



# Effectiveness of the Combination of Infrared Radiation (IRR) and Transcutaneous Electrical Nerve Stimulation (TENS) Interventions on the Functional Ability of Low Back Pain Farmers: A Quasi Experimental Study

Zulfikar<sup>1</sup>, Khairun Nisa Berawi<sup>2</sup>, Bayu Anggileo Pramesona<sup>3\*</sup>

<sup>1,2,3</sup> Master of Public Health Program, Faculty of Medicine, Universitas Lampung, Jl. Prof. Sumantri Brojonegoro No. 1, Rajabasa, Bandar Lampung, Lampung 35145, Indonesia

**ABSTRACT:** Low back pain (LBP) is an acute or chronic pain that can be felt in the waist area or in the lumbosacral area. One way to deal with LBP complaints is to use infrared radiation (IRR) and transcutaneous electrical nerve stimulation (TENS). This study aims to analyze the effectiveness of the combination of IRR and TENS on the functional abilities of farmers with LBP. The quasi-experimental study was conducted on 84 respondents (intervention group n=42, control group n =42) who were purposefully recruited from March to April 2024. Variable measurement is done using the back pain functional scale questionnaire (BPFS). Paired T Test and Independent T test are used for data analysis. The results of the study showed that although both groups had an influence on the functional abilities of LBP farmers ( $p < 0,001$ ), in the intervention group it was shown to improve the functional abilities scores of farmers with LBP compared to the control group (15.64 vs 13.29). It is recommended to farmers to carry out IRR and TENS therapeutic measures according to the functional scale of LBP, and it is also advised to healthcare professionals at the public health center to be able to establish cooperation with the parties concerned to organize the treatment program of LBP on farmers using the combination of IRR and TENS.

**KEYWORDS:** Low Back Pain, Farmers, Quasi Experimental Study, Indonesia.

## INTRODUCTION

Working positions as farmers have a 93.7% chance of experiencing Low Back Pain (LBP) complaints (Amalia et al., 2022). According to the WHO in (Novisca et al, 2021) shows that 33% of the population in developing countries have LBP. In the United Kingdom there are 17.3 million people who have had LBP complaints and of these 1.1 million people have suffered from paralysis caused by it. In the U.S. there are 26% of adults who suffer from LBPs for at least one day in a three-month period. In Indonesia, there are complaints of LBP, and when seen based on the diagnosis or symptoms there is an increase of 24.7%. The number of people affected by Indonesian LBP complaints is unknown, if estimated between 7.6% and 37%. Based on the diagnosis made by the health care personnel, the prevalence of LBP disease in Indonesia is 11.9% and based on the symptoms the prevalence of LBP in Indonesia reaches 24.7%. While the prevalence of LBP in Lampung Province reached 18.9%. Lampung province is an agricultural province, where it is found that workers in farms or farms have a fairly high risk of developing LBPs. Data of the Central Statistics Agency for 2020, the percentage of informal labour in the agricultural sector in the Province of Lampung was 90.48% (Agustin, 2022). While in the farmers in the village of Marga Agung, South Lampung regency that perform heavy movements, both static and dynamic often result in the appearance of musculoskeletal complaints LBP.

The most common cause of low back pain complaints are broken muscles or ligaments. It can be in the form of a squeeze or a tension in the lower waist can occur suddenly, or it can develop slowly over time due to repetitive movements (Nitallessy, 2023). While one of the most commonly recommended methods to deal with LBP complaints is physiotherapy, starting with special exercises, electrical stimulation and so on. The aim of the treatment is to control or reduce the pain, to repair the damage to the structure of the spine and to return to normal life activities as soon as possible (Sartoyo & Pradita, 2022). Infrared Radiation (IRR) is a physiotherapeutic device that utilizes the heat effects of emitted red rays to trigger blood circulation and reduce tension in the muscles. IRR has a wavelength of 1.5-225.6 microns and radiation reaches 5.6-1000 micron and penetration of 3.75 cm which gives a warming effect on deeper tissues in the injured area of the muscle will be more effective (Putra et al., 2021). Transcutaneous Electrical Nerve Stimulation (TENS) is widely used as an additional therapy in the management of LBP, a small machine operated



using small power electricity as a light electric method to relieve pain (Karisa et al., 2023). Farmers in the village of Marga Agung, South Lampung who perform heavy movements, both static and dynamic often result in the emergence of musculoskeletal complaints LBP. This study aims to analyze the effectiveness of the combination of IRR and TENS on the functional ability of the farmers with LBPs.

**METHODS**

The quasi-experimental study involved 84 respondents who were purposefully recruited and divided into two groups: the intervention group given the treatment of IRR and TENS of 42 respondents and in the control group given treatment only with IRR of 42. The independent variables used are IRR and TENS. The inclusion criteria are farmers with LBP who are stayed in the Marga Agung village, South Lampung regency, Lampung province, Indonesia, have no complaints of stroke disorder, age at least 18 years, and male sex willing to be respondent by signing informed consent, whereas the exclusion criterion is subjects who were not follow the research process until the specified time, obesity, and had injury.

The variable measurement is done using the back pain functional scale questionnaire. The back pain functional scale (BPFS) was used to evaluate the functional ability of patients with low back pain (Stratford et al., 2000). The BPFS questionnaire has a likert scale of 0-5. The respondent crossed one of the digits on the scale, where the higher the scales, the greater the pain he experienced. The validity and rehabilitation test results of 12 statement items on the questionnaire are declared valid ( $p < 0.05$ ) and reliable with the cronbach alpha value (0.940). The phase of the data collection process consists of three phases; Phase I is the collection of baseline data of the initial functional scores of farmers with LBP, which is carried out around the 3rd week of March 2024 after the ethical clearance is obtained. Phase II is the provision of intervention in both groups for 4 weeks. Univariate analysis is used to find out the distribution of frequency characteristic or picture of each variable studied, including distribution by age, education and functional ability of farmers with LBP. Paired T-test and Independent T-test are used for data analysis. The research has been issued with the Code of Ethics No. 352/KEPK-TJK/III/2024 dated 19 March 2024 from the Polytechnic Research Ethics Committee of the Ministry of Health Tanjungkarang Lampung, Indonesia.

**RESULTS**

**1. Univariate Analysis**

**Table 1. Characteristics of respondents (n = 84)**

Respondent characteristics		Intervention group (n = 42)		Control group (n = 42)	
		n	%	n	%
<b>Age (years)</b> (Mean ± SD) = (41.82 ± 11.63)	18 – 25	3	7.14	6	14.29
	26 – 35	11	26.19	9	21.43
	36 – 45	6	14.29	11	26.19
	46 – 55	13	30.95	9	21.43
	55 – 65	9	21.43	7	16.66
<b>Education</b>	Elementary school	20	47.62	24	57.14
	Junior high school	8	19.05	5	11.90
	Senior high school	14	33.33	13	30.96

Based on table 1, the average age of farmers was 41.82 years, with the majority (30.95%) farmers in the intervention group aged between 46-55 years, and the age of 36-45 years in the control group (26.19%). In addition, in both groups the vast majority farmers had primary school education (47.62% vs. 57.14%).



2. Bivariate Analysis

**Table 2. Paired T-Test results before and after intervention in each group on the LBP functional ability (n=84)**

LBP functional ability measurements	Mean		Mean		Mean Differences	P-value
	Pre test	Post test	Pre test	Post test		
Intervention group (n=42)	23.17	38.81	2.273	1.581	15.643	<0.001
Control group (n=42)	23.02	36.31	1.569	2.513	13.29	<0.001

Based on table 2, it is known that there is a difference in the average score of LBP functional ability during pre-test and post-test in each group ( $p < 0.001$ ) with mean differences in the intervention and control groups of 15.64 vs. 13.29.

**Table 3. Comparisons between groups during pre and post test on test dan post test on the LBP functional ability (n=84)**

LBP functional ability measurements	Mean ± SD	
	Pre test	Post test
Intervention group (n=42)	23.17 ± 2.273	38.81 ± 1.581
Control group (n=42)	23.02 ± 1.569	36.31 ± 2.513
p-value	0.738	<0.001

From table 3 it can be seen that there were no significant differences between the two groups at pre-test compared to the functional abilities of LBP in farmers ( $p = 0.738$ ). However, there were statistically differences in terms of the average functional ability scores of the farmers at post-test in both groups ( $p < 0.001$ ).

**DISCUSSION**

The results of this study show that most farmers are on average 42 years old and the majority are primary school-educated. LBP in workers generally begins in young adulthood with peak prevalence in the age group of 45-60 years (Purwasih et al., 2020). Study of the incidence of lower back pain is still prevalent among farmers aged 30-60 years, the age characteristic description results show that the average age of respondents is 46.61 with a standard deviation of 4.705, a minimum age of 38 years and a maximum age of 55 years (Kadek et al., 2021).

The combination of IRR and TENS interventions turned out to be effective against the functional capabilities of LBP farmers. This study showed that there were differences in post-test values in both (intervention group versus control group) compared to the functional ability of LBP in farmers using BPFS measurements, but greater influence on the intervention group than in the control group ( $p < 0.001$ ). The value indicates less than 0.05 or  $p < 0.05$  so it can be concluded that there is a significant difference between the data of the pretest and the posttest in the intervention group. (IRR dan TENS). The sample of this study in farmers with LBP complaints, which for the control group was only given treatment with IRR only with the aim of giving local heating to the tissue can eliminate the effects of pain, increase the elasticity of connective tissue and expand joint movement (Halimah et al., 2022). The intervention group was given a combination or addition of treatments using TENS aimed at mediating nerve fibers thereby reducing the activation of the sensory pathways that cause pain. So with the addition or combination of the use of TENS tools on farmers with LBP complaints greatly influenced the value of the functional ability of LBPs using BPFS. IRR is a physiotherapeutic modality often used to treat LBP that can function to increase blood flow and soften tissues so that it can reduce pain and maximize functional activity. While TENS has the potential to be used for all kinds of acute or chronic diseases, such as postoperative pain, postpartum pain, neuropathic pain, and non-specific pain in LBP.

Giving the IRR has a significant influence on the control group indicator (IRR) on the obtained BPFS significance value on each indicator of  $p < 0.001$ . The value indicates less than 0.05 or  $p < 0.05$  so it can be concluded that there is a significant difference between the pretest and posttest data in the IRR control group. In a previous study shows that infrared has an effect on the reduction of pain in patients with low back pain among surgery patients (Endaryanti et al., 2022). The results of the study though in both



groups had an influence on the functional ability of farmers with LBP ( $p < 0.001$ ). However, in the intervention group it was shown to improve the functional scores of farmers with LBP compared to the control group (15,64 vs 13,29). It can then be concluded that the combination of interventions using IRR and TENS, is more effective than using only IRR against functional capabilities in farmers suffering from LBP in the village of Marga Agung, South Lampung.

## CONCLUSION

The combination of IRR and TENS interventions has proven to be effective against the functional capabilities of LBP farmers in our study area. It is recommended to farmers to carry out IRR and TENS therapeutic measures according to the functional scale of LBP, and it is also advised to the healthcare professionals at public health center to be able to establish cooperation with the parties concerned to organize the treatment program of LBP on farmers using the measures of IRR and TENS.

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