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ERGO-PHYSIOLOGY DECREASES WORK POSTUR RISK AND LBP COMPLAINTS IN RED LAND WORKERS IN BOSEN VILLAGE, NORTH MOLLO SUB-DISTRICT, SOUTH CENTRAL TIMOR DISTRICT

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Abstract. The work of digging red earth is one of the physical activities of lifting and carrying. The field conditions of work, the slope level of the land wall and work aids used are one of the reasons why workers work with a bent and twisted posture. Such an posture increases the risk of Low Back Pain (LBP). LBP can reduce work capacity and productivity and in the long time reduce the quality of health and life of workers. For this reason, ergo-physiological intervention is carried out with the aim of reducing the level of risk of work posture and LBP. This research is an experimental study using the same subject design involving 30 red earth digg workers in Bosen Village as the subject of the research. Ergo-physiological interventions are given in the form of improving work posture and physiotherapy training. Improvement of work posture is focused on activities, digging move, and carrying excavated material and lifting excavated material onto transport trucks. Physiotherapy training uses a modified William flexion exercise method. Measuring the level of risk of the work posture using the REBA method and the LBP level using the modified LBP Oswestry questionnaire, carried out before and after the intervention. Differences in data before and after the intervention were tested using different tests of paired t test for normal distributed data and Wilcoxon Sign Rank test for data that were not normally distributed, each using a significance level of 5%. The results showed a decrease in the risk level of work posture and LBP of red earth digger workers is of 3.37 (34.56%) and 1.24 (32.29%) respectively. It was concluded that ergo-physiological interventions effectively reduce the risk of work posture and the level of LBP of red earth digger workers
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Keywords : physiotherapy, low back pain, work posture

1. INTRODUCTION

Bosen Village is one of the villages in the Mollo North sub-district of Timor Tengah Selatan District -NTT which has a variety of natural potential. One of the natural potentials of the village is red earth excavation. The land contour in the location of the excavated material is in the form of hilly expanses with elevations reaching 50-100 m. This excavated land has class A soil types with characteristics that have cohesive properties, good compressive level, and are relatively stable. Testimonials from buyers / consumers of red land said that the excavated land is of good quality as a building material [1].

Red earth excavation has been carried out since 40 years ago and until now is still done manually. Manual work requires great effort. To obtain excavated land, workers must dig / or tear down the hill walls little by little using simple equipment such as crowbars, shovels and hammer. The problem is that the work equipment has a

short handle so that when working, the worker performs with a bent posture [2]. In addition, the slope level of the excavation field reaches 20-90º, causing workers to work in a bent position. Such postures can increase the potential risk of disorders of the musculoskeletal system, especially the lower back area.

LBP is a pain that is felt in the lower back area, which is on L4 / L5 or L5 / S1 discs, can be either local pain or radicular pain or both. This pain is often accompanied by spreading pain towards the legs and feet. LBP is a general effect of manual work performed with non-ergonomic body position [3,4]. Age factors, heavy workload, increased working hours and whole body vibrations are risk factors for LBP complaints [5], [6]. LBP is a type of occupational disease, which can result in loss of work ability, reduce work productivity, and increase the risk of accidents [7].

The initial survey showed that more than 75% of the red earth excavation workers often began to work more slowly and take stolen breaks on the sidelines of activities, to reduce perceived back pain. Pain is felt due to the effect of lifting activity and carrying of soil excavation in a bent and twisted position. Displacement, removal and transportation of heavy texture soil excavations carried out in a bent work posture causes an increase in compression pressure on the lower back and this risks creating low back pain potential. Research on soil excavation workers who use shovels shows the potential for LBP to occur due to bending postures [8]. Other studies have shown that the trunk angle when working can increase the potential for low back pain [9]. Workers who are exposed to LBP rarely seek medical treatment because the medical cost factor is quite expensive. The method that is often done to reduce LBP is by massage, consuming painkillers, smeared with oil sequence or left alone [10], [11]. One risk factor for pain that is rarely known to workers is ergonomic factors [12] - [15]. These reasons cause the handling of LBP complaints to workers is not optimal.

Ergo-physiology is one type of intervention that combines improvement in work posture and physiotherapy training to reduce LBP pain. Posture improvement is given so that workers work with more ergonomic postures at each stage of work. For physiotherapy training, the Willian Extension exercise method is used, a specific exercise developed to strengthen muscle muscle which reflects lumbo-sacralspine, especially the abdominal muscles and gluteusmaximus muscles and stretches the lower back extensor muscle group [16]. This study focuses on knowing the effects of ergo-physiological interventions on reducing the risk of work posture and LBP.

2. METHODS

This research is an experimental research using treatment by subject design. The intervention of ergo-physiology is done in form of physiotherapy training and work posture improvement. Physiotherapy training applies William flexion exercise method. The training is in form of Home Exercise Program which is done before and after the activity three times a week for three weeks with the training duration of 30 minutes. The monitoring of Home Exercise Program is done by using subject log book which contains the record of types and duration of the activities and monitoring by using hand phone. This intervention used participative ergonomic approach. Research samples were taken from concrete-brick molding workers in Kupang city who had fulfilled sample eligibility. 30 of the red soil digger workers who had fulfilled the criteria were taken as samples. Assessment on the work posture used video camera and the results were analyzed by implementing REBA method, meanwhile the assessment on LBP used the modified LBP Oswestry questionnaires. The data of research results were analyzed descriptively and continued by the examination of average difference before and after intervention using T pair difference test for the normally distributed data and Wilcoxon Sign Rank examination for the data that were not normally distributed, with the significance level of 5% for each.

3. RESULTS AND DISCUSSION

The Characteristics of Research Subject

The subjects of the study consisted of 19 men and 11 women. The mean age of the subjects was 37.05 ± 9.24 years, classified as productive age. Previous research has stated that after the age of 30 years, the intervertebral disc degenerates to reduce the ability to withstand compression loads [8]. The mean body weight of the subjects was 59.03 ± 5.25 kg (range: 54-68 yrs) and height was 162.24 ± 10.25 cm (range: 153-172 cm). The subject body mass index was 22.64 ± 3.22 kg /m^2 (range: 18.68-25.63 kg /m^2) in the category of normal nutritional status. The work experience of the subject is 16.5 ± 11.15 years. Most subjects (58.50%) have junior high school education.

Work Posture

Work posture is the position of body parts when doing a cycle of movements and postures that workers often do. The measurement of work posture uses REBA by analyzing each position of the body while working from digging, moving excavation results, carrying and lifting to the transport truck. Work posture is formed due to physical stress due to activity in the skeletal muscles. The presence of this pressure causes the body to respond by forming a

certain posture. The results of the analysis show differences in work posture scores before intervention (period P0) and after intervention (period P1) (Figure 1).

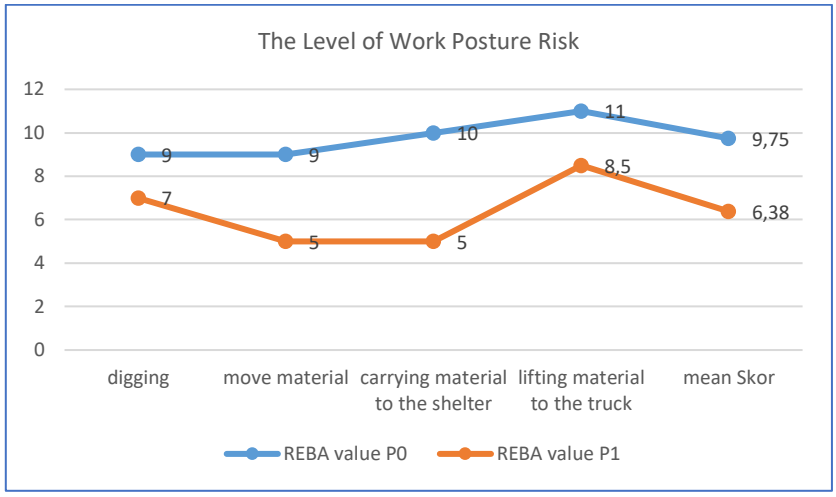

Figure 1. The Level of Work Posture Risk Before and After Intervention

Figure 1 shows the average risk level score of the P0 period posture at level 9.75. There are two sub-activities that have a risk level score above the average score, namely the sub-activity of transporting red earth excavation material to the shelter and lifting the excavated material to trucks in succession at levels 10 and 11. The high risk of work posture on the sub-activity is because when move the excavation material, body posture is in a position of bending and twisting with successive elevations reaching 30º and 40º or more. As a result of the position of the excavation material below the thigh height and the height of the truck above the workers' shoulder height, it allows the trunk to reach the maximum tilt angle [2]. Such postures cause an increased risk of injury and muscle complaints [17], [18]. In period P1, the level of risk of posture decreased at level 6.38 (34.56%) and was statistically significant ($p < 0.05$). Decreasing the level of risk is caused by improvements in work posture for each sub-activity. The biggest decrease occurred in sub-activity sub sub activity lifting minerals to shelters, namely 5.0 (50%) followed by sub-activities to move minerals, ie 4.0 (44.44%). Decreasing the level of risk is below the average score of P1 (6.36). There are improvements, causing body parts such as legs, arms and back to be more natural / ergonomic when carrying out activities to move minerals, transport and lift onto trucks. Ergonomic body position can reduce musculoskletal complaints [7], [8], [18], [19]. Qualitatively, ergo-physiological interventions reduce the level of risk from high to moderate levels.

LBP Reduction

The results showed a decrease in LBP complaints after intervention. The reduction in LBP complaints is shown in Figure 2.

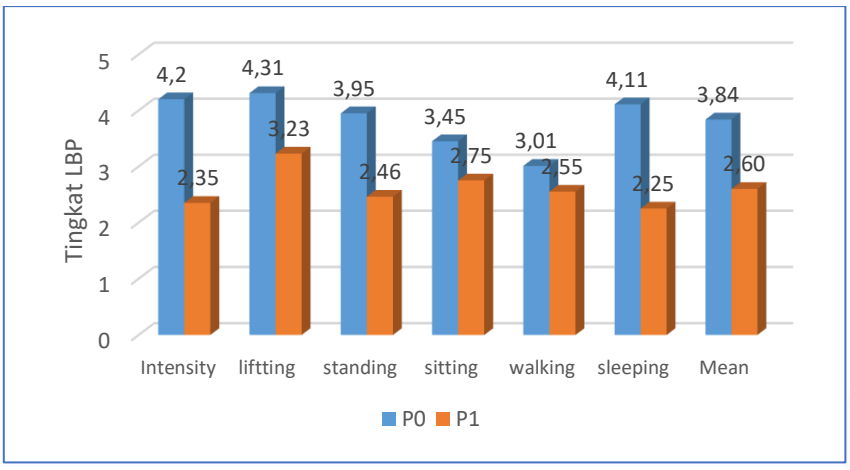

Figure 2. LBP levels felt in various activities in P0 and P1 periods

The intensity of lower back complaints felt by subjects before the ergo-physiology intervention was at the level of 4.20. Increased complaint score due to increased risk of work posture. It was reported that increased risk of work posture correlated with the potential for LBP [13], [17]. The activity of digging the ground and carrying the excavation results in a bent posture and the activity of moving the excavated material to the left or right side, and lifting it to the top of the truck beyond the optimum lift height will form a twisting posture. The working posture of bending and twisting will form a different trunk flexion and trunk twisting slope angle based on the type of activity performed [2]. The greater the slope angle of the style, the greater the force of force on the low back disc. The amount of force on the low back disc will increase the potential for LBP to occur [22], [23]. The intensity of this complaint is not only felt by the subject during the main activity, but also felt when doing other activities outside the main activities such as lifting weights, standing, sitting, walking and sleeping. Pain intensity was felt to be higher when the subject carried out lifting activity ie 4.31, sleep activity with pain intensity level of 4.11, compared to other activities (figure 2). The appearance of pain when carrying out activities outside the main activity shows that LBP experienced by the subject is chronic. Chronic LBP is a type of pain that is felt for longer ie 1-3 months or more [20], [21]. Chronic LBP pain is often caused by long-lasting work in a non-ergonomic [19], [23].

The combination of improved work posture and physiotherapy training, effectively reduced pain intensity to 2.35 or 44.05% and was statistically significant ($p < 0.05$). The decrease in LBP in this study is lower than previous studies on brick making workers [24]. The decrease in the intensity of complaints was more pronounced when the subjects carried out lifting activities, and while sleeping with scores of 1.88 (52.46%) and 1.65 (40.56%) respectively. Posture improvement and physiotherapy training in the right and regular manner and intensity can increase muscle flexibility and produce intermittent and continuous stretching of the lower back muscles so as to stimulate the golgi tendon. This stimulation will cause the muscle relaxation reflex in question [25]. This combination of treatments can reduce pain and spasm around the lower back area, increase the strength of the back muscles and local circulation and increase the stability and flexibility of the back muscles and improve posture [16], [25] - [27]. Regular training with an intensity of 3-5 times a week can reduce back pain under low back pain [24], [28]. Physiotherapy movements have an important role in strengthening back muscles, increasing aerobic capacity, and physical fitness in general, as well as reducing stress and shock effects due to static loads [17], [29], [30].

4. CONCLUSION

The conclusion of this reseach was the ergo-physiological intervention effectively reduced the risk level of work posture and LBP in red earth digger workers by 3.37 (34.56%) and 1.24 (32.29%) respectively compared to the initial conditions. Redesign of the spade handle is needed so that the work posture is more optimal.

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