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Effectiveness of combination theraphy of trigger point, deep tissue massage, and stretching for the low backpain healing

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Abstract: This research aims to determine the effectiveness of the combination therapy of trigger point, deep tissue massage, and stretching towards the low back pain healing which is indicated by the decreasing pain and increasing flexibility. The research was conducted in December 2021 in Temanggung and Yogyakarta. This research was basically an experimental study. The research design utilized a pre-experimental design with a one group pretest posttest design. The research sample was for about 21 people with the characteristics of the subject of Non Specific Low Back Pain (NSLBP) acute and subacute phases. The sampling was done by utilizing the incidental sampling method. The instruments were VAS to measure pain and Fingertip to Floor (FTF) to measure lower back flexibility. The combination therapy treatment was done for about 50 minutes, started by the manipulation of trigger points in the deep spinal muscles, longisimus dorsi, iliocostalis, quadratus lumborum, gluteus, hamstring, soleus, psoas major, and quadriceps muscles, and continued with manipulation of deep tissue massage techniques in the area of back, hips, thighs, and calves, followed by stretching with active assisted stretching techniques such as the moves of cobra, childpose, cat and camel, thread the needle, gluteus stretch, and piriformis stretch. The data analysis technique utilized paired t test to determine the significance of the difference with the terms of significance of $p < 0.05$. The findings show that there is a difference between the pretest and the posttest. The results of this study indicate that in the pretest the average score of pain is at 77.48, ante flexion is at 10.81, dextro flexion at 35.21, and sinistro flexion at 34.95. After being given treatment, the average score of pain is at 32.14, ante-flexion at 4.31, 31.91, and sinistro flexion at 32.48. The results of the paired t test show a significance value of 0.000, subsequently it can be concluded that the combination therapy of trigger point, deep tissue massage, and stretching is effective for the low back pain healing with the effectiveness levels at 58.52%, 60.12%, 9.37%, and 7.06% respectively for pain reduction and increased flexibility of ante flexion, dextro flexion, and sinistro flexion.

Keywords: low back pain (lbp), trigger point massage, deep tissue massage, stretching.

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INTRODUCTION

Low back pain (LBP) also known as low back or back pain which causes pain or pain in the area between the lower ribs and above the legs (Arwinno, 2018). The pain felt causes movement discomfort for a person, thus potentially reducing daily productivity. Low back pain can occur as a result of various activities carried out by a person during daily activities. Lifting heavy weights in an incorrect position has the potential to cause pain in the lower back area. It is not just hard work that has the potential to cause problems low back pain, the body posture formed when sitting in an unergonomic position can cause low back pain. When carrying out physical activities that involve movement of all body parts, there is the potential for pain in a person's lower back, if the intensity of exercise is heavy or exceeds the limit of maximum ability (Vasudevan, 2015; Urits et al., 2019; Dewi et al., 2022).

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It is explained in Sulistyawati et al. (2019) that Approx caused by mechanical or motion factors. This mechanical factor causes the muscles of the lower back area which are then commonly referred to aslow back pain myogenic. Low back pain myogenic occurs in normal anatomical structures that are used excessively or as a result of trauma, which causes stress or strain in the lower back muscles. This is related to daily activities, such as lifting heavy weights in the wrong way, standing for too long or sitting in the wrong way. Signs and symptoms of lower back pain due to muscle disorders are myofascial pain, which is typically characterized by pain in the area concerned (trigger points), a decrease in the range of motion of the muscle group in question (decreases range of motion), lower back muscle spasms 90% disturbance or abnormality in lower back pain. Low back pain causes pain in the lower back area, namely in the lumbar area. The pain felt in this area can occur due to muscle tension pressing on the painful nerves. This tension can be reduced by manipulating the affected muscles (Will et al., 2018; Ali & Nas, 2018; El-Sayed et al., 2023).

Metgud et al. (2020) citing Airaksinen, O. et al., (2006) said that the estimated prevalence of NSLBP is 23% and the incidence is 11%-22% in the general population. Metgud et al. (2020) citing Phansopkar, PA, (2014) said that almost 50% of the population at the age of 30 years will experience significant LBP events. Also added are Metgud et al., (2020) who quote from Wilson, E. et al. (2003) LBP is a problem throughout the world with a lifetime prevalence of 84%. In the research by Metgud et al. (2020), the number of subjects with complaints was foundlow back painas many as 44 participants. This research provides therapeutic manipulation treatment with techniques trigger points in the Quadratus Lumborum and Erector Spinae muscles. Pressure technique with a duration of 10 seconds. The results of this research stated that treatment trigger points in the muscles affected by the occurrence low back pain shows a significant change in results compared to the initial conditions as shown by the value in the statistical test showing the difference between the pretest and posttest, namely 5.23 with $p<0.0001$, so it is concluded that there is a significant change.

In research by Zheng, et al. (2012) with a total of 64 subjects. In this research, it is stated below low back pain has a high prevalence in many countries around the world and it is usually accompanied by local pain points in the lower back which is the main source of chronic non-specific low back pain, which is characterized by local muscle spasms and stiffness. The results of the study found a statistically significant increase ($P<0.05$) in pressure pain threshold, decrease in muscle hardness and lower VAS scores after treatment in the treatment group compared to the control group in this study, indicating an increase in the therapeutic efficiency of the application deep network tender point in combination with lumbar traction compared with lumbar traction alone.

In Purwata et al. (2015) research, it was found in the data that injuries low back pain found as many as 509 people with a percentage of 28.6% neuropathic pain which is most often found in Indonesia, followed by carpal tunnel syndrome/CTS with a total of 191 people with a percentage of 10.7%, frozen shoulder as many as 191 people with a percentage of 10.7%, diabetic neuropathy as many as 170 people with a percentage of 9.6%, and brachialgia as many as 108 with a percentage of 6.1%. During observation, it was found that the patient had LBP which caused changes in gait (gait), stooping, and discomfort in sitting or lying positions. In Wahab and Wahyuni's research in 2021, it was found that in Indonesia it is estimated that sufferers low back pain varies between 7.6% to 37% of the population in Indonesia and 80% of them have experienced low back pain in his life. The number of subjects with the inclusion criteria for complaints of low back pain was 20 people. This research provides therapeutic treatment using the stretching method William Flexion Exercise in the abdominal muscles, gluteus maximus, and hamstrings, to increase flexibility in the hip flexor and back (sacrospinalis) muscle groups, as well as to restore or perfect the working balance between the flexor & extensor postural muscle groups. The results of this research stated that treatment stretching has a good effect on increasing the range of motion of the patient's joints low back pain. With previous research in healing efforts low back pain, so this research combines various techniques from the benefits of the therapeutic techniques mentioned above. Efforts for healing against low back pain below is by carrying out massage therapy. Massage therapy has been used as a solution for treating cases of painful injuries that occur. The techniques used in massage therapy are Trigger Points and Deep Tissue Massage which can help individuals improve their physical condition, especially the perception of pain that arises due to injury. By providing manipulation to the tense muscles part lower back to upper limbs so that muscle tension can be released so that the pain felt becomes more tolerable or does not feel like the condition before therapy, then by carrying out manipulation trigger points

and deep tissue massage. This can also help increase the degree of ROM in case patients low back pain. Then apply stretching with technique active assisted which aims to increase the flexibility of the lower back.

METHODS

This research will use a research design pre-experimetal by design one group pretest posttest design that is, it consists of one group without a control group. In the research carried out pretest (initial test) before treatment in the form of measuring the pain scale and flexibility of the lower back and will be measured again after treatment to obtain data posttest (end). This study aims to determine the effectiveness of combination therapy trigger points, deep tissue massage, and stretching towards healing low back pain. This research was carried out on 18-31 December 2021. The research sites were carried out in Temanggung and Yogyakarta.

The population and sample in this study were patients with complaints low back pain with non- specific characteristics of LBP. The research subjects involved in this study were patients with complaints low back pain with the sampling method, namely incidental sampling. The following is a description of the research sample based on age grouping. This research found sample that the 21-30 age group is 7 people (33.33%). The 31-40 year age group was 5 people (24.81%). The 41-50 year age group was 2 people (9.52%). The 51-60 age group was 5 people (24.81%). The 61-70 age group was 2 people (9.52%).

In this research the instrument used was Visual Analogue Scale (VAS) to measure pain and Fingertip to Floor Test (FTF) to measure flexibility. Measurements were carried out at the beginning before treatment was given and at the end after treatment was given. The combination therapy treatment was carried out for 50 minutes which begins by providing manipulation trigger points, deep tissue massage, then continue stretching with active techniques assisted stretching. Analysis of different tests using different tests paired t-test with a difference test significance level $p<0.05$.

RESULTS AND DISCUSSION

The research results show that combination therapy treatment trigger point, deep tissue massage, and stretching in healing low back pain have an impact that is proven by results pretest and posttest have significant differences. Here's the data pretest pain and flexibility in the table 1:

Table 1. Subject Characteristics

		Pengukuran			
Var	**Data**	**N**	**Max**	**Min**	**Mean ± SD**
VAS	Pretest	21	50	97	77,48±12,87
	Posttest	21	10	50	32,14±11.16
Ante Fleksi	Pretest	21	-11	29	10,81±12,24
	Posttest	21	-14	25	4,31±12,61
Dextro	Pretest	21	25	48	35,21±6,49
Fleksi	Posttest	21	22	43	31,91±5,60
Sinistro	Pretest	21	25	47	34,95±6,40
Fleksi	Posttest	21	22	42	32,48±6,19

Based on the table above, it can be seen that the data pretest low back pain is indicated by a minimum VAS value of 50 and a maximum value of 97. Ante flexion data with a minimum value of -11 and a maximum value of 29. Dextro flexion data with a minimum value of 25 and a maximum value of 48. Meanwhile sinistro flexion data has a minimum value of 25 and a maximum value 47. As for the average data pretest pain is shown with a value of 77.48 while the standard deviation is 12.87. Average data pretestante flexion flexibility 10.81 with a standard deviation of 12.24. The average dextro flexion pretest data was 35.21 with a standard deviation of 6.49. Meanwhile, the average synstro flexion pretest data was 34.95 with a standard deviation of 6.40.

Based on the table above, it can be seen that the data posttest low back pain is indicated by a minimum VAS value of 10 and a maximum value of 50. Ante flexion data with a minimum value of

-14 and a maximum value of 25. Dextro flexion data with a minimum value of 22 and a maximum value of 43. While sinistro flexion data has a minimum value of 22 and a maximum value 42. As for the average data posttest pain is shown with a value of 32.14 while the standard deviation is 11.16. Average data posttest ante flexion flexibility 4.31 with a standard deviation of 12.61. Average data posttest dextro flexion 31.91 with a standard deviation of 5.60. Meanwhile, the average synstro flexion pretest data was 32.48 with a standard deviation of 6.19. Test results paired t-test shows a significance value of 0.000 which means p<0.05, thus H0 rejected and H1a ccepted then combination therapy trigger points, deep tissue massage, and stretching effective in healing low back pain. Results of calculating the effectiveness of combination therapy trigger points, deep tissue massage, and stretching against pain of 58.52%, ante flexion 60.12%, dextro flexion 9.37%, and sinistro flexion 7.06%.

This study aims to determine the effectiveness of combination therapy trigger points, deep tissue massage, and stretching towards healing low back pain. Providing massage therapy treatment with stretching if done properly and correctly, it is effective in reducing the pain felt and increasing the flexibility of the lower back in sufferers low back pain. Based on data analysis calculations, the results showed that the pain value before treatment was 77.48 and after treatment the pain value decreased to 32.14 with a calculated percentage of 41.36% with a significance value of 0.000 < p. Based on data analysis calculations, the results showed that the ante flexion flexibility value before treatment was 10.81 and after treatment was 4.31 with a calculated percentage of 41.99% with a significance value of 0.000 < p. Based on data analysis calculations, the results showed that the dextro flexion flexibility value before treatment was 35.21 and after treatment was 31.91 with a calculated percentage of 4.93% with a significance value of 0.000 < p. Based on data analysis calculations, the result was that the synstro flexion flexibility value before treatment was 34.95 and after treatment was 32.48 with a percentage calculation of 3.67% with a significance value of 0.000 < p.

The conclusion from the research carried out is that there is effectiveness of combination therapy trigger points, deep tissue massage, and stretching towards healing low back pain. This effectiveness is confirmed by calculating the resulting level of effectiveness, namely pain 58.52%, ante flexion 60.12%, dextro flexion 9.37%, and sinistro flexion 7.06%. The calculations showed a decrease in pain and an increase in lower back flexibility. Markminusin pain shows a decrease in pain, namely a smaller value scale at posttest compared topretest. Markminuson flexibility shows an increase, namely on a smaller scale posttest compared to pretest.

The treatment in this study was a combination of massage therapy technique strigger points, deep tissue massage, and stretching. Before treatment, the subject is first measured to determine the initial conditions experienced. Treatment is carried out in sequence trigger points, then deep tissue massage. After all the target muscles are given massage therapy, the subject is given directions on how to do it stretching facilitated by a therapist. Technical treatment trigger points and deep tissue massage towards healing low back pain carried out on the affected muscles which can be identified by palpation for the presence of tension, the muscles being manipulated, namely spinal muscle, illiocostalis, longisimus, quadratus lumborum, gluteus, hamstring, and quadriceps.

On complaints low back pain there is often tension in these muscles so that pain can arise in the affected areas. This therapy takes approximately 45-60 minutes, this is influenced by the patient's condition. As a result of muscle tension that occurs in the lower back area, the muscles affected include the back, buttocks and upper legs. These muscles are the erector spinalis, longisimus, illiocostalis, quadratus lumborum, gluteus group, hamstrings, gastrocnemius, soleus, psoas, and quadriceps. All of these muscles are manipulated to provide a relaxing effect with the aim of reducing tension, reducing pain and increasing flexibility.

Providing therapy tolow back painis a form of effort to help sufferers recover low back pain. The impact of disorders or disorders with these complaints causes pain and limited flexibility of the lower back. Many factors support the incident low back pain. According to Juliatri, et al. (2021) low back pain can be caused by two factors, namely individual and work. Individual factors include age, body mass index (BMI), gender, exercise habits, and destructive smoking behavior. Meanwhile, employment factors include work position and length of time worked.

Summarizing from Nugraha et al. (2020) that is the cause low back pain of non-specific and specific factors. Non-specific factors are soft tissue abnormalities in the form of muscle injury, ligaments, spasms or muscle fatigue. Meanwhile, specific factors result from vertebral fractures,

infections and tumors. Pain and limited flexibility of the lower back in sufferer low back pain caused by muscle tension which presses on the painful nerves, causing pain.

Fatmawati & Khotimah (2015) added that other causes of LBP are due to poor posture such as kyphosis, kyfolordosis, scoliosis, round back, and flat back, this can occur as a result of unergonomic working positions and/or the load being carried beyond capacity. This condition triggers the muscles to work beyond their limits, resulting in chronic fatigue which causes tension in the lower back which triggers pain. Fatmawati & Khotimah (2015) quoting from Borenstein & Wiesel (2004) saidthat is the main problem for sufferers low back pain is pain that interferes with functional activities. Massage therapy has been widely used for various types of physical disorders or disorders. In this study, the treatment given was massage therapy to sufferer low back pain. This aims to reduce the pain felt and increase the flexibility of the lower back (Chen et al., 2022; Saraswati et al., 2022).

Supported by Supliyani (2017) citing Rokade (2011) saying that massage is one method that can be used to reduce pain. Massage can stimulate endogenous analgesics (endorphins) and interfere with pain transmission by increasing the circulation of neurotransmitters produced naturally by the body at neural synapses in the central nervous system. Based on previous research by Sarrafzadeh et al. (2012) which supports the current author's research, it is said that treatment trigger points by pressing the points of tension that occur in the soft tissue using the therapist's hands, the therapist can release anesthetic (anti-pain) hormones in the form of endorphins and enkephalins. The release of this hormone can have the effect of inhibiting pain due to the theory gate control. With the mechanism that occurs, there is inhibition or blocking of pain, resulting in a decrease in pain, eliminating pain, and eliminating limitations in movement (Horner et al., 2020; Dingding et al., 2022).

The conclusion that can be drawn is point emphasis trigger points can improve the condition of disorders or abnormalities that occur in muscle tension. Strengthened by Fryer & Hodgson (2005) who said that pain is caused by myofascial trigger points in response to the therapist's steady application of pressure has been shown to change over the course of the therapy process. Manual pressure applied showed a score of 7 out of 10 but was tolerable. During the pressing process, it was discovered that the pain sensation felt by the subject decreased by 3-4 levels. This shows that pain sensitivity in myofascial reduced during therapeutic suppression treatment trigger points.

Supported by Guney & Ucar (2021), massage treatment facilitates increasing nutrition in tissue through increasing circulation which can speed up recovery. In the journal it is said that therapy deep tissue massage effective in reducing tension and shortening of muscles resulting in pain. Supported by Romanowski et al. (2012) research conducted on the effectiveness deep tissue massage towards sufferers low back pain with a total of 26 subjects divided into 2 groups. Group 2 was given treatment deep tissue massage changes were found with the mean pain value before treatment being 59.15±13.17 decreased after treatment to 34.23±10.70 with a VAS significance value of $p<0.001$. It was explained that massage therapy can help reduce the pain felt by sufferers low back pain. However deep tissue massage has a more significant effect than ordinary massage therapy. Deep tissue massage used to manipulate soft tissue provides an effective effect as a non-pharmacological treatment for low back pain. Supported by Weerapong et al., (2004) who said that static stretching is effective in increasing flexibility and influencing viscoelasticity thereby reducing muscle tension. Strengthened by Kim & Yim (2020) research conducted tested effectiveness stretching for sufferers of low back pain.

This research resulted in the fact that using statistical tests there were significant changes in pain, lower back instability and pelvic muscle flexibility. The resulting P value is lessfrom 0.05. Supported by Astuti & Koesyanto (2016), the research conducted tested the variables of back pain and flexibility. The results obtained from this research were initial pain (pretest) values for the experimental group mean amounted to 72.02. Meanwhile at the end (posttest) pain decreased with value mean of 54. Back LGS experienced significant changes with a pretest difference of 86.7% moderate level and 13.3% mild level compared with posttest 56.7% moderate level and 43.3% mild level.

This research provides significant meaning to the treatment stretching against back pain and LGS. Therapeutic treatment aimed at healing low back painby combining therapeutic techniques trigger points, deep tissue massage, and stretching for sufferers low back pain its effectiveness is

known. The impact of therapeutic treatment on sufferers low back pain can reduce pain and increase lower back flexibility.

CONCLUSION

Based on the explanation of the research results and discussion presented above, the author concludes thatlow back painis an event that causes discomfort to a person due to pain and impaired flexibility, thereby inhibiting activities. The prevalence of LBP is high, especially nonspecific LBP. Combination therapy treatment trigger points, deep tissue massage, and stretching effective for healing low back painwith a pain effectiveness rate of 58.52%. Combination therapy treatment trigger points, deep tissue massage, and stretching effective for healing low back pain with the level of flexibility effectiveness, namely ante flexion 60.12%, dextro flexion 9.37%, and sinistro flexion 7.06%.

CONFLIC OF INTEREST

There are no conflicts of interest related to this research or the publication of this manuscript

REFERENCES

Airaksinen, O., Brox, J. I., Cedraschi, C., Hildebrandt, J., Klaber-Moffett, J., Kovacs, F., et al. (2006). Chapter 4: European Guidelines for the Management of Chronic Non-Specific Low Back Pain. *European Spine Journal*, 15(Suppl 2), S192–S300. https://doi.org/10.1007/s00586-006-1072-1

Ali, M., & Nas, F. S. (2018). *Lower back pain; its causes and physical therapy: a review*. https://doi.org/10.15406/MOJYPT.2018.03.00040

Arwinno, L. D. (2018). Keluhan nyeri punggung bawah pada penjahit garmen. HIGEA, 2(3), 406 416.

Astuti, S. J., & Koesyanto, H. (2016). *Pengaruh Stretching terhadap Nyeri Punggung Bawah dan Lingkup Gerak Sendi pada Penyadap Getah Karet PT Perkebunan Nusantara IX (Persero) Kendal*. Unnes Journal of Public Health, 5(1), 1–8.

Borenstein, D. G., Wiesel, S. W., & Boden, S. D. (2004). *Low Back and Neck Pain: Comprehensive Diagnosis and Management* (Edisi ke-3). Philadelphia: Saunders.

Chen, P. C., Wei, L., Huang, C. Y., Chang, F. H., & Lin, Y. N. (2022). The Effect of Massage Force on Relieving Nonspecific Low Back Pain: A Randomized Controlled Trial. *International Journal of Environmental Research and Public Health*. https://doi.org/10.3390/ijerph192013191

Dewi, Y., Ayusandra Pramesti, R. S., Armita, D., & Sudaryanto, W. T. (2022). Manajemen Edukasi Terhadap Pencegahan Low Back Pain (LBP) pada Ikatan Keluarga Madrasah Raudatul Ulum Surakarta. *Jurnal Pengabdian Masyarakat*. https://doi.org/10.30640/abdimas45.v1i2.318

Dingding, S. O., Valdez, S. A. D., Ong, N. W. R., Macantan, J. M., Abas, J. C., Querubin, M. F., & Faller, E. M. (2022). A review on the effectiveness of massage therapy in pain management and treatment. *International Journal of Research Publication and Reviews*. https://doi.org/10.55248/gengpi.2022.3.6.4

El-Sayed, A., Cervoni-Rosario, B., & Harrast, M. A. (2023). Lumbar spine. In B. J. Krabak & A. Brooks (Eds.), *The youth athlete* (pp. 353–367). Academic Press. https://doi.org/10.1016/B978-0-323-99992-2.00056-6

Fatmawati, V., & Khotimah, S. (2015). Hubungan antara lama duduk dan sikap duduk dengan keluhan nyeri punggung bawah pada pengrajin batik kayu di desa wisata krebet bantul Yogyakarta. Jurnal Fisioterapi, 15(2), 105-111.

Fryer, G., & Hodgson, L. (2005). The effect of manual pressure release on myofascial trigger point in the upper trapezius muscle. Journal of Bodywork and Movement Therapies, 9(4), 248-255.

Guney, E., & Ucar, T. (2021). Effects of deep tissue massage on pain and comfort after cesarean: a randomized controlled trial. Clompementary Therapis in Clinical Practice, 43, 1-7.

Horner, P., Abshari, S., & Grove, C. (2020). *Massage: An alternative approach to pain management.* https://doi.org/10.1097/01.NURSE.0000657036.52377.00

Juliatri., Doda, D. V. D., & Palandeng, O. E. L. I. (2021). Faktor risiko nyeri punggung bawah pada dokter gigi di Sulawesi Utara. e-Gigi, 9(1), 107-117.

Kim, B., & Yim, J. (2020). *Core Stability and Hip Exercises Improve Physical Function and Activity in Patients with Non-Specific Low Back Pain: A Randomized Controlled Trial*. The Tohoku Journal of Experimental Medicine, 251(3), 193–206. https://doi.org/10.1620/tjem.251.193

Metgud, S. C., Monteiro, S. S., Heggannavar, A., & D'Silva, P. V. (2020). Effect of integrated neuromuscular inhibition technique on trigger points in patients with nonspecific low back pain: randomized controlled trial. Indian Journal of Physical Therapy and Research, 2(2), 99.

Nugraha, R. F., Respati, T., & Rachmi, A. (2020). Faktor risiko nyeri punggung bawah pada ibu rumah tangga. Jurnal Integrasi Kesehatan dan Sains (JIKS), 2(1), 35-38.

Phansopkar, P. A., & Kage, V. (2014). Efficacy of Mulligan's two leg rotation and bent leg raise techniques in hamstring flexibility in subjects with acute non-specific low back pain: Randomized clinical trial. *International Journal of Physiotherapy and Research*, 2(5), 733–741. https://doi.org/10.16965/ijpr.2014.682

Purwata, T. E., Munawaroh, Z., & Pradana, H. (2015). Neuropathic pain in Indonesia: An observational study on neuropathic pain management and patient quality of life. *Neurology Asia*, *20*(4), 361–367.

Rokade, P. B. (2011). Release of Endomorphin Hormone and Its Effects on Our Body and Moods: A Review. Dipresentasikan pada *International Conference on Chemical, Biological and Environment Sciences (ICCEBS'2011)*, Bangkok, Desember 2011.

Romanowski, M., Romanowska, J., & Grześkowiak, M. (2012). A comparison of the effects of deep tissue massage and therapeutic massage on chronic low back pain. In Research into Spinal Deformities 8, 176, 411-414.

Saraswati, P. A. S., Thanaya, S. A. P., & Nugraha, M. H. S. (2022). The effectiveness of back massage and ultrasound therapy combined with home-based exercise in reducing disability in mechanical low back pain. *Sport and Fitness Journal*. https://doi.org/10.24843/spj.2022.v10.i01.p04

Sarrafzadeh, J., Ahmadi, A., & Yassin, M. (2012). The effects of pressure release, phonophoresis of hydrocortisone, and ultrasound on upper trapezius latent myofascial trigger point. Archives of Physical Medicine and Rehabilitation, 93(1), 72-77.

Sulistyawati, Devi., Wiguna, I. N. A. P., & Aritama, I. P. K. (2019). Pemberian ultrasound lebih baik daripada infrared terhadap penurunan nyeri pada kasus nyeri punggung bawah miogenik. Bali Helath Journal, 3(2), 30-35.

Supliyani, E. (2017). Pengaruh masase punggung terhadap intensitas nyeri persalinan kala 1 di kota bogor. Jurnal Kebidanan "Mildwife Journal", 3(1), 22-29.

Urits, I., Burshtein, A. L., Sharma, M., Testa, L., Gold, P. A., Orhurhu, V., Viswanath, O., Jones, M. R., Sidransky, M. A., Spektor, B., & Kaye, A. D. (2019). Low Back Pain, a Comprehensive Review: Pathophysiology, Diagnosis, and Treatment. *Current Pain and Headache Reports*. https://doi.org/10.1007/S11916-019-0757-1

Vasudevan, S. (2015). *Common Pain Problems: Low Back Pain*. https://doi.org/10.1007/978-3-319-20322-5_9

Weerapong, P., Hume, P. A., & Kolt, G. S. (2004). Stretching: mechanisms and benefits for sport performance and injury prevention. Physical Therapy Reviews, 9, 189-206.

Will, J. S., Bury, D. C., & Miller, J. A. (2018). Mechanical Low Back Pain. *American family physician*, *98*(7), 421–428.

Wilson, E., et al. (2003). Prevalence and risk factors for back pain in sports: a systematic review with meta-analysis. British Journal of Sports Medicine, 55(11), 601–607. https://doi.org/10.1136/bjsports-2021-105022

Zheng, Z., Wang, J., Gao, Q., Hou, J., Ma, L., Jiang, C., & Chen, G. (2012). Therapeutic evaluation of lumbar tender point deep massage for chronic non-specific low back pain. Journal of Traditional Chinese Medicine, 32(4), 534-537.