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## The effect of progressive muscle relaxation on decreasing work stress in air traffic controller<sup>☆</sup>



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ATC;  
Relaxation;  
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### Abstract

**Objective:** This study aims to determine the effect of relaxation on reducing stress levels in Air Traffic Controller (ATC).

**Method:** The study design used quasi experimental research with pre-test post-test control group design. The sample of the research was ATC employees in Makassar Air Traffic Service Center, which amounted to 60 people consisting of 30 people given relaxation therapy interventions and 30 people as a control group. Data collection using questionnaires and blood pressure measurements. Data collection was done using the stress scale questionnaire (Perceived Stress Scale) and using the job stress NIOSH questionnaire.

**Results:** The results of the statistical test at the pretest and posttest with the Wilcoxon Sign Rank Test showed a value of  $z = -2670$  and a value of  $p = 0.008$  ( $p < 0.05$ ).

**Conclusion:** The conclusion that there were significant differences in work stress between pre-test and post-test in the intervention group, so there was a significant decrease in work stress after being given relaxation therapy.

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### Introduction

Air Traffic Control (ATC) is an occupation with important role in controlling aircraft travel activities, weather information through the Meteorology and Geophysics Agency (BMKG), visibility, wind direction, temperature, air pressure, information on the existence of airplanes which are monitored via radar, controlling aircraft landings, and establishing an aircraft apron. The importance of communication regarding

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information relating to aviation makes ATC officers considered the pilot's closest partners in the smooth flight.<sup>1</sup>

ICAO reported that over past five years, the number of air traffic accidents has decreased, in 2016 there were reported 75 incidents of accidents or a decline of around 18% from 2015, high accident rates occurred in 2012 there were 98 cases, while in 2013, 2014, 2015 amounted to 90 cases, 97 cases and 92 cases.<sup>2</sup> Every day ATC officers serve 340 aircraft movements to and from Makassar at Sultan Hasanuddin Airport and 3000 aircraft movements that pass through the Makassar Air Traffic Service Center (MATSC) working area.<sup>3</sup>

A recent study on ATC indicated that the biggest factor causing accidents was human error of 55%.<sup>4</sup> Stress will increase because should make an immediate decision, while on the other hand working hours of ATC is very constant in terms of busy and strict work schedules, work environment situations that isolated, so that it can be a factor of physical and mental stress which ultimately affects ability, responsiveness and ATC alertness. Fatigue can also cause safety incidents, obstruct ATC's ability and increase the difficulty of implementing safety guarantees, so that techniques and strategies and mechanisms coping for stress in each ATC employee are needed to avoid the dangers of work pressure especially related to mental stress such as depression, stress, and even burnout.<sup>5</sup>

According to Hewitt in Mustikawati, progressive muscle relaxation therapy exercises can release tension on the body and mind and improve awareness (improving health and protecting from disease, maintaining and combining energy, achieving psychophysical expertise and improving the state of psychophysical balance), so that the achieved a balance between body and soul that can help a person be more efficient in his life.<sup>6</sup> Based on description above, this study aims to examine the effect of progressive muscle relaxation on ATC employees to reduce stress levels at work.

## Methods

### Design

This study used experimental method, randomized control group pre-post-test design.

### Population and study setting

Research held in Air Nav Makassar. Samples were randomly selected from the population then divided in two groups intervention and controls. Each subject was observed by giving a pre-test and post-test. The number of experimental groups were 30 ATC employees given treatment in the form of progressive muscle relaxation techniques, while the number of control group were 30 ATC employees not treated.

### Variables

The variables of the research are relaxation and work stress. Respondent were divided into two groups, one group as intervention group and another group as control each group contain 30 ATC employees. Intervention group was given

relaxation training for a month while the control group did not get any exercise.

### Data collection

Data obtained by using Pre-test and post-test questionnaires. The questionnaire used was the stress scale (Perceived Stress Scale) and the questionnaire job stress from NIOSH to measure the effect of progressive muscle relaxation on decreasing the level of work stress of ATC employees.

### Data analysis

Statistical tests carried out in this study used Wilcoxon signed ranks test if the data were not normally distributed and *t*-test 2 groups were paired if the data were normally distributed to see differences in stress levels of ATC employees before and after applying progressive muscle relaxation. Data normality tested by using the Kolgomorov-Smirnov, data is normally distributed if the value is  $p > 0.05$ .

### Ethical aspect

Ethical permission has been obtained from the ethics committee Faculty of Public Health Hasanuddin University. All subjects were given informed consent before being included in the study.

## Results

The samples of the research were randomly selected from the population, then divided into two groups which consist of intervention and controls group. Then each subject was observed twice by giving a pre-test and post-test.

### Characteristics of respondents

Distribution of respondents' characteristic shown in Table 1:

Age of participating ATC employees in relaxation training majority age 21–30 years as many as (63.3%). ATC employees have fulfill requirements working hours (100%) in both the intervention group and the control group. ATC employees who have long working periods as much as 83.3% in the Control Group, while the new work period category is 23.3% in the Intervention group.

### The change of blood pressure, insomnia, and MSDS

Analysis of blood pressure, insomnia and MSDS can be seen in the Table 2.

Analysis show that control group obtained an alpha value of  $0.465 > 0.05$ , it means that there was no change in systolic blood pressure in the group, in intervention group with alpha  $0.001 < 0.05$ , so it could be concluded that there was a change in blood pressure after a month of relaxation exercises Table 3.

**Table 1** Characteristics of respondent.

Variable	Intervention		Control group	
	N	%	N	%
<b>Age</b>				
21-30 Years	19	63.3	20	66.7
31-40 Years	5	16.7	4	13.3
41-50 Years	5	16.7	6	20.0
51-60 Year	1	3.3	0	0
<b>Working time</b>				
Doesn't fulfill requirements	0	0	0	0
Fulfill requirements	30	100	30	100
<b>Working period</b>				
Long	23	76.7	25	83.3
New	7	23.3	5	16.7

Source: Primary data, 2019.

**Table 2** Changes of blood pressure, insomnia and MSDS among air traffic controller.

Group	Score	Average	Test used	p Value	Alpha	Conclusion
<b>Blood pressure</b>						
Control group	Pre-test	123.17	Paired T test	0.465	0.05	No change
	Post-test	123.33				
Intervention group	Pre-test	119.97	Paired T test	0.001	0.05	Change
	Post-test	111.97				
<b>Insomnia</b>						
Control group	Pre-test	1.83	Paired T test	0.05	0.05	Change
	Post-test	1.57				
Intervention group	Pre-test	1.93	Paired T test	0.025	0.05	Change
	Post-test	1.77				
<b>MSDS</b>						
Control group	Pre-test	1.87	Wilcoxon	0.083	0.05	No change
	Post-test	1.97				
Intervention group	Pre-test	1.40	Wilcoxon	0.003	0.05	Change
	Post-test	1.70				

Source: Primary Data, 2019.

The results showed the control group with  $p$  value of  $0.005 < 0.05$  so there were changes in health conditions (Insomnia). Whereas in the Intervention group alpha value of  $0.025 < p < 0.05$  was obtained so that it could be given the same conclusion that there were changes of insomnia after doing progressive muscle relaxation exercises for a month [Table 4](#).

The result showed that Control group had an alpha value of  $0.083 > p$  value  $0.05$  with a conclusion there were no changes of MSDS. Whereas in the Intervention group that was an alpha value of  $0.003 < 0.05$  so there was a change of MSDS.

#### Changes of workload, mental load and physical health disorders

Analysis the changes Workload, Mental Load and Physical Health Disorders can be seen as follows:

The results show the control group has an alpha value of  $0.085 > 0.05$  with a conclusion no changes in workload. Whereas in the intervention group there was an alpha value of  $0.019 < 0.05$  so that it could be concluded that there was a change in workload after exercises.

The results showed that control group had alpha value of  $0.816 > 0.05$  with conclusions there were no changes in mental burden. The Intervention group alpha value was  $0.02 < 0.05$  so there was a change of mental burden after doing exercises.

Results of analysis show that the changes in physical health disorders show that control group has an alpha value of  $0.41 > 0.05$  with conclusions there are no changes in physical health disorders where as in the Intervention group alpha value is  $0.01 < 0.05$  so it can be concluded that there is a change in physical health problems after doing exercises.

**Table 3** The changes workload, mental load and physical health disorders among air traffic controllers.

Group	Scores	Average score	Test used	p Value	Alpha	Conclusion
<i>Workload</i>						
Control group	Pre-test	38.53	Wilcoxon	0.085	0.05	No change
	Post-test	35.53				
Intervention group	Pre-test	37.70	Wilcoxon	0.019	0.05	Changes
	Post test	39.27				
<i>Mental Load</i>						
Control group	Pre-test	9.93	Wilcoxon	0.816	0.05	No Change
	Post-test	12.53				
Intervention group	Pre-test	9.40	Wilcoxon	0.02	0.05	Change
	Post-test	9.60				
<i>Physical Health Disorders</i>						
Control group	Pre-test	70.30	Wilcoxon	0.41	0.05	No change
	Post-test	67.97				
Intervention group	Pre-test	71.50	Wilcoxon	0.01	0.05	Changes
	Post-test	76.67				

Source: Primary Data, 2019.

**Table 4** Changes in stress levels among air traffic controllers.

Group	Score	Level of stress				Conclusion
		Average	Used test	p-Value	Alpha	
Control group	16 Pre-test	16.73	Paired T test	0.083	0.05	No changes
	post-test	16.93				
Intervention group	Pre-test	14.00	Paired T test	0.001	0.05	Changes
	Post-test	9.20				

Source: Primary Data, 2019.

### Stress level

Analysis of data on changes in stress levels can be seen as follows:

The results of analysis show the control group with alpha value of  $0.083 > 0.05$  with conclusions there are no changes in the level of work stress. Whereas in the Intervention group there was an alpha value of  $0.001 < p$  value  $0.05$  it could be concluded that there was a change in workload.

### Discussion

The result shows that there is an effect of relaxation exercise to decrease systolic blood pressure. Stress results in sympathetic stimulation that can increase the frequency of blood pressure, cardiac output and vascular pressure and the sympathetic stimulating effects of increasing blood pressure. This is supported by research conducted by Setyaningrum with the title of the effectiveness of progressive muscle relaxation and slow deep breathing to decrease blood pressure, improve sleep quality and decrease stress levels in hypertensive patients. It was found that there were significant differences in the reduction of stress levels in the control group 1 and control group 2 so that this intervention is very effective for reducing blood pressure and stress.<sup>7</sup>

The results show that there is an effect of progressive muscle relaxation on changes in insomnia. This is also in accordance with the research conducted by Prasetya entitled the effect of progressive muscle relaxation on changes in insomnia among the elderly.<sup>8</sup> From the results it can be concluded that there is an effect of progressive muscle relaxation to reduce MSDS. In accordance with the research conducted by Dewi about the effect of progressive muscle relaxation on lower back pain in third trimester pregnant women, obtained results that there is effect of progressive muscle relaxation on decreasing the lower back pain scale in the 1 trimester pregnant women.<sup>9</sup>

Based on the analysis it can be concluded that there is an effect of progressive muscle relaxation toward changes in mental burden. In the study conducted by Kustanti and Widodo about the effect of progressive muscle relaxation on changes in mental status of schizophrenic clients in Surakarta psychiatric hospital was concluded that 8 respondents who were treated with progressive relaxation techniques there were 4 respondents who experienced a decline in mental status that quite big, from the serious category to being moderate category.<sup>4</sup>

Based on the analysis it was found that changes in physical health disorders before and after progressive muscle relaxation exercises. From the results obtained, it can be concluded that there is an effect of progressive muscle

relaxation on changes in physical health disorders. In accordance with the research conducted by Azhlyia showed that there were effects of relaxation techniques on pain adaptation responses.<sup>10</sup>

From the results that obtained, it can be concluded that there is an effect of progressive muscle relaxation on changes in workload. In the Prihatsani study entitled reducing the work stress of correctional institutional officers with COPE techniques it was concluded that there was a significant effect of the adoption of COPE techniques as an alternative solution to reduce the work stress of correctional institutional officers.<sup>11</sup>

From the results obtained, it can be concluded that there was an influence progressive muscle relaxation exercises to stress level. It's caused by adulthood factors which tend to have high stress levels in the medium category. Stress results in sympathetic stimulation that can increase the frequency of blood pressure, cardiac output and vascular resistance as well as the sympathetic stimulating effects of increasing blood pressure.<sup>12</sup>

## Conclusion

Progressive muscle relaxation has some influence on changes insomnia, MSDS, mental burden, physical disorders, workload, and the level of stress among Air Traffic Controller in Makassar.

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## Conflict of interest

The authors declare no conflict of interest.

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