



The Intervention of Slow-Stroke Back Massage Cutaneous Stimulus Techniques in Patients with Rheumatoid Arthritis

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Received: May 11, 2023

Revised: June 25, 2023

Accepted: July 25, 2023

Published: July 31, 2023

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DOI: [10.29303/jppipa.v9i7.4449](https://doi.org/10.29303/jppipa.v9i7.4449)

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Abstract: Rheumatoid Arthritis (RA) is the highest order of disease in the elderly in Indonesia in 2020 where with a percentage value of 49% and this disease occurs more frequently in women than in men. Treatment of pain in RA patients can be done with pharmacological therapy and non-pharmacological therapy. The aim of the study was to respondent's intervention technic slow-stroke back massage cutaneous stimulus pada patient RA patients in the working area of the Pariaman Health Center. This research is a quantitative type using a quasi-experimental research design method. In this study design, there was an intervention group without a control group. Research design approach with one group pretest-posttest. The conclusion obtained in this study was that RA elderly respondents in the working area of the Pariaman Health Center were the female sex was 16 respondents (53.30%), and the male sex was 14 respondents (46.70%). The RA elderly pain scale before being given Kutaneus Slow-Stroke Back Massage therapy in the working area of the Pariaman Health Center, namely 26 respondents (86.70%) experienced moderate pain and 4 respondents (13.30%) experienced mild pain. Pain scale in elderly RA after being given Kutaneus Slow-Stroke Back Massage therapy in the working area of the Pariaman Health Center, namely 16 respondents (53.30%) experienced mild pain and 14 respondents (46.70%) experienced moderate pain.

Keywords: Cutaneous stimulus slow-stroke back massage; Pain intensity; Rheumatoid arthritis

Introduction

Rheumatoid arthritis (RA) causes severe pain that can hinder daily activities. RA is a serious chronic disease almost all over the world, especially in elderly women. RA is synonymous with high levels of uric acid in the blood, calcification of the joints, and metabolic syndrome. RA is a chronic, inflammatory, systemic autoimmune disease that affects the joints with varying degrees of severity among patients. Risk factors include age, gender, genetics, and environmental exposure. Many complications can occur, such as permanent joint damage requiring arthroplasty, rheumatoid vasculitis, and Felty's syndrome requiring splenectomy if left untreated. RA is chronic, that is, it can heal and recur repeatedly, causing joint damage (Radu & Bungau, 2021). RA can be suffered by young or old people, but it

is the elderly who are most at risk of recurrence.

In 2016, the World Health Organization (WHO) informed that the number of sufferers of RA had reached 355 million people worldwide. The number of RA sufferers will continue to increase by 25% until 2025. In Indonesia, it is known that the prevalence of RA based on symptoms has increased from 2.47% to 7.30% in 2018. Based on data from Basic Health Research in 2020, information was obtained that 40% of RA is suffered by elderly women. In Pariaman, West Sumatra, it is known that 14,062 people suffer from RA with complaints of joint pain. Treatment of joint pain by nurses needs to be done so that patients feel comfortable. Handling joint pain can be done using various joint pain relief techniques. Diagnosis of joint pain must be fast so that the cause of infection and inflammatory disease of the RA joint can be identified (Kaeley et al., 2020).

How to Cite:

Aprihatin, Y., Andriani, L., & Yanti, E. (2023). The Intervention of Slow-Stroke Back Massage Cutaneous Stimulus Techniques in Patients with Rheumatoid Arthritis. *Jurnal Penelitian Pendidikan IPA*, 9(7), 5710-5715. <https://doi.org/10.29303/jppipa.v9i7.4449>

Inflammation of the RA joint circumference requires special therapy to prevent damage to the sufferer's joints and joint pain. Joint pain causes sufferers to worry about moving, interferes with activities, frustration, and reduces the patient's quality of life. The character of pain, the onset and clinical course of joint pain, the pattern of disease attacks in the joints, and the age at the onset of the clinical picture are the obvious clinical manifestations (Jutley et al., 2017). In the interest of synovia, the examination can provide clues about the disease (Seyhan & Carini, 2019). The causes can be inflammatory, degenerative, infectious, metabolic, and joint pain. Joint pain can be treated with pharmacological therapy and non-pharmacological therapies.

Pharmacological therapy using Cyclooxygenase Inhibitors (COX inhibitors) can cause gastrointestinal disorders, bleeding in the gastrointestinal tract, peptic ulcers, perforation, and kidney disorders (Kuna et al., 2019). Non-pharmacological therapy is preferred by patients in dealing with pain compared to pharmacological therapy. There are several examples of non-pharmacological therapy, namely distraction, relaxation, guided imagery, hypnosis, and cutaneous stimulation (De Paolis et al., 2019). The cutaneous stimulus is a slow-stroke back massage to provide comfort, increase blood circulation, and relax the patient. Previous research related to slow-stroke back massages has been carried out by several researchers. Research conducted by Asman, 2020 examines the effect of Slow-Stroke Back Massage cutaneous stimulus in RA patients (Asman et al., 2022).

Subsequent research examines the effect of the cutaneous stimulus, a slow stroke back massage on pain intensity in rattan craftsmen who suffer from low back pain. Likewise examines the effect of slow stroke back massage cutaneous stimulation on the intensity of osteoarthritis pain in the elderly. Furthermore, studied the effect of cutaneous slow-stroke back massage stimulus on the pain scale of primary dysmenorrhea in females (López-Liria et al., 2021). Based on previous research, it appears that not much has been studied about the effectiveness of cutaneous slow-stroke back massage stimulation on pain intensity in RA patients. In addition, a preliminary survey conducted by the research team at the Pariaman Health Center found 15 people complaining of pain in their joints, 5 out of 15 people said the pain they experienced was very disturbing to their daily activities, disturbing rest and sleep, 8 out of 15 people said the impact of pain has caused many problems in his family such as not being able to do a job or earn a living to fulfill his daily needs.

Based on these conditions, as health workers it is necessary to apply a cutaneous stimulus technique slow-

stroke back massage, and its effects that can provide a sense of comfort for sufferers of RA. This is useful to assist in reducing the pain felt by RA sufferers so that sufferers can move and work. The research objective was to Respondents to the intervention technique slow-stroke back massage cutaneous stimulus in RA patients in the working area of the Pariaman Health Center.

Method

This research was conducted in South Pariaman District, West Sumatra and the type of research was quantitative using a quasi-experimental research design. In this study design, there was an intervention group but the researchers did not use a control group. Research design approach with one group pretest-posttest. The population and sample are 30 elderly respondents with a total sampling technique using a paired t-test approach. The data collection technique was carried out by asking for informed consent from the respondent, before the respondent was given a slow-stroke back massage cutaneous stimulus intervention, the researcher carried out a description of the pain scale in the elderly who underwent a slow-stroke back massage cutaneous stimulus for RA sufferers in the working area of the Pariaman Health Center through sheets prepared pain scale.

Result and Discussion

The results of this study were used to see the frequency distribution of respondents based on gender, pain scale before the slow-stroke back massage cutaneous stimulus technique, and pain scale after the slow-stroke back massage cutaneous stimulus technique for those suffering from RA:

Table 1. Respondents Based on the Sex of RA Sufferers in the Working Area of the Pariaman Health Center

Gender	N	Percentage (%)
Man	14	46.70
Woman	16	53.30
Total	30	100

Based on table 1, shows that the sex of RA sufferers in the working area of the Pariaman Health Center is mostly female, namely 16 (53.3%) of whom are male, 14 (46.70%).

Based on table 2, the frequency distribution of the respondents' pain scale before the cutaneous stimulus technique, slow-stroke back massage, RA sufferers in the working area of the Pariaman Health Center, most of them fall into the moderate pain scale category, namely 26 (86.70%), while those in the mild pain scale category are 4 (13.30%).

Table 2. Respondents Based on Pain Scale Before the Slow-Stroke Back Massage Cutaneous Stimulus Technique for RA Patients in the Working Area of the Pariaman Health Center

Pain N	Percentage	(%)
Mild Pain	4	13.30
Moderate Pain	26	86.70
Total	30	100

Table 3. Respondents Based on Pain Scale After the Intervention of the Slow-Stroke Back Massage Cutaneous Stimulus Technique for RA patients in the Working Area of the Pariaman Health Center

Painful	N	Percentage (%)
Mild Pain	16	53.30
Moderate Pain	14	46.70
Total	30	100

Respondents Based on the Sex of RA Sufferers in the Work Area of the Pariaman Health Center

The results of this study also confirm the theoretical explanation that women have a high risk of experiencing joint disorders, including pain due to RA. Women who have entered menopause and are entering old age will experience a decrease in hormones in the form of estrogen which has an impact on the imbalance of osteoblasts and osteoclasts resulting in a decrease in bone mass causing thinning bones, hollow joints, joint stiffness, flaking of joint cartilage resulting in joint pain including joint pain. Joints because RA (Maeda et al., 2022).

According to Fernanda Romo-García et al. (2020) circumstances where the elderly female gender has a higher risk of experiencing RA pain, is due to the influence of hormones. One of them is the hormone estrogen, which plays a role in regulating the menstrual process and maintaining bone mass so that in the elderly there is a decrease in hormone production, causing women to be at risk of experiencing bone disorders, one of which is RA (McCarthy & Raval, 2020).

Respondents Based on the Pain Scale Before the Cutaneous Stimulus Technique Slow-Stroke Back Massage to RA Patients in the Working Area of the Pariaman Health Center

The results of this study are one of the clinical manifestations which show that most of the elderly experience pain in the moderate category. Where moderate pain is experienced by the elderly objectively can be seen from the elderly often making sounds like hissing, and sometimes grinning, the elderly are also still able to indicate the location of the pain they are experiencing and can describe the condition of the pain they are experiencing and can follow orders related to nonpharmacological management to reduce pain. the pain they experienced. The results of Rahmat et al. (2021)

this study where the pain scale data before therapy the respondents experienced a pain scale of 6 or moderate pain with a total of 12 respondents, while the lowest pain scale was 2 or a mild pain scale of a total of 3 respondent. The pain experienced by the elderly often occurs in the knees, feet, hips, hands, and in various other joints.

Mills et al. (2019) states that the severity of pain is determined by perception factors. Perception is the result of the reconstruction of the central nervous system about the pain impulses received. Reconstruction is the result of the interaction of the sensory nervous system, cognitive information, and emotional experience. This continuous interaction mutually influences a person's perception of pain, the impulse delivery process, and the patient's response to the pain itself. Research conducted by Germossa et al. (2019) said that where the highest pain intensity before therapy was 9 respondents (60%).

These data show the same results as the research Anggraeni et al. (2023) that has been done where the category of pain most commonly experienced by elderly people with RA is moderate pain. This pain is a form of unpleasant subjective sensory and emotional experience due to tissue damage, especially in the joints of the elderly with rheumatoid arthritis. Pain in RA sufferers is caused by Macfarlane et al. (2022) that inflammation caused by an immunological process in the synovial section which if left alone will have an impact on the formation of synovitis and the formation of pannus so that in the long term it will cause joint damage. The impact of this damage will free the release of inflammatory substances in this will occur the release of prostaglandin, prostacyclin, and thromboxane (Wang et al., 2021). Prostaglandins produced through the cyclooxygenase pathway will cause pain and inflammatory reactions.

The results of this study were also supported by research conducted that before being given cutaneous stimulus technique therapy, and slow-stroke back massage, the average pain scale felt by patients was 4.83 with a median value of 5. Meanwhile, after being given cutaneous stimulus therapy, and slow-stroke back massage, the average pain scale felt by patients was 2.67 with a median value of 2.5. According to Mota et al. (2019), where interventions in pain management are pharmacological and non-pharmacological. One of the non-pharmacological techniques used to reduce pain is skin and muscle stimulation techniques (slow-stroke back massage) which is an alternative in providing therapy to reduce pain because it is easy to do so it can be done by families, does not require high costs expensive and does not require an active role from the mother so that it can be done even though the mother's response to pain is excessive (El Geziry et al., 2018).

Respondents Based on the Pain Scale After the Slow-Stroke Back Massage Cutaneous Stimulus Technique for RA Patients in the Working Area of the Pariaman Health Center

This message is an action that can provide comfort that can relieve tension, relax the patient and improve circulation. The workings of this slow-stroke back massage can cause the release of endorphins, thus blocking the transmission of painful stimuli (Pilozzi et al., 2020). Techniques for doing slow-stroke back massage can be done in several approaches, one of the methods used is to gently and rhythmically rub the client's skin with your hands, circular motions at a speed of 60 strokes per minute (Bahceli et al., 2022). The movement starts in the middle of the lower back and then moves up to the left and right shoulder area.

Marfuah et al. (2019), pain intensity is a description of how severe the pain is felt by the individual. Measurement of pain intensity is highly subjective and individual, and the likelihood of pain of the same intensity is felt very differently by two different people. The use of lotions in carrying out therapy is expected to provide a warm sensation and result in local vasodilation. Vasodilation will increase blood circulation in the area that is rubbed so that cell activity increases and will reduce pain. Other therapeutic values of back massage include reducing muscle tension and promoting physical and psychological relaxation (Mylonas et al., 2021).

Furthermore, (Parra-Fernández et al., 2020) it is known that the average pain intensity after giving a cutaneous slow-stroke back massage stimulus to RA patients is 23.1 (mild pain scale) with the highest pain scale being 4 and the lowest being 0. The difference in decreasing pain scale intensity is 22.6, which means that there has been an average decrease painful. The intensity of pain felt by respondents before giving the intervention entirely (100%) reported moderate level pain and the pain intensity of respondents after giving a cutaneous slow-stroke back massage stimulus was obtained by approximately two-thirds of respondents (71.4%) reported mild pain and more than a quarter (28.6%) moderate pain.

Sujianto et al. (2019) also found results that slow-stroke back massage cutaneous stimulation can significantly reduce pain in RA patients with a p-value = 0.000. According to Ong Sio et al. (2023) the effect of slow-stroke back massage cutaneous stimulation on RA is due to a mechanism for reducing pain which can be explained by the gate control theory. Namely, the intensity of pain is reduced by blocking the transmission of pain at the gate, and the endorphin theory, namely the decrease in pain intensity is influenced by increased levels of endorphins in the body so that the individual's perception of pain decreases (Indriani et al., 2022). After cutaneous stimulation, and slow-stroke back massage,

the A beta nerve fibers which are abundant in the skin will be stimulated so that the gate closes and the pain stimulus is not transmitted to the brain. In addition, endorphins are also released so that levels increase. Both of these cause a decrease in the intensity and value of the pain scale felt by the research subjects.

The mechanism of slow-stroke back massage with gentle strokes provides a warm sensation by causing local blood vessel vasodilation (Suwaryo et al., 2022). The theory and results of this study are also in line with the opinion of (Pilozzi et al., 2020) who stated that cutaneous massage is a non-pharmacological action that aims to relieve pain by blocking the transmission of painful stimuli by encouraging the release of endorphins. Massage and touch are sensory integration techniques that affect the activity of the nervous system so that if the individual perceives touch as a stimulus to relax, then a relaxation response will appear (Grandi & Bruni, 2023). Relaxation is very important in helping clients to increase comfort and free themselves from endless pain. Based on this, to overcome RA in respondents, the researchers hope that RA sufferers and their families will not only know about how to perform cutaneous slow-stroke back massages but are expected to be able to apply this technique to their family members who are experiencing RA pain.

Conclusion

The sex of the RA elderly respondents in the working area of the Pariaman Health Center was the female sex was 16 respondents (53.30%) and the male sex was 14 respondents (46.70%). Pain scale in elderly RA before being given Kutaneus Slow-Stroke Back Massage therapy in the working area of the Pariaman Health Center, namely 26 respondents (86.70%) experienced moderate pain and 4 respondents (13.30%) experienced mild pain. Pain scale in elderly RA after being given Kutaneus Slow-Stroke Back Massage therapy in the working area of the Pariaman Health Center, namely 16 respondents (53.30%) experienced mild pain and 14 respondents (46.70%) experienced moderate pain.

Acknowledgments

Thanks to all parties who have supported the implementation of this research. I hope this research can be useful.

Author Contributions

Conceptualization, Yessy Aprihatin, Linda Andriani, and Erpita Yanti; methodology, Linda Andriani; validation, Yessy Aprihatin, and Erpita Yanti; formal analysis, Erpita Yanti; investigation, Yessy Aprihatin, and Linda Andriani; resources, Erpita Yanti and Linda Andriani; data curation, Linda Andriani; writing-original draft preparation, Erpita Yanti, and Yessy Aprihatin; writing-review and editing, Erpita Yanti; visualization, Yessy Aprihatin, and Erpita Yanti; supervision,

Linda Andriani; project administration, Erpita Yanti; funding acquisition, Yessy Aprihatin and Linda Andriani. All authors have read and agreed to the published version of the manuscript.

Funding

This research was independently funded by researchers.

Conflicts of Interest

No Conflicts of interest.

References

- Anggraeni, R., Villayatina, V., Jati, R. P., Aeni, Q., & Nurwijayanti, A. M. (2023, May). Description of the Characteristics of Barriers to Pain Comfort: Sleep Quality in Elderly with Rheumatoid Arthritis in Kendal Regency. In *Proceedings of the International Conference on Nursing and Health Sciences* (Vol. 4, No. 1, pp. 113-118). Retrieved from <https://www.jurnal.globalhealthsciencegroup.com/index.php/PICNHS/article/view/1715>
- Asman, A., Asman, A. A., Asman, A., & Asman, A. A. (2022). Effect of slow stroke back massage nursing (SSBMN) cutaneous stimulus on pain intensity on sweet food cravings (Arai Pinang) suffering low back pain (LBP). *International Journal of Health Sciences*, 3054-3061. <https://doi.org/10.53730/ijhs.v6nS9.13197>
- Bahceli, P. Z., Arslan, S., & Ilik, Y. (2022). The effect of slow-stroke back massage on chemotherapy-related fatigue in women with breast cancer: An assessor blinded, parallel group, randomized control trial. *Complementary Therapies in Clinical Practice*, 46, 101518. <https://doi.org/10.1016/j.ctcp.2021.101518>
- De Paolis, G., Naccarato, A., Cibelli, F., D'Alete, A., Mastroianni, C., Surdo, L., Casale, G., & Magnani, C. (2019). The effectiveness of progressive muscle relaxation and interactive guided imagery as a pain-reducing intervention in advanced cancer patients: A multicentre randomised controlled non-pharmacological trial. *Complementary Therapies in Clinical Practice*, 34, 280-287. <https://doi.org/10.1016/j.ctcp.2018.12.014>
- El Geziry, A., Toble, Y., Al Kadhi, F., & Pervaiz and Mohammad Al Nobani, M. (2018). Non-Pharmacological Pain Management. In N. A. Shallik (Ed.), *Pain Management in Special Circumstances*. IntechOpen. <https://doi.org/10.5772/intechopen.79689>
- Fernanda Romo-García, M., Zapata-Zuñiga, M., Antonio Enciso-Moreno, J., & Enrique Castañeda-Delgado, J. (2020). The Role of Estrogens in Rheumatoid Arthritis Physiopathology. In R. Hamdy A. Mohammed (Ed.), *Rheumatoid Arthritis – Other Perspectives towards a Better Practice*. IntechOpen. <https://doi.org/10.5772/intechopen.93371>
- Germossa, G. N., Hellesø, R., & Sjetne, I. S. (2019). Hospitalized patients' pain experience before and after the introduction of a nurse-based pain management programme: A separate sample pre and post study. *BMC Nursing*, 18(1), 40. <https://doi.org/10.1186/s12912-019-0362-y>
- Grandi, L. C., & Bruni, S. (2023). Social Touch: Its Mirror-like Responses and Implications in Neurological and Psychiatric Diseases. *NeuroSci*, 4(2), 118-133. <https://doi.org/10.3390/neurosci4020012>
- Indriani, I., & Hardyanti, S. (2022). A Descriptive Study of Gestational Diabetes Mellitus in Yogyakarta. *Journal of Maternal and Child Health*, 7(2), 183-192. <https://doi.org/10.26911/thejmch.2022.07.02.04>
- Jutley, G. S., Latif, Z. P., & Raza, K. (2017). Symptoms in individuals at risk of rheumatoid arthritis. *Best Practice & Research Clinical Rheumatology*, 31(1), 59-70. <https://doi.org/10.1016/j.berh.2017.09.016>
- Kaeley, G. S., Bakewell, C., & Deodhar, A. (2020). The importance of ultrasound in identifying and differentiating patients with early inflammatory arthritis: A narrative review. *Arthritis Research & Therapy*, 22(1), 1. <https://doi.org/10.1186/s13075-019-2050-4>
- Kuna, L., Jakab, J., Smolic, R., Raguz-Lucic, N., Vcev, A., & Smolic, M. (2019). Peptic Ulcer Disease: A Brief Review of Conventional Therapy and Herbal Treatment Options. *Journal of Clinical Medicine*, 8(2), 179. <https://doi.org/10.3390/jcm8020179>
- López-Liria, R., Torres-Álamo, L., Vega-Ramírez, F. A., García-Luengo, A. V., Aguilar-Parra, J. M., Trigueros-Ramos, R., & Rocamora-Pérez, P. (2021). Efficacy of Physiotherapy Treatment in Primary Dysmenorrhea: A Systematic Review and Meta-Analysis. *International Journal of Environmental Research and Public Health*, 18(15), 7832. <https://doi.org/10.3390/ijerph18157832>
- Macfarlane, F. R., Chaplain, M. A. J., & Eftimie, R. (2022). Modelling rheumatoid arthritis: A hybrid modelling framework to describe pannus formation in a small joint. *Immunoinformatics*, 6, 100014. <https://doi.org/10.1016/j.immuno.2022.100014>
- Maeda, K., Yoshida, K., Nishizawa, T., Otani, K., Yamashita, Y., Okabe, H., Hadano, Y., Kayama, T., Kurosaka, D., & Saito, M. (2022). Inflammation and Bone Metabolism in Rheumatoid Arthritis: Molecular Mechanisms of Joint Destruction and Pharmacological Treatments. *International Journal of Molecular Sciences*, 23(5), 2871. <https://doi.org/10.3390/ijms23052871>

- Marfuah, D., Nurhayati, N., Mutiar, A., Sumiati, M., & Mardiani, R. (2019). Pain Intensity among Women with Post-Caesarean Section: A Descriptive Study. *KnE Life Sciences*. <https://doi.org/10.18502/kl.v4i13.5322>
- McCarthy, M., & Raval, A. P. (2020). The perimenopause in a woman's life: A systemic inflammatory phase that enables later neurodegenerative disease. *Journal of Neuroinflammation*, 17(1), 317. <https://doi.org/10.1186/s12974-020-01998-9>
- Mills, S. E. E., Nicolson, K. P., & Smith, B. H. (2019). Chronic pain: A review of its epidemiology and associated factors in population-based studies. *British Journal of Anaesthesia*, 123(2), e273–e283. <https://doi.org/10.1016/j.bja.2019.03.023>
- Mota, M., Cunha, M., Santos, M. R., Silva, D., & Santos, E. (2019). Non-pharmacological interventions for pain management in adult victims of trauma: A scoping review protocol. *JB I Database of Systematic Reviews and Implementation Reports*, 17(12), 2483–2490. <https://doi.org/10.11124/JBISRIR-2017-004036>
- Mylonas, K., Angelopoulos, P., Tsepis, E., Billis, E., & Fousekis, K. (2021). Soft-Tissue Techniques in Sports Injuries Prevention and Rehabilitation. In R. Tairar (Ed.), *Contemporary Advances in Sports Science*. IntechOpen. <https://doi.org/10.5772/intechopen.96480>
- Ong Sio, L. C., Hom, B., Garg, S., & Abd-Elseyed, A. (2023). Mechanism of Action of Peripheral Nerve Stimulation for Chronic Pain: A Narrative Review. *International Journal of Molecular Sciences*, 24(5), 4540. <https://doi.org/10.3390/ijms24054540>
- Parra-Fernández, M. L., Onieva-Zafra, M. D., Abreu-Sánchez, A., Ramos-Pichardo, J. D., Iglesias-López, M. T., & Fernández-Martínez, E. (2020). Management of Primary Dysmenorrhea among University Students in the South of Spain and Family Influence. *International Journal of Environmental Research and Public Health*, 17(15), 5570. <https://doi.org/10.3390/ijerph17155570>
- Pilozzi, A., Carro, C., & Huang, X. (2020a). Roles of β -Endorphin in Stress, Behavior, Neuroinflammation, and Brain Energy Metabolism. *International Journal of Molecular Sciences*, 22(1), 338. <https://doi.org/10.3390/ijms22010338>
- Pilozzi, A., Carro, C., & Huang, X. (2020b). Roles of β -Endorphin in Stress, Behavior, Neuroinflammation, and Brain Energy Metabolism. *International Journal of Molecular Sciences*, 22(1), 338. <https://doi.org/10.3390/ijms22010338>
- Radu, A.-F., & Bungau, S. G. (2021). Management of Rheumatoid Arthritis: An Overview. *Cells*, 10(11), 2857. <https://doi.org/10.3390/cells10112857>
- Rahmat, N. C. A., Setyaningsih, Y., & Suroto, S. (2021). The Effect of Dynamic Stretching On Musculoskeletal Disorders (MSDs) In Smoked Fish Workers. *Jurnal Keterampilan Fisik*, 128–135. <https://doi.org/10.37341/jkf.v0i0.286>
- Seyhan, A. A., & Carini, C. (2019). Are innovation and new technologies in precision medicine paving a new era in patients centric care? *Journal of Translational Medicine*, 17(1), 114. <https://doi.org/10.1186/s12967-019-1864-9>
- Sujianto, U., & Johan, A. (2019). Effects of Therapeutic Touch to Reduce Anxiety as a Complementary Therapy: A Systematic Review. *KnE Life Sciences*. <https://doi.org/10.18502/kl.v4i13.5237>
- Suwaryo, P. A. W., Aminah, S., Waladani, B., Setianingsih, E., & Setianingsih, R. (2022). Physiotherapy Treatment of Hypertension Patients to Reduce Headache Using Slow Stroke Back Massage Therapy. In I. Permana & E. Rochmawati (Eds.), *Proceedings of the International Conference on Sustainable Innovation on Health Sciences and Nursing (ICOSI-HSN 2022)* (pp. 176–182). Atlantis Press International BV. https://doi.org/10.2991/978-94-6463-070-1_22
- Wang, B., Wu, L., Chen, J., Dong, L., Chen, C., Wen, Z., Hu, J., Fleming, I., & Wang, D. W. (2021). Metabolism pathways of arachidonic acids: Mechanisms and potential therapeutic targets. *Signal Transduction and Targeted Therapy*, 6(1), 94. <https://doi.org/10.1038/s41392-020-00443-w>