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## 9-WORKING AND MUSCULOSKELETAL DISORDERS POSTURE ON CONCRETE WORKERS OF PRODUCTION DIVISION AT PT. ...

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## WORKING AND MUSCULOSKELETAL DISORDERS POSTURE ON CONCRETE WORKERS OF PRODUCTION DIVISION AT PT. X BALI

Komang Y Suryawan<sup>1)</sup>, Henry R Handoyo<sup>2)</sup>, George Tanudjaja<sup>3)</sup>

### ABSTRACT

**Introduction:** Musculoskeletal disorders are injuries that Affect the musculoskeletal system that can be the caused or aggravated by the working environment. Factors that can cause musculoskeletal disorders are exertion of force, repetition, and awkward posture. Awkward posture held too long in the same position will cause injuries and complaints , which in turn will Decrease the productivity for the workers and the company.

**Purpose:** The aim of the study is to examine the correlation between working posture and musculoskeletal disorders on concrete workers of the production division in PT. X Bali.

**Method:** This study is an observational analytical study with cross-sectional design, participated by 43 concrete workers of production division using consecutive sampling technique. The study was held at PT X's concrete plant on Jl. Prof. Dr. Ida Bagus Mantra No. 2461, Gianyar, Bali from 15th July to 17th July. Working posture was measured with Rapid Entire Body Assessment (REBA) and the level of musculoskeletal disorder was measured with Nordic Body Map (NBM). Both variables were Analyzed using Kendall's Tau-C to Determine the correlation between working posture and musculoskeletal disorders.

**Results:** Most workers had moderate risk of working posture measured with REBA (46.5%). Using the NBM method, most workers had moderate levels of musculoskeletal disorders. (46.5%). The distribution of MSDs on the body part are mostly located on the shoulder and hip. Analysis of correlation between working posture and musculoskeletal disorder results in ( $p < 0.001$ ) and ( $r = 0.769$ ).

**Conclusion:** that there is a significant correlation between work posture with musculoskeletal complaints in concrete factory workers of the production unit at PT. X Bali.

**Keywords:** Working posture, musculoskeletal disorder, concrete worker

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## INTRODUCTION

Infrastructure development is one of the indicators of progress and is regarded as a locomotive of development for regions and countries. Infrastructure development can spur economic growth and the creation of jobs. Development of road infrastructure is an important issue in the development of a region. Human resources is an essential factor in the development of infrastructure.<sup>(1)</sup>

The main purpose of the implementation of ergonomics in working life is to create a work environment that is safe and productive, so workers can fulfill their duties within the organization. There are many risk factors in the science of ergonomics in the workplace as working posture, exposure to vibration, and other factors can cause injury to muscles, tendons, or innervation which in time can lead to musculoskeletal disorders or musculoskeletal disorders (MSDs).<sup>(2)</sup>

MSD is a health problem in the skeletal muscles that can be very mild to very severe. These complaints arise when the muscle receives repeated load for a long period.<sup>(3)</sup> According to the Basic Health Research (Riskesdas) in 2013 the prevalence of musculoskeletal complaints in Indonesia amounted to 11.9 %. The prevalence of musculoskeletal complaints was highest in Bali Province (19.3%). The highest prevalence of musculoskeletal

complaints were among farmers, fishermen and laborers amounting to 31.2 percent.<sup>(4)</sup>

MSDs are the complaints or abnormalities involving the musculoskeletal system such as muscles, tendons, ligaments, nerves and joints. Work-related musculoskeletal disorders (WMSDs) are musculoskeletal disorders caused or aggravated by the dangers that arise in the workplace. WMSDs arise from activities involving the musculoskeletal system overload, exceeding the body's ability to heal itself. This complaint appears gradually as a result of excessive use and inadequate healing. There are several factors at work that led to WMSDs such as excessive stretching, repetitive activities, unnatural or odd work postures. Risks of awkward work postures are characterized by body position moving away from natural or neutral position.<sup>(3)</sup> In Indonesia, awkward work postures may arise due to the incompatibility of the tools and the work station with the worker's body. There are secondary factors causing WMSDs such as pressure, vibration, and temperature that often arise in the workplace.<sup>(3)</sup>

PT. X is a company engaged in the construction industry, one of which is the production of precast concrete or precast concrete products, which is done in the manufacturing factory. Readymix Concrete are sand materials stirred and processed at

the Batching Plant to produce a ready-made concrete cast, such as concrete paving blocks and concrete that serves small to cover the soil surface. Based on preliminary observations of the posture of workers at the plant, it was found that in the welding unit workers kneel on the ground, while the concrete reinforcement or rebar tying units the workers take a stooped posture which is unusual posture. Based on the above, research is conducted to determine the correlation between work posture with musculoskeletal complaints in a concrete factory worker production PT. X

## METHOD

This research is an observational analytic study that observes the subject of research to find the relationship between variables without intervention. The method used is a cross-sectional method that researchers conducted observations and measurement data independent variables with the dependent variable at a time to determine the correlation work posture and musculoskeletal complaints in a concrete factory workers in the production department of PT. X Bali. The population in this study was all concrete factory workers in the production department of PT. X Bali who worked during the month of July and August 2019. The sample in this study was concrete factory workers in

the production department of PT. X Bali who met the inclusion criteria and did not meet the exclusion criteria within of the research period. In this study the sampling technique used was non-probability sampling, consecutive sampling. Consecutive sampling sequentially sampling techniques that meet the selection criteria until the required number of subjects met.

Criteria for inclusion in this study were the respondents were employed in concrete production, willing to become respondents, and have a service life of one year or more. Exclusion criteria in this study were workers who have a history of trauma or disorders of the musculoskeletal system and the workers were not signed at the time of data collection is done.

## RESULTS

Based on the research that has been done, the following characteristics of the respondents described the data in the form of respondents age, years of smoking, exercise habits.

**Table 1. Characteristics of Respondents**

variables	Frequency (n)	Percentage (%)
<b>Age (years)</b>		
<30	27	62.8%
≥30	16	37.2%
<b>Gender</b>		
Male	40	93%
woman	3	7%

Work unit		
Readymix	17	39.5%
Precast	17	39.5%
paving	9	20.9%
Smoking habit		
Smoke	33	76.7%
Do not smoke	10	23.3%
habit Sports		
Sports	15	34.9%
not Sports	28	65.1%

Based on the above data the frequency of the under 30 years age group is higher, at 27 (62.8%) compared to the age group of 30 years or more, 16 (37.2%). Based on gender frequencies, most subjects were male, as many as 40 people (93%), while the frequency of female subjects were 3 people (7%).

Frequency of respondents unit at the factory of PT. X Bali at the time of the study show Readymix and precast units together as many as 17 people per unit (39.5%), while the lowest frequency contained in the paving work units as many as 9 people (20.9%).

According to the work period, the frequency group of respondents who have a working period of less than three years as many as 18 people (41.9%), while respondents who have a service life of three years or more as many as 25 people (58.1%).

According to the table above, the frequency of smoking habits was higher

with as many as 33 people (76.7%), while the group of respondents who do not smoke was as many as 10 people (23.3%).

The frequency of respondents who do not have exercise habits were as many as 28 people (65.1%), while the group of respondents who have a habit of exercising as many as 15 people (34.9%).

**Table 2. Correlation Working with Musculoskeletal Posture**

Risk Level Posture	The level of musculoskeletal disorders			Total	The p-value	Correlation coefficient ( $\tau$ )
	Low risk	Medium risk	High risk			
Low risk	13	0	0	13	0,000	.769
Medium risk	4	16	0	20		
High risk	0	4	6	10		
Total	17	20	6	43		

The variables have a correlation significance value of  $p < 0.001$  ( $\alpha = 0.05$ ), this shows that there is a significant correlation between work posture with musculoskeletal complaints in a concrete factory worker production PT. X Bali. The value of the correlation coefficient ( $\tau$ ) on analysis test obtained  $\tau = 0.769$  which means there is a positive correlation between the two variables. Positive correlations indicate a directly proportional

relationship between independent and dependent variables, if the level of risk is higher for working posture then the musculoskeletal disorders experienced level will be higher. The strength of the correlation is said to be strong if the value of approaching the value of +1. The results of this study found a strong correlation. It can be concluded that there is a significant relationship and a strong positive correlation between work posture with musculoskeletal complaints so that  $H_0$  can be rejected and  $H_a$  accepted

## DISCUSSION

There are various risk factors that lead to the emergence of musculoskeletal disorders or musculoskeletal disorders (MSDs) on workers. Broadly speaking, a risk factor for the emergence of MSDs is divided into individual factors and occupational factors. Occupational factors may include stretching, repetitive activities, as well as working posture. Work postures were measured using the method of rapid entire body assessment (REBA) and classified into five levels of risk based on observations. Individual factors are factors that are present and different for each person. Individual factors such as age, sex, smoking habits, physical fitness contribute to the emergence of musculoskeletal complaints

that have been measured to determine the distribution of the survey respondents.

Age is one of the factors that contribute to the emergence of individuals MSDs. Based on the distribution of age groups, the majority of workers age in the concrete factory PT. X Bali was <30 years as many as 27 people (62.8%);  $\geq 30$  years of age group of 16 people (37.2%). MSDs began to be felt at the age of 25 to 65 years, especially in the working age. Complaints usually first often felt since the age of 35 years and will increase with age and results in decreased muscle strength resulting in the emergence of musculoskeletal disorders.<sup>(3)</sup> Workers at a concrete factory PT. X Bali has the potential to experience musculoskeletal complaints.

The longer a person do the same job, the more the individual will continue to be exposed to risk factors that arise in the work environment that may cause musculoskeletal disorders. Based on the survey, as many as 25 people (58.1%) had worked at the plant for 3 years or more, while as many as 18 people (41.9%) work under 3 years.

Individuals who have the habit of smoking has decreased capacity of the lungs resulting in the decline in the ability to absorb oxygen so that the physical fitness of the body decreases. Due to low oxygen levels in individuals who have a



9 smoking habit, when doing activities that require great strength, carbohydrates metabolism into energy is inhibited which causes a buildup of lactic acid and emerging musculoskeletal complaints. <sup>(3)</sup> In this study, the majority of respondents have the habit of smoking, 33 persons (76.7%), while only 10 (23.3%) do not have the habit of smoking.

Workers who have a greater physical strength more rarely have musculoskeletal complaints compared to workers with lower physical strength. Physical strength can be obtained by exercising. Based on the distribution of the research, the majority of workers do not have the habit of exercise, 28 people (65.1%), while workers who have the habit of exercising were as many as 15 people (34.9%). This of course can be influential in the rise of musculoskeletal disorders on the respondent.

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6  
3 In the research that has been conducted, there were 16 workers at risk working posture that was accompanied by moderate levels of musculoskeletal complaints. The results of this study found a significant relationship between work posture with musculoskeletal complaints with  $p < 0.001$  and a correlation coefficient of  $r = 0.769$ . The value of the correlation coefficient indicates a strong positive correlation, which means that the higher the level of risk experienced by

employees' working posture, the higher the level of experienced musculoskeletal disorders, and vice versa.

This study reinforced previous research 2015 that measures the working posture of sitting on embroidery workers with upper limb rapid assessment method (RULA) and measure musculoskeletal disorders (MSDs) with NBM questionnaire. The research found significant association with moderate positive correlation. As well as research conducted by Jalajuwita and Paskarini in 2016 that found significant relations between the working position with musculoskeletal disorders in the welding unit ( $p = 0.005$ ) and a moderate correlation.

At the concrete factory workers in the production department of PT. X Bali, it was found that the workers take a position that is unnatural or awkward like kneeling on the ground or bending that causes the joints of the body to move away from the range of motion (ROM) and causes excessive muscle stretching. In addition to awkward postures, there are also workers who maintain posture and do not move actively, this contributes to the rise of complaints.

Awkward working postures maintained for too long by the workers will lead to the emergence of musculoskeletal disorders. As a result of

workers who have complaints would interfere with many aspects of life such as decreased motivation or inability to follow the work activity. This would impact the work environment or the company, either directly due compensation for treatment, or indirectly such as decreased productivity and absenteeism. <sup>(5,6,7,8,9,10)</sup>

## CONCLUSION

Based on the research that has been done, it was concluded that there is a significant correlation between work posture with musculoskeletal complaints in concrete factory workers of the production unit at PT. X Bali.

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