

## **THE EFFECT COMBINATION OF ISOTONIC EXERCISE AND EDUCATION FOR LOWER BACK PAIN RELIEF FOR LAUNDRY WORKERS IN PABELAN VILLAGE**

**Dwi Kurniawati\*, Agus Kresna Ardiyana**

Department of Physiotherapy, Faculty of Health Science, Universitas Muhammadiyah Surakarta

[dk122@ums.ac.id](mailto:dk122@ums.ac.id) (Dwi Kurniawati)

Laundry is one type of informal businesses, which has been growing rapidly in the community. Laundry workers generally conduct drying, squeezing, rinsing, lifting, folding, and ironing. These can lead to musculoskeletal disorders, which are generally felt in the lower back. In order to overcome the problem of lower back pain, one can do exercises Combination of Isotonic (COI) and education. The aim of this study was to investigate the effect of exercise Combination of Isotonic (COI) and Education on reducing low back pain (LBP) in the laundry workers who experienced lower back pain in the village Pabelan Muhammadiyah University of Surakarta. The design of this study was observational with Quasi Experimental research design Pre and Post Two Group Design by comparing the two groups, namely, exercise Combination of Isotonic (COI) and education in the form of stretching exercises m. hamstring conducted over 4 weeks with 18 respondents. There was a study using the Wilcoxon's test and Mann Whitney influence to test different influences. The results of the study showed the effect of exercise Combination of Isotonic (COI) and Education by using Wilcoxon test. Namely, Combination of Isotonic exercises (COI) with the results mean  $p = 0.007$   $p < 0.05$  could be concluded that there was no effect on the reduction of lower back pain, and from Education with the results mean  $p = 0.025$   $p > 0.05$  could be concluded that there was no influence on the decline lower back pain. As well as the results of different test exercises which influenced the treatment between Combination of Isotonic (COI) and Education was measured by using Mann Whitney test with the results mean  $p = 0.002$   $p < 0.05$ . It could be concluded that there was a difference between the effect of combination of isotonic exercises (COI) and education to relief lower back pain. Finally, it could be concluded that there was a difference between the effects of exercise Combination Of Isotonic (COI) and Education to the decrease lower back pain.

**Keywords: Exercise Combination of Isotonic (COI), Education, Lower Back Pain.**

### **Presenting Author Biography**



**Dwi Kurniawati.** A physiotherapist and a lecturer at Department of Physiotherapy, Faculty of Health Science, Universitas Muhammadiyah Surakarta, Indonesia.

## INTRODUCTION

The incidence and severity of lower back pain disorders (LBP) is more common in women workers than men. The prevalence of low back pain in Indonesia showed that 60% of adults experience low back pain. The terms of the incidence of low back pain usually began when they were between 20 years - 55 years old and a maximum of 30 years of age (<40 years)[1].

Static position at work is the main factor that can not be avoided. If the static state is constantly suffered or experienced, there is no doubt that it will cause health problems such as low back pain. According to Tulder [2], LPB is not a disease or diagnosis that indicates a disease but refers to clinical syndromes with the manifestations of pain and complaints of discomfort such as tension or muscle stiffness in the region of lower back, which starts in Vertebrae Thorax XII to the anus [2]. The experienced LBP could result in lost of work hours that might interfere with work productivity. Furthermore, sitting for a long period of time could cause excessive weight and tissue damage in the lumbar spine [1].

The states of exercise therapy in the case of LBP with new methods such as Proprioceptive Neuromuscular Facilitation (PNF) techniques Combination of Isotonic (COI) will be more effective because it is an exercise designed to improve neuromuscular response mechanisms by stimulating proprioceptors. The exercise pattern of PNF itself has a spiral pattern, and a diagonal direction that is synergistic with the central system of muscle control, as well as the performance of the exercise patterns and the adjustment is in line with the used muscle fibers. The performance of PNF patterns movement itself can stimulate the muscles to work in a way to optimize muscle function that is used in performing a movement [3].

The provision of education that could be done independently could help reduce the pain that is being experienced by a person. Education alone is an event that seeks to promote knowledge of health of a person or group; therefore, one can understand the management of risk factors for disease, and promote healthy behavior in the effort to improve the health status and prevent a resurgence of the disease. Knowledge and abilities could be given to people by practice and study the newly-acquired knowledge or just to provide them with instruction [4]. Laundry industry that takes place in a household has flourished in the campus environment and among students; the industry piques the students' interest and this industry is very helpful in lessening the students' burden. In general, laundry job is divided into three main phases, such as: washing, drying and ironing.

Lower Back Pain (LBP) is a pain in the lumbar and lumbosacral. This pain has very diverse sharpness and intensity. The pain can be caused by muscle strain or pressure on a nerve root, back pain is usually felt as pain, stress, or stiffness in the back. This pain can be worsened by improper posture while sitting or standing, looking down the wrong way, or lifting heavy things [5]. In order to determine the type of LPB complaint suffered by the subjects, they were asked to do some specific tests such as the Straight Leg Rising Test (Laseigue's Test) and Sitting Root Test to determine the type of back pain they experienced [6]. Lower back muscle strength and stretching is used for a wide range of activities, such as standing, walking and lifting. Lordotik lumbar posture is a natural posture which can not be changed. A person who experience chronic low back pain showed that his lumbar extensor muscles are weaker than the flexor muscles; hence, he cannot lift heavy weights. Muscle itself is actually not clear as the source of the pain, but the muscle spindles clearly innervated by the sympathetic nervous system with chronic hyperactivity, sympathetic system (as in anxiety), muscle spasms spindles; thus, it feels the sense of tenderness.

The tenderness due to muscle attachment causes the experience of chronic inflammation that will cause pain. The imperfect muscle attachment imperfect will release harmful emission nerve stimulation resulting in pain, thereby inhibiting muscle activity. It is proven that it has no direct relationship between the amounts of harmful stimuli inhibiting the function of muscles with muscle strength available. Once pain is eliminated, there will be greater muscle power. Therefore, the decline in muscle strength may be related to pain, exercise can stimulate the recovery of muscle strength [2].

The working posture of the regulation of body posture changes while working. Different working attitudes will produce different muscle strengths. At work, it should be done posture naturally so as to minimize the incidence of musculoskeletal injuries. The leisure is achieved when workers have done a good and safe working posture [7].

Sitting position requires less energy than standing, because it can reduce the amount of static load on leg muscles. However, wrong sitting posture will cause problems on back, for example laundry employee with incorrect posture will suffer on their back. The pressure on the spine will increase when sitting compared to when standing or lying down. If it is assumed that in normal position, the pressure is about 100%, when a person is sitting tensely or stiffly (erect posture), it can cause the pressure reaches 140% and when a person sit by bending forward, it will cause the pressure to reach 190%. Tense posture requires more muscle activity of the spinal posture by leaning forward [8].

Oswestry Disability Index (ODI) is a questionnaire designed to facilitate medical personnel such as physiotherapists to obtain data on the level of lower back pain suffered by patients that have an impact on the patient's functional ability of daily living [9].

Combination of Isotonic (COI) is a form of exercise that uses the PNF techniques on the isotonic contraction with movement aimed at the agonist, which is to control / control a coordinated muscle contractions. This technique combines several types of muscle contraction such as concentric, eccentric, and maintained. In this exercise, the agonist movement patterns is not accompanied by a phase of reflex movements that can make a smoother movement, controlled, and coordinated so as to get a functional movement. The exercises that are performed within 2 to 4 weeks will have a favorable effect on the increase in muscle strength in trunk mobility and endurance so as to reduce the level of pain [3]. In addition to other studies that stated that the provision of training for 4 weeks will show very significant results to increase core muscle strength; therefore, it can decrease the risk of back pain [10]. The exercises were conducted in accordance with FITT (frequency intensity, time, technique) in the sitting position and were performed by the number of 3 sets of 15 repetitions where there was the duration of treatment for 5 seconds on each repetition. After it was given rest breaks between sets, the set tops and the second for 30 seconds and the second up to three set were for 60 seconds, the total duration of exercise was 30 to 45 minutes, the exercise was carried out for 4 weeks with intensity 3 times in 1 week.

The mechanism of COI for reducing pain is a response to muscle through stimulation of neural mechanisms that may result the proprioceptor facilitation or inhibition [11]. With the stress and overload received by isotonic muscle, it will result in the additional strain on the tendon; hence, the muscle spindle will receive stronger stimulus. This causes muscle stimulation to receive spindle that reaches the threshold, where the stronger the muscle is stretched, it will make contractions stronger. When the voltage muscles become stronger, the contractions suddenly stop and relax the muscle, and become involve in muscle relaxation, which occurs due to an active Golgi tendon organ. This is in accordance with the principle of reciprocal Innervatie where reflex muscle contraction agonist activity will make relax

antagonist, the relaxation effects can also be called reflex inhibition or autogenic inhibitions [12].

The education was provided in the form of Active Stretching exercises on Hamstring muscle resulting from work sitting posture in a chair with long period of time to undergo shortening. Hamstring muscle itself has an important role as a stabilizer postural because the hamstring muscles connect with muscles in the lower back, which serves as a component for posture stabilizer [13]. Therefore, in essence, the shortening the hamstring muscles while experiencing muscle pain will have an impact on the movement of the sacroiliac joint. Complexity Hamstring muscles or hamstring muscle complex (HMC) is functionally very important connection for the hip and knee extensors Flexors.

## METHODS

The study was conducted on the laundry industry in Pabelan village on January for four weeks with a frequency of exercise three times a week. This type of research was Quasi Experiment with Pre and Post Test Two Group Design. The population consisted of 100 laundry workers; in accordance with the inclusion and exclusion criteria, 18 people were selected. In this study, they were divided into 2 groups: a group given exercise Combination of Isotonic (COI) and a group given Education. The data analysis techniques were Wilcoxon's test; and Mann-Whitney influence was used to test different influences. The inclusion criteria were a) female respondents; b) aged 25-40 years old; c) laundry worker who worked in sitting position; d) the respondents who complained lower back pain myogenic and were measured with specific tests such as Straight Leg Rising Test (Laseigue's Test) and Sitting Root Test; and the specific test results showed a negative result (-); and e) the workers willing to become respondents. The exclusion criteria consisted of a) the respondents who had another job in addition to working in the laundry; and b) the respondents who were ill to other causes beyond the complaints of lower back pain.

## RESULT AND DISCUSSION

In this study, the frequency of respondents who were in the age range 25-26 and 39-40 years old were the majority number. Age is a factor causing complaints of the musculoskeletal system [14]. It stated that the maximum muscle strength of a person occurred at the age 20-29 years old; therefore, the muscle condition would continue to decline in accordance with age. As a person got older, it will be followed by the emergence of muscle pain [15].

**Tab 1.** Frequency Distribution of Age

Age Group (Years)	Respondents	
	Frequency (n)	Percentage (%)
25-26	4	22.20
27-28	2	11.12
29-30	2	11.12
33-34	2	11.12
35-36	2	11.12
37-38	2	11.12
39-40	4	22.20
Total	18	100.0

**Tab 2.** Working Length Frequency Distribution

Working Length (Hours)	Treatment Group		Control Group	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
≤ 5	0	0	0	0
> 5	9	100	9	100
Total	9	100	9	100

From these data, it was known that all the respondents worked for more than 5 hours. The period of employment was a risk factor that greatly affected a worker against the risk of musculoskeletal complaints [15], especially for the type of work that required a static position for a long, long tenure with the activities conducted under static conditions would eventually cause prolonged musculoskeletal disorders.

The findings in his research found that workers who sat in static position for 91-300 minutes (5 hours) had higher risk of low back pain, which was 2.35 times greater when compared with workers who sat in static position for 5-90 minutes, because remained in sitting position for long period of time caused the excessive load and tissue damage in the lumbar spine [1].

**Tab 3.** Effect of Combination of Isotonic Exercises to Lower Back Pain Reduction

	Mean	SD	Z	Sig.(2-tailed)
Pre Test	38.56	10.10	-2.675 <sup>o</sup>	0.007
Post Test	31.44	7.28		

**Tab 4.** Education against Pain Reduction Effect of Lower Back

	Mean	SD	Z	Sig.(2-tailed)
Pre Test	28.67	8.72	-2.236 <sup>o</sup>	0.025
Post Test	27.56	27.56		

From the table it could be concluded that administering Effect of Exercise Combination of Isotonic or Education were equally influential to the decrease lower back pain. The table below presented the second treatment that resulted to  $p < 0.05$ .

**Tab 4.** Different Effects of Combination of Isotonic Exercise and Education To Decrease Lower Back Pain

	Mean	SD	Z	Sig.(2-tailed)
Difference Combination of Isotonic	4.11	5.67	-	0.002
Difference Education	1.50	0.51	3.067	

Based on data, it could be seen that the administration of Combination of Isotonic exercises were more effective than Education to decrease lower back pain by seeing the difference in the mean value between Combination of Isotonic Exercise and Education. Exercise Combination of Isotonic could be a major influence on decreasing lower back pain in the respondent because it was an exercise designed to improve the response mechanism of

neuromuscular by stimulating proprioceptors [13.] In order to respond the functions of contraction of the muscle spindle so that it would lead to the increased stimulation to the Golgi tendon organ, resulting in a process of relaxation and pain reduction. On the other hand, the education was conducted independently only to give the effect to respond to the muscle stretching of muscle spindle stretch receptors that inhibited the Golgi tendon organ for excessive muscle tension and could reduce pain and improve muscle flexibility [16].

## CONCLUSIONS

Based on the analysis and discussion it could be concluded that: (1) Exercise Combination of Isotonic and Education had an influence on the reduction of lower back pain for laundry workers. (2) There was a difference between the effects of exercise Combination of Isotonic and education on reducing lower back pain in laundry workers.

## REFERENCES

- [1] Samara, D. (2005), *Duduk Statis Sebagai Faktor Risiko Terjadinya Nyeri Punggung Bawah Pada Pekerja Perempuan*, Vol.24 No.2, Universitas Medicina, Jakarta.
- [2] Dachlan, L. M. (2009). *Pengaruh Back Exercise Pada Nyeri Punggung Bawah*, Universitas Sebelas Maret, Surakarta.
- [3] Kofotolis, N. K. E. (2006). *Effects of Two 4-Week Proprioceptive Neuromuscular Facilitation Programs on Muscle Endurance, Flexibility, and Functional Performance in Women With Chronic Low Back Pain*, <http://ptjournal.apta.org/content/86/7/1001>.
- [4] Setiawati, (2008). *Proses pembelajaran dalam pendidikan kesehatan*, Jakarta: TIM.
- [5] Huldani, D. R. (2012). *Nyeri Punggung*, Universitas Lambung Mangkurat, Fakultas Kedokteran, Banjarmasin.
- [6] Brader H. K. J.G., & Wiksten DL., Isear Jr JA. (2006). *Special Tests For Orthopedic Examination*: 3rd ed. America: Slack /Incorporated.
- [7] Purwaningsih, R., & Purnawan, A.W. (2007). *Buku Ajar: Ergonomi Industri*. Semarang: Prodi Teknik Industri UNDIP.
- [8] Nurmianto, E. (2004). *Ergonomi Konsep Dasar dan Aplikasinya*. Edisi ke-2. Surabaya: Penerbit Guna Widya.
- [9] Trisnowiyanto, B. (2012). *Instrumen Pemeriksaan Fisioterapi dan Penelitian Kesehatan*. Cetakan II. Yogyakarta: Nuha Medika.
- [10] Franklin, C. V. J., & Kalirathinam. D., & Tushar. P. N. N. (2013). *Effectiveness of PNF Training for Chronic Low Back Pain*, Volume 2, Issue 4, [www.iosrjournals.org](http://www.iosrjournals.org), IOSR Journal of Nursing and Health Science. Sep. – Oct. 2013: PP 41-52
- [11] Purbo, H, dkk, (2002), *Metode PNF (Proprioceptive Neuromuscular Facilitation)*, Makalah Pelatihan Metode PNF, Sasana Husada. Surakarta.
- [12] Medicinesia, (2011). *Jeras Somatosensoris dan patofisiologi gangguanya*, diakses pada tanggal 20 november 2015, [http://medicinesia.com/kedokteran -dasar/neurosains/jeras-somatosensoris-dan-patofisiologi-gangguanya](http://medicinesia.com/kedokteran-dasar/neurosains/jeras-somatosensoris-dan-patofisiologi-gangguanya).

- [13] Wismanto, (2011). *Pelatihan Metode Active Isolated Stretching lebih Efektif daripada Contract Relax Stretching dalam Meningkatkan Fleksibilitas Otot Hamstring*. Bandung. Jurnal Fisioterapi
- [14] Tarwaka, (2014). *Ergonomi Industri: Dasar-dasar Pengetahuan Ergonomi dan Aplikasi di Tempat Kerja*. 2<sup>nd</sup> Edition with Revision, 1<sup>st</sup> Copy. Surakarta: Harapan Press.
- [15] Panulat, Pandu D. (2015). *Hubungan Sikap Kerja Duduk Dan Masa Kerja Dengan Keluhan Nyeri Punggung Bawah Pada Pekerja Pande Besi Di Sentra Industri Pande Besi Desa Padas Kecamatan Karanganom Kabupaten Klaten*. Skripsi. Universitas Muhammadiyah Surakarta.
- [16] Evan, (2010). *Metode Stretching Otot Hamstring*; accessed on 7 December 2015, from <http://www.infofisioterapi.com/metode-streching-otothamstring.html>.