

## Effectiveness of Exercise Therapy Based on Loosening, Stretching and Strengthening in the Treatment of Chronic Pelvic Disorders



R. Permana Wijaya<sup>1</sup>, Yudik Prasetyo<sup>2</sup>, Sabda Hussain As Shafi<sup>3</sup>, Enggista Hendriko Delano<sup>4</sup>, Faki Khairun Naili<sup>5</sup>, Fadil Al fathan Asis<sup>6</sup>, Sundari Putri Rahayu<sup>7</sup>, Muhamad Naufal Alwan<sup>8</sup>

<sup>1,2,3,4,5,6,7,8</sup>Department of Sport Science, Faculty of Sport and Health Science, Yogyakarta State University, Indonesia St. ColomboNo. 1, Karangmalang, Yogyakarta, 55281, Yogyakarta

**ABSTRACT:** Exercise Therapy is one part of the treatment of chronic pelvic disorders. This study aims to determine the effectiveness of Exercise Therapy based on loosening, stretching and strengthening in handling chronic pelvic disorders to reduce pain, increase range of motion, and joint motion function in symptoms of chronic pelvic disorders. The study used pre-experimental with a one-group pretest-posttest design conducted on members at Darah Muda Squad (DMS) Fitness Klaten, Central Java who experienced chronic pelvic disorders as many as 15 people. The research instrument used in the form of a numeric rating scale (NRS) in measuring pain intensity, a goniometer measuring instrument used to measure range of motion, and harris hip score functions in assessing motion function. The treatment given is Exercise Therapy based on loosening, stretching, and strengthening for approximately 30 minutes for 6 treatments. The data analysis technique uses paired t-test or Wilcoxon sign rank test according to the data to compare pretest and posttest data. The results showed that pain intensity decreased from  $6.5 \pm 1.3$  to  $2.5 \pm 1.03$  (64%) with  $p=0.001$ , flexion movement increased from  $78.1 \pm 7.4$  to  $100.5 \pm 4.5$  (29%) with  $p=0.000$ , extension movement increased from  $13.2 \pm 2.1$  to  $23.3 \pm 2.5$  (76%) with  $p=0.000$ , abduction movement increased from  $11.2 \pm 1.8$  to  $20.1 \pm 1.2$  (53%) with  $p=0.000$ , adduction movement increased from  $19.8 \pm 5.06$  to  $30.4 \pm 3.4$  (79%) with  $p=0.000$ , internal rotation movement increased from  $18.8 \pm 4.9$  to  $29.7 \pm 1.5$  (58%) with  $p=0.001$ , external rotation movement increased from  $25.2 \pm 4.05$  to  $33.7 \pm 3.8$  (33%) with  $p=0.000$ , motion function increased from  $56.7 \pm 5.7$  increased to  $82.9 \pm 5.6$ . (46%) with  $p=0.000$ . It can be concluded that Exercise Therapy based on loosening, stretching, and strengthening is effective in reducing pain, increasing range of motion and joint function, so it is recommended in the treatment of chronic pelvic disorders.

**KEYWORDS:** exercise therapy, pain, range of motion, movement function

### I. INTRODUCTION

Basically, the general public and sportsmen are inseparable from physical activities that can result in the risk of injury. The occurrence of injury is caused by impact (trauma) or *overuse* in the form of *strains*, *sprain*, *bone fractures*, and bruises characterised by pain (dolor), swelling (tumour), redness (rubor), increased temperature (calor) and a decrease in body function. (Arovah, 2021: 2). Cases of injury to the joints are injuries that are often experienced, ranging from the wrist, elbow, shoulder, waist, pelvis, knee, ankle to toe joints. Each injury has a different way of healing. Injury healing is based on the time of injury and the duration of the incident such as acute and chronic.

One of the most common joint injuries is the hip joint. Cases of pelvic disorders can occur due to sports activities, doing daily activities or accidents. (Hernowo & Ambardini, 2019: 2). In Asia, the risk of hip joint disorders in men is 5.6% because it is caused by an abnormality in the inclination angle in the hip joint which can lead to joint discongruence. (Al-Muqsith, 2017: 1). In Indonesia, the percentage of hip-pelvic disorders in a hospital in Surabaya was. 45.5% of 46 people studied with various factors attributed as the cause of pelvic disorders due to heavy physical workload and poor positioning (Lusianawaty, 2013: 2). The situation is in accordance with observations made in the sports injury therapy "MAFAZA" in January - July 2022, there were 2,000 patients treated and there were 165 (8.25%) patients experiencing complaints of pelvic injuries (Krismantoro, 2023: 1). The results of the study stated that as many as 249 people with a percentage of 18.99% experienced pelvic disorders (Graha, 2012: 7). While

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other data states that 95% of patients experiencing dislocation of the hip joint also experience injuries to other parts of the body, for example, *acetabulum fractures*, *inferior limb fractures* (23%), *superior limb fractures* (21%), head injuries (24%), *thoracic* injuries (21%) and *abdominal* injuries (15%). (Al-Muqsith, 2017: 1). Based on the data above, it can be concluded that injuries to the hip joint are often experienced and can interfere with daily activities such as walking, standing, sitting and sports. The *pelvis* is an *acetabulofemoral* joint formed from the junction of the *femur* and *pelvis* bones (Arovah, 2021: 125). There are various types of pelvic disorders including *arthritis*, *fracture* (broken or cracked), *dislocation* (misplaced), and *bursitis*. (Graha, 2019: 60).

Injury can result in discomfort, namely the perception of pain. Pelvic pain can be caused by prolonged sitting and standing, causing discomfort in the pelvic area and can affect many systems in the body such as endocrine, urinary, reproductive and digestive nerves (Bradley, 2017: 1). Injury is closely associated with discomfort in the body, which is the body's natural response to signal that something is not right in the body. Discomfort can be in the form of pain, Anderson & Parr (2011: 62) state pain is a negative sensory and emotional experience associated with actual or potential tissue damage. It is also a symptom that is common to most injuries. Pain is multidimensional and with varying degrees of variation. Based on the aspect of intensity, pain can be categorised into mild, moderate and severe pain. Based on duration, pain can be categorised into *transient*, *intermittent*, and *persistent*. Based on quality, pain can be categorised into sharp, dull, hot, and so on. Based on time, it can be categorised with 3 phases, namely acute, sub-acute and chronic phases. (Arovah, 2021: 48-49).

According to the period of occurrence, pain can be divided into acute and chronic pain. Acute pain is pain in a short period of time and can act as a stimulus that helps individuals to protect injured tissue in order to avoid repeated injury. Healing of the injured tissue will be followed by a decrease in acute sensitisation of the injured area and the sensory threshold will return to normal. Chronic pain is pain that continues after the tissue has healed and continues beyond the period that should be, this is due to pain receptors that continue to turn on (Janasuta & Putra, 2017: 21). According to Kurniawan (2015: 4) in addition to acute and chronic pain there are several other types of pain, including: (1) *Nociceptive* pain is pain that arises due to mechanical, chemical, temperature stimuli that result in activation or sensitisation of peripheral nociceptors (nerves responsible for pain stimulation); (2) *Neuropathic* pain arises as a result of neural damage to the peripheral nerves or to the central nervous system which includes central and peripheral afferent nerve pathways. *Neuropathic* pain is projected as pain that gives a feeling or sensation such as stabbing or burning; (3) *Somatic* pain is pain described as sharp, stabbing, and easily localised pain and burning that usually originates from the skin, subcutaneous tissue, skeletal muscles, tendons, mucous membranes, bones, and peritoneum. Examples of somatic pain are stage two labour pain and peritoneal irritation; (4) *Visceral* pain is pain characterised by pain that radiates and leads to the surface area of the body and away from the site of pain. *Visceral* pain occurs as rhythmic contractions of smooth muscle, as an example of visceral pain is cramping often associated with gallbladder disease, ureteral obstruction, menstruation, gastroenteritis, and uterine distension in the first stage of labour. *Visceral* pain may occur due to ischaemia, smooth muscle spasm, ligament stretching, distension of soft structures such as the gall bladder, bile ducts and ureters.

Bahrudin (2017: 8) explains that pain is a sensory and emotional experience due to actual or potential tissue damage or described through the damage. Pain can occur due to stimuli received by pain receptors (*nociceptors*). Pain receptors are free nerve endings found in muscles, joints, skin, *visceral*, and *vascular*. These pain receptors are responsible for the nociceptive stimulus arising from mechanical, temperature, and chemical changes (Kurniawan, 2015: 2). The mechanism of injury occurs in soft tissue (muscles, tendons, ligaments) which will result in closed bleeding in the tissue and swelling. The occurrence of swelling causes increased pressure on the tissue and will result in pain and stiffness (Zein, 2016: 16). Symptoms of pelvic disorders can cause painful sensations, limited *range of motion* and joint function. Measurement of *range of motion* in the pelvis is a measurement of *flexion*, *extension*, *abduction*, *adduction*, *internal rotation* and *external rotation* movements which can be measured using a goniometer. Limitations in motion function can be measured using the *Harris hip score* questionnaire.

In an effort to manage symptoms of pelvic disorders, pharmacological and non-pharmacological treatments can be used. One of the non-pharmacological treatments used is *Exercise Therapy*. The use of *Exercise Therapy* is one of the efforts that can be made in injury rehabilitation with the aim of achieving a 100% healing rate. (Nugroho and Ambardini, 2016: 30). The systematic application of *Exercise Therapy* has the benefit of increasing the range of motion of the joints, strengthening weak muscles and increasing ability in daily activities (Nagavani, 2012: 18).

The form of therapy used in the management of pelvic disorders in the form of *Exercise Therapy* or exercise therapy in the form of providing physical exercise programmes is increasingly being recommended in the management of chronic injuries. *Exercise Therapy* is a systematic physical activity that improves or prevents musculoskeletal disorders, especially injuries to the joints and restores joint function to near its original function or optimises joint function. (Arovah, 2021: 49). *Exercise Therapy* is the performance of body movements or physical activities carried out systematically and planned in preventing physical weakness and improving body function (Pristianto, 2018: 2). *Exercise Therapy* is a recovery program that has systematic performance,

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planned body movements, postures, and physical activities aimed at clients to improve or prevent physical weakness in improving body function and preventing and reducing health-related risk factors, optimising overall health and fitness conditions (Amanati, Purnomo, Abidin, Wibisono, 2018: 63). The main focus of *Exercise Therapy* is a programme that emphasises the healing process for physical weakness and improved body function. *Exercise Therapy* is one of the efforts to manage injuries using body movement exercises, both actively and passively. The purpose of *Exercise Therapy* is rehabilitation to overcome functional and movement disorders, prevent complications, reduce pain and train postoperative functional activities (Damping, 2012: 24).

*Exercise Therapy* is designed to suit the individual needs of each patient with the main goal of optimising body function. Body function is related to several parameters such as balance, cardiorespiratory fitness, coordination, flexibility, mobility, motor control, neuromuscular control, postural control and stability. The whole system reacts, adapts and develops in response to *physical stress* including physical activity. Physical activity helps the body to maintain functional ability, cardiorespiratory endurance and mobility. However, if done in excess, physical activity can also result in injury in the form of *strains, sprain, fractures* or chronic degenerative conditions. Therefore, *Exercise Therapy* must be designed so that the physical activity programmed is suitable for the needs of the patient with the minimum risk of injury due to exercise and get the maximum possible increase in the functional capacity of the body.

The use of *Exercise Therapy* used in this study is based on *loosening, stretching and strengthening*, this is used as a treatment for chronic pelvic disorders, some studies that use *Exercise Therapy* in handling injuries include the effectiveness of exercise therapy to reduce pain and improve ankle function after ankle injury researched by Hendrawan (2019: 46-52) obtained the results of a decrease in pain by 77.00%, and an increase in function by 8.66%. The effectiveness of masage therapy followed by *core stability exercise* for healing chronic pelvic disorders researched by Sari (2020: 90-91) obtained the results of a decrease in pain by 92.28%, an increase in ROM with an average value of 16.24%. The effect of "geregkutara" exercise therapy on reducing pain and improving function after ankle injury in GPS futsal players researched by Fadilla (2018: 6) obtained the results of a decrease in pain by 87.5% and an increase in motion function when walking by 12.5%, running 25% up the stairs 25% tiptoe 18.92%, jumping 18.18%, jumping 21.21%. Previous research tends to focus on one particular aspect, such as *stretching or strengthening* and has not fully integrated the elements of *loosening, stretching and strengthening* as a whole.

Therefore, this study aims to determine the effectiveness of *Exercise Therapy* that integrates *loosening, stretching and strengthening* in reducing pain, increasing *range of motion* and motion function in chronic pelvic disorders.

## II. METHODS

This study uses a pseudo-experimental method with a *one group pretest-posttest design*, where the research subjects become one group, then a sampling technique is carried out using *purposive sampling* based on inclusion and exclusion criteria. The inclusion criteria in this study are 1) patients with chronic pelvic disorders, 2) willing to become respondents, 3) age 15-40 years, 4) experiencing decreased function of movement and feeling pain in the pelvis occurs in the chronic phase. while the exclusion criteria are 1) anatomical abnormalities in the pelvic bones such as fractures, dislocations and joint damage. 2) there is no history of tumours, kidney disease, diabetes, heart disease and osteoporosis, 3) no open wounds. The research was conducted centred on Darah Muda Squad Fitness Klaten Central Java with sample determination using *sample size calculator* considerations.

In its implementation, the sample will be measured in the *pretest* and *posttest* phases including pain using the *numeric rating scale (NRS) instrument* which is a tool used to measure the degree of pain felt (Nugent, Lovejoy, Shull, Dobscha, Morasco, 2021: 2235). The scale used uses a range of 0-10. NRS has a validity value of  $r = 0.90$  and reliability = 0.95. Based on research conducted by Li, Liu & Herr in Swarihadianti (2014: 46), so this instrument is valid and reliable for use in the data collection process. To measure the level of pain felt by patients can use the *Numeric Rating Scale (NRS)*, because it can measure with a range of parameters from no pain to the most severe pain on a scale of 0-10. The smaller the number shown, the smaller the pain felt by the patient and the greater the number shown by the NRS, the greater the pain felt by the patient. Measurement of *range of motion* is carried out using a goniometer measuring instrument is a tool for measuring *range of motion*. The goniometer measuring instrument has been tested for validity and reliability in research conducted by Rosmita in Noviani (2023: 40). The validity and reliability tests on the goniometer resulted in a validity of 0.95 and a reliability of 0.51. Then measuring joint motion function using the *Harris hip score* questionnaire. Based on research conducted by Soderman, P & Henrik, M (2001: 192), this study compares *WOMAC, SF-36, and Harris Hip Score* in patients randomly selected through a computer algorithm from Sahlgrenska University Hospital showing that among the three instruments there is no significant difference, *WOMAC* has the highest domain value ( $r = 0.91$  for pain and  $r = 0.93$  for function). Reliability tests on the *Harris Hip Score* showed excellent reliability in pain 0.93 and function 0.95, it can be concluded that the research instruments are valid and reliable.

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Samples that have been measured will receive *treatment* in the form of *Exercise Therapy* by integrating *Loosening*, *Stretching* and *Strengthening*. Analysis of the data that has been collected using the SPSS *Statistic* application to test the effectiveness of *exercise therapy treatment* integrating *loosening*, *stretching*, and *strengthening* is carried out with a normality test step to determine whether the data is normally distributed or not normally distributed and continued with a different test using *paired t test* or *wilcoxon test*.

## III. RESULT AND DISCUSSION

### A. RESULT

This research was conducted centered on Darah Muda Squad Fitness Klaten Central Java, based on the criteria of the research sample experiencing pelvic disorders, the research sample received treatment in the form of Exercise Therapy based on loosening, stretching, and strengthening. This treatment was carried out for 30 minutes per session and given 6 times. This Exercise Therapy program was given to research samples who experienced chronic phase pelvic disorders which aimed to reduce pain sensations, increase range of motion, and restore joint function in patients with chronic pelvic disorders. The results of the study can be seen below:

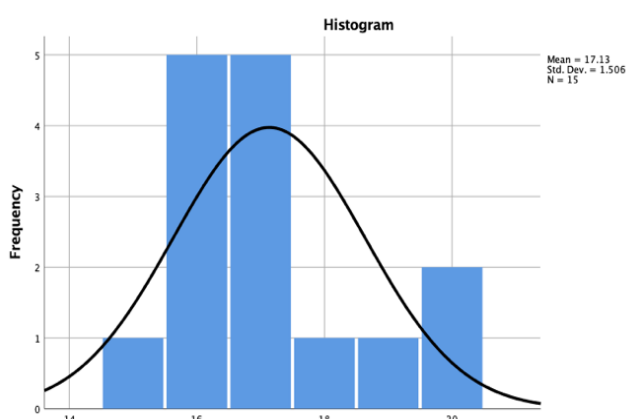


Diagram 1. Frequency Distribution Based on Age

### Age

The age range of the research subjects was between 15-40 years, with an average age of 17.13 years, with a standard deviation of 1.5. The research data showed that most complaints of pelvic disorders were at the age of 16-17 years.

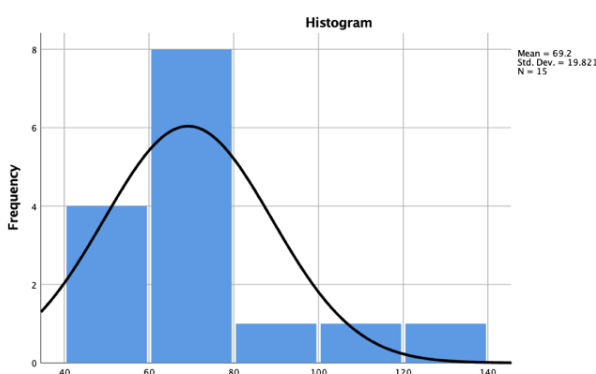
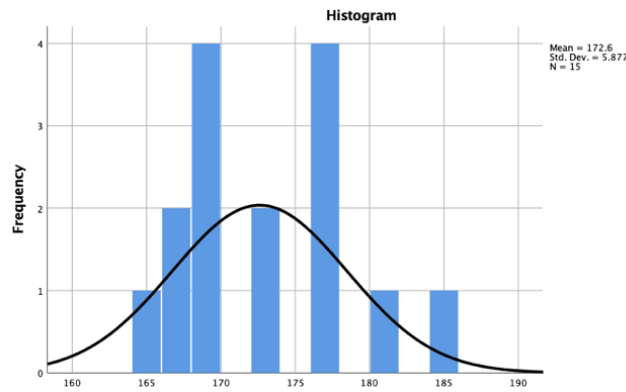


Diagram 2. Frequency Distribution Based on Weight

### Weight

The range of body weight of the subjects of this study was 49-120 Kg, with an average body weight of 69.20 Kg and a standard deviation of 19.8.

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**Diagram 2. Frequency Distribution Based on Height**

## Height

The research subjects in this data had an average height of 172.6 cm, with a standard deviation of 5.8. The range of subject height is between 165-185 cm.

**Table 1. Data Based on Cause of Injury**

Penyebab Cedera	Jumlah
Latihan	8
Angkat Beban	3
Diam dalam waktu lama	4
Total	15

Table 1 presents the data obtained based on the cause of injury, showing that exercise is the most common cause of chronic pelvic disorders.

**Table 2. Results of Normality Test with Shapiro-Wilk**

	Shapiro-Wilk	
NRS	Sig.	Information
	0,004	Not Normally Distributed
ROM Flexion	Shapiro-Wilk	
	Sig.	Information
	0,892	Normally Distributed
Extension ROM	Shapiro-Wilk	
	Sig.	Information
	0,995	Normally Distributed
Abduction ROM	Shapiro-Wilk	
	Sig.	Information
	0,592	Normally Distributed
Adduction ROM	Shapiro-Wilk	
	Sig.	Information
	0,623	Normally Distributed
Internal ROM of Rotation	Shapiro-Wilk	
	Sig.	Information
	0,003	Not Normally Distributed
Rotational External ROM	Shapiro-Wilk	
	Sig.	Information
	0,689	Normally Distributed
Motion Function	Shapiro-Wilk	
	Sig.	Information
	0,050	Normally Distributed

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Based on Table 4, it explains that the results of the NRS Scale normality test have a significance value of 0.004. The normality test of Flexion ROM gets a significance value of 0.892. The normality test of the Extension ROM gets a significance value of 0.995. The normality test of the Abduction ROM gets a significance value of 0.592. Adduction ROM normality test gets a significance value of 0.623. The normality test of Internal Rotation ROM gets a significance value of 0.003. The normality test of External Rotation ROM gets a significance value of 0.689. Motion function normality test gets a significance value of 0.050.

In the normality test other than the NRS and Internal Rotation pain scale, the significance value is greater than 0.05 so that it can be said that all data are normally distributed except for the NRS scale and Internal Rotation ROM.

After the normality test, the next step is the t-test. T-test to prove the hypothesis is accepted or rejected. The basis for determining the decision on the comparison of  $p$  with the value  $\alpha = 0,05$ . If  $p < 0,05$  then  $H_0$  is rejected and  $H_2$  is accepted. Conversely, if  $p > 0,05$  then  $H_0$  is accepted and  $H_1$  is rejected. The results of the t-test are briefly explained in the table below.

**Table 3. Paired T-test Results**

	Sig.	Conclusion	Description
NRS	0,000	Significant	<i>Wilcoxon test</i>
	Sig.	Conclusion	Description
ROM Flexion	0,000	Significant	<i>Paired T test</i>
Extension ROM	0,000	Significant	<i>Paired T test</i>
Abduction ROM	0,000	Significant	<i>Paired T test</i>
Adduction ROM	0,000	Significant	<i>Paired T test</i>
Internal ROM of Rotation	0,000	Significant	<i>Wilcoxon test</i>
Rotational External ROM	0,000	Significant	<i>Paired T test</i>
	Sig.	Conclusion	Description
Motion Function	0,000	Significant	<i>Paired T test</i>

Based on table 3, the significant value of data using *paired t-test* gets a significance value of 0.000 which is smaller than 0.05. So from this data it can be concluded that  $H_0$  is rejected and  $H_1$  is accepted, thus there is an effectiveness of *Exercise Therapy* on reducing pain and increasing *range of motion* and motion function in chronic pelvic disorders.

**Table 4. Wilcoxon Difference Test Results**

	Sig.	Conclusion	Description
NRS	0,000	Significant	<i>Wilcoxon test</i>
	Sig.	Conclusion	Description
Internal ROM of Rotation	0,000	Significant	<i>Wilcoxon test</i>

Based on table 5 on the pain scale and internal rotation movement with not normally distributed in the normality test, so using the *Wilcoxon* difference test. The results of this t-test have an Asymp.sig (2-tailed) of 0.001 more than 0.05. It is concluded that  $H_0$  is rejected and  $H_1$  is accepted, meaning that there is an effectiveness of *Exercise Therapy* on reducing pain and increasing *range of motion* and motion function in chronic pelvic disorders.

## B. DISCUSSION

This study was conducted to determine the effectiveness of Exercise Therapy on reducing pain, increasing range of motion and motion function in patients with pelvic disorders. The sample in this study amounted to 15 people, with an overall average BMI value of 23.3 and entered normal criteria. This study includes pre-experimental with a one-group pretest-posttest design, where the research subjects become one group according to the researcher's criteria, then data collection and measurement are carried out before and after being given Exercise Therapy treatment that integrates loosening, stretching and strengthening this aims to be able to know whether or not there are changes experienced by research subjects before and after treatment.

A person experiences chronic fascial pelvic disorders due to intensive physical activity, such as running, jumping, and making rapid changes in direction, which can put excessive pressure on the pelvic structure. These repetitive movements have the potential to strain the muscles and ligaments around the pelvis, increasing the risk of chronic injury if not managed properly.

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In addition, the use of inappropriate techniques and the absence of adequate warm-up before training or competition can also increase the likelihood of pelvic injury (Setiawan, 2011: 95).

The results showed that pain perception decreased by 64%, increased *range of motion* in *flexion* 29%, *extension* 76%, *abduction* 53%, *adduction* 79%, *internal rotation* 58%, *external rotation* 33% and *hip joint motion function* measured using *harris hip score* increased by 46%. The results of this study are in line with research conducted by Davit Firmanda Hernowo (2018) entitled "The Effectiveness of Frirage Masage Combination Therapy and PNF Exercise on the Recovery of Pelvic Disorders of Patients of the UNY FIK Therapy Clinic" which showed a significant effect on reducing pain by 51.31%, increasing the *range of motion of flexion* movements by 6.60%, *extension* by 26.85%, *abduction* by 28.23%, *adduction* by 10.74%, *medial rotation* 5.6% and *lateral rotation* 6.77%. In motion function, the effectiveness is 72.10% for walking, 73.3% for sitting standing and 50.53% for standing on one leg. Research conducted by Aditya Septian Nurcahya (2020) entitled "The Effectiveness of a Combination of Massage Therapy and PNF Exercise Therapy for Healing Chronic Pelvic Disorders" experienced a significant effect on reducing pain by 67.24% and experiencing an increase in *range of motion* with an average of 60.93%. Research conducted by Bhirama Noraga Adhyaksa (2020) entitled "The Effectiveness of Tepurak Manipulation Therapy Followed by *Theraband* Exercise for Healing Chronic Pelvic Injuries" obtained significant results in reducing pain by 74.94%, increasing *range of motion* in *flexion* movements by 29.97%, *extension* movements by 56.94%, *adduction* movements by 25.53%, *abduction* movements by 29.01%, *internal rotation* movements by 35.95%, and *external rotation* movements by 33.50%. Thus *exercise therapy* is effective in reducing pain scales, increasing *range of motion*, and joint motion function in patients with chronic pelvic disorders.

### IV. CONCLUSIONS

Sitting and standing for long periods of time can cause discomfort in the pelvic region. The pelvis supports the weight of the upper body when one rests on the legs and this is also affected by the pull of gravity downwards. Add to this carrying weights such as heavy bags or carrying children, and it will cause our pelvis to often feel fatigue and pain. Injuries can lead to discomfort and the perception of pain. Pelvic pain can be caused by prolonged sitting and standing, causing discomfort in the pelvic area and can affect many systems in the body such as endocrine, urinary, reproductive and digestive nerves. Symptoms of pelvic disorders can cause painful sensations, limited range of motion and joint function. Based on the results of the research, it was concluded that the provision of Exercise Therapy integrating loosening, stretching, and strengthening for 6 treatments was effective and significant in reducing pain, increasing range of motion in flexion, extension, abduction, adduction, internal rotation, and external rotation movements. In addition, the function of hip joint motion has also increased. These results indicate that the Exercise Therapy program can be a significant nonpharmacological intervention in reducing pain, increasing range of motion, and improving hip joint motion function in patients with chronic hip disorders. This intervention can be recommended in the management of chronic pelvic disorders.

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