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Stretching Interventions and Their Effect on Mental the Workload

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Abstract*: Cleaning workers are jobs that require physical strength especially if the work is carried out at a height, and it is not uncommon to complain about musculoskeletal discomfort in physical areas that feel uncomfortable when working in an un ergonomic position. From the observation results If observed posture when cleaning wokers work, body position tilted and bent with angles ranging from 20°-60°, neck bent with an angle of about 20 °, cleaning is done repeatedly by shifting the left hand and right hand with the angle of the upper arm > 90° raised for 10 minutes and forearm around 40°, this illustrates the condition of awkward posture cleaning wokers not ergonomic, posture that is not ergonomic will cause musculoskeletal disorder. The purpose of this research is to measure the effect of stretching on mental workload in an effort to mental recovery. To achieve these objectives, first determine the type of glass cleaning activity outside the building at a height including: preparing tools, climbing stairs, cleaning glass, moving to other areas and cleaning tools, determining stretching movements, then conducting experiments in this case divided into 3 (three) treatment, first without stretching, giving stretching in the morning at 10 am for 6 minutes and stretching during the day at 2 pm for 6 minutes. Measurement of mental workload using the Subjective Workload Assessment Technique (SWAT) method, statistical processing by carrying out the covariance homogeneity test, Multivariate test and followed by the MANOVA test. The results of this research that stretching in addition to having a positive influence on the decline in mental workload, can also be used for mental recovery. Working at a height with a work posture that is not ergonomic, will increase the level of mental workload.

***Keywords*: Stretching, Mental workload, Subjective Workload Assessment Technique (SWAT), Cleaning workers, Elevated Place.**

I. INTRODUCTION

Cleaning Workers who work at a height do not only need physical strength to do glass cleaning work that is outside the building, but also require mental strength related to the ability to concentrate to control the situation to avoid work accidents and control the fear of fear of falling when at an altitude. Work equipment is also an important thing as a tool to make it easier to do work and provide safety assurance when carrying out an activity. From the results of observation of stairs aids that are used to ascend to the area to be cleansed are also used as a foothold to do work, which has a small surface so that the footwear quickly feels pain and makes the feet become unbalanced and posture also becomes un ergonomic, (Darvishi et al, 2016) stated that Subjective Mental Workload (SMWL) has a relationship with Musculoskeletal Disorder (MSDs), where SMWL is increasing, the risk of MSDs is increasing. (MacLeod. 1995) states that posture that is not ergonomic will pose a risk of MSDs.

Regarding the mental strength needed to work at a height becomes important, remembering that concentration to control the occurrence of work accidents and the fear of falling need to get serious attention. From the observations it can be seen that glass works in accordance with height> 5 m. The tools are used consist of bamboo equipped with bamboo equipped with safety equipment provided on the floor> 90 ° this is explained need assistance in connecting and controlling the taste is so that it is not necessary, according to the needs of the work will make the mental workload increases, if this lasts longer without any relaxation it can cause boring and stress (Tsujita and Morimoto. 2002), (Basahel et al. 2012) (Hutabarat et al. 2013) increase physical and mental intensity, ultimately will decrease accuracy, speed of response and decrease work productivity.

Some researchers have conducted research in an effort to provide relaxation so that recovery occurs physic by providing rest breaks, (Savage and Pipkins, 2006) conducted research by giving short pause in work so that the muscles get enough time for recovery otherwise the muscles will become fatique and strain , what is meant by fatigue here is decrease in maximal ability, muscle fatigue will disrupt productivity such as decreased strength and loss of precise motor control and will have a negative impact on performance in the form of speed and quality. (Kroemer et al., 1994) Operational fatigue is defined as a reduced muscular ability to continue an existing effort. (Grandjean, 1982) Types of rest pause include Spontaneous pause: rest pause done by workers on their own initiative if the work is heavy, usually done not long but done often; Disguised pause: rest pause done by workers when they are bored, needs to relax because no one can do manual work or mental work continuously without interruption, usually done by diverting their activities with easy things such as cleaning machine parts, tidying up the workplace and sit more comfortably; Work-conditioned pause: rest pause that is received by the worker while waiting for the machine to finish its work phase, or cool the tool, the machine or the tool is being repaired; Prescribed pause: rest pause which is a management

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provision for example for a coffee break, or another type of pause (midday break).

Some other types of rest breaks include micro breaks (McLean et al., 2001), frequent short breaks (Henning et al., 1997), supplementary rest breaks (Galinsky et al., 2000), work-rest schedules (Balci and Aghazadeh, 2000), add rest breaks (Dababneh et al., 2001), rest periods (Savage and Pipkins, 2006), and rest break interventions (Faucett et al., 2007), in general, each type of break break is generally rest break schedule strategy in an effort to produce a rest break recommendation that is tailored to the type of work and the purpose of recovery physical tasks as well as productivity and musculoskeletal discomfort.

Micro break (McLean et al., 2001) is a rest break that is given every 20 minutes or every 40 minutes group intervals with duration rest breaks each for 30 seconds, research is carried out on data entry computer work, there are 3 (three) aspects studied : physiological aspects, where measurements are made using portable electrophysiological data loggers, physical parts measured include: neck, back, trapezius / supraspinatus channel and wrist extensors; aspects of musculoskeletal discomfort are measured using a visual analog scale (VAS); Productivity measured by the number of words obtained for 3 hours. The research was conducted for 4 weeks with the characteristics of the participants: age between 23-50 years (median = 34 years), experience between 2-18 years. The results showed that micro break had a positive impact on reducing discomfort, especially at 20 minutes intervals, giving micro breaks did not interfere with worker productivity and giving micro breaks increased productivity compared to no rest breaks, but significantly no difference in productivity between 20 minutes and 40 minutes intervals.

Frequent short rest breaks (Henning et al., 1997) is a rest break that is done in 2 ways in every 1 hour of work namely frequent breaks and short breaks, frequent rest breaks done 3 times each for 30 seconds and short breaks during 3 minutes, during the short break the participants did stretching exercises. There are two jobs namely entering customer insurance claims into the data base and making client benefits decisions. The research was divided into 2 models: model1 for the smaller site and model 2 for the large site. The aspects studied were 3 (three): Mood state, Discomfort and Productivity. The results showed no improvement in productivity in model 2, but in model 1 there was an increase in productivity and comfort including in short rest breaks by stretching exercise.

Supplementary rest break (Galinsky et al., 2000) is a rest break that is done by giving an additional rest break for 5 minutes every hour on conventional rest breaks, conventional rest breaks is done for 15 minutes at each half time. This research aims to examine the effect of supplementary rest breaks on 21 musculoskeletal discomfort, eyestrain, mood, and performance in data-entry workers, supplementary rest break results show that discomfort for body parts of the body, and eye strain is significantly lower compared to conventional schedule, as well as having a positive impact on performance.

Work-rest schedule (Balci and Aghazadeh, 2000) is a work rest schedule strategy that is done in 3 ways: 60 minutes of work / 10 minutes of rest; 30 minutes work / 5 rest; in 1 hour there are 4 rest breaks where 3 times every 15 minutes work / 30 seconds rest and 15 minutes to 4 rest for 3 minutes followed by exercise. This research was conducted to measure discomfort, speed, accuracy, biomechanical activity and performance for data entry and mental task work. Discomfort measurement using a questionnaire, performance is measured based on the ratio of typing the correct word to the total number of words that have been typed, electromyography is used to measure biomechanical activity. The results showed that 15 minutes / micro was superior to longer and infrequent rest breaks, mental tasks produced higher psychological discomfort, lower physical discomfort and lower performance than data entry tasks.

Add rest break (Dababneh et al., 2001) is a rest break that is done by giving additional rest breaks to regular rest breaks. The regular rest break time is 15 minutes for part time, additional rest breaks are done in 2 ways. Method 1: Additional rest breaks for 3 minutes for every 27 minutes of work; Method 2: Additional rest breaks for 9 minutes for every 27 minutes of work. This research was conducted to measure the production rate (production rates in pieces per minute) by using a video camera to monitor production continuously; discomfort using the discomfort questionnaire; and stress level using stress questionnaire for meat processing plants. The results showed that of the two rest schedules having a negative effect on production, and 9-minute breaks had decreased discomfort. Most of the workers in this research preferred a 9-min rest schedule, and workers were not prepared to accept the fragmentation of short breaks (frequent breaks).

Rest periods (Savage and Pipkins, 2006) are rest breaks that is given for 2 minutes rest period for each after 10 minutes of work, after 20 minutes (control) and 24 minutes (experiment) of the drilling process, measurements of pre-test and post-test hand strength are performed for conditions control and experiment. The purpose of this research is to examine the effect of recovery time (rest period) on fatigue and productivity. The results of fatigue research in the experiment significantly decreased (pre-test and post-test), the control decrease was greater than the experiment, the number of screws drilled between the control and experimental group participants was significantly different, participants who were given a rest period significantly decreased their productivity smaller than those without a rest period.

Rest break interventions (Faucett et al., 2007) is a rest break that is given for 5 minutes every hour (experiment) a total rest 20 minutes per day compared to no rest break (control). This research was conducted to test the symptoms and productivity for agricultural work (strawberry harvesting) harvesting carried out in a bent body position (stoop). The results showed that workers with experimental conditions had significantly less symptoms (less severe symptoms) than workers under control conditions, and their productivity experienced variations.

Stretching and exercise is a development of rest breaks, Stretching is a relaxation effort by doing physical movements to stretch muscles in an effort to prevent muscle strains, (Fenety et al., 2002) states that excercise programs will have an impact on decreasing musculoskeletal discomfort and postural immobility. In general it can be said that stretching and exercise can provide flexibility in muscle and range of motion (ROM), reduce musculoskeletal discomfort and fatigue levels.

Stretching and joint mobilization exercises reduce musculoskeletal discomfort and fatigue (Lacase et al., 2010) conduct research by making exercise programs that aim to determine the impact of exercise programs on musculoskeletal discomfort, mental and physical fatigue compared to only giving rest breaks to call center operators airline company, the research was conducted for 10 weeks, a week carried out for 4 days where every day 10 minutes exercise program in which there are stretching (hamstrings, spinal columns, forearms and shoulders). Musculoskeletal discomfort measurement using visual analog scale (VAS) with corlett-bishop body discomfort map (BDM) to determine the location of discomfort, mental and physical fatigue is measured using a chalder fatigue questionnaire. The results of the research found that both groups experienced a decrease in discomfort but the exercise program was more efficient than a rest break in decreasing discomfort, physical fatigue and mental fatigue.

In this research, trying to provide a solution to mental fatigue due to work at a height by providing stretching in which in previous studies stretching was associated only with physical recovery, and will be measured the impact on mental workload. Measuring instruments used in measuring mental workload use subjective measurements using Subjective Workload Assessment Technique (SWAT) (Rubio et al., 2004). SWAT has 3 workload dimensions: time load, mental effort load and psychological load each subjective rating using 3 levels: low (1), medium (2) and high (3) (Reid et al, 1989).

Subjective Time Load (T) rating low (1) means that it often has loose time; interruption and overlap activities rarely occur and almost never; medium (2) means it rarely has loose time; interruption and overlap activities rarely occur; high (3) means almost no loose time; Interruption and overlap activities often occur.

Subjective rating Mental Effort Load (E): low (1) means that very little use of mental effort or concentration; almost automatic activities, requiring little or no attention; medium (2) means that the need for concentration and mental effort is moderate; moderate activity high due to uncertain conditions, unpredictable or not understood; high (3) means that mental effort needs are very extensive and concentration is needed; Very complex activities require total attention.

Subjective rating Mental Effort Load (E): low (1) means confusing conditions are categorized as small, the level of risk is small, the occurrence of frustration and anxiety can be easily overcome; medium (2) means that moderate stress occurs because confusion, frustration and anxiety are felt against workload; requires compensation so that performance can be maintained; high (3) means that stress is very high due to the level of difficulty, frustration and anxiety; requires self-control and high determination.

Steps in calculating the SWAT Score (Reid et al, 1989) (Rubio et al., 2004): first is Scale development: combining all possibilities of three levels for each of the three dimensions containing 27 cards. Each operator will sort the cards into rank orders that reflect perceptions or increase workload. The second is Event-scoring: an actual rating of the workload for a predetermined task, so here each operator will state the rating value for each task for each SWAT dimension according to what is felt / experienced. Next provide scoring according to the results of step 3. Third is Converted to numeric score: convert the scale interval from the first step (scale development) into a numeric score between 0-100.

II. METHOD AND MATERIALS

Cleaning workers used as participants are those who work the National Institute of Technology Malang-East va-Indonesia, selected participants are all men who do not ve a history of high blood pressure, heart disease and abetes as many as 30 people. Participant demographics: ean age 35 years ± 7.61; Average body weight 64 kg ± 17; Average height 163 cm ± 4.00; Body Mass Index BMI) averaging 23.14 kg / m² ± 3.88. They work from 7 am to 4 pm with a break from 12.00 to 13.00. Materials used to clean glass include: glass cleaner (such as a site), used paper to clean the surface of the glass and a cloth rag to clean the rface of the glass. The tools used include: bed sheet as a ace, a ladder as a tool to go up to the area to be cleaned and a place to foot when working, *kapi* is a tool to wipe *spirtus* water that is sprayed on the glass surface of rubber material.

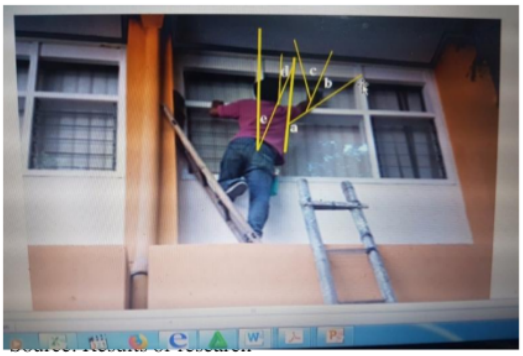

Figure 1a. Cleaning Workers Posture

Figure 1b. Cleaning Workers Posture

Source: Results of research

Body posture when working as shown in figure 1 (1). Upper arm angle position (a) = 130 °; Forearm angle (b) = 40 °, wrist angle = 35 °, neck angle = 20 °, trunk angle = 30 ° and position of one leg raised. Body posture when working as shown in figure 1 (2). Upper arm angle position (a) = 100 °; Forearm angle (b) = 20 °, wrist angle = 35 °, neck angle = 40 °, trunk angle = 50 °. Activities undertaken in glass cleaning include: preparing tools, climbing stairs, cleaning glass, moving to other areas and cleaning tools.

Source: Results of research

Fig. 2. 6 (six) Stretching Movements

Stretching movements used are movements directed at 7 areas of the body that are felt uncomfortable and painful, where from the results of preliminary research more than 50% of participants stated pain in the body area: left shoulder, right shoulder, back, waist, buttocks, right knee and left foot, this movement is called CW-5 Stretch:

1. Left Shoulder and Right Shoulder
   Pull your hands toward the back as high as possible and hold for 10 seconds, do the movement 6 times, as in figure 2. (1)
2. Back and waist
   Push your lower back forward and hold for 10 seconds, doing the movement 6 times, as in Figure 2. (2)
3. Butt
   Push the Butt toward the right, left, front and back sides and each side is carried out for 10 seconds, do this movement 6 times, as in figure 2. (3a and 3b).
4. Right Knee and Left Knee
   Hold your knees with your arms crossed, then bend your knees like sitting position and hold for 10 seconds, do this motion 6 times, as shown in figure 2. (4)
5. Left Foot
   Straighten your left leg and bend your body, then pull the toe and hold for 10 seconds. do this movement 6 times, like in picture 2. (5)

This stretching treatment is done 2 times in 1 day, at 10 am and 2 pm, so that the total stretching time is 6 minutes in the morning and 6 minutes during the day. Mental Workload Measurement using the method of Subjective Workload Assessment Technique (SWAT) and Software Subjective Workload Assessment Technique (SWAT), version 3.1, 1996, Dayton, Ohio, Rescale SWAT values are grouped in 3 categories: Low: 0-40; Medium: 41-59; High: 60-100, Where the SWAT Rescale assessment is based on Time load (T), Mental Effort (E) and Psychology Stress (S) scale. For further calculations the grouping will be divided into 2 (two) categories, namely: High and Not High, not high including low and moderate: 0-59, and for Height: 60-100. Measurement of SWAT values is carried out without stretching and with morning stretching and during the day, then the statistical data processing is carried out by covariance homogeneity test, Multivariate test and continued with MANOVA test

III. RESULTS AND DISCUSSION

The results of the Mental Workload measurements stated by Rescale SWAT value were carried out without Stretching, Stretching at 10am, and 2pm, the results as shown in table 1, illustrate the average value of Rescale SWAT for each activity starting from the preparation of tools, climbing stairs clean the glass, move to another area, to clean the appliance.

Table-I: SWAT RESCALE Values of 30 participants for 5 (five) Activities Before Stretching, Morning Stretching and Daytime Stretching

Participant	Before Stretching					After Stretching in the morning					After Stretching in the Daytime				
	Setting Up the Tool	Climbing up the stairs	Clean the glass	Move to Other Areas	Tidy Up the Tool	Setting Up the Tool	Climbing up the stairs	Clean the glass	Move to Other Areas	Tidy Up the Tool	Setting Up the Tool	Climbing up the stairs	Clean the glass	Move to Other Areas	Tidy Up the Tool
1	35	84,2	85	50,9	35	35	68,4	68,4	52,6	50,9	17,5	52,6	66,7	52,6	21
2	6,9	63	65,1	23,2	41,9	7,3	49	76,2	48,8	16,3	16,3	48,8	48,8	23,2	12
3	25,4	54,1	54,1	39,6	48,1	39,6	48,7	76,7	39,9	54,1	13,6	39,9	54,1	77,4	34,5
4	7,4	62	53,5	76,8	34,5	11,7	30,5	65,5	30,5	41,8	0	23	11,7	19,2	11,3
5	0	62	87	41,6	14,8	26,8	67,5	52,7	56,4	40,8	56,4	40,8	78,7	40,8	76,5
6	30,1	67	78,2	44,9	53,3	30,1	78,2	78,2	21,7	44,9	11,5	46,7	51,8	30,1	8,3
7	28,3	78	75,1	49,4	0	11,8	43,1	90,8	70,7	29,3	29,3	65,9	65,9	45,8	38,4
8	13,7	59,6	76	57	27,2	27,1	59,6	50,8	51,1	40,6	13,7	45,9	51	64,6	27,2
9	11,8	47,7	70,3	37,1	14,2	14,2	47,7	73,5	44,4	14,6	0	77,1	51,7	100	14,2
10	11,8	54,9	58,6	65,9	29,3	28,3	75,1	34	53,2	29,3	0	43,1	45,8	75,1	0
11	56,4	68	78,7	78,7	0	26,8	56,4	74	56,4	40,8	29,6	67,5	67,5	56,4	11
12	56,4	81	78,7	78,7	0	21,7	53,3	53,3	30,1	44,9	10,2	55	48	53,3	21,7
13	15	62,3	70,3	51,7	29,2	15	37,1	51,7	81,5	32,7	43,8	47,7	70,3	37,1	22
14	23,2	82	74,5	41,9	48,8	0	15,9	6,9	14,1	9,1	6,9	23,2	65,1	23,2	12
15	13,4	71	84	40,6	43,6	40,6	46,2	76	43,6	57	13,4	59,6	43,5	40,6	43,6
16	17,5	68,4	81	52,6	50,9	17,5	50,9	68,4	33,3	17,5	17,5	68,4	54	68,4	35
17	15,7	82	63	34,5	18,5	28,4	70,4	70,4	47	42	15,7	28,4	44	65,5	18,5
18	26,8	64,6	64,6	38,8	45,6	3,5	54,2	81,2	55,5	26,8	0	57,6	83,4	64,6	26,8
19	7,3	15,9	74,4	48,7	16,3	0	67,2	48,8	100	9,1	0	42,1	67,7	74,5	0
20	0	77,1	51,7	100	14,2	0	47,4	43,8	70,3	0	0	32,7	32,7	51,7	29,2
21	0	49,4	50,1	80,2	0	17,6	67	80,2	63,4	3,7	50,1	80,2	40	33,7	47
22	39,9	76,7	76,7	25,4	39,9	11,8	48,1	76,7	62,4	14,2	13,6	48,7	77,4	62,9	25,4
23	3,5	54,2	81,2	55,5	26,8	0	57,6	83,4	64,6	26,8	12	57,6	52	32,1	38,8
24	31,3	60,6	50,2	47,3	47	0	42	65,5	84	0	15,7	42	63	34,5	18,5
25	0	80	82	43,4	26,1	7	23,7	23,7	59	6,1	32,1	82,7	19,1	49,4	6,1
26	9,1	51,9	72,8	60,9	22,5	26,5	34,5	72,8	43,5	0	26,5	34,5	72,8	43,5	0

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Participant	Before Stretching					After Stretching in the morning					After Stretching in the Daytime				
	Setting Up the Tool	Climbing up the stairs	Clean the glass	Move to Other Areas	Tidy Up the Tool	Setting Up the Tool	Climbing up the stairs	Clean the glass	Move to Other Areas	Tidy Up the Tool	Setting Up the Tool	Climbing up the stairs	Clean the glass	Move to Other Areas	Tidy Up the Tool
27	11,8	48,1	76,7	62,5	14,2	13,6	62,3	76,7	54,1	25,4	13,6	62,3	76,7	54,1	25,4
28	0	77,7	85,5	74,3	48,2	0	59,4	85,5	56	25,6	0	59,4	85,5	56	25,6
29	0	42	82	78,7	0	14,8	67,5	51,9	67,5	29,6	14,8	67,5	51,9	67,5	29,6
30	7	32,7	32,7	51,7	29,2	43,8	47,7	70,3	70,3	0	43,8	47,7	70,3	70,3	0

Source: research result.

Table-II: The Average of SWAT RESCALE Values for 5 (five) Activities Before Stretching, Morning Stretching and Daytime Stretching

Descriptive Statistics SWAT RESCALE

Activity	Treatment	Mean	Std. Deviation	N	Category
Setting Up the Tool	Before Stretching	16,82	15,69	30	Not high
	After Stretching in the morning	17,35	13,34	30	Not high
	After Stretching in the Daytime	17,25	15,54	30	Not high
Climbing up the stairs	Before Stretching	63,59	12,59	30	High
	After Stretching in the morning	52,55	14,89	30	Not high
	After Stretching in the Daytime	51,62	15,73	30	Not high
Clean the glass	Before Stretching	70,22	15,84	30	High
	After Stretching in the morning	64,27	19,14	30	High
	After Stretching in the Daytime	57,04	17,66	30	Not high
Move to Other Areas	Before Stretching	64,84	19,78	30	High
	After Stretching in the morning	54,2	18,44	30	Not high
	After Stretching in the Daytime	52,27	18,88	30	Not high
Tidy Up the Tool	Before Stretching	27,31	17,29	30	Not high
	After Stretching in the morning	25,8	17,54	30	Not high
	After Stretching in the Daytime	22,65	16,63	30	Not high

Source: Results of research

From table II, it can be seen that the average value of SWAT Rescale for the activity of preparing tools without stretching and with morning and afternoon stretching there is an increase in the average value of SWAT Rescale by 3.15% in the morning stretching to without stretching and 2.5% stretching during the day against without stretching but this increase is all still in the category of not high.

For the activity of climbing stairs without stretching and with morning and afternoon stretching there is an average decrease in the value of SWAT Rescale by 17.36% in the morning stretching to no stretching and 18.82% stretching during the day without stretching and this decrease causes the category changes from height without stretching to not being high in morning stretching and daytime stretching.

For the activity of cleaning the glass without stretching and with morning and afternoon stretching there is an average decrease in the value of the SWAT rescale by 8.47% in the morning stretching to no stretching and 18.77% stretching during the day without stretching and this decrease causes the category changes from height on without stretching and stretching in the morning to not high on stretching during the day.

For activities moving to other areas without stretching and with morning and afternoon stretching there is an average decrease in the value of SWAT Rescale by 16.41% in the morning stretching to no stretching and 19.38% stretching during the day without stretching and this decrease causes there is a change in the category from height without stretching to not high in morning stretching and daytime stretching.

or the activity of cleaning tools without stretching and with morning and afternoon stretching there is an average reduction in the value of SWAT Rescale by 5.53% in the morning stretching to without stretching and 17.06% daytime stretching against without stretching and this decrease is all still in the category of not high.

stretching there is an average decrease in the value of SWAT Rescale by 17.36% in the morning stretching to no stretching and 18.82% stretching during the day without stretching and this decrease causes the category changes from height without stretching to not being high in morning stretching and daytime stretching.

For the activity of cleaning the glass without stretching and with morning and afternoon stretching there is an average decrease in the value of the SWAT rescale by 8.47% in the morning stretching to no stretching and 18.77% stretching during the day without stretching and this decrease causes the category changes from height on without stretching and stretching in the morning to not high on stretching during the day.

For activities moving to other areas without stretching and with morning and afternoon stretching there is an average decrease in the value of SWAT Rescale by 16.41% in the morning stretching to no stretching and 19.38% stretching during the day without stretching and this decrease causes there is a change in the category from height without stretching to not high in morning stretching and daytime stretching or the activity of cleaning tools without stretching and with morning and afternoon stretching there is an average reduction in the value of SWAT Rescale by 5.53% in the morning stretching to without stretching and 17.06% daytime stretching against without stretching and this decrease is all still in the category of not high.

Table- III: Box's Test for covariance matrix homogeneity / homogeneity tests

Box's Test of Equality of Covariance Matrices[a]	
Box's M	46,092
F	1,409
df1	30
df2	23983,922
Sig.	,068

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.
a. Design: Intercept + Treatment

a. Note: *p < 0.05; **p < 0.01.
b. Source: Results of research

In Table III. above, it can be seen that the Sig Box's M value is 0.068, which is greater than Alpha 0.05, thus accepting the null hypothesis that the covariance homogeneity test has been fulfilled. So, data can be used further MANOVA test.

Table- IV: Box's Test for covariance matrix homogeneity / homogeneity tests

Multivariate Tests[a]						
Effect		**Value**	**F**	**Hypothesis df**	**Error df**	**Sig.**
Intercept	Pillai's Trace	,961	409,321[b]	5,000	83,000	,000**
	Wilks' Lambda	,039	409,321[b]	5,000	83,000	,000**
	Hotelling's Trace	24,658	409,321[b]	5,000	83,000	,000**
	Roy's Largest Root	24,658	409,321[b]	5,000	83,000	,000**
Treathment	Pillai's Trace	,196	1,830	10,000	168,000	,059
	Wilks' Lambda	,808	1,868[b]	10,000	166,000	,053
	Hotelling's Trace	,232	1,904	10,000	164,000	,048*
	Roy's Largest Root	,206	3,453[c]	5,000	84,000	,007**

a. Design: Intercept + Treatment
b. Exact statistic
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
Note: *p <0.05; **p < 0.01.
Source: Results of research

From the results of calculations, namely in table 3. Multivariate Test above, obtained the significance value of the Roy's Largest Root test is 0.007 and the Hotelling's Trace test obtained a significant value of 0.048. So because both of these tests have p-values less than α (0.05), it can be decided H1 states that together the treatment-free variables (without stretching, morning stretching and afternoon stretching) significantly influence the SWAT variable on the five dependent variables at the level 95% confidence.

Table-V: MANOVA Tests

Tests of Between-Subjects Effects						
Source	**Dependent Variable**	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	Prepare the tool	4,716[a]	2	2,358	,011	,989
	Climbing up the stairs	2659,600[b]	2	1329,800	6,354	,003**
	Clean The glass	2615,154[c]	2	1307,577	4,224	,018*
	Move to other areas	2751,523[d]	2	1375,761	3,794	,026*
	Tidy Up the Tool	338,553[e]	2	169,276	,575	,565
Intercept	Prepare the tool	26447,020	1	26447,020	119,172	,000**
	Climbing up the stairs	281445,360	1	281445,360	1344,797	,000**
	Clean The glass	366811,872	1	366811,872	1184,815	,000**
	Move to other areas	293471,161	1	293471,161	809,252	,000**
	Tidy Up the Tool	57395,776	1	57395,776	194,948	,000**
Treatment	Prepare the tool	4,716	2	2,358	,011	,989
	Climbing up the stairs	2659,600	2	1329,800	6,354	,003**
	Clean The glass	2615,154	2	1307,577	4,224	,018*
	Move to other areas	2751,523	2	1375,761	3,794	,026*
	Tidy Up the Tool	338,553	2	169,276	,575	,565
Error	Prepare the tool	19307,263	87	221,923		
	Climbing up the stairs	18207,770	87	209,285		
	Clean The glass	26934,704	87	309,594		
	Move to other areas	31550,126	87	362,645		
	Tidy Up the Tool	25614,111	87	294,415		
Total	Prepare the tool	45759,000	90			
	Climbing up the stairs	302312,730	90			
	Clean The glass	396361,730	90			
	Move to other areas	327772,810	90			
	Tidy Up the Tool	83348,440	90			
Corrected Total	Prepare the tool	19311,980	89			
	Climbing up the stairs	20867,370	89			
	Clean The glass	29549,858	89			
	Move to other areas	34301,649	89			
	Tidy Up the Tool	25952,664	89			

a. R Squared = ,000 (Adjusted R Squared = -,023)
b. R Squared = ,127 (Adjusted R Squared = ,107)
c. R Squared = ,088 (Adjusted R Squared = ,068)
d. R Squared = ,080 (Adjusted R Squared = ,059)
e. R Squared = ,013 (Adjusted R Squared = -,010)

Note: *p < 0.05; **p < 0.01

Source: Results of research

The MANOVA test results obtained the conclusion that preparing tools and cleaning tools obtained significance values greater than 0.05, which means there is not significant difference in the value of SWAT Rescale preparing tools and cleaning tools without Stretching, Morning Stretching and daytime stretching. While climbing stairs, cleaning the glass and moving to other areas obtained a significance value of less than 0.05, this means that there is a significant difference in the value of SWAT Rescale when climbing stairs, cleaning the glass and moving to other areas before stretching, after morning stretching and After daytime stretching.

If observed posture while working as in figure 1 (1) (2), the angle of the upper arm position (a) = 130 ° and 100 ° and; Forearm angle (b) = 40 ° and 20 °, wrist angle = 35 ° and 35 °, neck angle = 20 ° and 40 °, trunk angle = 30 ° and 50 ° and the position of one leg is raised, this describe the body posture that is not ergonomic, working in an un ergonomic position if left for a long time without any rest break then it can result in Musculoskeletal Disorder (MSDs), (Dinar et al, 2018) conveying that the factors that can cause MSDs are duration of rest, work posture and job stress perception. (Sharan., And Ajeesh, 2012) work style, work posture is closely related to regional pain.

Some researchers say that stretching during rest breaks can benefit muscle strain, as stated (Lacase et al., 2010) stretching is better than giving a rest break, and can have an impact on decreasing discomfort, physical fatigue and mental fatigue.

As the results of this research that Stretching has a significant influence on the value of SWAT Rescale when climbing stairs, cleaning the glass and moving to other areas before Stretching, after morning stretching and after daytime stretching with a decrease in the average value of SWAT Rescale by 17.36% in morning stretching against without stretching and 18.82% stretching during the day, while for the activity of cleaning the glass without stretching and with morning and daytime stretching there is a decrease in the average value of SWAT Rescale by 8.47% on morning stretching against without stretching and 18.77% stretching

during the day without stretching, for activities to move to other areas without stretching and with morning and daytime stretching there is a decrease in the average value of SWAT Rescale by 16.41% in the morning stretching without stretching and 19.38 % stretching during the day against without stretching, this decrease changes the category of high mental workload to not high, this shows that posture that is not ergonomic will cause the occurrence of MSDs and Stretching significantly influence the decline in mental workload. This is reinforced by Darvishi et al., 2016, from the results of the research it was revealed that mental workload has a significant relationship to MSDs, so the more MSDs increase the mental workload also increases, and vice versa the lower mental workload the lower the MSDs as well. ((Habibi, et al. 2015) concluded that MSDs have a strong relationship with mental workload which includes: workload frustration, total workload, temporal demand, effort, and physical demand and this shows that workload frustration or stress has a relationship with workplace so if Uncomfortable workplaces will increase workload frustration and MSDs. Related to this research glass cleaning activities carried out outside the building at a height turned out to result in high mental workload, this is influenced by conditions that are not ergonomic work postures, causing high levels of MSDs and require high concentrations and when given stretching resulting in mental workload can be reduced to not high.

IV. CONCLUSION

Posture that is not ergonomic at work will result in MSDs, and the increasing MSDs will have an impact on increasing mental workload. Working at an altitude requires mental strength because it is related to the ability of the response to control the fear of fear of falling and the ability to concentrate to avoid the risk of accidents. Stretching can be used not only as a physical recovery effort but can also be used to reduce the increase in mental workload.

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