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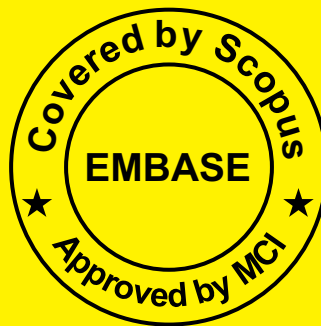


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Relationship between Mental Workload and Fatigue of Motorcycle Rider among East Java Student

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ABSTRACT

Fatigue is a decreased body condition due to physical and psychological burden. Fatigue affects the ability to ride a motorcycle. One of them is affected by workload. Aims of this study to analysis correlation between fatigue state and workload on senior high school students that use motorcycle. A cross-sectional study was conducted. Data collected from population in east java Island Indonesia. Population of study are student from senior high school. Sample size of this study was 453 student who rider motorcycle. Questioner to measurement of fatigue use Subjective Self Rating Test from Industrial Fatigue Research Commite (IFRC). Questionare to assess mental workload used National Agency and Space Administration Task Load Index (NASA-TLX). The results showed that the characteristics of respondents in this study were mostly female (57.6%) and aged 17-19 years old. Most of respondents had mental workload were middle (52.5%). Overall, Effort, Mental Demand, Temporal Demand acquired the highest workload scores while physical demand recovered lowest workload score. The overall fatigue level showed that 62.9% of students who ride motorcycle felt fatigue as middle and 32% as high. Subjectively activity fatigue felt by most respondents (99.8%). Frequency of fatigue that felt respondents is rare. Mental demand has a negative correlation with fatigue. Physical Demand has a negative correlation with activity and mental fatigue. Temporal Demand has a negative relationship with activity fatigue. Own Performance has a negative relationship with fatigue. Effort has a negative relationship with fatigue. Frustration on level and fatigue obtained a significant positive correlation. Schools consider conditions that cause frustration to students so that the risk of fatigue can be reduced.

Keywords: Workload, frustration on level, Sex, prevalence of fatigue

Introduction

Fatigues are condition. Fatigue is a condition of decreased energy so that it does not have the will and ability to do activities. Fatigue is one of the indicators of physical quality. Analysis by Armstrong *et al*⁽¹⁾ in his study found a phenomenon of 66% of people driving vehicles tired or sleepy and 2.4% of participants who experienced fatigue having a history of traffic accidents.

The study of Engberg, *et al* found that the proportion of fatigue in the population of women aged 25-45 years is 10.8 % while in men in the same age group is 9.7%⁽²⁾. Women have a higher incidence of fatigue than men. Fatigue that occurs in motorcycle riders can cause loss of concentration while driving. Motorcycle riders who experience sleepiness 5.9 times experience traffic accidents⁽³⁾. Fatigue is a risk for a significant incidence of motorcycle accidents Fatigue is a condition that can be physical fatigue and mental fatigue that can be triggered by stress, medication, overwork, or mental and physical illness. Sleep quality, decreased quality of life, stress are significantly associated with fatigue and residual fatigue. Short sleep, depressed mood, length of work associated with residual fatigue⁽⁴⁾.

Muscle fatigue is a loss of muscle strength (muscle contractility) reversibly during work. Fatigue is a condition that can be caused due to neurological and

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non-neurological factors. Neurologic factors that cause fatigue include central fatigue (mental fatigue), mental disorders (mental disorder), disorders of the central nervous system (organic Central Nervous System). Non-neurological factors include heart problems, pulmonary disorders, blood disorders, metabolic diseases and chronic fatigue syndrome (CFS) ⁽⁵⁾.

Material and Method

Design of this study is cross-sectional. Method of data collection to get information was obtained through a survey. Participants of this study was student of senior high school that chosen considering with criteria was motorcycle driver. The sample selection is based on multistage random sampling. The first stage is the determination of the location of the school based on the selection of the city with the highest accident rate. The second step is to determine the school based on cluster random. The third step is to determine students through simple random sampling. Questioner instrument that use this study. Questioner distributed to student after obtaining head of school to conduct the study. Before the participant answers the questionnaire, the overall project goals and objectives of the survey were explained to student and head of school. Four hundred fifty three of six hundred eleven copy were filled. Collected data at 2017. The level of workload of students who drive two-wheeled vehicles based on the calculation of the NASA TLX method. Fatigue measurement of respondents in this research used Subjective Self Rating Test from Industrial Fatigue Research Commite (IFRC). The sample of the study were student who used motorbikes aged 17-

19 years. The mental workload data was analyzed by summing all mental workloads value divided by fifteen before being grouped. Data on mental workload are grouped into three. High group if the value of mental workload is more than 75%, medium if 50% -75% and mild if less 50%. Severe group if the value of fatigue is more than 90%, medium if 61% -90%, mild if 31-60% and no fatigue if less 30%. Descriptive statistics was Correlation analysis was performed using spearman non parametric analysis. A significance level of 0.05 was used for all statistical analysis.

Result and Discussion

Characteristic of Respondents: Respondents in this study were senior high school. The range age was 17-19 years old and average was 17 (± 0.32) years old. Most of the gender of the respondents are female (57.6%). Respondent experience workload are middle (52.5%). The results of the research conducted by Barret (2018) show that women’s feedback fatigue is higher in prevalence than men ⁽²⁾⁽⁶⁾⁽⁷⁾.

Fatigue Status: Most respondents experience fatigue. The prevalence of fatigue obtained from the results of the study was 99.8%. The proportion of students who experienced severe fatigue found in the study was 4.2%. Fatigue item include are activity, mental and physical fatigue. Most fatigue that felt responden is actifity fatigue. Activity fatigue felt by respondents 99.8%, as for other, mental fatigue (99.3%), physical fatigue (98.9%). The frequency of activity, mental and physical fatigue experienced by respondents is rare. Descriptif analysis showed in table 1.

Table 1: Descriptive statistics of fatigue items

Fatigue item	Mean	Mode	Standar Deviasi	Minimal	Maximal
AF	29.68	30	5.29	10	47
MF	28.23	30	5.45	10	60
PF	26.60	26	5.70	10	48

AF: Activity Fatigue; MF: Mental fatigue; PF: Physical fatigue

According to Tien’s study, academic stress has an effect on the severity of fatigue ⁽¹¹⁾.An education system that requires students to interact with the internet so students use time to seek knowledge for academic demands through the internet. The study by Chatharine and Lamyae said that internet-addicted students experience higher fatigue than students without internet addiction.An education system that requires students to interact with the internet so students use time to seek knowledge for academic demands through the internet. The study by Chatharine and Lamyae said that internet-addicted students experience higher fatigue than students without internet addiction ⁽¹²⁾.

Activity Fatigue Status: There were ten item to measure activity fatigue in the Subjective Self Rating Test questionnaire. Sleepy, want to lie down and tired of the whole body aimed the highest activity fatigue scores while standing unstable obtained the lowest activity fatigue scores. Respondents that felt Heavy feeling on the head (92.8%) that most of frequency headache was rare (55.6%). Respondents that felt tired of talking (96.2%) that most frequency were rare (57.8%). Respondents that felt weight on feet (86.0%) that most frequency felt weight on feet were rare (48.3%). Yawning felt by respondent (95.5%) that most frequency felt yawning were often

(41.9%). Respondents felt distracted mind (92.3%) that most frequency o sense distracted mind were rare (46.6%). Sleepy symptoms felt by respondents (98.9%) that most frequency were often (44.6%). Respondents (88.1%) felt burden on the eyes that most frequency felt burden on the eyes were rare (41.7%). Awkward and rigid movements felt by respondents (81.1%) that most frequency were rare (37.5%). Most frequency of respondents (69.4%) felt standing unstable that most frequency were always never (36.4%). Want to lie down symptom felt by respondents (96.8%) that most frequency were rare (39.5%). Presentation of each item shown in table 2.

Table 2: Descriptive statistics of activity fatigue items

Activity fatigue item	Yes		No	
	Frequency	%	Frequency	%
Heavy feeling on the head	412	92.8	32	7.2
Tired of the whole body	427	96.2	17	3.8
Weight on feet	382	86.0	62	14.0
Yawning	424	95.5	20	4.5
Distracted mind	410	92.3	34	7.7
Sleepy	439	98.9	5	1.1
burden on the eyes	391	88.1	53	11.9
Awkward and rigid movements	360	81.1	84	18.9
Standing unstable	308	69.4	136	30.6
Want to lie down	430	96.8	14	3.2

Mental Fatigue Status: Mental fatigue included in the Subjective Self Rating Test questionnaire are ten item. Presentation of each item shown in table 3. Trust condition, not concentrating and feeling anxious accessed highest mental fatigue scores while not diligent in work received the lowest mental fatigue scores. Hard to think Tired of talking felt by respondents that most of frequency were rare (45%). Nervous was felt by 85.4% of respondents that the highest frequency is rare (52.3%) Not concentrating felt by most respondent were rare (65.3%). Most frequency of the respondents that sense difficult to focus were rare (57.2%). Easy to forget symptoms felt by respondents that most frequency were rare (51.9%). Most of respondents that felt not trust were rare (44.2%). Feeling anxious felt by most of respondents were rare (56.3%). Difficult to control attitude felt by respondents (85.6%) that Most frequency of respondents that felt difficult to control attitude were always never (46.8%). Not diligent in work symptom felt by respondents (82.9%) that most frequency were rare (46.6%).

Table 3: Descriptive statistics of mental fatigue items

Mental fatigue item	Yes		No	
	Frequency	%	Frequency	%
Hard to think	403	90.8	41	9.2
Tired of talking	379	85.4	65	14.6
Nervous	394	88.7	50	11.3
Not concentrating	417	93.9	27	6.1
Difficult to focus	396	89.2	48	10.8

Conted...

Easy to forget	414	93.2	30	6.8
Trust	427	96.2	17	3.8
Feeling anxious	417	93.9	27	6.1
Difficult to control attitude	380	85.6	64	14.4
Not diligent in work	368	82.9	76	17.1

Physical Fatigue Status: Physical fatigue experienced by respondents is explained in 10 questions. Tables 4 expressed the various condition that describe Physical fatigue. Physical symptoms of fatigue felt by most students were dyspnea (99.1%). Respondents that felt headache were 94.8% that most of frequency headache was rare (48.8%). Stiff on the shoulder felt most frequency was rare (39.1%). Most frequency respondents that felt back pain were rare (47.2%). Dyspneu felt by most of respondents were never (39.7%). Most frequency of the respondents that sense thirsty were often (44.6%). Hoarseness symptoms felt by respondents that most frequency were rare (43.7%). Most of respondents that felt dizziness were rare (43.9%). Eyelid spasme felt by most of respondents were rare (42.2%). Most frequency of respondents that felt tremor on the limbs were always never (32.9%). Unhealthy symptom felt by most respondents were rare (56.3%).

Table 4: Condition of Physical fatigue by Senior High School Students

Condition	Yes		No	
	Freq.	%	Freq.	%
Headache	437	94.8	24	5.2
Stiff on the shoulder	452	98.0	9	2.0
Back pain	454	98.4	7	1.5
Dyspneu	457	99.1	4	0.9
Thirsty	381	82.6	80	17.4
Hoarseness	447	96.9	14	3.0
Dizziness	449	97.3	12	6.7
Eyelid spasme	454	98.4	7	1.5
Tremor on the limbs	446	96.7	15	3.3
Unhealthy	449	97.3	12	2.6

Mental Workload Status: Respondents who are young people are faced with social problems and the demands of their lives. Teenagers are a stable period. Table 5 show about description analysis mental workload.

Table 5: Descriptive statistics of mental workload fatigue

Workload item	Mean	Mode	SD	Minimal	Maximal
Effort	3.17	3	1.34	0	5
Mental Demand	2.69	3	1.33	0	5
Temporal Demand	2.61	2	1.26	0	5
Own Performance	2.54	3	1.32	0	5
Frustration on Level	2.16	3	1.58	0	5
Physical Demand	1.84	2	1.36	0	5

Correlation between mental workload and physical fatigue status: Some workload item shown in table 6.

Table 6: Corellation between workload and physical fatigue status

Workload Item		Fatigue item		
		Activity fatigue	Mental fatigue	Physical fatigue
MD	Corelattform Coefficient	-0.107*	-0.073	-0.014
PD	Corelattform Coefficient	-0.021	-0.037	0.033
TD	Corelattform Coefficient	-0.039	0.007	0.060
OP	Corelattform Coefficient	-0.203**	-0.137**	-0.097*
E	Corelattform Coefficient	-0.214**	-0.229**	-0.187**
FL	Corelattform Coefficient	0.266*	0.234**	0.194**

MD: Mental Demand; PD: Physical Demand; TD: Temporal Demand; OP: Own Performance; E: Effort; FL: Frustration on Level

*Correlation is significant with $\alpha = 0.05$ level (2 tailed)

** Correlation is significant with $\alpha = 0.01$ level (2 tailed)

Student activities include learning that requires remembering, counting and looking for subject matter. Student activities include learning that requires remembering, counting and looking for subject matter. This activity is getting easier, so the activity fatigue gets lower.

Students in this survey felt that the more satisfied the completion of school assignments, the lower activity fatigue. Low performing students are students who experience more fatigue (16). Low performing students are students who experience more fatigue

School assignments given to students include group and individual assignments, if students have succeeded in working will give satisfaction to the students themselves.

Efforts that have been made in completing the tasks that lead to good performance, According to the results of this study indicate that significantly increasing efforts will decrease the activity fatigue.

This study show that between frustration on level and mental fatigue have corelltion. According to Williamson et al, mental health is associated with fatigue (9). Study in University of Montreal shows that 72,7% stress caused by workload (8). Stress is part of a condition that determines a person’s level of frustration related to fatigue. The study conducted by Annupama et al stated that there is a correlation between stress and fatigue in students (7). Feel safety is a part of determining the level of frustration. There is a relationship of feel safety with

mental workload. Mental burden is related to the process of attention and effort (15). Social interaction is related to feel safety.that related to the level of frustration. The study conducted by Michiyo et al showed that students with low social interactions tended to increase depression scores (10). Studies in Pakistan which are the results of a survey show financial responsibility is a cause of frustration (13).

Conclusion

The mental workload is related to fatigue. Mental demand has a negative correlation with fatigue. Physical Demand has a negative correlation with activity and mental fatigue. Temporal Demand has a negative relationship with activity fatigue. Own Performance has a negative relationship with fatigue. Effort has a negative relationship with fatigue. Frustration on level and fatigue obtained a significant positive correlation.

Conflict of Interest: In carrying out this research, researchers do not have conflict of interest with research informants and between participants

Source of Funding: This research was conducted with self funds

Ethical Clearance: This research was conducted on the awareness of respondents as volunteers in filling out the questionnaire. Before the study, respondents were given an explanation and signed informed consent.

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