood circulation, heart rate, blood pressure), respiration, basal metabolism and the maintenance of homeostasis. (Purkayastha et al., 2019). Below figures, numbers 5 and 6 gave more explanations.

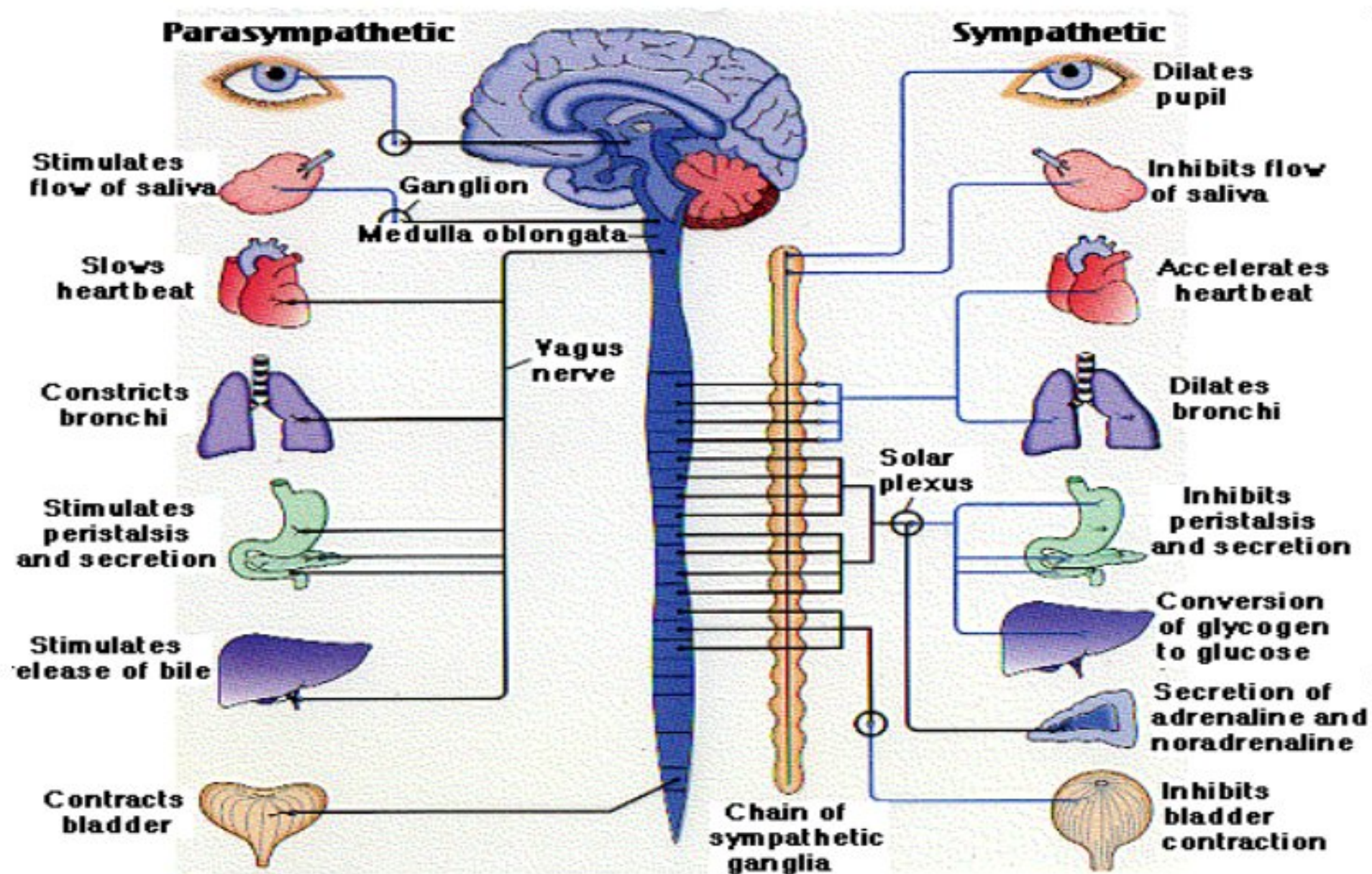


Figure 5



Figure 6

b. Types of Nervous

Nerve cells are grouped into three types based on their functions: sensory, motor, and intermediate or association nerve cells. (Article & Franjic, 2019). Figure number 7 gives more information.

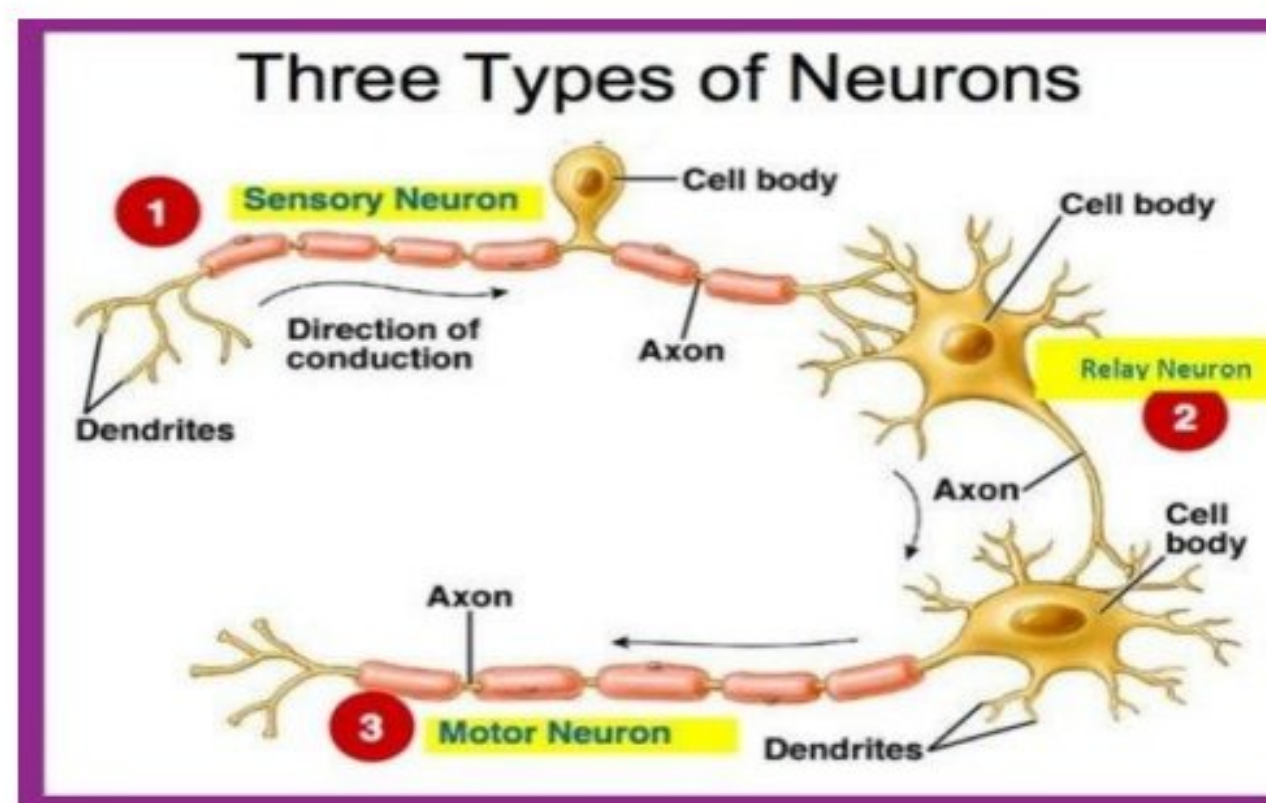


Figure 7 : Types of Nervous

Source : (Hollis & Jones, 2009)

c. Sensory Neurons

Sensory neurons are cell neurons grouped together which will form ganglia, the antiphon cylindraxe is short, only the antiphon dendrite is long. The sensory neurons have a sincere thong back the insinuations so much that garden party processing of stimuli. These nerve cells better deliver nerve impulses that sense the organs continue exaltation the understanding or the spinal philtre of variety, these nerve cells are commonly referred to as sensory neurons. (Xia et al., 2019).

d. Motor Neurons

The comparative short dendritic parts and preferable long axons constitute the motor neurons. Dendrites are hard-bound to singular axons, while axons are hard-bound to effector parts below the size of muscle or glands. The goals of the motor neurons was to push the impulses from certain parts of the brain/parts of the spinal elixir, then to reproduce them to the muscles/glands of the body. Thus, these neurons are easily called motor neurons. (Ni & Zhang, 2019).

e. Neuron Connectors / Interneurons

Transmitter neurons are composed of several poles and are endowed with short dendrites, they have a large workforce and long and short axons. The other part there is the presence of the synapse. The spinal cord contains the majority of neurons. Then, the stimulation of the sensory neurons towards the motor neurons is provided by the part of the human brain (Segev et al., 2016).

f. Classification of Nervous

The function and structure of the nerves make it possible to classify the nerves into two categories. The nervous system of vertebrates (including humans) is classified into central nervous system (CNS) and peripheral nervous system (PNS). The (CNS) is the first classification and consists of the brain and the spinal cord. The spinal canal is made up of the spinal cord, while the cranial cavity includes the brain (Kornthong et al., 2014). Classification of the nervous can be seen in the figure number 8

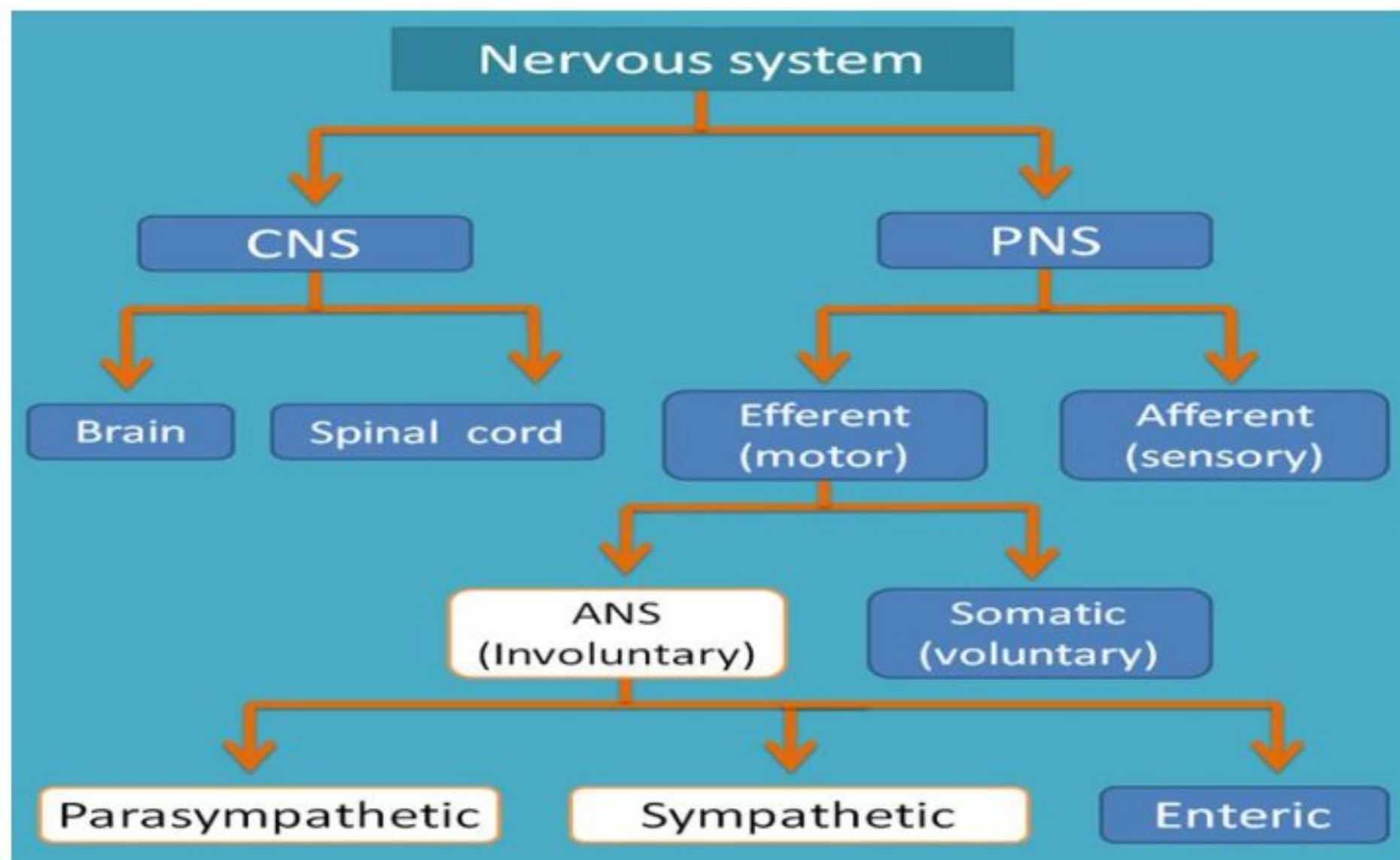


Figure 8: Classification of the Nervous(Kornthong et al., 2014)

the functioning of good health and well-being depends on the anxiety apparatus. (1) waking up, (2) automatic movements: ventilation and (3) complex approaches: thinking, reading, memorizing and feeling emotions are all coordinated by the anxious. The growth and development of the brain is coordinated by the nervous system, we can cite sensations

(touch or hearing) and perception. Thoughts and emotions, Learning and memory, Movement, balance and coordination, Sleep, Healing and rehabilitation, Stress and the body's responses to stress, Aging are in control of the nervous system.

3. Therapeutic Massage

a. What Is Massage?

Massage is a manual therapy that utilizes many techniques depending on the masseur. Effleurage, petrissage, friction, vibration, tapotement, chiropractic, and deep tissue techniques were more used. They aim to reduce muscular tension and restore injured muscle, joint pain, nerve pain, Musculo skeletal injured, discomfort, and pain. Expected benefits from massage therapy: (1) minimize muscle pain (2) Develop motor skills and performance of athletes (3) avoid the occurrence of trauma during and after physical exertion (4) ensure rapid recovery after a muscle injury or injury, (5) development of physical condition and well-being (6) improving sleep, (7) improving blood circulation, (8) clearing chemical irritants and metabolic waste after physical exertion (9) improve athlete performance (Benjamin, 2007, Nunes et al., 2016, Nurkertamanda et al., 2017, Kumar, 2018). (10) decreases stress and improves mental health (Giamberardino et al., 2011). Most type of massage takes a long time for execution, between 60-90 minutes (Sinha, 2010, Vigotsky & Bruhns, 2015). However, the masseur must be equipped with knowledge in the following areas (1) anatomical and sports courses, (2) physiology courses, (3) kinesiological courses (4) sports and health.

Active all types of massage have positive benefits on the human body. They can restore function, motor skills, reduce muscle tension, improve blood circulation, decrease stress levels, improve sleeping, improve athlete performance, but there are still many critical things like the time of recovering still long; massage has fast benefits but is not endure (NDAYISENGA, 2020; Ndayisenga, 2021a), the reason why they're a strong need of parenting with a therapeutic exercise program to maintain more time the health.

b. Swedish Massage

English and Dutch-speaking countries are the most often to apply Swedish massage therapy. In other countries this treatment is recognized as "classic massage". Per Henrik Ling is a researcher who improves the practice of this treatment. The basic naming was done by a recognized Dutchman named Johann Georg Mezger(Jamsek, 2014). There are 5 techniques of this Swedish treatment: (1) Effleurage, (2) Kneading, (3) Tapotement, (4) Friction, (5) Vibration / Shaking. With the manipulation of this treatment the pains, wounds, and muscle damage are restored. This Swedish massage therapy pendant provides relief from: joint problems, minimalizing muscle tension, osteoarthritis, low back pain, back pain and stress reduction. The Swedish treatment can be applied between 30 to 90 minutes, except in cases of force majeure, it is applicable for all people while respecting the contraindications. Swedish massage therapy is used for the treatment of mild to severe trauma all over the body.

c. Deep Tissue Massage

Deep tissue abrasion therapy is used to heal certain multilayered traumas. Deep tissue rubbing therapy treatments are used to treat specific deep muscle and connective tissue traumatology. This treatment used the forearm, elbow and fist. Muscle tension was ensured by delivering deep support. Therapeutic pressure should be characterized by rhythm and intensity. Muscle tension, stress, and muscle discomfort are treated with this therapy. This exercise consists of three types of manipulation: effleurage, kneading, and friction (Balletto, 2019). This exercise improved blood circulation. Therapists regularly treat anxiety, muscle pain, repetitive strain, postural disorders, or injuries. This type of massage is recommended firstly for people with limited motion due to chronic pain or electrical damage. It was ideal for treating repetitive motion injuries such as tennis elbow and carpal tunnel syndrome. It may help to reduce the signs of osteoarthritis. Deep tissue rubbing used additional pressure compared to Swedish massage. The massage was closed from 60-90 minutes and targets specifically muscle knots, and specific problem areas in the deeper layers of muscle mass and connective tissue. Deep tissue massage is designed to relieve tense muscles, stress, and pain. There are three types of manipulation commonly used when applying deep tissue massage. Effleurage, Kneading, and Friction (Balletto, 2019). In addition, a combination of deep tissue massage techniques with stretching exercises was more efficient. The therapist treats muscle anxiety and soreness, repetitive effort, postural disorders and muscles pain. It was recommended for those who have limited motion due to chronic

pain or electrical damage. It is ideal for treating repetitive motion injuries such as tennis elbow and carpal tunnel syndrome, and reduces symptoms of osteoarthritis (Romanowski et al., 2017)

d. Soft Tissue Release (STR)

Soft tissue friction involved direct body motions against muscles and other smooth tissues of human body. That treatment techniques included scraping connective tissue : muscles, tendons, ligaments, and fascia (Maros & Juniar, 2016, Balletto, 2019). The treatment was a technique in which the therapist actively stretched the muscle fibers, tendons and fascia. Repeatedly and rapidly stretches small areas of soft tissue by applying precise muscle pressure and stretching with movement. Fascial and positional release, trigger point therapy, use of stainless steel tools, pins and focals, 'gravitational' adhesive stripping, different moves using pads to develop position ([Margaret_Hollis,_Elisabeth_Jones]_Massage_for_The(BookFi.Org).Pdf, n.d, Davis et al., 2020)

4. Therapeutic Exercise

Physiotherapeutic exercise treatment aims to develop motor skills, improve muscle strength, muscle power, and increase range of motion. The treatment of the patients must be specific and personalized according to the condition of the beneficiary. The motor functions, well-being are influenced by physiotherapy treatment. Back pain, spinal problems, muscle discomfort can be treated with physiotherapeutic exercises.

a. The goal of exercise therapy

The target of therapeutic exercise were (1) to keep muscle strength, (2) endurance and cardiovascular health, (3) to ensure positive change in muscle strength, and (4) to ensure the returning of motor functions. (5) mobility and range of motion. (6) balance and proprioceptics (7) muscular explosiveness (8) synchronism of movements (Thompson, Scott, Loghmani, Ward, & Warden, 2016; Whittaker et al., 2019), Physiotherapeutic exercises can be classified according to: voluntary assisted dynamic movements , free dynamic movements, dynamic movements in the face of external force resistance, movements without nervous control.

b. Understanding Stretching

In most cases, stretching is known as a warm-up and should be applied at the start of any athletic activity. Stretching is recommended for all sports practitioners finally to be able to avoid the trauma that may arise due to the lack of effectiveness of warm-up (Baxter, Mc Naughton, Sparks, Norton, & Bentley, 2017). The benefits of this practice were: (1) ensures good blood circulation of the whole body, (2) awakening of the cardiovascular system before physical effort (3) control of the basal metabolism. (4) to make gas exchange efficient in hemoglobin; (5) improvement of nerve impulses; (6) good control of muscle contractions and relaxations (8)) improvement of physical achievement, (9) reduction of muscular pathologies (10) ensuring harmonious physical and psychological development.

c. Active stretching

This kind of activity was carried out on the muscular tissues besides the assist of exterior forces. An instance of this dynamic stretch is to stand up and slowly increase one leg to a forty five degree angle. It was essential due to the fact it actively builds muscle range of motion, which is recognized to correlate higher with bodily overall achievement than passive stretching. The fundamental drawback of this lively stretch was that it can set off a stretch reflex, and this stretch can be ineffective for sure physique issues and trauma like acute sprains, inflammatory, and bone fractures. (Gartley & Prosser, 2011)

d. Dynamic Stretching

This type of stretch puts a lot of strain on your muscle tissue and joints. This practice need to be carried out in a rhythmic, managed and concrete way (Polat, Cetin, Yarim, Bulgay, & Cicioglu, 2018). Joints, tendons, ligaments and muscular tissues are affected by way of this kind of stretching. Variations between static and dynamic stretching appear in the vary where defined moves and dreams observe to the training. Static stretching lasts for some time after the ache was reached, whilst dynamic stretching did the contrast. This is actively stretched as lengthy as there was room for the burdened joints. The aim of static stretching was range of motion, and the purpose of dynamic stretching was joint flexibilities.

e. Passive stretching

This type of activity was an approach that permitted the athlete to loosen up except affecting the area of movement. External strength can be created manually or routinely with parenting tools. Some of the advantages that can be received from trunk stretching were: this method was nice when the muscle agonist was in a vulnerable condition to acquire movement. reaction (Chaitow, n.d.). This method was advantageous if the trip did no longer block stressful muscle groups. It was viable to measure the path of exercising and its depth whilst stretching improved crew concord when stretching with different athletes (Majlesi & Unalan, 2010). The essential disadvantage of this activity was that if the pal abuses exterior energy, there was a larger chance of pain or damage. Additionally, due to the massive distinction between energetic and passive stretching zones, this approach can motive stretch reflexes and enlarge the hazard of damage if carried out quickly. But the usage of this approach can additionally enhance the lively range of motion (فاطمی, 1395).

f. Ballistic Stretching

A conducted scientific study carried out by Page (2012), stated that the form of ballistic stretching was identical with calisthenics gymnastic. During this practice the movements were dynamic. The movements were systematic, controlled, and abundant (Colson, 1975). For example, maintain a seated position with your legs stretched out and stretched out at the end of the floor, try to touch the tips of your toes. Another example was standing with straight

legs, trying to touch the ground while keeping the segments aligned. All the movements must be carried out in a systematic, repeated and rapid manner.

g. Static Stretching

This kind of activity was a stretching exercise carried out slowly in a muscle till anxiety built up and motives muscle ache or discomfort. The awkward function has been maintained for a whilst now. Hold the uncomfortable function for 20 to 25 seconds. The cause of static stretching was to amplify and keep range of motion (Moscão et al., 2020). The operational view from the researcher recommends that stretching is the most exercise used in human musculoskeletal trauma to carry out the pain and injuries. However, there are still some critical things like stretching with external power has advantages and disadvantages. In contrast, that technique is used with improper energy, lacking parenting stroke, some useful tool is costly, not only for that kind of exercise but also many therapeutic exercises need the use of the machine or special training tools. Therefore, there is a proper need to develop a very cheap therapeutic exercise program that does not involve complex machine tools for training.

5. Model of Therapeutic Massage and Exercise

The study used a therapeutic message: (1) Swedish rub down, (2) Deep tissue rubdown, and (3) Soft tissue release rubdown. The program was combined with (a) stretching exercise, and (b) strengthen exercise.

a. Foundation/Grand Theory of Model Development

The product developed was based on therapeutic massage, and exercise. The therapeutic massage was found as a vital tool in healing musculoskeletal disorders (Schilling et al., 2020). Therapeutic exercise is used to increase flexibility, strengthening (Gasibat & Suwehli, 2017). One type of therapeutic massage was found not enough in restoring musculoskeletal disorders. The combined therapy was found more greater (Skillgate et al., 2020). Based on the previous theories. The developed product was focused on a combination of three massage: Swedish massage, Deep Tissue rubdown, Soft Tissue Release, and exercises.

b. Conceptual Model of Therapeutic Massage and Exercise

Back Musculoskeletal disorders are the common injuries that affect the low back muscles, thoracic muscles, neck/cervical muscles, bones, ligaments, nerves, and joints. They are characterized by pain, inflammation, sprain, strain, degenerative disc, sciatica nervous, etc. (Maros & Juniar, 2016, Australian Institute of Health and Welfare (AIHW), 2019). Therapeutic Swedish rubdown, deep tissue, and Soft tissue release were chosen as a vital tool to restore musculoskeletal disorder, increase flexibility. Therapeutic exercise have more impacts on increasing ROM, and strengthening (Page, 2012).

B. Review of Relevant Studies

Table 2: Relevant Research Studies

The result from the relevant studies has been presented in below table 2.

Authors	Research Title	Aims	Variable	Methods	Data Analysis	Result
Holly Louisa Davis, Samer Alabed, Timothy James Ainsley Chico (Davis et al., 2020)	Effect of massage on performance and recovery: a systematic review and meta-analysis	To assess the direct effect of massage on the performance of the athlete	Massage, performance, and recovery	systematic review and meta-analysis	The data have been gathered and treated by HD, SA, and TC with RevMan 5.3 software.	No proof that rub down performed measures of strength, jump, sprint, endurance or fatigue, promote ROM, and DOMS
Skillgate, E., Pico-Espinosa, O. J., Côté, P., Jensen, I., Viklund, P., Bottai, M., & Holm, L. W. (Skillgate et al., 2020)	Effectiveness of deep tissue massage therapy and supervised strengthening and stretching exercises for subacute or persistent disabling neck pain. The Stockholm Neck (STONE) randomized controlled trial	To compare the effectiveness of deep tissue massage, supervised strengthening and stretching exercises, and combined therapy (exercise followed by massage)	Deep tissue massage therapy, strengthening stretching exercises disabling neck pain	Deep tissue rubdown therapy	Analysis of the facts was once susceptible because the researchers simply used examine T-Test solely they must use evaluation deeply with different software program to verify the robust impact of rub down on strengthening and stretching	Changes in ache depth favoring rub down and mixed remedy in contrast to advice; at seven weeks (RR ¼ 1.36; 95%CI:1.04–1.77) and 26 weeks (RR ¼ 1.23; 95%CI:0.97–1.56); and seven (RR ¼ 1.39; 95%CI:1.08–1.81) and 12 weeks (RR ¼ 1.28; 95%CI:1.02–1.60), respectively, however now not at later follow-ups. The workout confirmed a increased enchancement in ache depth at 26 weeks (RR ¼ 1.31; 95%CI:1.04–1.65)
Crawford, C., Boyd, C., Paat, C. F., Price, A., Xenakis, L., Yang, E. M., Zhang, W., Buckenmaier, C., Buckenmaier, P., Cambron, J., Deery, C., Schwartz, J., Werner, R., & Whitridge, P. (Crawford et al., 2016)	The Impact of Massage Therapy on Function in Pain Populations—A Systematic Review and Meta-Analysis of Randomized Controlled Trials: Part I, Patients Experiencing Pain in the General Population	To assess multi dimension of pain	Massage, Therapy, Function in Pain	SIGN 50 Checklist	Meta-analysis	Massage therapy effectively treats pain One type of massage therapy was weakly recommended for reducing pain

Jim Schilling , Sujeiry Guzman1 , Chad Lewis1 , Jupil Ko (Schilling et al., 2020)	A Comparison of the Immediate Effect of Swedish Massage vs. Passive Stretching on Range of Motion in Overhead Athletes	To compare the clinical outcome and effectiveness of Swedish massage and a traditional passive stretching program on the shoulder of ROM in overhead athletes	Swedish Massage, Passive Stretching on Range of Motion	Swedish massage or a conventional sedentary static stretching program for one session of 5 minutes. No detailed methodology	The Pearson chi-square test Weakness in data analysis was found because only used correlation and the Chi-square test	Swedish rubdown had higher effects in 4 out of the 5 shoulder motions measured in contrast to passive static stretching. Swedish rubdown by myself can no longer a hundred percent fix pain, make bigger ROM, and Strengthen.
Nambi, G., Abdelbasset, W. K., Elsayed, S. H., Alrawaili, S. M., Abodonya, A. M., Saleh, A. K., & Elnegamy, T. E. (2020) (Nambi et al., 2020)	Comparative Effects of Isokinetic Training and Virtual Reality Training on Sports Performances in University Football Players with Chronic Low Back Pain-Randomized Controlled Study	(The objective of this study is to find and compare the effects of isokinetic training and virtual reality training on sports performances	Isokinetic Training, Virtual Reality Training, Sports Performances	Isokinetic Training, Virtual Reality Training	Student-T, Test Weakness in analysis	Isokinetic training can improve performance but Isokinetic training does not improve back pain
Günay, S., Yildirim, Y., & Karadibak, D. (2014) (Günay et al., 2014)	The Effect of The Muscle Endurance Training on The Chronic Low Back Pain Abstract	To compare two different exercises programs in the treatment of chronic low back pain.	Classical Strength Exercises (CSE), Muscle Endurance Training (MET)	Classical Strength Exercises (CSE), Muscle Endurance Training (MET)	Paired -T-Test Weakness in analysis	The 6th-week size of incapacity was decrease in the MET team than that of the CSE team (p<0.05). This application wishes extra time to fix low back ache.
Abaraogu, U. O., Ezema, C. I., Igwe, S. E., Egwuonwu, A. V., & Okafor, U. C. (2016) (Abdelraouf et al., 2020)	Effects of core stability exercise combined with virtual reality in collegiate athletes with nonspecific low back pain: a randomized clinical trial	To assess the effect of combined core stability exercises (CSE) and VR training in improving body balance and function in collegiate male athletes with nonspecific low back pain (LBP).	core stability exercise, virtual reality, nonspecific low back pain:	Trunk muscle stabilization exercises for lumbar instability, Virtual reality	Independent-T-Test Weakness in analysis	CSE education plus digital actuality is extra wonderful than CSE coaching on my own in enhancing whole physique. There is no specification of low back pain

Miake-Lye, I. M., Mak, S., Lee, J., Luger, T., Taylor, S. L., Shanman, R., Beroes-Severin, J. M., & Shekelle, P. G. (2019) (Miake-Lye et al., 2019)	Massage for Pain: An Evidence Map	evidence map” to visually depict the distribution of the evidence available for massage and various pain indications to identify gaps in evidence and to inform future research priorities.	Massage, pain, evidence map	Systematic reviews reporting pain outcomes of massage therapy	Methodological Quality of Systematic Reviews (AMSTAR) criteria.	Massage can improve pain, but most studies often do not provide adequate details on massage therapy.
Sherman, K. J., Cherkin, D. C., Hawkes, R. J., Diana, L., & Deyo, R. A. (2010) (Sherman et al., 2010)	Randomized Trial of Therapeutic Massage for Chronic Neck Pain	To evaluate the effectiveness of massage on chronic neck pain	Massage, chronic neck pain	Trial massage But no specific technics	Log-binomial regression Weakness in analysis	During ten weeks of treatment, a significant improvement, no details of manipulation massage In the 26 the week, it appears to function improvement The treatment takes longtime
Dolder, P. A. Van Den, Ferreira, P. H., & Refshauge, K. M. (2015) (Dolder et al., 2015)	Effectiveness of Soft Tissue Massage for Nonspecific Shoulder Pain: Randomized Controlled Trial	To compare the effects of soft tissue massage and exercise with those of exercise alone on pain, disability, and range of motion in people with nonspecific shoulder pain.	Soft Tissue Massage, Nonspecific Shoulder Pain	Soft Tissue Massage The exercise was not detailly specified	Correlation Weakness in analysis	The addition of smooth tissue rub down to an workout application for the shoulder conferred no extra advantage for enhancing pain, disability, or vary of action in human beings with nonspecific shoulder pain.
Pergolizzi, J. V., & LeQuang, J. A. (2020) (Pergolizzi & LeQuang, 2020)	Rehabilitation for Low Back Pain: A Narrative Review for Managing Pain and Improving Function in Acute and Chronic Conditions	Rehabilitation for low back pain and improvement of function	Rehabilitation , Low Back Pain, function	Physical Therapy and Exercise. Lacking physical therapeutic exercise detail	Correlation Weakness in analysis	Nonspecific LBP (which may additionally additionally be acute) has no recognized anatomical cause. Physical remedy and exercising on a regular. Medically, the supervised software may reduce, pain, enhance characteristic and fix correct stability with Pilates and water workouts
Mueller, J., & Niederer, D. (2020) (Mueller & Niederer, 2020)	Dose-response-relationship of stabilization exercises in patients with chronic non-specific low	The cause is to evaluate the dose-response-relationship of stabilization workouts on ache systematically and	Dose, stabilization exercises, regular non-specific low	A systematic review with meta-regression was conducted	Meta-regression Weakness in analysis	Three to 5 instances per week led to the biggest impact on LBP with 20 to 30 minutes per session

	back pain: a systematic review with meta-regression	incapacity in sufferers with continual non-specific LBP		(Pubmed, Web of Knowledge, Cochrane)		
Ribeiro, D. C., & Sole, G. (2019) (Ribeiro & Sole, 2019)	Effectiveness of a tailored rehabilitation versus standard strengthening program for patients with shoulder pain: a protocol for a feasibility randomized controlled trial (the Otago MASTER trial)	The intention of this feasibility trial is to assess: (1) participant recruitment rate, (2) the percentage of members enrolled from the total variety screened, (3) adherence to the rehabilitation the program, (4) drop-out rates, (5) gain estimates of adverse reactions to treatment, (6) achieve estimates of intervention outcomes	Tailored rehabilitation, standard strengthening programmed, shoulder pain	customized or standardized restoration,	cost-effectiveness evaluation of the standardized strengthening and the tailor-made rehabilitation interventions, evaluation of variance, with alpha	A mixed-model evaluation of variance, with alpha set at 0.05, and energy at 80%. Since this is a feasibility , the study, we will no longer regulate alpha for more than one comparisons. To decide whether or not it is viable to habits the whole trial, we will think about 75%CI as the chance threshold at 3-month follow-up. Longtime for recuperating
Dubé, M.-O., Desmeules, F., Lewis, J., & Roy, J.-S. (2020) (Dubé et al., 2020)	Rotator cuff-related shoulder pain: does the type of exercise influences the outcomes? Protocol of a randomized controlled trial	This investigation pursuits to evaluate the short, mid and long-term effects, in phrases of symptoms, practical limitations, kinesiophobia and pain catastrophizing, of three unique shoulder rehabilitation procedures (education, strengthening, motor control) in adults with RCRSP.	Rotator cuff-related shoulder pain	periods over 24 weeks (baseline, 3, 6, 12, and 24 weeks), six intervention periods over 12 weeks for each workout businesses and two training sessions over 12 weeks for the schooling group	ANOVO two way Descriptive statistics, (independent t-tests and χ^2 tests)	There is an influence of rotator cuff-related shoulder, but it takes longtime more than 12 up to 24 weeks
Gutiérrez-espinoza, H., Araya-quintanilla, F., Cereceda-, C.,	Effect of supervised physiotherapy versus home exercise application in	To determine whether supervised physiotherapy is more	Supervised physiotherapy , home	An electronic search was performed in	Correlation Weakness in analysis	Supervised physical therapy and home-based progressive

Álvarez-bueno, C., Martínez-vizcaíno, V., & Cavero-redondo, I. (2019) (Gutiérrez-espinoza et al., 2019)	sufferers with subacromial impingement syndrome: A systematic evaluate and meta-analysis.	high-quality for functional improvement and ache alleviation than a domestic workout software in subjects with subacromial impingement syndrome.	exercise program, subacromial	Medline, Central, Embase, Pedro, Lilacs, Cinahl, SPORTDiscus, and Web of Science databases.		shoulder strengthening and stretching workout routines for the rotator cuff and scapular muscle tissues are equally high-quality in sufferers with subacromial impingement syndrome is dealt with conservatively.
Niederer, D., & Mueller, J. (2020) (Niederer & Mueller, 2020)	Sustainability consequences of motor manage stabilization workouts on pain and feature in chronic nonspecific low again ache patients: A systematic assessment with meta-analysis and meta-regression	To current evidence on sustainability results of motor manipulate workouts on ache depth and incapacity in continual low returned ache sufferers	Motor manage stabilization exercises, pain, function, continual nonspecific low returned ache	RCTs and CTs on chronic (> 12/13 weeks) nonspecific low back pain, written in English or German	Systematic review with meta-analysis and meta-regression with PRISMA	We located that motor manipulate stabilization workout routines lead, with low to reasonable great evidence, to a sustainable enchancement in pain depth and disability in continual non-specific The ache was once not unique even even though the therapeutic application has a effective impact
Van Dillen, L. R., Lanier, V. M., Steger-May, K., Wallendorf, M., Norton, B. J., Civello, J. M., Czuppon, S. L., Francois, S. J., Roles, K., & Lang, C. E. (2020). (Van Dillen et al., 2020)	Effect of Motor Skill Training in Functional Activities vs. Strength and Flexibility Exercise on Function in People with Chronic Low Back Pain: A Randomized Clinical Trial	To decide whether or not an exercise-based therapy of person-specific motor ability education (MST) in the overall performance of purposeful things to do is extra effective in improving function then energy and flexibility workout (SFE) immediately, six months and 12 months following treatment.	Motor Skill Training, Functional Activities Strength, Flexibility	modified Oswestry Disability Questionnaire scores)	The primary outcome was the MODQ (0%-100%).	People with persistent LBP who obtained MST had increased temporary and long-term enhancements in characteristic than those who acquired SFE. The remedy takes a lengthy time
Owen, P. J., Miller, C. T., Mundell, N. L., Verswijveren, S. J. J. M., Tagliaferri, S. D., Brisby, H., Bowe, S. J., & Belavy, D. L. (2020)	Which specific modes of exercise training are the most? Effective for treating low back pain? Network meta-analysis	Examine the effectiveness of unique modes of exercise training in non-specific persistent low back ache (NSCLBP).	Exercise training, low back pain	Network Meta-Analyses (PRISMA-NMA) Most of the research	NMA was performed following the current PRISMA NMA	There is low-quality proof that Pilates, stabilization/motor control, resistance training, and cardio exercising coaching are the most fantastic treatments, pending the consequence of interest, for adults with NSCLBP

(Owen et al., 2020)				lacked the detailed technic		
Hong, S., & Lee, G. (2020) (Hong & Lee, 2020)	Effects of a low again workout software on low returned ache patients' lumbar lordotic angle, belly muscle power, and ache	This learn about goals to become aware of the consequences of a low returned workout application on low returned ache patients' lumbar lordotic angle, belly muscle power, and pain.	Low decrease lower back exercising program; Low once more suffering patients; Abdominal muscle power; McKenzie Exercise; William Exercise.	Low back exercise program	Pretest-posttest sketch This learn about carried out the statistical evaluation the usage of SPSS 18.0 version, Lacking evaluation data.	the lumbar lordotic attitude elevated after the interventions, however there used to be no tremendous difference, and there have been considerable variations in stomach muscle energy and ache (p < .05) Time 30 minutes per week at some point of six weeks
Tjøsvoll, S. O., Mork, P. J., Iversen, V. M., Rise, M. B., & Fimland, M. S. (2020) (Tjøsvoll et al., 2020)	Periodized resistance education for continual non-specific low returned pain: a mixed methods feasibility learn about	We investigated the feasibility of a 16-week supervised heavy resistance education software with weekly undulating periodization for persons with power non-specific low-back pain (LBP).	Heavy resistance training, Weekly undulating periodization, Persistent non-specific low again pain, Mixed methods, Feasibility study, Numeric ache rating scale, Pain-related disability, Pain self-efficacy, Muscle energy	mixed-methods feasibility learn about combining quantitative and qualitative strategies	STATA/MP version 15.1 Lacking software analysis data	Periodized resistance coaching with weekly undulating periodization is a possible coaching approach for this crew of humans with chronic non-specific LBP. Time16 weeks
Hubscher, C. H., Montgomery, L. R., Fell, J. D., Armstrong, J. E.,	Effects of exercise training on urinary tract function after spinal cord injury	To verify the impact of workout coaching on urinary tract	exercise training, function	Independent-T-test	Statistical analysis included one-way ANOVA	It was significant, but with longtime

Poudyal, P., Herrity, A. N., & Harkema, S. J. (2016). (Hubscher et al., 2016)		feature after spinal twine ache	spinal cord injury			
Batalha, N., Paixão, C., Silva, A. J., Costa, M. J., Mullen, J., & Barbosa, T. M. (2020) (Batalha et al., 2020)	The Effectiveness of a Dry-Land Shoulder Rotators Strength Training Program in Injury Prevention in Competitive Swimmers	This study aimed to analyze the acute effects of training programs conducted on dry land to prevent shoulder rotators injuries.	Dry-Land Shoulder Rotators Strength, Training Program, Injury Prevention	8 hours of training per week., by swimming The missing detail training program	All analyses were performed using SPSS (version 22.0; SPSS, Inc., Chicago, IL, USA)	The findings propose that a compensatory power education program does not have a big acute impact on the strength, endurance, and muscle stability of shoulder rotators. The application used used to be now not big to forestall shoulder accidents
Eshghi, S., Zarei, M., Abbasi, H., & Alizadeh, S. (2020) (Eshghi et al., 2020)	The Effect of the Shoulder Injury Prevention Program on Shoulder Isokinetic Strength in Young Male Volleyball Players	To synthesize proof on the effectiveness of one-of-a-kind ET applications to limit CNSNP and related disability, and whether or not dosage impacts outcomes.	Muscle imbalance; functional strength; overhead sports	Isokinetic Strength The program used was inferior, with no validity and reliability of the latter	A two-way (2 × 2) repeated measures ANOVA	The damage prevention program did now not decorate the isokinetic electricity of younger volleyball gamers selected for this learn about during eight weeks of the execution of 8 S. ESHGHI ET AL.The program. Significant results were located in FDR, with an enlarge in the quantity . However, the practical deceleration ratio (FDR) has a vulnerable impact size.
Price, J., Rushton, A., Tyros, I., Tyros, V., & Heneghan, N. R. (2020) (Price et al., 2020)	Effectiveness and ultimate dosage of exercising coaching for continual non-specific neck pain: A systematic evaluate with a narrative synthesis	To synthesize proof on the effectiveness of one-of-a-kind ET applications to limit CNSNP and related disability, and whether or not dosage impacts outcomes.	Exercise Training, chronic non-specific neck pain	A systematic review and data synthesis	Two independent reviewers (JP/VT) assessed the Risk of Bias (RoB) using the Cochrane RoB Tool	Twenty-six trials from 3990 citations (n = 2288 participants). A vary of ET programs limit pain/disability in the quick term (low to reasonable evidence). This software has a brief term on the neck ache
Rimaud, D., Calmels, P., & Devillard, X. (2005) (Rimaud et al., 2005)	Effects of training programs for spinal cord injury	To review the literature on the efficiency of training programs for SCI.	Spinal cord injury (SCI); Paraplegia; Adaptation; Reconditionin g; Training program; Efficacy;	rehabilitation, training, workout conditioning, bodily fitness, exercising prescription, adaptation,	Independent-T-test Weakness in analysis	make bigger maximal upper-extremity muscle strength, dash energy output and maximal strength output

			Muscle strength; Cardiovascular; Cardiorespiratory; Bone mass; Fitness	effect, or benefit. We located sixty five articles associated to the physiological and psychological outcomes of education applications on sufferers with SCI		
Mureșan, D.-A., Pielmuși, A., Perju Dumbravă, L., & Fodor, D. M. (2019) (MUREȘAN et al., 2019)	The impact of stretching workouts as section of the rehabilitation application for patients with spinal wire harm	The intention of this case-control find out about was to consider the effect of a stretching module introduced to the precise physiotherapy software for sufferers with SCI	stretching exercises, rehabilitation program, spinal wire harm	Physiotherapy and occupational remedy Missing education application important points	Statistical evaluation used to be carried out the usage of Microsoft Excel, specific records being introduced as diagrams, absolute and relative frequencies, and non-stop variables	The inclusion of stretching workouts in the precise physiotherapy application for sufferers with spastic paraparesis after spinal wire harm appears to have a favorable temporary influence through lowering spasticity and enhancing ambulation. Critical the following software additionally has a brief time period

After conducting a meta-analysis of the relevant research about massage, and therapeutic exercises for back musculoskeletal disorders, the study concluded the following: (1) all the researchers surveyed lacked program training details. The researchers did not deeply explain how to apply for each therapeutic program, whether massage, therapeutic exercise, or rehabilitation. (2) The result from 2005 until 2021 about the effect of one type of massage has a

short term, the researcher wants to combine three types of massage according to the kind of muscles and injuries. (3) The result from the meta-analysis showed again that the therapeutic exercise programs used were not explained the volume of training, loading, intensity, repetition, and rest. (4) The result showed that all the papers surveyed the methodology used took a long time for treatment, over eight weeks to 26 weeks. Still, the developed massage, therapeutic exercise, and rehabilitation program will take five weeks, three times per week, for treatment. (5) More than 70% of the articles surveyed showed that the researchers were more interested in low back muscles disorders despite many people having low back, spinal, shoulder, and musculoskeletal neck disorders. So, if the treatment doesn't affect the whole spine, the subject should not endure health; remember that most back muscles and bones work in synergy. (6) Most of the programs used did not have validation and reliability because their effect on back musculoskeletal was short-term. (7) no found research treats at the same time the whole back musculoskeletal disorders (low back pain, thoracic, and cervical pain). (8) Most research done treated nonspecific low back pain, spinal pain, and neck pain. So, if the researcher did not specify the nature of injury/pain is very difficult to find a good program or a sweet table massage to restore the pain or injury. Therefore, the research will have to specify the current type of pain or injury for the back muscles. (9) In the hand of analysis data, the meta-analysis showed that more than 80% used one software with one analysis; the researcher can not expect the deeply analyze it he doesn't use more multi analyzing with

various software. For this current research, the author used Wilcoxon and Shapiro Wilk, Paired t-test analysis to assess the effectiveness of the newly developed massage, therapeutic exercise, and rehabilitation for the back musculoskeletal pain/injuries. (10) most of the articles surveyed did not clearly explain the details of their program massage and therapeutic exercise. All the observations push the research to develop new therapeutic massage and exercises for back musculoskeletal disorders.

Table 3: Recapitulative Table of Relevant Studies and Future Study

After analyzing the relevant studies, the resume from the documentation research and the expected development research has been presented in Table 3 below after analyzing the relevant studies.

Critical from Relevant Studies	Developed Research
<ol style="list-style-type: none"> 1. No details of massage, therapeutic exercise, and rehabilitation 2. Short term/benefit 3. Longtime for treatment from 8-26 weeks 4. More than 70% focused on low back pain/injuries 5. Lack of Validation, and reliable massage, therapeutic exercise, and rehabilitation program 6. No research which combined more than one type of massage 7. Treatment of non-specific pain/injuries 8. Many manipulation/stroke 9. Longtime of the treatment, more than 45 minutes 	<ol style="list-style-type: none"> 1. With details 2. Long term/benefit 3. Only five weeks 4. Back musculoskeletal disorders/pain (neck pain, spinal pain, and low back pain) 5. With validation and reliability of the program before being applied 6. Combined three types of massage: Swedish massage, deep tissue massage, soft tissue massage, and exercises 7. Treatment of specific pain/injuries 8. Limited stroke 9. Therapeutic training 20-35 minutes

C. Conceptual framework

Back MSDS is a ordinary problem in the total world. This frequent trouble takes foundation from many sources: first each day activities such as sports activities for athletes and coaches, second degenerative disease. The ageing is one of the factors which motives the returned musculoskeletal injuries; next, the unbalance between input and output has a excessive common in inflicting the later problem. The research used a combined message like (1) Swedish massage, (2) Deep tissue massage, and (3) Soft tissue release massage; in addition, he also suggested some kinds of exercises grouped in two phases like (a) stretching exercise, (b) strengthen exercise. Below are the full explanations for why the researcher combined the massage and the raison why he took those exercises. The conceptual framework for this research is given in table 4 as the following;

Table 4: Conceptual framework

Back Musculoskeletal Disorders (BMSDs)	<p>Symptoms</p> <p>Back Musculoskeletal issues are the frequent accidents that have an effect on the low again muscles, thoracic muscles, neck/cervical muscles, bones, ligaments, nerves, and joints. They are characterized via pain, inflammation, sprain, strain, degenerative disc, sciatica nervous, and so on. (Australian Institute of Health and Welfare (AIHW), 2019).</p>
Massage/Exercise	Benefits from Massage and Exercise
Swedish massage	<p>Swedish rubdow helps to clear the body and mind of unwanted responses to stress. Increase Flexibility. Swedish Massage will elongate the muscles, open the joints and decrease swelling</p> <ul style="list-style-type: none"> • Decreasing pain. • Improving the circulation of the blood • Treatment of muscles ached. • Develop the rang of motion • Minimalized the stress.

	<ul style="list-style-type: none"> • Increase in immune (Miake-Lye et al., 2019, Momeni et al., 2020)
Deep tissue massage	<ul style="list-style-type: none"> • Reduce stress relief. Deep tissue rubdown is a better stress reliever. • Take off the pain • Decreasing blood pressure, and Heart Rate. • Breaks Up Scar Tissue & Makes Movement Easier. • Minimalized Arthritis Symptoms. • Treated muscle ache (Romanowski et al., 2017)
Soft tissue release	<p>helps to enhance overall flexibility and decrease the probabilities of having muscle injury. This kind of rubdown includes stretching the muscle fibers, promoting flexibility, and maintaining it.</p> <p>aids in relaxing muscles, · increases blood circulation and lymph flow, · improves the recovery time of strained ligaments and muscular</p> <ul style="list-style-type: none"> • Improve muscle relation, • develop blood circulation and lymph flow, • increasing the healing time of strained ligaments and muscular tissue, • keep off the inflammatory of joints and heart rate, • make good the range of motion of the joints, • development of endorphins, • make strong the immune system, • decreases muscle spasms, • improves oxygen flow, and • helps to relieve muscle tension. (Learning et al., n.d, Mohanty, 2018, Kameda & Tanimae, 2019)
1. Knee lift 2. Hip and low back stretch 3. Double hips rotation 4. Hips swinging	<ul style="list-style-type: none"> • Make muscle strong • Support joint and increase flexibility • Release hip flexor muscles • Increase ROM of abdominal and oblique muscle • Increase the hip flexion, spine flexion, reduce spine and muscle tension (Gordon & Bloxham, 2016, Shariat et al., 2019)
5. Squeeze 6. Muscle cladding 7. Hamstring stretch	<ul style="list-style-type: none"> • Increase hip muscles strengthen • Make strong hip ligaments, make strong joints • Make strong dorsal muscle (Kasprzak, 2020)

8. Bridging 9. Side leg raises 10. Prone straight leg raise	
11. Sphinx pose 12. Cobra pose & Payer pose 13. Cat cow 14. Quadruped arm & leg raise 15. Quadruped Reach	<ul style="list-style-type: none"> • Help to correct the spine form • Increase shoulder muscle strengthen • Reduce pain, increase back muscle strengthen <p>Full body strengthen, all back muscles, and forward muscles like pectoralis, abdominal, back and forward leg muscles support, arms strengthen Neck muscle strengthen (Ben, n.d., Luciano et al., 2020)</p>

Based on the conceptual framework the researcher showed the lack of the previous treatment about BMSDs, and decided to improve the treatment program. The below table illustrated the steps on which the development has been done.

Table 5: Comparative of Classic and New therapeutic model

Classic Model/MSDs	Treatment	Volume	Time	Effects	Price
Low back MSDs	<ul style="list-style-type: none"> • Swedish massage • Stretching exercise 	No detail	8-26 Weeks	Short effect	Expensive
Cervical MSDs	<ul style="list-style-type: none"> • Soft tissue release 	No detail	8 weeks	Short effect	
Thoracic MSDs	Not yet	Not yet	-	-	
The New Therapeutic Massage and Exercise Model					
Low back MSDs Thoracic MSDs Cervical MSDs	<ul style="list-style-type: none"> • Swedish massage • Deep tissue massage • Soft tissue release ▪ Therapeutic exercise: ✓ Stretching exercise ✓ Strengthen exercise 	With detail	5 Weeks	Longue effect	Cheep

D. Hypothesis or Research Questions

1. How to design/develop the mixed model: therapeutic massage and exercises model for back musculoskeletal disorder rehabilitation?
2. How feasibility of the therapeutic massage and exercises models for back musculoskeletal rehabilitation?
3. How effective are the therapeutic massage and exercise models for rehabilitation for back musculoskeletal disorders?

CHAPTER III

RESEARCH METHOD

A. Model of the Development

This study is a Research and Development (R&D) (Borg W R and Gall M D, 1989). The 4 points of R&D end up the preliminary steps in conducting this study. The merchandise would be designed and developed for later examined and improved/ revised from the preliminary steps. The lookup and improvement (R & D) method in training has ten steps; for this lookout, all the ten steps have been regarded. The ten steps have been presented below in Figure 9 as the following.

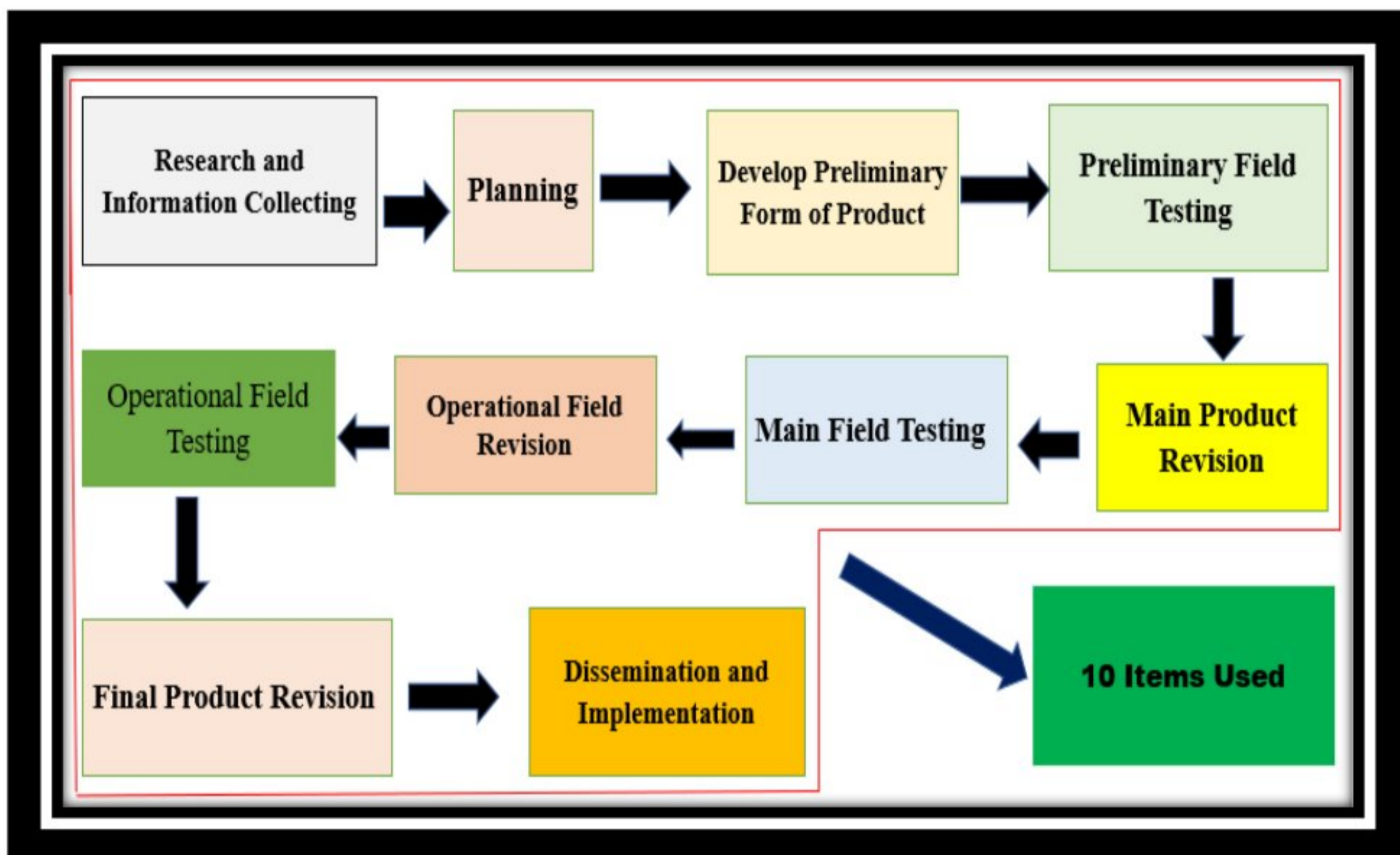


Figure 9: Illustrative Diagram of Massage and Exercise Development

B. Procedures of the Development

The development procedure in this research was to modify the ten-step Borg. Gall development procedure, namely (1) literature research to design a product, namely a combination of therapeutic massage and exercise program, (2) and (3) planning and preliminary draft product, the content validation and inter-reliability of the product developed were applied on this stage. (4) and (5) Small-scale and large-scale trials. At this stage, the main revision and critical were done, (6) and (7) main testing and operational testing revision, (8) and (9) Operational field testing and final revision of the developed product for the effectiveness of the product to recovery back musculoskeletal disorders, increasing of flexibility, and strengthen. (10) the last stage was the dissemination of the product developed.

In a few words, this developed product began with a literature review to analyze the theory and previous research relating to this research. After a design draft or planning of therapeutic massage, exercise for back Musculoskeletal disorders rehabilitation has been applied. The expert judgment for the product developed was done to assess its validity and reliability. The field trials were constituted of small-scale, large-scale tests to assess the draft product's accuracy, safety, and feasibility. The main revision, operational field testing, evaluated the developed product's effectiveness. The last stage was disseminating and implementing designed products through international journal articles.

C. Trial Design of the Product

The trial design of the product was constituted by trial design as the components of the therapeutic massage and exercise for back musculoskeletal disorders rehabilitation. Second, the research sample has been determined. The data collection technique was explained, and data analysis has been clarified below. The trial design of the product was applied in four steps

(1) trial design, (2) trial Subject, (3) data collection techniques and instruments, and (4) Data Analysis.

1. Trial Design

In this study, there are four designs of trial products, namely:

- a. The literature review research design used a systematic review design
- b. Design of content validation and inter-reliability test using the Delphi technique.
- c. Trial design using action physiotherapist/masseurs.
- d. Effective test design using experiment pretest-posttest of variables like level pain, ROM, and strength.

2. Trial Subject

- a. The subjects of literature review research used journals and books.
- b. The subjects of the validation test used seven experts consisting of 5 academic experts and 2 professional experts who have certificates.
- c. The subjects of small-scale trials were four masseurs, and ten in large-scale trials
- d. The subjects for testing the effectiveness were 24 people with back musculoskeletal disorders. The criteria of including in this research, the subject must have the three types of BMSDs (Cervical, Thoracic, and low back pain). The sample was taken by purposive sampling.

3. Data Collection Techniques and Instruments

- a. Research data collection techniques were reviewed through international journals and books. The collecting expert validation test data used the Delphi technique, while the research instrument used a Likert scale from 1 to 4. The value 1: not very appropriate;

value 2: not appropriate; value 3 appropriated, a value four very appropriated. The content validity value of all terms was above 0, 82 (high).

b. The data collection technique of the implementation effectiveness test used a questionnaire. The instrument used a Likert scale from 1 to 4 (value 1: is not very easy/safe, value 2 is not easy/safe, value 3 is easy/safe, value 4 is very easy and safe. The content validity value of all terms was above 0.85 (high).

c. The data collection technique used the goniometer to assess ROM. The sit-ups and Leg press were used to assess strength.

4. Data Analysis

- a. The data from the literature review were analyzed with a narrative review.
- b. Analyzing data from the expert assessment with the Aiken formula has been used with a confidence level of 95%
- c. The product trial data were analyzed using qualitative analysis based on variables' accuracy, safety, and ease of application.
- d. The effectiveness of the product was analyzed with Paired t-Test, Wilcoxon, and Shapiro Wilk. To clarify the research procedure above, the researcher presents a research flow consisting of three stages, each stage consisting of research design, data collection techniques, data analysis, and achievement indicators as shown in table 5 as follows:

Table 6: The Steps of the Study

Research stages	Research type/design	Data collection technique	Data analysis	Achievement indicators
Literature study	Documents	Narrative review	Qualitative	Compiled a combination massage therapy program with exercises for back muscle injuries
Expert Judgment	Evaluation	Delphi	Formula Aikens	Tested content validity and inter-rater reliability of the combination massage therapy program with exercises for back muscle injuries
Field Test	Evaluation	Qualitative	Qualitative	Proven effectiveness of the implementation of a combination massage therapy program with exercises for back muscle injuries
	Pre-Experiment	Questionnaire	Qualitative	Proven effectiveness of the implementation of a combination massage therapy program with exercises for back muscle injuries
		Measurement test	-Paired t-Test -Wilcoxon -Shapiro Wilk	

5. Techniques of the Data Analysis

The literature review has been analyzed using narrative review, the data from content validity have been analyzed using Aiken Formula, and data from questionnaire have been analyzed using descriptive statistics. Data from the first and second trials, after 15 times of treatment, 3 times per week during 5 weeks have been analyzed using paired sample t-Test to assess the difference between pre-test and post-test of the variables like level of pain, the ROM, and strengthen. The research sample was 24 subjects with musculoskeletal disorders, and One-Sample Kolmogorov-Smirnov used the normality test. Wilcoxon was used to determine whether there were any differences between the pre-test and post-test of the variables tested (level of pain, the ROM, and strength) with SPSS Amos 23.

CHAPTER IV

THE RESULTS OF RESEARCH AND DEVELOPMENT

A. Results of the Initial Developed Product

Based on the results of the literature review, the results of the initial product model of the therapeutic massage and exercise models for back musculoskeletal disorders rehabilitation were based on three types of massages (1)Swedish massage, (2)Deep Tissue Massage and (3) Soft Tissue Release combined with therapeutic exercise as it has been presented in table 6, and 7 as the following:

Table 7: Manipulation and Volume of Back Musculoskeletal disorders Massage

Therapy: 10 minutes, 3time/Week during 5Weeks

Volume and Massage Therapy Manipulation				
Manipulation	Instructions	Volume	Intensity	Duration: 10 minutes
Swedish Massage Effleurage Petrissage Friction Tapotement: cupping Hacking Beating	From ventral layer position: apply effleurage from neck muscles to lower members' muscles	10-15 floatings (1 set)	Low-moderate	2 min
	Apply petrissage on the whole hips, scapula muscle, and neck muscles	20-25 floatings (1 set)	Low-moderate	1 min
	Apply friction to the specific muscle pain or injury	20-25 movements (1 set)	Moderate	1min
	Cupping technique to overall blood flow, promote cell repair and create new blood vessels in the tissue	20-40 movements (1 set)	Moderate	20 secs
	Hacking to stimulate nerves and blood flow	20-40 movements (1 set)	High	20 secs
	Apply beating on adipose muscles like the gluteus, and			High

	latissimus dorsi, trapezius, deltoid to destroy myogenesis	20-40 movements (1 set)		
Deep Tissue Petrissage Friction	Apply petrissage and friction deeply again to care out myoglobin muscle.	10-20 floating (1 set) 10-20 floating (1 set)	High High	1 min 1 min
Soft Tissue Release Petrissage Friction Massage Effleurage Vibration	Apply petrissage and friction with soft tissue release to stimulate large nervous, increase endorphin, and ROM of hips and shoulder joints	20-30 strokes (1 set) 20-30 strokes (1 set)	Moderate Moderate	1min 1min
	Apply effleurage and Vibration to remove the waste product, increase healing, and recover	20-30 strokes (1 set) 20-30 strokes (1 set)	Moderate Moderate	1min

After critical analysis from previous research related to therapeutic massage in restoring musculoskeletal disorders, it has been concluded to combine three types of massage to allow fast recovery. There was no more lookout from the previous research where more than one type of massage has been combined.

Swedish massage has been chosen based on its benefits, like clearing the body and mind of unwanted responses to stress. Increase flexibility. Elongation of the muscles, the opening of the joints and decreased swelling, Pain management, Increased blood flow, Rehabilitation for muscle injuries.

Deep tissue massage has been chosen for deep and robust muscles, reduces pain, lowers blood pressure and heart rate, breaks up scar tissue & makes movement easier, relieves arthritis symptoms, rehabilitates injured muscles, and is a great stress reliever.

Soft Tissue Release: helps to improve overall flexibility, involves stretching muscle fibers, increases blood circulation and lymph flow, improves healing time of strained

ligaments and muscular, improves the healing time of strained ligaments and muscular tissue, reduces the inflammation of joints and heart rate, increases endorphins, strengthens the immune system, decreases muscle spasms, improves oxygen flow.

Table 8: Program for Relieving Back Musculoskeletal Injuries, and Increasing Strength, Flexibility, and Function Skills 20-35 Minutes X 3 t X 5 W

Hips, Spine, and Scapula Therapeutic Exercise, And Rehabilitation Program				
Principes	Type of Exercise / Component	Instructions	Volume, intensity, frequency, duration, set, rest	The benefits
Readiness Principle Individual Principles Adaptation Principles Overload Principle Progressive (Enhancement) Principle Principle of Specification Principle of Variation The principle of heating Principles of Long Term Training The Reversibility Principle The Principle of Over-moderation (Moderate) Systematic Principles	Stretching Exercises			
	1. Knee lift 2. Hip and low back stretch 3. Double hips rotation 4. Hips swinging	Apply exercise number [1-4] in a laying position. Do it yourself or with a partner. Apply it on each side or each member concerned.	Moderate intensity 5 repetition/exercise/Size 2 Sets Duration : (5 min) Resting: 10 secs	Stretching of low back muscles Improving Hips Joint Stretching of all back muscles (neck, low back) Stretching of the spine (C1-C7; T1-T12; L1-L5)
	First Set Back Strengthen Exercise Muscles			
	5. Squeeze 6. Sit Up 7. Hamstring stretch 8. Bridging 9. Leg Press 10. Side leg raises 11. Prone straight leg raise	In laying position, apply exercises nr, 5,6,7, and 8. Do each exercise for 10 secs/size. From exercises nr 9 and 10, use side and ventral positions and do them for 10 seconds each.	Moderate-High Intensity Ten repetitions 2sets Resting 15 secs /set Duration: 5 min	Strengthen hip muscles Strengthen of Dorsi muscle Strengthen of upper scapula muscle
Second Set Back Strengthen Exercise Muscles				

	12.Sphinx pose	ventral layer, bust rises up, arms extended in push-up position (11)	Moderate-High Intensity 3 repetitions for (11) duration: 30 secs	Relieve of LBP Strengthen of shoulder and arm muscles
	13.Cobra pose&	pay position, thigh buttock angle closure, flat back, arms extended forward, full back extension forward (12)	3 repetition for (12) Duration: 30 secs	Decompression of LBP
	Payer pose	Cut cow, hollow back, then rounding the back upwards, the body must be relaxed (13)	2x20-25 repetition for 2 Sets (13). Duration: 1 minute	Strengthen of all back muscle, hip, and arm muscle
	14.Cat cow	quadruped arms, full leg extension at hip height, opposite arm extended forward, hold and alternate position, flat back (14)	2sets 3 repetitions with holding each repetition 10 secs per size (14) Duration: 1 minute	Neck, shoulder, all back muscles, and Spine
	15.Quadruped arm&leg raise	quadruped reach, take off with one arm and touch as far as possible through the opposite arm, straighten the bust upwards and the outstretched arm upwards (15)	10-15 repetitions per size for (15), 2 sets. Resting: 15 secs after set 2sets Duration: 2 minutes Duration of second set: 10 min	
	16.Quadruped Reach			

The choice of exercise type was made according to the solicited muscles while referring to the objective to be achieved, such as reducing muscle pain, increasing flexibility, and increasing muscle strength. The exercises were grouped systematically so that the patient performed them in good sequence and a good climate of comfort. All security measures were taken. The therapeutic exercise was classified into three categories: (1) Stretching exercise, (2) First set of strengthening exercises, and (3) Second set of strengthening exercises. Applying the therapeutic exercise model straightforward and feasible, the researcher showed the related image in figures 11 and 12.



Figure 10: Back Musculoskeletal Disorders Therapeutic Exercise Image



Figure 11: Second Set Back Strengthen Exercise Muscles Image

1. Product Validation Results Developed

The product developed has been brought out for expert validation. This product was constituted by therapeutic massage and exercise. The product has been systematically validated. The product developed has been validated by seven experts who have enough knowledge in therapeutic massage, therapeutic exercise, sports training, sports science, physical education, and sports, and physiologists. The result from the expert's validation has been presented in tables 8; 9 and 10 below. There are three types of validation: [0-0.4] Low,]0.4-0.8[middle; [0,8-1] Strong or high score(Aiken, 1980)

Table 9: Validity of Swedish Massage, Deep Tissue, and Soft Tissue Release

Swedish Massage												
Evaluator	Item 1		Item 2		Item 3		Item 4		Item 5		Item 6	
	Score	s	Score	s	Score	s	Score	s	Score	s	Score	s
A	4	3	4	3	3	2	4	3	4	3	4	3
B	2	1	3	2	3	2	2	1	4	3	4	3
C	4	3	4	3	4	3	3	2	4	3	4	3
D	3	2	3	2	3	2	3	2	3	2	3	2
E	3	2	4	3	3	2	3	2	3	2	3	2
F	3	2	3	2	3	2	1	0	3	2	2	1
G	4	3	4	3	4	3	4	3	4	3	3	2
$\sum s$	16		18		16		13		18		16	
V	0.76		0.85		0.76		0.61		0.85		0.76	

Legend: Item1: Effleurage, Item2: Petrissage, Item3: Friction, Item4: cupping, Item5: Hacking, Item6: Beating. First of all, the Swedish massage was based on Effleurage, Petrissage, Friction, Tapotement, cupping, Hacking, and Beating. The six items were instructions related to the Swedish massage application, which can be seen in table 6. All the scores obtained were up 0.61 to 0.85. The later validation score attested that the Swedish massage items were included in middle to high category.

Table 10: Validity of Deep Tissue, and Soft Tissue Release Massage

Deep Tissue, and Soft Tissue Release Massage						
Evaluator	Item 1		Item 2		Item 3	
	Score	s	Score	s	Score	s
A	4	3	4	3	3	2
B	3	2	3	2	4	3
C	4	3	4	3	4	3
D	2	1	3	2	3	2
E	4	3	4	3	4	3
F	3	2	4	3	4	3
G	4	3	4	3	4	3
$\sum s$	17		19		19	
V	0.80		0.90		0.90	

Legend: Item1: Petrissage, and Friction in deep tissue, Item2: Petrissage, and Friction, Item3: Effeirage, and Vibration (Item2,3) in Soft Tissue Release. All the items were validated within a value from 0.80 to 90.

Table 11: Validity of Therapeutic Exercise

Therapeutic Exercises						
Evaluator	Item 1		Item 2		Item 3	
	Score	s	Score	s	Score	s
A	4	3	4	3	3	2
B	4	3	3	2	4	3
C	4	3	4	3	4	3
D	4	3	3	2	4	3
E	3	2	4	3	4	3
F	4	3	3	2	3	2
G	4	3	4	3	4	3
$\sum s$	20		18		19	
V	0.95		0.85		0.90	

Legend: Item1: Stretching exercise, **Item2:** First set of strengthening exercises, **Item3:** Second set of supporting exercise. The therapeutic exercise was based on three types of activities stretching exercise(item1), a First set of strengthening exercises (item2), and a second set of strengthening exercises (item3). All its items were validated from 0.85 to 0.95. The later value attested that the developed model could restore Musculoskeletal spine disorders. Globally the whole developed program has been validated within value:**0.82**. The validation was classified in strong category.

2. First Revision of the Draft Model

After scoring the items that constituted the therapeutic massage and exercise, the evaluator's program suggested that some activities still need parenting for patients with high spine musculoskeletal disorders. For example, people with chronic low back pain have a great problem doing the sit-up alone without parenting.

3. Second Validation of the Draft Model

The combined therapeutic massage and exercise training program draft was compiled and then validated by exercise therapists and health professionals. These experts are Prof. Dr. Tomoliyus, MS. as, an expert in sports training, and Prof. Dr. dr. BM. Wara Kushartanti, M. S, as an expert in sports health and exercise therapy, Dr. Ali Satia Graha, S.Pd., M. Kes as Therapy and Rehabilitation of Sports Injuries, massage therapy; Dr. dr. Rachmah Laksmi Ambardini, M. Kes. as an expert in health and exercise therapy, c) Dr. Drs. Bambang Priyonoadi, M. Kes. as massage expert d) dr. Novita Intan Arovah, MPH., Ph.D. is an expert in physiotherapy, Sports Therapy Rehabilitation. The experts agreed that the later therapeutic massage and exercise model was great for restoring musculoskeletal disorders. They also suggested some recommendations to improve the therapeutic model

4. Second Revision of the Draft Model

After analyzing the constituents of this model, taking into account the research objectives, the evaluators suggest some recommendations to improve this program. Comments are noted in the table below. The input from the experts was presented in table 10 down as the following:

Table 12: Input from the Experts Validators

Nr	Expert Name	Specialization	Input on Exercise Therapy Model
1	Prof. Dr. Tomoliyus, MS	Sports Training	Overall, it's good to apply to people with different musculoskeletal disorders.
2	Prof. Dr. dr. BM. Wara Kushartanti, M.S,	Sports Health and Exercise Therapy	For patients suffering from high-level musculoskeletal injuries, focus more on massage therapy, and add therapeutic exercise progressively from middle to high intensity. The patient must have a therapeutic massage and exercise during the same session. Remind the patient to continue the therapeutic practice at their homestay to make a fast recovery.
3	Dr. Ali Satia Graha, S.Pd., M.Kes	Therapy And Rehabilitation of Sports Injuries, Massage Therapy	Before applying for this program, the user has to check out the type of injury because the spine has a diversity of pathology
4	Dr. dr. Rachmah Laksmi Ambardini, M. Kes	Health And Exercise Therapy	Focus on therapeutic massage and stretching exercises to relieve fast pain after applying the strengthening exercise
5	Dr. Drs. Bambang Priyonoadi, M. Kes.	Massage Therapy	Patients with high-level spine injuries need more therapeutic massage to restore pain after applying strengthening exercises to increase motoric function.
6	dr. Novita Intan Arovah, MPH., Ph.D	Physiotherapy, Sports Rehabilitation Therapy	Improve Conceptual Framework by linking Deep Tissue Massage, Soft Tissue Release, Swedish Massage, Stretching, and Strengthening on one side with Pain, ROM,

			Strength, and Functional Scale on the other side
7	Prof.Dr. Salvator Nahimana	Physical Education, And Sports	Add strengthening exercise in the draft model
8	Prof.Dr. Gaturagi Charles	Exercise Physiology	The patients can be assisted because some exercises are difficult to be done by the patient alone with high-level pain

5. Third Validation of the Draft Model

The model was then launched in a validation committee to be analyzed in-depth in the physical education and sports at the University of Burundi. All contributors have agreed that this model can be applied to patients with back musculoskeletal disorders.

6. Third Revision of the Draft Model

The systematic and deeply analyzing of the draft model pushed the researcher to find that the product developed was very sweet and could be used. Nevertheless, in add more of the high level of spine Musculoskeletal pain, most patients have a significant problem with movement in their lifestyle work. Besides the therapeutic exercise proposed in the product draft, the researcher added the leg press and sitting-up as an assessment tool of strength because strength is quality; without it, movement is impossible.

Why do leg press extension exercises?

The leg press is an essential exercise with a short range of motion. It helps develop kinetic chain muscles like glutes, hamstrings, quadriceps, hips flexor, and hips muscles. It helps to reduce any strain placed on the low back. The leg press engages the major muscle groups. It

increases overall athlete's performance and maintains its motion patterns in daily subject life. A strong lower body prevents injury and manages chronic diseases like arthritis, heart disease, osteoporosis, and diabetes. Lock in the significant muscle bunches of your body, which makes a life lower.

Why Do Sit-Ups exercises?

Sit-ups exercise has a significant impact on the human body as:

- a) Exercise multiple areas of the human body
- b) Sit-ups workout a kinetic chain muscle like:
 - Low back muscle
 - Hips flexor muscles
 - Internal and external obliques muscles
 - Abdominal muscles
 - Chest muscles
- c) Improving human Posture as:
 - Good posture requires that the muscles around the spine have balanced and strong to provide equal support to the human body
 - Reduce low back pain
 - Better neck and shoulder health
 - Better thoracic health
 - Better form during a workout

Sit-ups improving: (1) strength, (2) power, (3) balance, and (4) Coordination

B. Results of the Trial Products

The results from the trial were presented in two steep results from the small trial and the result from the large trial

1. Results from the Small Try Out of Product Developed

The product draft in the form of therapeutic massage and exercises for musculoskeletal disorders rehabilitation has been revised according to the results of expert validation, will then be tested on four masseurs to find out: its (1) accuracy, (2) safety, and (3) feasibility. The masseurs practice the program for patients with back musculoskeletal disorders after being sent a questionnaire to assess the product draft according to the above aspects. The results from the small tryout have been presented in the form of Tables 11, 12, and 13 below.

Table 13: Accuracy Aspects

Items	Average
Are the combined therapeutic massage and exercise models appropriated for recovering back Musculoskeletal injuries?	4
Are the combined therapeutic massage and exercise models appropriated for increasing the ROM of people suffering from back Musculoskeletal injuries?	4
Is the combined therapeutic massage and exercise models appropriate for strengthening people suffering from back Musculoskeletal injuries?	4
Are the combined therapeutic massage and exercise models appropriated for increasing the function motoric of people suffering from back Musculoskeletal injuries?	4
Are the combined therapeutic massage and exercise models easy to be applied?	4

1: Very inappropriate

2: Inappropriate

3: Appropriated

4: Very appropriated

From the aspect of accuracy, it can be concluded that the value obtained is 4, which means that it is good/correct/clear from the aspect of accuracy.

Table 14: Security Aspect

Items	Average
Are the motions of combined therapeutic massage and exercise models safe for people suffering from back Musculoskeletal disorders?	4
Are the proposed exercises affordable for subjects suffering from back Musculoskeletal disorders?	3.75
Are the proposed exercises accessible for cervical, thoracic, and low back pain individuals?	3.75
Are the proposed motions of combined massage feasible?	4

1: Very Inappropriate

2: Inappropriate

3: Appropriated

4: Very appropriated

From the security aspect, it can be concluded that the value obtained is 3,875, meaning that the security aspect is good/appropriate/clear.

Table 15: Feasible Aspects

Items	Average
Is the combined therapeutic massage and exercise models easy to be practical?	3.75
Are the proposed actions of combined massage realizable?	4
Are the proposed exercises practicable?	4

1: Very inappropriate

2: Inappropriate

3: Appropriated

4: Very appropriated

From the aspect of feasibility, it can be concluded that the value obtained is 3.916, meaning that the aspect of feasibility is quite good/quite precise/and sufficiently clear. From all results

of the small-scale tryout, it can be concluded that the product draft has met its consideration in the hand of accuracy, security, and feasibility. The following step was to send the same product draft to be applied to many masseurs to reach high consideration.

2. Result Large Try Out of the Product Developed

Large-scale tryouts have been applied to 10 (ten) masseurs or therapists(Nine or 9 masseurs have bachelor in physiotherapy, and one or 1 has bachelor in Physical Education and Sports). After the practice, they were sent a questionnaire to evaluate their perception of the product draft. The questionnaire items were the same as in the small tryout. The results were presented in summary after having made an a-depth analysis of the constituents of each aspect tested. Table 14 shows all the information.

Table 16: Result Large Try Out of the Product Developed

Items	Average
Accuracy Aspects	3.74
Security Aspects	3.75
Feasible Aspects	3.9

1: Very not appropriated

2: Not appropriated

3: Appropriated

4: Very appropriated

Analysis of the results of large-scale trials shows no significant difficulties or obstacles in implementation. These results imply that the draft model can be carried out with any masseur or therapist to recover back musculoskeletal injuries.

C. Revision of the Product

The reality on the ground has meant that the design carried out at the start encounters certain modifications to meet the patients' expectations. The way massage therapy was initially available has been improved. The whole body massage has been applied. Some exercises have been added, like (1) sit up and leg press, because they positively impact low back pain and thoracic and cervical injuries. The duration of the treatment proposed at the start has undergone modifications because of the complexity of the antecedents. The therapy took, on average, 30-45 minutes. So, 30 minutes for moderate cases and 45 minutes for complex issues. The developed product was constituted of therapeutic massage and exercise models for back musculoskeletal injuries rehabilitation. Therapeutic massage was a combination of (1) Swedish massage, (2) deep tissue massage, and (3) soft tissue release. Swedish massage has been applied to the whole body. The benefits of Swedish massage as Swedish massage helps to increase blood flow, rehabilitation for muscle injuries, decrease muscle pressure, reduce stress, improves the immune system, increases flexibility, elongates the muscles, opens the joints, and decreases swelling and pain management. The whole body massage has been applied because the hips are located between the upper and lower members. Some muscles (psoas major, piriformis, gluteus maximus, tensor fasciae latae, quadratus lumborum), and nerves originate in the upper lengthen to the bottom of the body. Figure 13 below shows the deep and superficial muscles considered during the treatment.

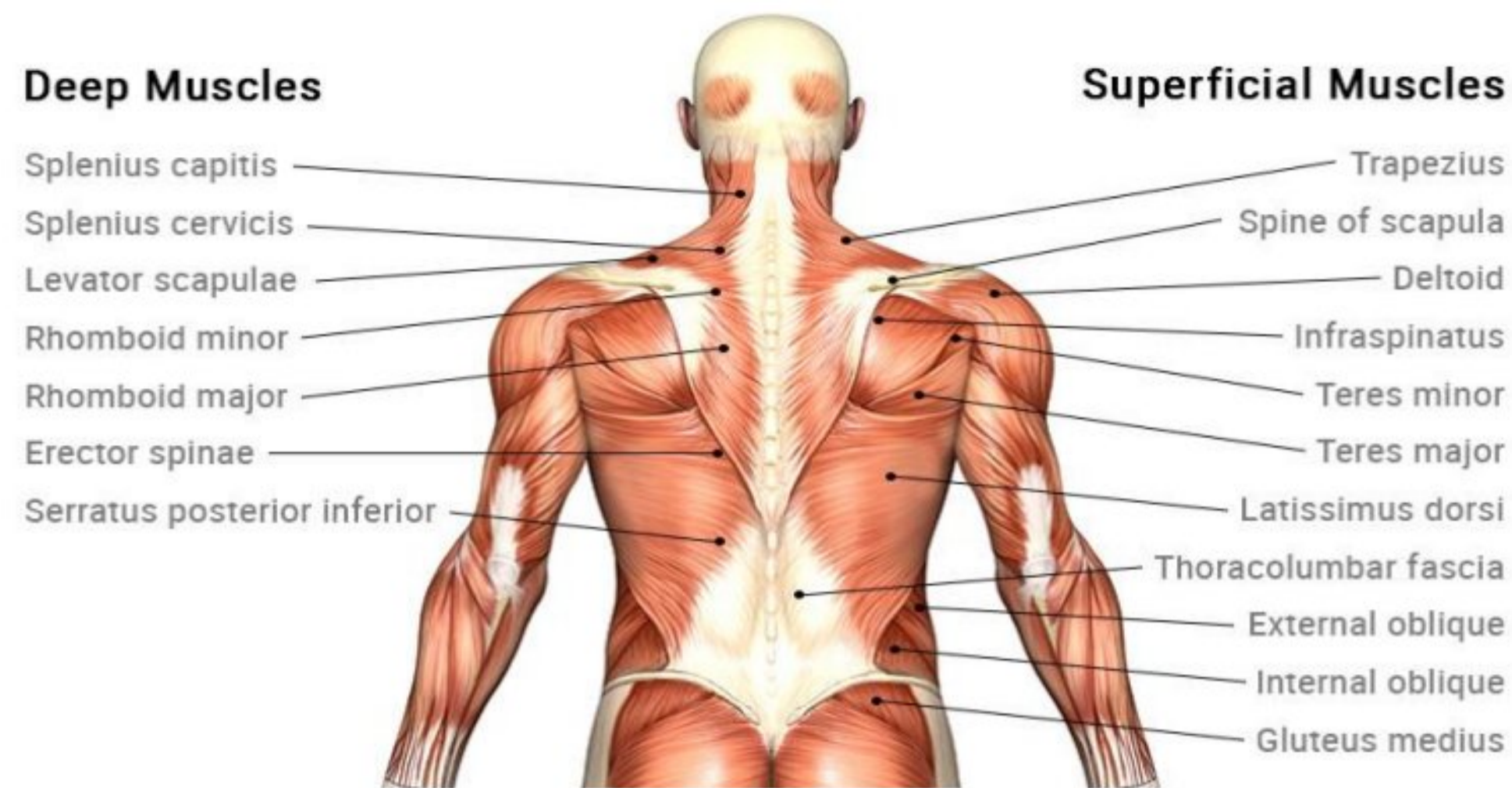


Figure 12: Deep&Sperficial Back Muscles
Source: (Guide, n.d.)

- Generally, the treatment begins with massage therapy for patients with high-level pain; second, therapeutic exercise is applied. However, a short massage could be done for them after therapeutic exercise to relieve muscle tension and increase endorphin, dopamine, and serotonin hormones.
- For those who have moderate level pain as a warm-up, they should do (1) fitness bicycle indoors, (2) treadmill, (3) walking, and (4) running with moderate intensity. After the warm-up, the subjects continued with therapeutic exercise, and at the end, they got a therapeutic massage.
- All the subjects have homework to continue to do the physical activity to allow fast recovery. They have been taught how to make breve or short massage therapy themselves.
- Patients have three times per week for treatment, but after treatment, the patients have homework. Some can go swimming as a supplementary treatment because swimming significantly impacts relieving musculoskeletal disorders.

1. Final Product

After all corrections and improvements from experts, the final product can be presented as the following in table 15, and 16 below.

**Table 17: Manipulation and Volume of Back Musculoskeletal injuries Massage Therapy:
10 minutes, 3times/Week during 5Weeks**

Manipulation	Volume and Massage Therapy Manipulation			
	Instructions	Volume	Intensity	Duration: 10minutes
Swedish Massage Effleurage Petrissage Friction	From ventral layer position: apply effleurage from neck muscles to lower members' muscles	10-15 floating (1 set)	Low-moderate	2min
	Apply petrissage on the whole hips, scapula muscle, and neck muscles	20-25 floating (1 set)	Low-moderate	1 min
	Apply friction to the specific muscle pain or injury	20-25 strokes (1 set)	Moderate	1min
Tapotement: cupping	Cupping technique to overall blood flow, promote cell repair and create new blood vessels in the tissue	20-40 strokes (1 set)	Moderate	20 secs
Hacking	Hacking to stimulate nerves and blood flow	20-40 strokes (1 set)	High	20 secs
Beating	Apply beating on adipose muscles like the gluteus, and latissimus dorsi, trapezius, deltoid to destroy myogenesis	20-40 strokes (1 set)	High	20 secs
Deep Tissue Petrissage Friction	Apply petrissage and friction deeply again to care out myoglobin muscle.	10-20 strokes (1 set) 10-20 strokes (1 set)	High High	1 min 1min
Soft Tissue Release Petrissage Friction Massage Effleurage	Apply petrissage and friction with soft tissue release to stimulate large nervous, increase endorphin, and ROM of hips and shoulder joints	20-30 strokes (1 set) 20-30 strokes (1 set)	Moderate Moderate	1min 1min

Vibration	Apply effleurage and Vibration to remove the waste product, increase healing, and recover	20-30 strokes (1 set) 20-30 strokes (1 set)	Moderate Moderate	1min
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a. Procedure of the Therapeutic Massage Program

The practice of massage requires careful attention, and takes systematic steps. The practitioner or masseur should consider the steps below.

1. Preparation Before Massage

The therapeutic massage, of course need preparations so that the massage process runs smoothly and the patient feels satisfied with the results from the massage. Some requirements are requested.

2. Massage Room

The massage room is a place for masseurs to carry out massage manipulation activities. The massage room should ideally be spacious, comfortable and kept clean with good air circulation.

3. Massage Bed

Basically, the selection of massage beds is adjusted to the needs and comfort for the patient and does not hinder when the masseur will manipulate massage to the patient. Some complementary tools are highly recommended to facilitate the massage manipulation process such as a bolster, oil massage, sheets, Bolsters can be used as a fulcrum when performing massage manipulations.

4. Dosage and Frequency of Massage

The dose for massage varies greatly depending on the needs and conditions of the patient. They are some things very important in massage which need to pay attention for certain body parts masseur and masseuse. They have to control their

hands, the ideal palm for massage is muscular, soft textured, with a palm size large enough to provide a comfortable and warm touch. The fingers' tabs have to be carried.

5. Body Hygiene and Health

Working as a masseur is a profession that requires considerable physical strength, techniques, tactics. Because a lot of muscle performance is needed with the help of body weight. Therefore, a masseur is often required to always be in shape so that the massage results are satisfactory.

6. Clothes for Massage Practice

In general, there is no provision for masseur clothing. Although there is no provision for hygiene factors, practicality and beauty need to be considered. Because massage is a profession in the health sector, masseurs should also use clothes that are commonly used by health workers.

7. The Position of Patient and Masseur

Patients can be massaged in a prone sleeping position, supine or in a half-sleeping and half-sitting position. Masseur positioned himself in such a position that he could easily reach the patient's body in a comfortable manner. The masseur can be positioned on the right, left and above the patient's head. Determining the position of this masseur depends on which area you want to massage or what manipulation will be used. It is important to remember that the masseur's motion must be undisturbed. Can freely move from left to right and so on.

8. Massage Movement Direction

Therapeutic massage used the heart as the center, because the heart is the center of blood circulation. The goal is to accelerate the flow of lymph fluid and venous blood. The venous blood contain a lot of combustion residues, meaning that it must push the blood in the direction of the blood flow in the veins. All veins lead to the heart, where for the veins at the bottom of the heart assisted by valves (valvula) which will prevent blood from falling back down.

9. Straight Line Direction

This direction is often used when performing the Effleurage massage technique

10. Pressure in Massage

In general, the initial manipulation is usually done with light pressure to detect any abnormalities and pain in the patient. Variations of various kinds of manipulation can be possible according to the needs and conditions of the patient and the masseur who performs it. Manipulation pressure can be explained as follows:

Table 18: Massage Pressure

Massage Pressue	Instructions
Smooth Pressure	Used to palpate and detect possible abnormalities under the skin tissue in the form of lumps or clots and to diagnose disease in patients.
Light pressure	Used to initiate the massage action by performing repeated manipulations. The longer the pressure manipulation is increased to further stimulate the tissue being massaged.

Medium Pressure	Used to better reach the muscle under the skin, so that the muscles react to the manipulation performed.
Strong Pressure	Used for patients whose skin is thick or covered with fat, so to reach the muscles under the skin tissue requires great strength.
Very Strong Pressure	Used in certain cases, other than for patients with thick skin, usually for muscle injuries that are located under deep skin tissue.

11. Rhythm and Intensity

The rhythm is given depending on the type of technique used, for example Effleurage is carried out slowl, moderate to high, and Tappotement is given quickly. The rhythm of massage is determined by what effect it wants to achieve, such as for relaxation it must be slow and rhythmic, while for fast and hard stimulation, it still adjusts to the patient's condition. For the stroke, the first movement is slower than the return movement, so the rhythm is regular.

b. Effleurage

Effleurage is a massage technique in the form of gentle strokes or melt starting from using the fingertips and continued with the palms of the hands. All movements must be in the direction of the veins/towards the heart. There are many ways to do this technique this is because it is tailored to the needs. Like the Effleurage technique on the back is different from the hand and also not all types of euffleurage can be used for all body parts.The following effleurage technique has a relaxing effect, decreasing inflammation, reduce muscle tension, increase blood flood, and has benefits for cleaning dirt. Here below are for kinds of Effleurage

that can be applied on the back muscle, namely: (1)use all fingers, and palms of the right and left hand first, (2)use of the proximal end of the palm of the right and left hand. (3)use of posterior end of the metacarpals, (4)use of the digital end of the second phalanges and the back part of the third phalanges of each hand. All the manipulation can be seen on the figure 13



Figure 13: Combined technique of all fingers, and palms of the right and left hand

The use of all fingers, and palms of the right and left hand first, allows the masseur to relieve pain, to increase blood circulation, to cast out inflammatory muscle, to increase well being. The use of all fingers allows the masseur to exert deep pressure which help to relieve the large and deep muscles. When the two techniques are combined, they can fasterly improve the physical health of human.

Using the back of the finger, and Using two palms

The use of a back of the finger is very good technique to insist on the muscular structure finally to relieve the muscle. The masseur must take care not to burn the joints of the fingers.

This technique is very effective for relieving sciatic nerves, hip pain, pelvic muscle pain. The second technique makes it possible to take the entire stakeholder, it allows a complete simulation of the muscle and the improvement of blood circulation. This technique allows the masseur quickly get rid of muscle pain.

c. Petrissage

Petrissage massage procedure is applied by using the pressure on the body's part. Performing this technique the masseur should be done comfortably and rhythmically so that the patient feels relaxed. For the patient, the part of the patient who wants to be given Petrissage manipulation must relax, not tense the skin surface, accelerate the circulation of blood and lymph fluid, facilitate the supply of nutrients in the muscles as it can be seen on the figure 5. There are many types of petrissage, here below the researcher showed the most strokes usually used in treating back musculo-skeletal disorders. There four types given below with each explanations.

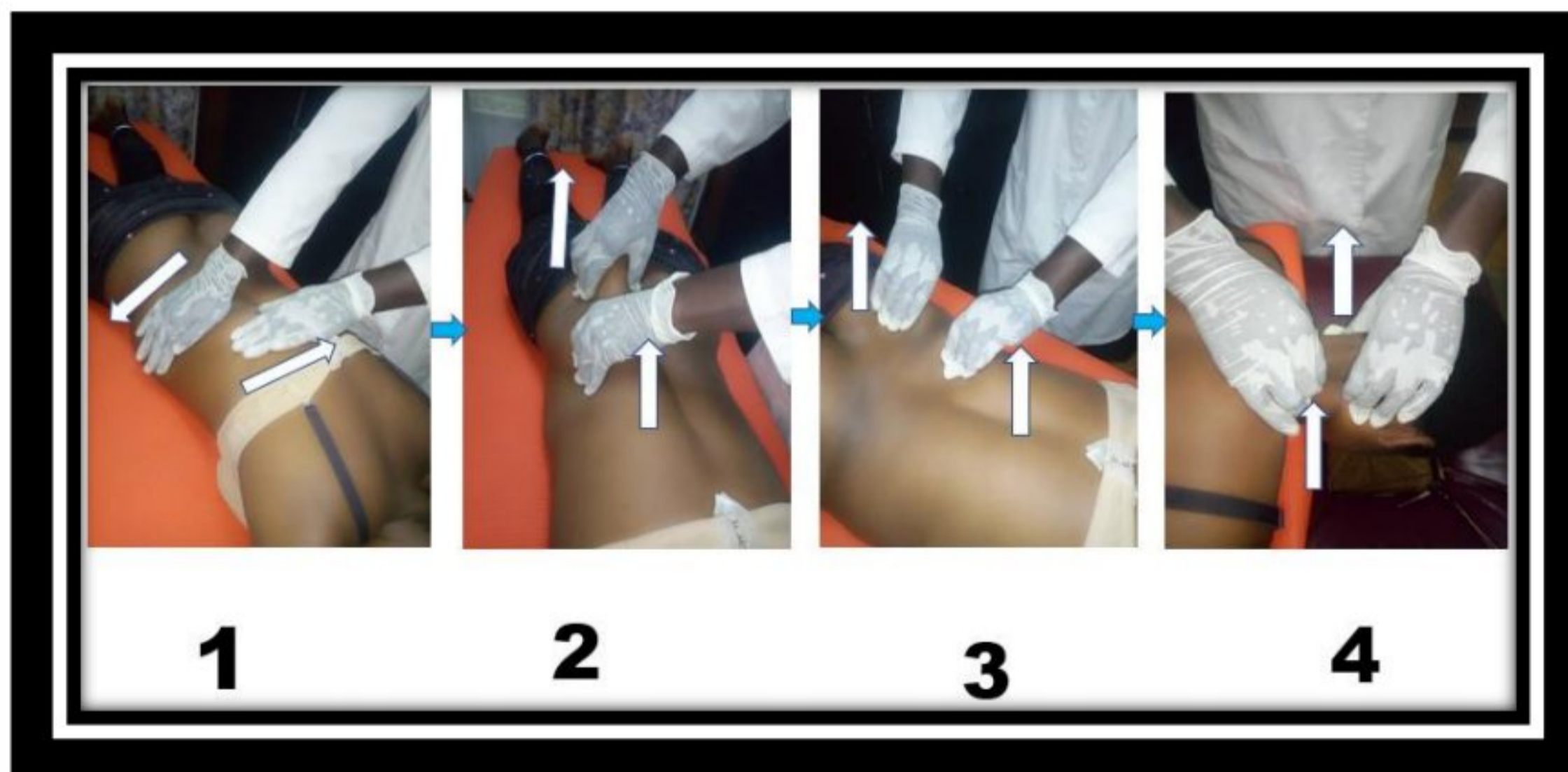


Figure 14: Petrissage with Two Hands, Two Hands Alternately Squeeze

The figure 14 showed that Petrissage can also be done in various ways according to the needs of which part will be manipulated. Can use both hands simultaneously, can alternate palms. Hand and thumb or with the fingers according to the muscles of the body being

massaged. The purpose of this manipulation is to rest muscles, reduce muscle tension, soften muscle contractions, maximize body metabolism and eliminate fatigue. Two hands simultaneously make a squeezing motion up and down on all surfaces, starting from the low back to the neck (image 1,2,3,and 4). Relax the muscles. Drain toxins and waste. Stimulate venous and lymphatic circulation. Stretch the deep tissues.

d. Friction

This technique aims to break down the accumulated remnants of burning calories in the muscles. Such as stiffness or clots that occur in connective tissue. Friction is useful for normalizing blood circulation, raising body temperature, accelerating lymph circulation, resting tired muscles after competing, accelerating the supply of nutrients to body tissues. The manipulation technique can be seen on figure 15 below.



Figure 15: Friction

The figure 15 showed the way friction is applied, with four fingers except the thumb, the thumb fingers are applied from the low back to the distal extremity of cervical vertebral. The base of the three middle fingers are performed on the side of the cervical vertebral column, palms for all parts of the back.

e. Shaking

The purpose of Shaking is to restore muscle tension, speed up the transport of nerve information to body tissues, relax muscles, prevent muscle spasms caused by the buildup of lactic acid which has the effect of reducing joint space. Accelerate the supply of nutrients needed in body parts.

f. Tappotement

Tappotement is a massage manipulation by hitting the massaged area in a rhythmic and controlled manner. Tappotement can be done with the hands clenched into fists, with the palms of the hands or with both palms together and then on the side of the little finger as a point that is applied to the patient. This controlled stroke provides stimulation to the body's tissues, and causes various reactions depending on the speed, strength and timing of the stroke. Blows that are done quickly and for a long time will cause a harder stimulus. The purpose of Tappotement is to improve blood circulation, increase muscle tone, accelerate the supply of nutrients to tissues, and accelerate metabolism. The later manipulation can be seen on the figure 16 below.

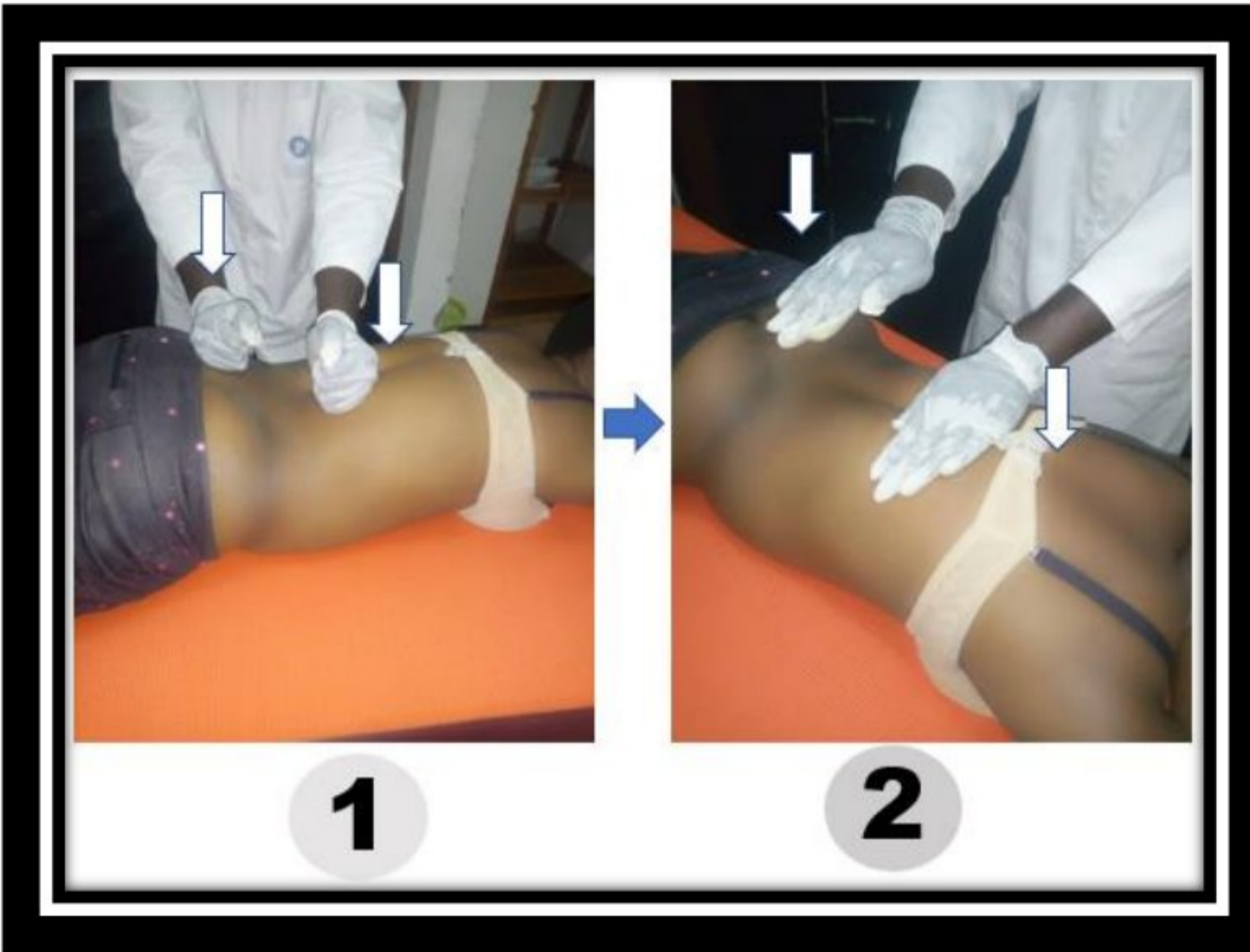


Figure 16: Tappotment

The figure 16 showed the way tapotement is applied. There are many way to do it either with hitting, cuping, and cutting. The pressure used depending on the massaged aera, but also on the muscles types.

g. Vibration

This movement is intended to stimulate the vegetative nerves in the internal and external organs, to influence these tools. In the technical implementation of this manipulation, it varies according to the place of the area being massaged. The purpose of providing this vibration manipulation is to relax muscles, increase the flexibility of tissues, soothe nervous tension in the area being massaged.

Table 19: Program for relieving back musculoskeletal injuries and Increasing Strength, Flexibility, and Function skills 20-35 minutes X 3 t X 5 W

Hips, Spine, and Scapula Therapeutic Exercise, And Rehabilitation Program				
Principes	Type of Exercise / Component	Instructions	Volume, intensity, frequency, duration, set, rest	The benefits
Readiness Principle Individual Principles Adaptation Principles Overload Principle Progressive (Enhancement) Principle Principle of Specification Principle of Variation The principle of heating Principles of Long Term Training The Reversibility Principle The Principle of Over-moderation (Moderate) Systematic Principles	Stretching Exercises			
	1. Knee lift 2. Hip and low back stretch 3. Double hips rotation 4. Hips swinging	Apply exercise number [1-4] in a laying position. Do it yourself or with a partner. Apply it on each side or each member concerned.	Moderate intensity 5 repetition/exercise/Size 2 Sets Duration : (5 min) Resting: 10 secs	Stretching of low back muscles Improving Hips Joint Stretching of all back muscles (neck, shoulder, low back) Stretching of the spine (C1-C7; T1-T12; L1-L5)
	First Set Back Strengthen Exercise Muscles			
	5. Squeeze 6. Sit Up 7. Hamstring stretch 8. Bridging 9. Leg Press 10. Side leg raises 11..Prone straight leg raise	In laying position, apply exercises nr, 5,6,7, and 8. Do each exercise for 10 secs/size. From exercises nr 9 and 10, use side and ventral positions and do them for 10 seconds each.	Moderate-High Intensity Ten repetitions 2sets Resting 15 secs /set Duration: 5 min	Strengthen of hip muscles Strengthen of Dorsi muscle Strengthen of upper scapula muscle
	Second Set Back Strengthen Exercise Muscles			

	12.Sphinx pose	ventral layer, bust rises up, arms extended in push-up position (11)	Moderate-High Intensity 3 repetitions for (11) duration: 30 secs	Relieve of LBP Strengthen of shoulder and arm muscles
	13.Cobra pose& Payer pose	pay position, thigh buttock angle closure, flat back, arms extended forward, full back extension forward (12)	3 repetition for (12) Duration: 30 secs 2x20-25 repetition for 2 Sets (13).	Decompression of LBP Strengthen of all back muscle, hip, and arm muscle
	14.Cat cow	Cut cow, hollow back, then rounding the back upwards, the body must be relaxed (13)	Duration: 1 minute 2sets 3 repetitions with holding each repetition 10 secs per size (14)	Neck, shoulder, all back muscles, and Spine
	15.Quadruped arm&leg raise	quadruped arms, full leg extension at hip height, opposite arm extended forward, hold and alternate position, flat back (14)	Duration: 1 minute	
	16.Quadruped Reach	quadruped reach, take off with one arm and touch as far as possible through the opposite arm, straighten the bust upwards and the outstretched arm upwards (15)	10-15 repetitions per size for (15), 2 sets. Resting: 15 secs after set 2sets Duration: 2 minutes Duration of second set: 10 min	

The researcher combined the two programs: combine massage and physiotherapeutic exercise to evaluate the level of pain, strength, and range of motion (ROM). The researcher showed the physiotherapeutic exercise image in Figures 14 and 15 below.



Figure 17: Back musculoskeletal injuries therapeutic exercise image



Figure 18: Second Set Back Strengthen Exercise Muscles Image

2. Effectiveness of Product Model

The effectiveness result of the product developed has been presented in the table 20 as the following

Table 20: Spine Musculo-Skeletal Level Pain, Sit Up, Leg Press, and Subjects Characteristics

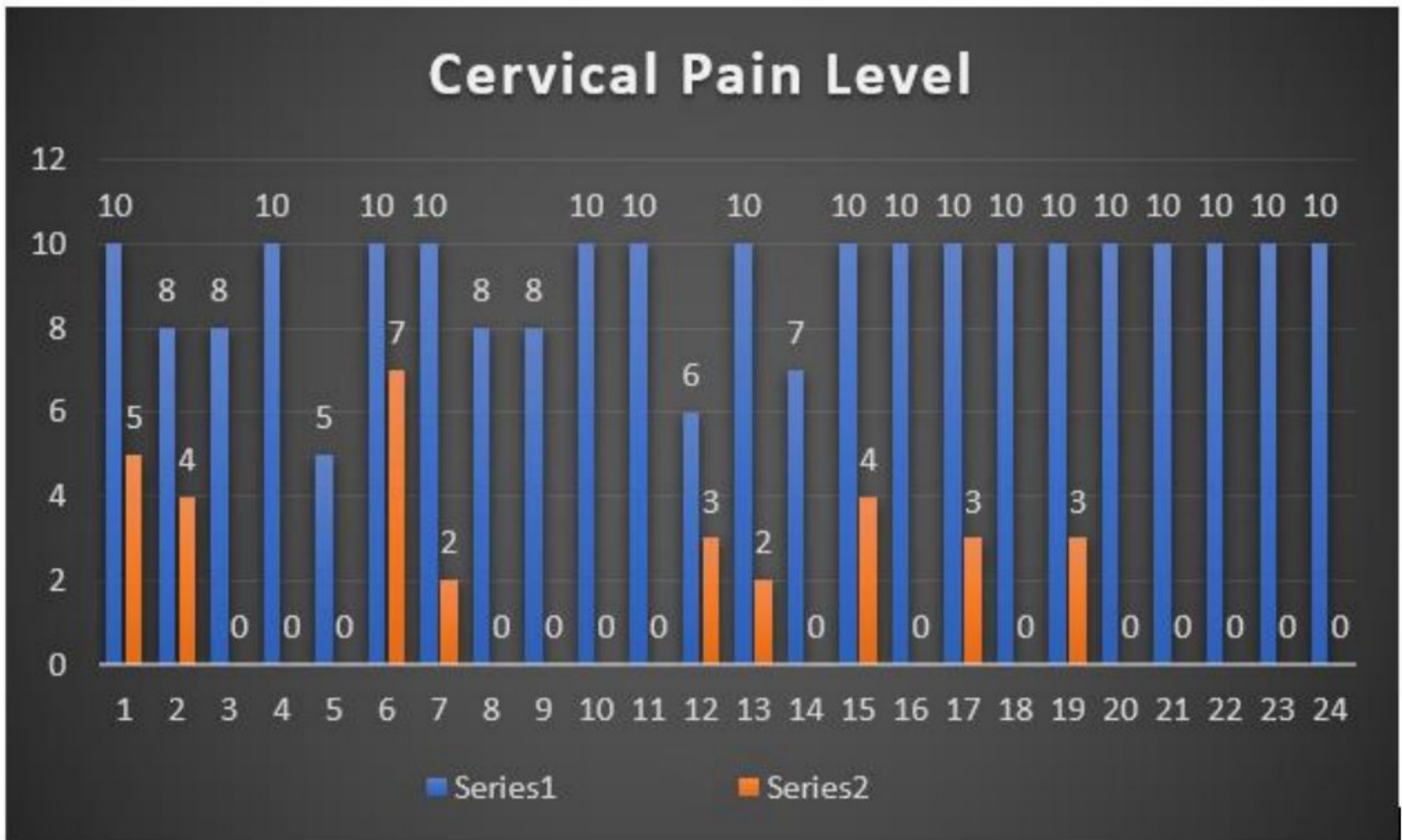
Subjects			Cervical Pain Level		Thoracic Pain Level		Low Back Pain Level		Sit Up		Leg Press		Subjects Characteristics			
Nr	Gender	Age	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Weight	Hight	BIM	Causes
1	F	54	10	5	10	4	10	0	35	42	33	58	75	165.5	27,38	-Work place -Sports inactivity -Overweight
2	M	62	8	4	9	4	9	6	18	28	38	50	75	173	25,05	- Overweight/obesity -Sports inactivity -workplace
3	F	28	8	0	9	0	10	0	23	25	33	58	55	155	22,89	-Nervous sciatic -Obesity -Sports inactivity
4	F	32	10	0	8	0	10	0	3	10	50	66	55	156.5	22,45	-Morbid obesity -Sports inactivity -Sciatic nervous
5	M	49	5	0	5	0	10	2	13	33	3	43	69	197	17,77	-Overweight -Sciatic nervous -Sports inactivity -Workplace
6	F	62	10	7	6	3	10	3	30	44	23	34	90	163	33,87	-Stroke -Social Stress/cesarean
7	F	34	10	2	10	3	10	5	15	25	23	65	78	159.4	30,69	-Repetitive bladder surgery -Oldest -work place

8.	F	53	8	0	8	3	10	0	10	35	21	51	87	175	28,40	-Road accident
9	M	62	8	0	8	0	9	0	0	25	22	40	69	170	23,87	-Workplace -Sports inactivity
10	F	40	10	0	10	0	10	0	0	19	44	65	76	160	29,68	-Obesity -Sciatic nervous -Sports inactivity -Workplace
11	F	51	10	0	10	01	10	0	0	27	28	41	92	173	30,73	-Obesity -Sciatic nervous - Coccyx arthritis -Sports inactivity -Workplace
12	F	46	6	3	8	3	8	0	21	43	43	52	86	168	30,47	-Obesity -Sciatic nervous -Lumbar disease -Sports inactivity -Workplace
13	F	33	10	2	8	1	10	7	44	52	64	67	65	161.5	25,39	-Sciatic nervous -Lumbar disease -Coccyx arthritis -Sports inactivity -Workplace
14	F	49	7	0	7	0	8	0	30	40	44	62	81	154	34,15	-Obesity -Sciatic nervous -Lumbar disease -Sports inactivity -Workplace
15	F	47	10	4	10	6	10	5	25	46	20	61	72	160	27,69	Overweight -Sciatic nervous -Sports inactivity -Workplace -Lumbar disease
16	M	40	10	0	10	0	10	0	0	13	0	57	70	170	24.22	-Stroke -Nutrition

17	F	47	10	3	10	4	10	4	21	41	24	52	84	178	26,51	-Sciatic nervous -Sports inactivity -Workplace -Lumbar disease
18	F	40	10	0	10	0	10	0	0	13	0	57	65	165	25,79	-Sciatic nervous -Sports inactivity -Workplace -Lumbar disease
19	F	51	10	3	10	3	10	0	50	58	29	45	75	160	29,68	Sciatic nervous -Workplace -Lumbar disease -Diabetes
20	F	53	10	0	10	0	10	2	0	10	36	64	76	154	32,04	Sciatic nervous -Workplace -Lumbar disease -Diabetes
21	F	51	10	0	10	2	10	4	35	40	55	62	75	160	29,68	Sciatic nervous -Workplace -Lumbar disease
22	M	49	10	0	10	0	10	0	0	30	0	40	45	146	21,11	
23	F	52	10	0	10	0	10	5	10	30	41	50	65	165	25,79	Sciatic nervous -Workplace -Lumbar disease
24	F	58	10	0	10	2	10	3	8	30	44	50	80	162	30,48	Sciatic nervous -Workplace -Lumbar disease

This table describes the patients' characteristics like gender, age, spine level injuries, ROM of hips, height, weight, body index mass, and the main causes of Musculoskeletal injuries. Most of the patients were women, and the subjects were aged between 28-62, the great number of the sample was an old category.

The scale numeric pain graduated from 0 up to 10 has been applied to assess the pain level. The graduation was like 0: no pain; 1-3: mild; 4-6: moderate to severe; 7-8: very severe; and 10: worst pain possible. Regarding the pre-test data, most of the subjects have very severe pain both of the cervical, thoracic, and low back. The main causes of the injuries were: (1) workplace, (2) sports inactivity, (3) oldest, (4) road accident, (5) bladder surgery, (6) obesity, (7) sciatic nervous, (8) stroke, (9) cesarean. Most subjects were female. From the same table, the post-test data predict that the treatment causes a significant decrease in pain because most of the sample was in the mild category after treatment of 3 times per week for five weeks. The patient has at the same time the therapeutic massage and therapeutic exercise. Before statistic analysis, it can be seen that the post-test data were strongly different from the pre-test that, the following different predict that there was positive influence from the product developed on relieve of spine Musculoskeletal injuries and increasing ROM of hips. The BIM of the subjects showed that a great number were in the obesity category, which can cause low back pain. People need to regularly exercise and take care between intake and output to balance nutrition and sports expenditure. However, the result from the effectiveness has been collected in the form of a table, as shown in Table 18 below.

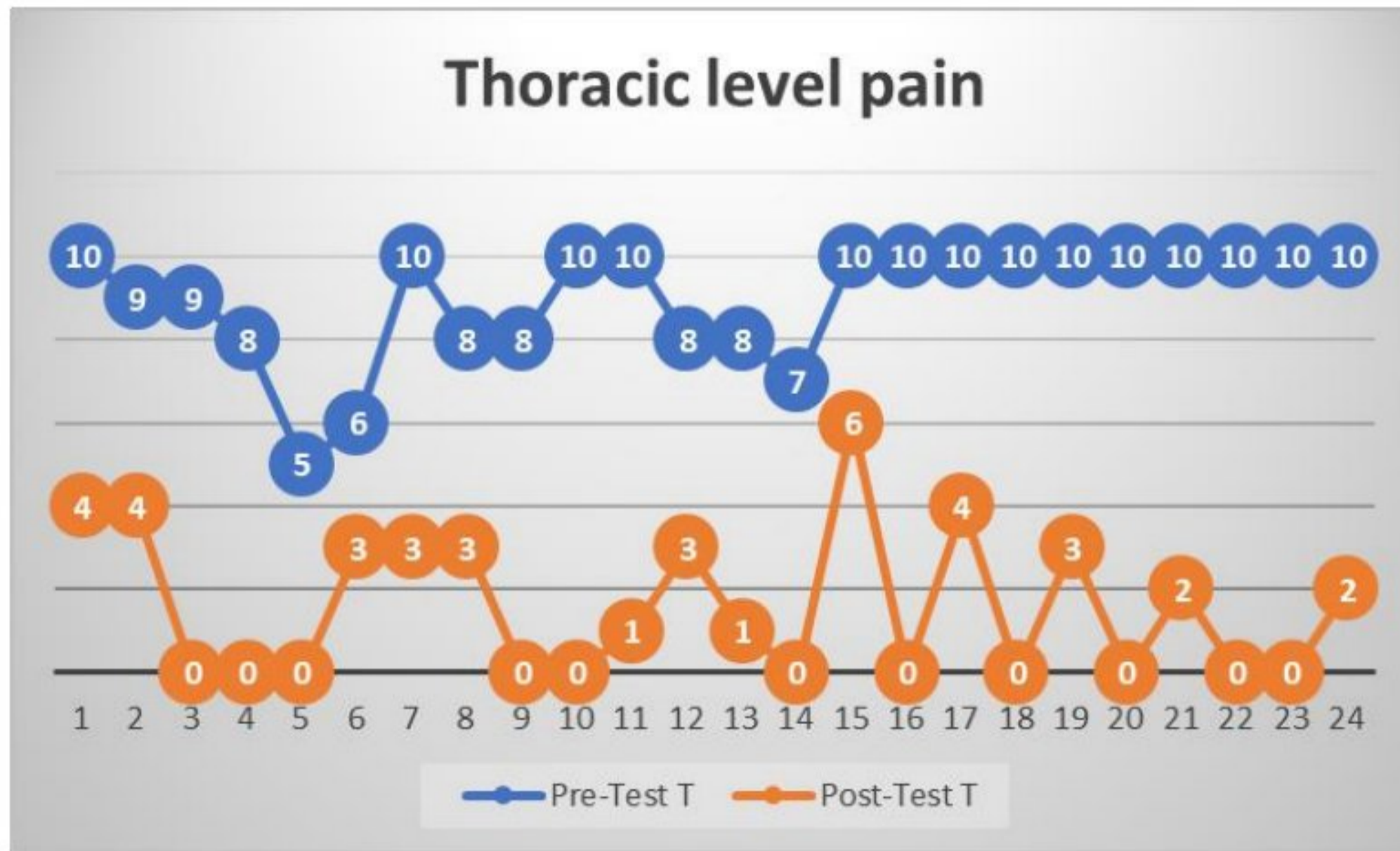


Graphic 1: Cervical Pain Level

Legende: the bleu color presented pre-test of the cervical pain

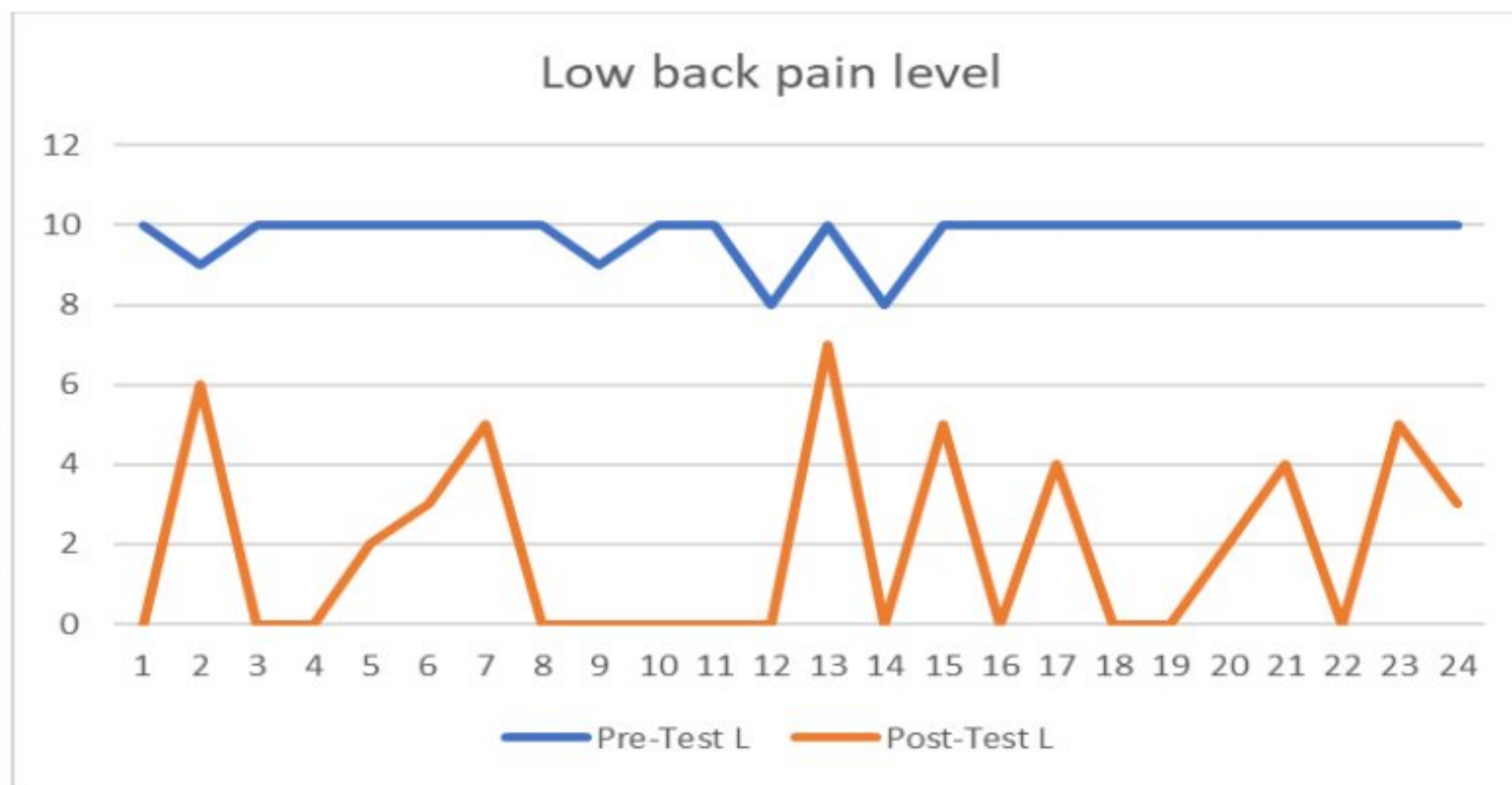
The yellow color presented the post-test of the level pain after treatment

This graphic showed that 22 or 91,66% from the subject surveyed were with chronic pain more that 7/10 degree of pain. After the treatment the result from the graphic tested that all the pain of the subject has a significant decreasing level.



Graphic 2: Thoracic Level Pain

The result from the pre-test showed that 22 were with severe level within pain level out of 7. Only 2 were in middle pain level. At the end of the treatment the result showed a strong significant decreasing of the thoracic pain among as 45,83% were totally without pain, and 54,17% were with minor pain. It can be concluded that the treatment was effective.

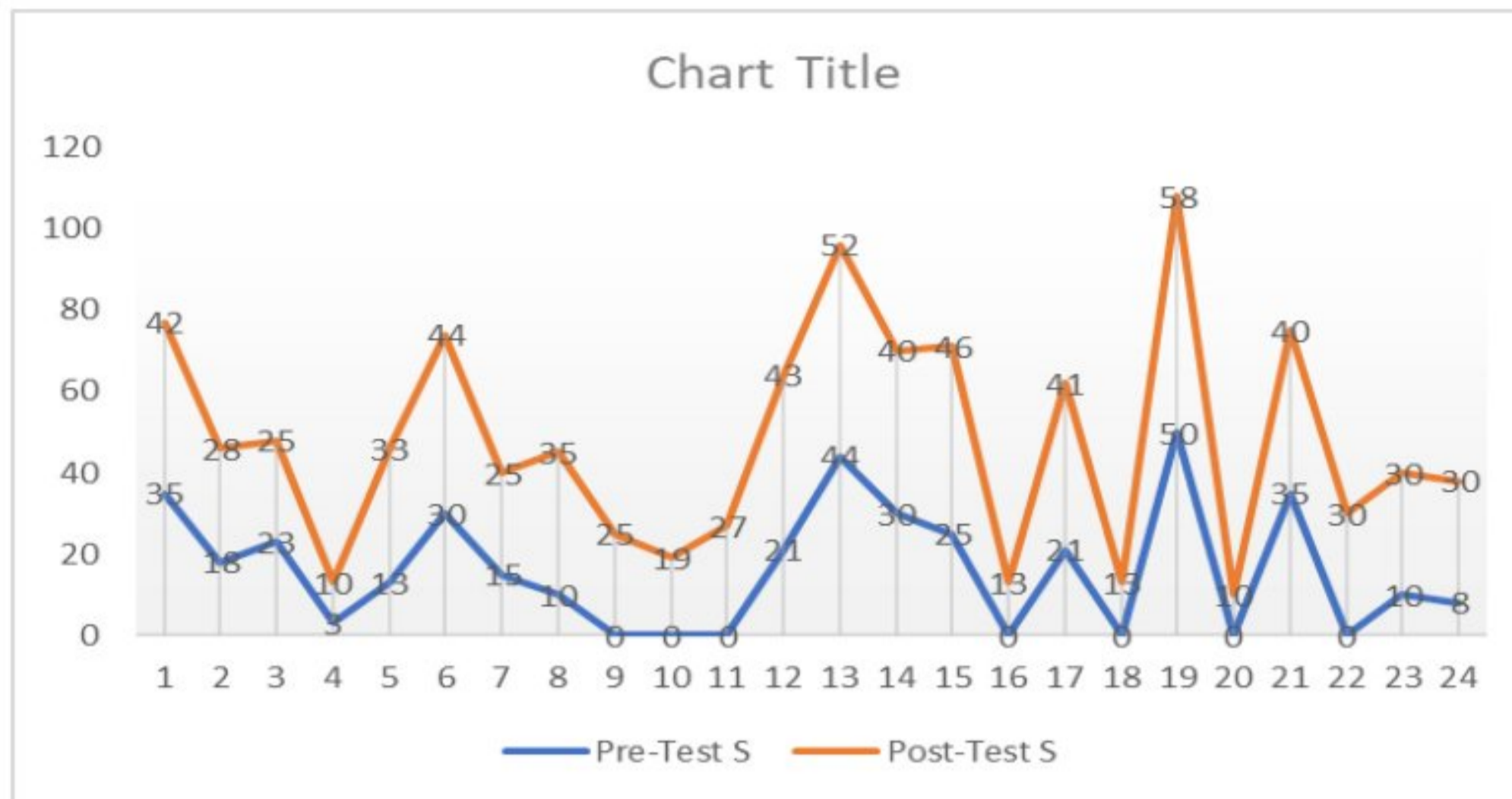


Graphic 3: Low Back Pain Level

The above graphic showed that 100% from the subjects surveyed have severe low bac pain.

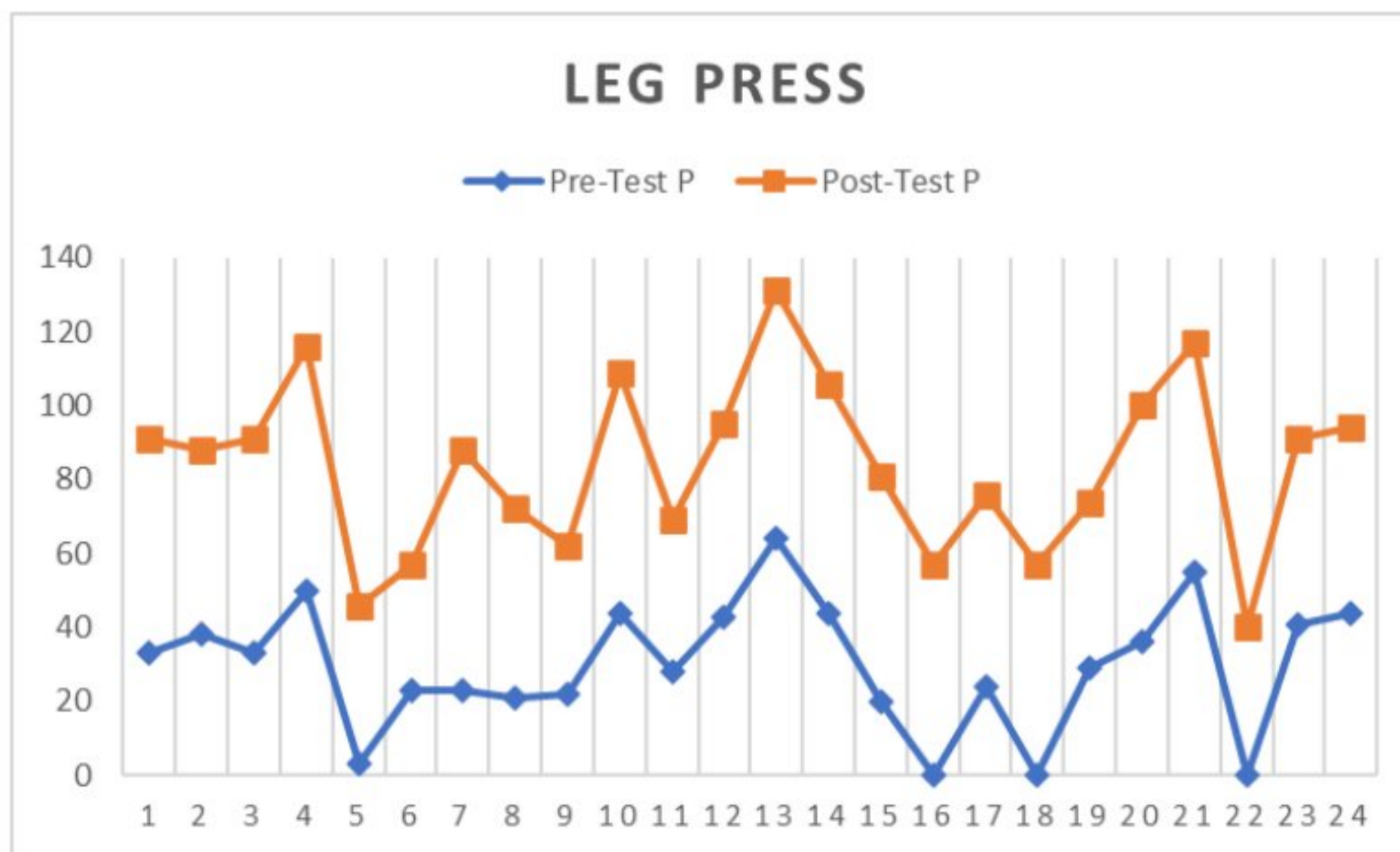
After the treatment 70, 83(17/24) were totally without any pain, 28, 17% were with minor pain.

The program used can be agreed as a good way to fix low back pain



Graphic 4: Sit Up Data

The result from this graphic above showed that there was different between pre-test data and post-test data. The summary from the above result was that the program used increased strengthen.



Graphic 5: Leg Press Data

The result from this graphic above showed that there was different between pre-test data and post-test data. The summary from the above result was that the program used increased strengthen.

Table 21: Pret-Test, and Posttest of Hips ROM for Large Trial Test

Subjects	HIPS ROM					
	Trunk Flexion		Right extension		Left extension	
	Pre-test	Posttest	Pre-test	Posttest	Pre-test	Posttest
1	81	112	23	46	30	40
2	20	38	20	38	20	36
3	60	111.5	7	23	11	36.5
4	0	85	11	22	9	20
5	28	90	29	39	25	39
6	40	90	12	24	18	23
7	50	114	18	39	25	33
8	12	99	15	35	23	40
9	62	79	12	26	14	26
10	102.5	119.5	23	39	14	35
11	0	50	0	24	12	27
12	107	110	30	37	22	36
13	103	106	34	36	32	37
14	93	100	25	40	35	45
15	44	47	10	32	10	32
16	0	52	0	20	0	20
17	98	118	38	42	39	40
18	0	47	0	20	0	20
19	100	107	26	40	31	42
20	90	100	5	10	0	15
21	106	120	30	40	26	40
22	0	90	0	50	0	30
23	88	120	30	30	32	40
24	114	116	29	42	35	50

Table 18 shows the ROM of the hips before and after treatment. The ROM of the hips has been assessed from (1) forward flexion, (2) right extension, and (3) left extension using a goniometer. Before the treatment, patients had limited flexibility because of great pain in doing the movement. However, muscle pressure is an as strong factor that limits the ROM. After the treatment, it has found out a high facility in motion, but not only that, but the ROM has better increased. Most patients cannot bend and take something from the bottom up because they feel uncomfortable with spine injuries; after treatment, they do it easy. Regarding the table data, it can be seen that the pre-test data of each variable were

pretty different from the post-test data. The result was high in the post-test data, which tasted an improvement in flexibility from the treatment applied. Before applying data analysis, the normality has been checked, as it is shown in table 1

Table 22: Test of Normality of Back Musculo-Skeletal Level Pain, Sit Up, and Leg Press by Shapiro-Wilk

	Shapiro-Wilk		
	Statistic	df	Sig.
Cervical Pre-Test	.635	24	.000
Cervical Post-Test	.422	24	.000
Thoracic Pre-Test	.731	24	.000
Thoracic Post-Test	.822	24	.001
Low Back Pre-Test	.466	24	.000
Low Back Post-Test	.780	24	.000
Sit Up Pre-Test	.904	24	.026
Sit Up Post-Test	.968	24	.626
Leg Press Pre-Test	.953	24	.312
Leg Press Post-Test	.943	24	.186

Shapiro-Wilk test was used to assess normality. The data found only in sit-up post-test, leg press pre-test, and post-test data were normally distributed consecutively within sig values: 0.626, 0.312, and 0.186; all the later data were superior to 0.05. The sig value of other data was inferior to 0.05, as shown in the table19 above. However, if the test results show that the data is normally distributed, a parametric statistical test is used using the paired sample t-test/a two-tailed test technique. Meanwhile, the test results above showed that the information is not normally distributed, then a nonparametric statistical test is used using the Wilcoxon signed ranks test. The analysis data has been done in table 20 below.

Table 23: Statistic Analyze with Shapiro-Wilk

	Shapiro-Wilk	
	Mean	St. Deviation
Cervical Pre-Test	9.17	1.465
Cervical Post-Test	2.79	6.947
Thoracic Pre-Test	9.00	1.445
Thoracic Post-Test	1.63	1.813
Low Back Pre-Test	9.75	0.608
Low Back Post-Test	1.92	2.376
Sit Up Pre-Test	16.29	15.241
Sit Up Post-Test	31.63	13.041
Leg Press Pre-Test	29.92	17.433
Leg Press Post-Test	53.75	9.575

Analyzing with Shapiro Wilk only helped compare the mean of each variable tested. The above result showed that the post-test mean of pain level was small compared to the pre-test mean of the regional level. The small mean tasted that the level of pain has significantly decreased. In other words, the decreasing of the level mean meant that the program applied had a great impact on helping back musculoskeletal disorders. The post-test mean was high for sit-up and leg press, which means that the patients increased strength and range of motion.

The difference in SD between the pre-test and post-test of each variable showed a great significant improvement in pain reduction and improved ROM and strength.

Table 24: Analysis of Pre-test, and Post-test of Cervical, Thoracic, and Low back Pain Level, Sit up, and Leg Press of Large Trial by Wilcoxon Test

	Cervical Pain	Thoracic Pain	Hips Pain	Sit Up - Sit Up	Leg Press
	Pre-&Post-test	Pre-&Post-test	Pre-&Post-test	Pre-&Post-test	Pre-&Post-test
Z	-3.627 ^b	-4.300 ^b	-4.326 ^b	-4.200 ^c	-4.287 ^c
Asymp. Sig. (2-tailed)	.000	.000	.000	.000	.000

Table 20 above showed that from the pre-test of each variable, the P-value was small than 0.05, which indicated a positive impact of the product developed to the spine Musculoskeletal injuries. The hypotheses were that:

H0: There is a significant difference between the pre-test and post-test of the variables tasted.

HA: There is no significant difference between pre-test and post-test of the variables tasted

Data were analyzed using paired sample -Test to assess if there is any difference between pre-test and post-test. The result found showed that pre-test and post-test of cervical pain were with P-value of $0.000 < 0.05$; pre-test and post-test of thoracic level pain was within P-value of $0.000 < 0.05$; pre-test and post-test of low back pain level has a P value of $0.000 < 0.05$; the variable of sit up, and leg press have a P value of $0.000 < 0.05$. However, all the P values were inferior to 0.05, which tasted that H0 was accepted and HA rejected. So, there is a significant solid difference between pre-test and post-test data. In other words, the developed therapeutic massage and exercise models have a great positive impact on relieving Musculoskeletal spine injuries.

The sit-up exercise has been used to evaluate before and after the treatment the capacity of spine muscle and spine level pain. The sit-up was applied for one minute to assess the strength. Many sit-ups the patient should do before and after treatment. Nevertheless, leg press exercise has been used to evaluate hips muscles strength because most subjects have the worst extreme pain. The same activity was applied for one minute to know how many the patient could push with his legs. The result of the treatment is presented in table 21 below.

Table 25: Normality of Variances test of Pre-Test and Posttest Hips ROM by Shapiro-Wilk

Tests of Normality			
	Shapiro-Wilk		
	Statistic	df	Sig.
Forward Flexion Pre-test	.875	24	.006
Forward Flexion Post-test	.848	24	.002
Right extension Pre-test	.933	24	.115
Right extension Post-test	.941	24	.170
Left extension Pre-test	.939	24	.152
Left extension Post test	.944	24	.204

The result from table 21 showed that the data of some items were not normally distributed. The sig value of forwarding flexion for the pre-test and post-test was inferior to 0.05, as seen in the table above. The data were normally distributed for other items because the sig value was superior to 0.05. Because of the inconvenience of normality, the data were analyzed with Paired-T-Test by Wilcoxon.

Table 26: Statistic Analyze with Shapiro-Wilk

	Shapiro-Wilk	
	Mean	St. Deviation
Forward Flexion Pre-test	58.27	42.103
Forward Flexion Post-test	92.54	26.634
Right extension Pre-test	17.79	11.935
Right extension Post-test	33.08	9.864
Left extension Pre-test	19.29	12.246
Left extension Post-test	33.44	9.009

The Shapiro Wilk showed a high mean in posttest in each variable. The great mean confirmed a significant improvement in the hand ROM.

Table 27: Analysis of Pre-test and Post-test of ROM by Paired Samples Test of Large trial Out

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Forward Flexion – Forward Flexion	-37.083	27.531	6.489	-50.774	-23.393	-5.715	17	.000
Pair 2	Right Extension - Right Extension	-15.278	6.506	1.534	-18.513	-12.042	-9.963	17	.000
Pair 3	Left Extension – Left Extension	-13.694	6.605	1.557	-16.979	-10.410	-8.797	17	.000

The table over appeared that from the pre-test and post-test of each variable, the P esteem was little than 0.05, demonstrating a positive effect from the item created on the spine Musculoskeletal injuries. The hypothesis was that:

1. **H0: There's a critical difference between pre, and post-test ROM data**
2. **HA: There's no noteworthy distinctive between pre, and post-test ROM data.**

Information was analyzed utilizing matched test -Tests to survey on the off chance of any diversity between pre-test and post-test. After applying the paired sample T-Test between pre-test and post-test, the results found were consecutive: forward flexion P-value 0.00; right extension P-value 0.00, and left extension P-value 0.00. The results above tasted that H0 was accepted, and HA was rejected. In other words, the result found in sig (2 tailed) confirmed a strong significant effect from the therapeutic massage and exercise in restoring the range of motion. After treatment, people can work easily without any barriers.

D. Review and Discussion of the Final Product

The final developed product in this research has received an assessment from several experts who have carried out small and large scale trials and revisions, input from experts, and subjects tests. So, that researcher can make a final product **therapeutic massage and exercises models for back musculoskeletal disorders rehabilitation.** The model was compiled in the form of therapeutic massage, exercise models guide book, and implementation videos in Compact Disk (CD), which will also be published on social media. The scientific article from this research will also be published in the international journal Scopus indexed.

After applying for the developed program on patients with different back musculoskeletal injuries, the result showed that they could return well quickly. The same effect has been funded in the research done by Laura Allen in 2016, which attested

that therapeutic massage has great importance in healing common back injuries like pain, nervous sciatic, and scoliosis (Allen, 2016). In the research done by Joseph in 2018, the use of Massage combined with Therapy Lumbopelvic Stability Exercises as Compared to Standard Massage Therapy in Low Back Pain has been found as well (Joseph et al., 2018). Nevertheless, if one program is used alone, many types of research showed that the recovery is not the reason because the combined therapeutic massage with exercise is more excellent in healing chronic back musculoskeletal injuries. The same program has increased strength, improved function motoric, decreased stress and increased well-being.

A Systematic Review and Meta-Analysis have done by Moreira et al.; in 2016, few studies of low back injuries and the musculoskeletal related to the arm, elbow, wrist, hand, and finger were not statistically significantly assessed. Physical activities are vital for restoring musculoskeletal pain and neck and shoulder pain (Moreira-Silva et al., 2016, Govaerts et al., 2021). The therapeutic massage and exercise effectiveness for back musculoskeletal injuries rehabilitation is more important in restoring low back pain, thoracic pain, cervical pain, shoulder pain, elbow pain, wrist, and finger pain. The proposed exercises in the developed program also significantly impact the strengthening of lower members. In addition, more therapeutic massage has been applied to the whole body. It has improved the entire body's specificity of that new therapeutic massage and exercise for musculoskeletal injuries rehabilitation. The developed program was elementary to be applied, accurate, and safe.

E. Limitations of the Research

The limitations of this research were as follows:

1. Lack of complete control of patients after treatment.
2. The lack of an electromyogram for analyzing nervous factors.
3. The lack of financial means to extend the research over a vast territory.
4. The lack of full demonstration of exogenous and endogenous factors could influence the treatment results; for example, besides the musculoskeletal injuries, the patients presented other pathologies or a history that could delay fast recovery. For instance, among the subjects, samples were suffering from (1) lumbar-arthrosis, (2) spine arthritis, (3) spondylosis, (4) osteoporosis, (5) sciatica nervous, (6) fracture bones, (7) discal hernia, (8) post-stroke, (9) stress.
5. The lack of spine monitoring radiology was an obstacle before and after treatment.
6. Research subjects could not be closely monitored when doing independent exercise at their respective homes.

CHAPTER V

CONCLUSIONS AND SUGGESTIONS

A. Conclusions of the Products

Conclusions about the developed product of therapeutic massage and exercises model for back musculoskeletal disorders rehabilitation were found as:

A design or mixed model of therapeutic massage and exercises for back musculoskeletal disorder rehabilitation has been applied based on three types of massages Swedish massage, Deep Tissue Massage, and Soft Tissue Release. The model was constituted by stretching exercises and strengthening exercises in therapeutic exercises. The therapeutic massage was constituted by five stroke: (1) eflourage, (2) petrissage, (3) tapotment, (4) vibration, et (5) shaking. The time allowed on therapeutic massage was ten minutes(10 min). The intensity was applied from low to high. The therapeutic exercise was constituted by three type of exercise: (1) thirst set of stretching exercise, (2) et second set of strengthen exercise, the time allowed to this late was between 20-35 minutes. The whole program have to be applied 3 times per week, but the patient should do more than 3 times without the Therapist because the program was esey to be applied even though you are alone. Experts in sports therapy and massage have validated the therapeutic massage and exercise model. The results showed that the developed program had been validated with an Aiken score of more than 0.82, strong validation, and an intra-reliability of 0.84 with Cronbach's Alpha. Small and large trials showed a strong mean of 95% in terms of accuracy, safety, and feasibility of the developed program. The effectiveness test showed an enormously significant difference between the pre-test

and post-test of the tested variables with a P Value<0.05. The product developed was very feasible to be applied by masseurs. It has been tested for its accuracy and safety and was found very comfortable. This model was very easy and didn't imply more equipment.

The developed product has been applied and strongly impacts healing or restoring back musculoskeletal disorders, increasing flexibility, and strengthening muscles. This model involved the whole body instead of other therapeutic programs that took a party of the body. The later model didn't demand complex tools, only small tapis, stretching, and strengthening ropes. You need to use expensive tools and complicated manipulations for the previous therapeutic program applied.

B. Suggestions for the Product Utilization

The developed product model can be used for recovery from back musculoskeletal injuries. The degree of functional disability must be considered, which can be assessed by scale numeric pain and goniometer for a range of motion. Besides that, the use of the developed product must be started with a full body massage, preceded by therapeutic exercise regarding the patient's present condition. The intensity and complexity of the developed product will increase progress, in other words, from moderate to complex.

C. Dissemination and Further Product Development

1. Dissemination can be done through socialization in the community with musculoskeletal disorders. Hospitals, clinics, therapeutic centers, kinesitherapy, physiotherapy, and sports training centers.
2. The product can be developed further by incorporating musical elements in the exercise or combining it with swimming to allow fast recovery.

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APPENDIX

Table 24: Team Experts Validators

Nr	Expert Name	Specialization
1	Ilham S.Si; M.Or Lecture of Sports Science at State University of Padang PhD Student in Sports Therapy and Rehabilitation	S.Si; M.Or Sports Therapy and Rehabilitation
2	Firmansyah Putra, M.Pd Manual Therapeutic massage PhD Student in Sports Therapy and Rehabilitation	M.Pd Sports Therapy and Rehabilitation
3	Liza, S.Si, M.Pd State University Padang Lecture	S.Si, M.Pd
4	Harun Universty Lecture and Therapist	Therapist
5	IIT Selviani University Lecture of Padang	Physiotherapist
6	TOMMY FONDY, M.P.d Professional Masseur (Sport Teacher, Trainer Athletic, National Umpire, Sport Massage, Segment massage	M.P.d Sport Massage, Segment massage
7	Prof. Charles Gaturagi	Physiologist and University Lecture

EFFECTIVENESS OF THE DEVELOPED DISAIN

Questionnaire

By: Japhet Ndayisenga

IDANTITAS

Name		Gender	M / F
Age		Weight	kg
Work/ Professional		Height	cm
Address			

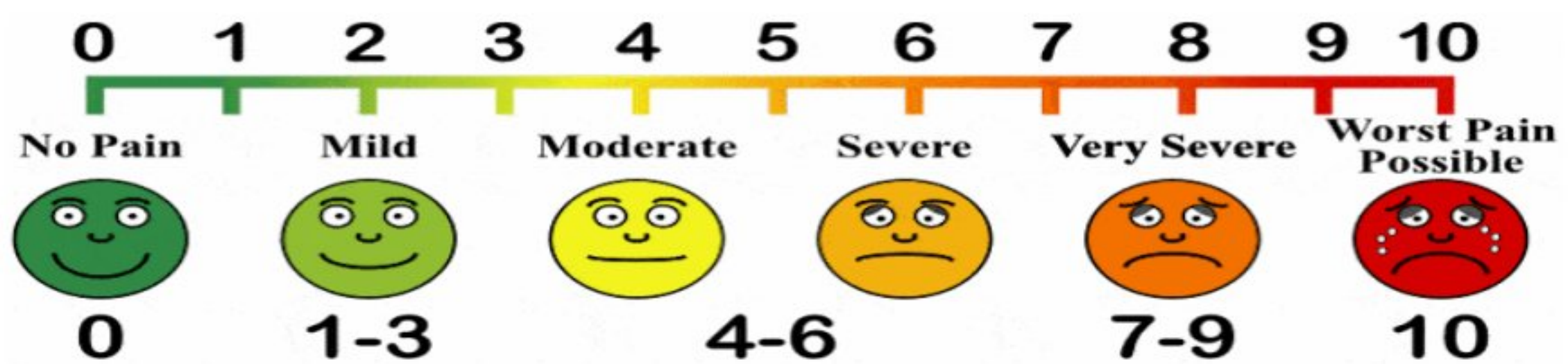
A. Anamnesis

I. History Injury

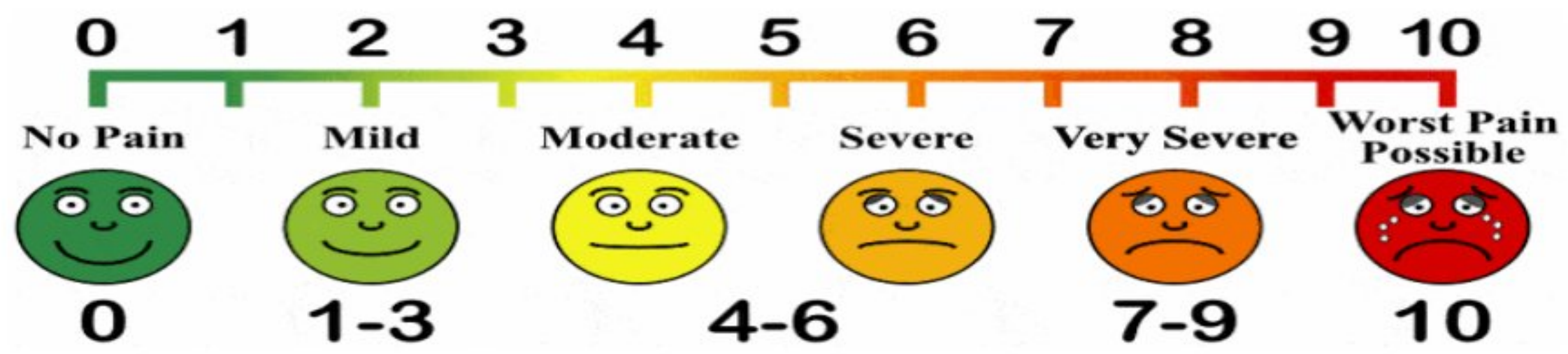
Injury History	Start Injury	Duration of Injury	Causes Injuries
1. Cervical Neck (C1-C7)			
2. Thoracic (T1-T12) pain/injuries			
3. Lumbar or Low back pain (L1-L5)			

II. What is the level of your body injury (Low – High)?

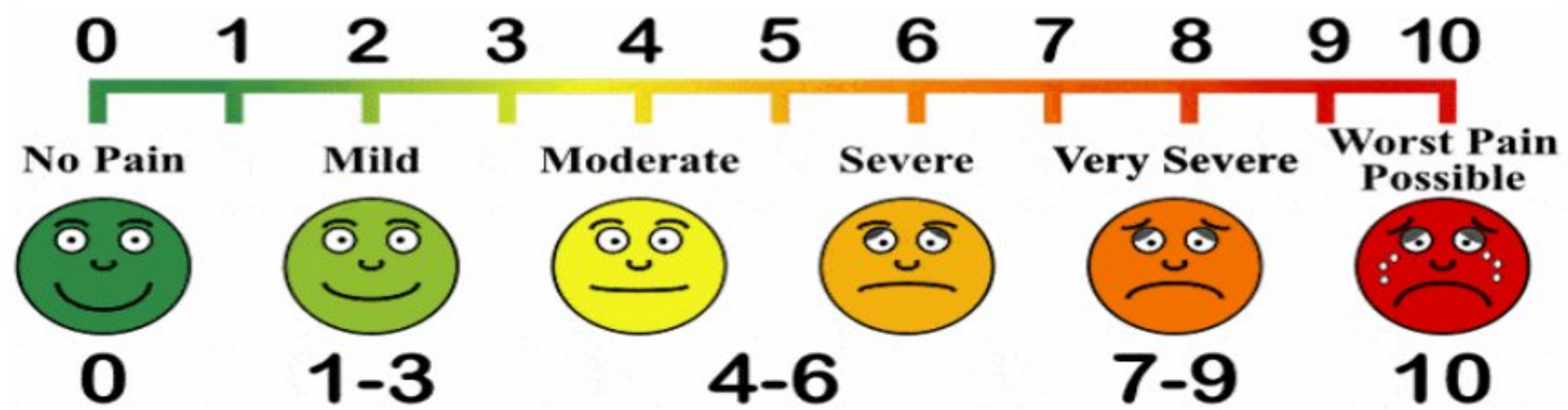
1. Cervical muscles:



2. Thoracic Muscles:



3. Low back Pain:



EXAMINATION

Pretest (Date /.... / 2021)			Posttest (Date // 2021)		
I.ROM			I.ROM		
Low Back Pain	Right	Left	Low Back Pain	Right	Left
Flexion	0	0	Flexion	0	0
Extension	0	0	Extension	0	0
Low Back Pain			Low Back Pain		
Forward bent			Forward bent		
2. Strength of Upper Limbs			2. Strength of Upper Limbs		
Sit-Ups/Minute		Sit-Ups/Minute	
Leg-Press/Minute		Leg-Press/Minute	

Table 11: Accuracy Aspects

Items	Average
Are the combined therapeutic massage and exercise models appropriated for recovering back Musculoskeletal injuries?	3,8
Are the combined therapeutic massage and exercise models appropriated for increasing the ROM of people suffering from back Musculoskeletal injuries?	4
Is the combined therapeutic massage and exercise models appropriate for strengthening people suffering from back Musculoskeletal injuries?	3,8
Are the combined therapeutic massage and exercise models appropriated for increasing the function motoric of people suffering from back Musculoskeletal injuries?	3,5
Are the combined therapeutic massage and exercise models easy to be applied?	3,6

1: Very inappropriate

2: Inappropriate

3: Appropriated

4: Very appropriated

From the aspect of accuracy, it can be concluded that the value obtained is 4, which means that it is good/correct/clear from the aspect of accuracy.

Table 12: Security Aspect

Items	Average
Are the motions of combined therapeutic massage and exercise models safe for people suffering from back Musculoskeletal disorders?	3,6
Are the proposed exercises affordable for subjects suffering from back Musculoskeletal disorders?	3,9
Are the proposed exercises accessible for cervical, thoracic, and low back pain individuals?	3,7
Are the proposed motions of combined massage feasible?	3,8

1: Very Inappropriate

2: Inappropriate

3: Appropriated

4: Very appropriated

From the security aspect, it can be concluded that the value obtained is 3,875, meaning that the security aspect is good/appropriate/clear.

Table 13: Feasible Aspects

Items	Average
Is the combined therapeutic massage and exercise models easy to be practical?	3,9
Are the proposed actions of combined massage realizable?	3,9
Are the proposed exercises practicable?	3,9

Reliability Statistics of the Instrument

Cronbach's Alpha	N of Items
.844	12

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
item1	38.57	16.619	.695	.816
item2	38.29	17.238	.890	.808
item3	38.57	18.286	.707	.822
item4	39.00	15.000	.644	.828
item5	38.29	18.238	.647	.824
item6	38.57	18.286	.405	.842
item7	38.43	15.952	.780	.808
item8	38.14	19.143	.491	.835
item9	38.14	21.143	.021	.860
item10	38.00	21.667	-.095	.861
item11	38.29	17.238	.890	.808
item12	38.14	20.810	.096	.856