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Time Setting of Stretching to Improve Response speed of Transportation Drivers in Malang City

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Abstract

Mental task is one of city transportation driver jobs related to concentration and ability to control the visual information received. Superior mental ability is a necessity in order to control the car properly to avoid accident. To obtain information related to provision of stretching treatment of drivers to improve their response speed. Stretching treatment and response speed measurement were done in the morning and afternoon. To achieve the purpose, the research was conducted in following stages: (1) determining the route/path of city transportation, (2) searching for 30 respondents/drivers with age ranges of 25 up to 60 years, (3) determining the stretching movements, named D-Stretch, and (4) time setting of stretching treatment. The time treatments were grouped into following three groups: (1) without stretching, (2) stretching in the noon and (3) stretching in the morning and noon. Measurement of driver response was done by props tool, the drivers is asked to provide a response to props; the response speed is recorded in camera. The research findings showed that without morning stretching the response speed or speed in the afternoon slower. Stretching time in the morning and noon could increase the response speed in the afternoon. The drivers had more swiftly response to represents a decrease in fatigue and stress. The conclusion was stretching treatment in the morning and noon will provide a positive contribution to driver alertness, particular city transportation drivers. The response speed of driver became better and faster. Stretching treatment in the noon will gave a positive contribution to driver alertness in car to drive public transportation or faster response speed and driver becomes more awake.

Keywords: Timing, muscle stretching, driver response speed, alertness.

INTRODUCTION

Works driver has physical and mental task. Physical tasks relate with skills and ability to operate the car, while the mental task relate with concentration and ability to control and speed response to visual information received. City car driver with low physic and mental abilities could decrease safety and causing an accident (Recarte and Nunes, 2003). The main cause factors of accidents were lack of care and lower speed response of driver (Taylor and Dorn, 2006). When driving a car, a driver requires continuous attention to the complex and dynamic tasks to detect the environment changes in an effort to concern with potential hazards.

Mechanical machine vibration has an ergonomic risk to driver (Chander and Maria 2017; Chiasson et al., 2015; Pavlovic-Veselinovic et al., 2016). It was described that mechanical vibration is mixture of various frequencies to make stress and relax the tonus muscle and tire effect (6). Repeat activity to move gears, brakes and clutch become frequent due to more vehicles volume and crowded, this case accelerates driver fatigue. It will likely create cumulative trauma disorders (CTDs) such as tendonitis if working for long time without rest (Suma'mur, 1995; MacLeod, 1995; Amell and Kumar, 2000; Seth et al., 1999; Bell and Wang, 1997).

The survey also shows that mental aspect when driving a car make the concentration and ability to control the car becomes a major factor to increase the workload of driver mental (Heikoop et al., 2017). Visual information received in form of road traffic density and road user behavior become stimuli to make fatigue mental. It showed that working for a long time without relaxation will create boring and stress (Hutabarat et al., 2013). In a long time, it could cause stress and higher workload (Hjortskov et al, 2004; Mazur et al., 2012; Mandrick et al., 2016) . It was explained that the condition will affect not only the work but also the mental workload level of workers (Hughes and Reeves, 2005). High intensity of physical and mental workload creates low accuracy and longer response and lower productivity (Basahel et al., 2012; Hutabarat et al., 2013). Ignoring the indifferent and boring will create stress (chronic or acute stress), eg anxiety, depression and personality disorder as a form of psychosocial and mental state (Tsujita and Morimoto, 2002). The signs of fatigue include lower attention/response speed, lower and barriers of perception, slow and difficult to think, lower willingness to work and lower efficiency for physic and mental activities which causes lower alertness and it could cause accidents (Suma'mur, 1987; Hutabarat et al., 2016).

Based on above description, this study aim is to obtain information related to provision of stretching treatment of

drivers to improve their response speed. Stretching treatment and response speed measurement were done in the morning and afternoon.

MATERIAL AND METHOD

This experimental study was conducted to city car drivers, from February to August 2016. Participants were city transport drivers in Malang City, East Java-Indonesia. The participants were selected based on purposive sampling method. The criteria were: (1) working from 07 am until 06 pm, (2) the city car drivers agree to become participants and signing the informed consent, (3) the age between 25 to 65 years and (4) they drive city cars at average levels of traffic density of 2 meters per second. Based on these criteria there were 30 city car drivers that could be used as participants. The cars used were All Purposes Vehicle (APV) or Suzuki Carry, 1600 cc

The the traffic path was controlled by choosing path with following criteria. The traffic path density level was about 2 meters per second of movement; road width about 7.5-10 meters at one path and 15-20 meters for 2 paths with a distance of about 15-20 kilometers per path. Traffic path contained private cars, motorcycles and public transport cars and dominated by motorcycles.

The measurement instruments of this study were paper display and video recorder. Papers display containing letters and numbers were placed in rows with a distance of 5 cm. The letters and numbers sizes were varied in 10 model of display. The camera with HD quality was used to get accurate data.

The study was conducted with following procedure. Stretching was done for 10 minutes. It was based on Subaru Izuzu at an automotive plant. The treatments were differentiated based on without stretching (for control), stretching at noon and afternoon (first treatment), and stretching at morning and noon (second treatment).

Stretching named D-Stretch was done at base area with standing position for 5 minutes and rest position for 5 minutes. It was done without music for movements stretching as movements for neck, back, hands, fingers, hips and legs (figure 1). Figure with number (1) (5) (6) shown the neck flexibility: moving the neck to left-right, forward-backward and turning heads left to right, then turning the head right to left for 75 seconds. Figure with number (2) (4) (12) shown the back flexibility: rotating the hand with bent from front to back, and vice versa, right and left left parallel to move to left or right for 75 seconds. Figure with number (3) and (7) shown hands flexibility: moving the hands to forward and backward in a parallel position with shoulders, the hand position was flexed and moved forward and backward for 75 seconds. Figure with number (8) (9) (10) (11) shown foot flexibility: running in the place, followed by lifting the left and right leg and hand alternately, walking forward and backward for 75 seconds. The total stretching was 5 minutes.

The D-stretch treatment was controlled by two experts. One expert gave examples and followed by all participants. To ensure the proper D-stretch treatment, one other expert monitored the participants to correct the wrong movement.

Measurements of response speed were conducted during the lunch break for respondents without or with stretching. They were requested to provide a response to display shown on each driver and recorded by camera. The recorder was used to measure the response speed for each driver to 10 models display. Result of responses time were tabulated and presented with Microsoft Office Excel 2007 and then analyzed statistically by SPSS V.20 for Window. The response speed differences between morning, noon and afternoon were calculated be seeking the deducting the average response speed of morning as benchmark with noon and afternoon. Positive results showed faster (better) response speed while negative result shows slower response time.

The measurement was divided into 3 stages. Stage 1 measured the participants without stretching. It was used at control group to know the response speed without treatment. Stage 2 measured participants with noon stretching only (first treatment). Stage 3 measured participants with the morning and noon stretching (second treatment). Measurements were done after stretching session.

Figure 1. D-Stretch Movement

RESEARCH RESULT

The participants were drivers with age between 25-65 years old. Participants with age above 50 years old show better response speed after the stretching treatment. Body Mass Index (BMI) was from 17.51 to 26.57. Participants did not have following medical record: high blood pressure, diabetes and heart disease. The education of most public car drivers in Malang City was Junior High School.

The responses speed (seconds) for control group (without stretching) is shown in table 1 and figure 3 below.

Table 1 show that first measurement for non stretching (control) of this research was done three (3) times namely in the morning hours at 10 o'clock, noon at 2 o'clock and afternoon at 5 o'clock. The results show that average response speed speed of driver without stretching in the morning was 5.0733 seconds, while during the noon was 5.2667 seconds, slower 0.1934 second than morning, while in afternoon was 5, 4600 seconds, slower 0.3867 second than morning. The trend shows slower speed response (the longer response speed) from morning to afternoon. It indicates that driver condition during the work was getting tired and stressed. It will decrease the response speed (the longer response speed).

Response speed (second) for first treatment (stretching at noon) was shown in table 2 below.

Table 1: Response speed without Stretching (control)

	N	Minimum	Maximum	Mean	Std. Deviation	Description
Morning at 10 o'clock without stretching (MWS)	30	3.80	5.90	5.0733	.45632	Benchmark
Noon at 2 o'clock without stretching (NWS)	30	4.50	6.30	5.2667	.45283	-0.1934
Afternoon at 2 o'clock without stretching (AWS)	30	4.80	6.50	5.4600	.40565	-0.3867

Table 2: Response speed with Noon Stretching (first treatment)

	N	Minimum	Maximum	Mean	Std. Deviation	Description
	30	3.80	5.90	5.0733	.45632	Benchmark
Noon at 2 pm o'clock with stretching (NS)	30	4.10	6.30	4.8967	.57565	0.1766
Afternoon at 5 pm o'clock without stretching (AWS)	30	4.10	5.90	5.0000	.47051	0.0733

Table 2 showed first treatment with following treatment, noon at 2 o'clock with stretching and afternoon at 5 o'clock without stretching. Average response speed at morning without stretching was 5.0733, while during noon with stretching was 4.8967 seconds, faster 0.1766 second than morning. Response speed at afternoon without stretching was 5 seconds, faster 0.073 second than response speed at morning. It means the response speed of driver increased by 0.1766 second than in the morning, but it was slower 0.0733 second at afternoon. Faster response speed indicated that stretching during noon increase the response speed of driver. It means the stretching during noon could reduce fatigue and stress.

Response speed (second) for second treatment (stretching in the morning and noon) was shown in table 3 below.

Table 3: Response speed with stretching in the morning and noon (second treatment)

	N	Minimum	Maximum	Mean	Std. Deviation	Description
Morning at 10 o'clock with stretching (MS)	30	3.80	6.10	4.9333	.61270	Benchmark
Noon at 2 o'clock with stretching (NS)	30	3.80	5.80	4.8600	.51902	0.0733
Afternoon at 5 o'clock without stretching (AWS)	30	3.90	6.00	4.8733	.57472	0.06

Table 3 showed the measurement of second treatment with two stretching, in the morning at 10 o'clock with stretching, noon at 2 o'clock with stretching and afternoon at 5 o'clock without stretching. Average response speed at morning with stretching was 54.9333, while during noon with stretching was 4.8600 seconds, faster 0.0733 second than morning. Response speed at afternoon without stretching was 4.8733, faster 0.06 second than response speed at morning. It means the response speed of driver increased by 0.0733 second than in the morning, but its response speed slower 0.0733 at afternoon. Faster response speed indicated that stretching during noon increase the response speed of driver. It means the stretching during noon could reduce fatigue and stress.

Table 4: Results of Main Treatment Effect

Tests of Between-Subjects Effects					
Measure: MEASURE_1					
Transformed Variable: Average					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	22938.785	1	22938.785	66706.125	.000
Response_speed	4.253	9	.473	1.374	.195
Stretching	22.948	2	11.474	33.367	.000
Response_speed * Stretching	4.728	18	.263	45.846	.000
Error	299.174	870	.344		

This study uses error rate of 5% ($\alpha = 0.05$). Table table 4 showed that the response speed had p value of 0.195 (p.value=> α). It could be said that there is no difference in the average response speed of overall measurement without stretching. Furthermore, stretching treatment had p value of 0.000 (p.value <α). It could be said that three stretching treatment gives faster at response speed. Furthermore, interaction between the two had p value of 0.000 (p.value< α). It could be seen that the interaction increased the response speed. In other words, it could be seen that stretching could increase response speed of car drivers in Malang City.

DISCUSSION

Table 1 illustrate that without stretching (control treatment) the speed response at noon was slower than morning. The worst was at afternoon, where the speed response even became slower than morning and noon. It means that along with length of working time and conditions that require concentration and speed response, in the noon driver began to feel fatigue. This condition even more worse at afternoon. This would affect to the driver alertness in response to any incident seen and faced. This was reinforced by Sumakmur (1987) that the sign of fatigue was lower attention to do a job. If this continues for long time, could lead to traffic accidents.

Stretching treatment at noon (first treatment), as shown in table 2, could increase the response speed of public car drivers in Malang City. It showed that stretching treatment at noon can increase response speed of the public car drivers in Malang City. Decreased the tension or stress levels. According to Hjortskov et al. (2004) if the tense situation was too long and not addressed, it could lead to stress and higher workload.

The best result was shown for stretching treatment at morning and noon (second treatment), as shown in table 3. The response speed of public car drivers in Malang City consistently showed a faster trend. It means that stretching treatment at noon at afternoon give best response speed of the public car drivers in Malang City.

Testing the effect between subject was analyzed by SPSS 20 for Windows. The result at table 4 showed that there were no difference of response time for without stretching treatment. The stretching treatment significantly can increase the response speed. The combination without treatment and stretching treatment also could increase the speed response. It means that stretching treatment could increase the average speed response of public car drivers in Malang City.

CONCLUSION

These research results showed that stretching treatment can increase response speed. Stretching at noon could give better response speed than without stretching. Stretching at morning and noon give fastest response speed. I has a positive contribution to driver alertness of public car drivers in Malang City to avoid accident and decrease the stress and fatigue.

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