The Identification of Motorcyclist Safety Risk among University Students in Yogyakarta, Indonesia

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ABSTRACT

Introduction: Traffic accidents are cases of concern both nationally and internationally. Their impact ranges from injuries to death. In Indonesia, traffic accidents are dominated by students who use motorcycles. With this in mind, this study is focused on identifying the driving attitudes that are responsible for traffic accidents among university students.

Methods: The cross-sectional survey study was conducted from January 2023 to February 2023, located in the Special Region of Yogyakarta, Indonesia. Data was gathered using simple random sampling on 97 students based on experiences while driving such as safety attitude, frequencies on motorcycle inspections, and driving attitude. The next step is a comparison between results based on student experiences and risk assessment by experts. The expert assessment used two personnel of Police Resort from Yogyakarta and Purworejo, Indonesia.

Results: Participants were divided into 81.4% men (N=79) and 18.6% women (N=18), with a mean age ± standard deviation of 21 ± 1.8 years. Awareness of safety attributes is demonstrated by the use of helmets by 92.78% of participants, and motorcycle inspections on rearview mirrors (85.57%), rims & tires (79.38%), and brakes (71.13%). In terms of road driving attitudes, students drive with fatigue (82.47%) and sick (61.86%), drive in bad weather (78.35%), and exceed the standard of speed (53.61%). The results of the risk assessment show that 7 variables have a high risk, namely helmet, inspection on the brake, driving in fatigued physical condition, driving in sick physical condition, using gadgets when driving, traffic sign violation, and overspeeding.

Conclusion: Based on these results, it show that students' driving readiness is quite good with the attributes of vehicle safety and feasibility. This is shown by the use of helmets and break checks by students with the highest risk on the road. However, the need to be concerned is that the bad riding attitude includes physical health conditions, driving according to traffic safety standards, and paying attention to weather conditions. Improvements are needed especially by drivers to create safe and secure driving conditions.

Keywords: Accident, Awareness identification, Motorcyclist, Safety, Traffic, University students

Introduction

Safe driving is the basic factor that determines comfort in driving. Due to the large number of vehicle users in traffic on the road, there is a need for awareness among drivers. It aims to create a sense of security and comfort, as well as safety until it reaches the destination.[1,2] Without awareness of each driver, this goal cannot be achieved. The experience of discomfort can significantly influence the psychological well-being of the driver, leading to heightened levels of

anxiety.[3,4] If this continues, the worst risk that may arise is a traffic accident.

Traffic accidents can occur anywhere and have an impact on material and immaterial losses.[5] Material losses are losses that are immediately felt from the beginning and can be measured by money such as maintenance costs for repairing the damaged vehicles. As for immaterial losses, they are losses that cannot be assessed with money and are more moral, such as trauma and fear for a long time. Victims of physical accidents may suffer permanent or non-permanent injuries until death.[6,7]

Based on the Central Statistics Agency in Indonesia,[8] there were 103,645 accident cases recorded in 2021. From this data, it was also recorded that the total amount of material losses suffered by accident was 246,653 (in Million Rupiah). In addition, the direct impact of this accident caused a total of 16.44% deaths, 6.86% serious injuries, and 76.70% minor injuries. The existence of these accident data cannot be separated from the development of the number of vehicles in Indonesia recorded in 2021, amounting to 141,992,573 vehicles of various types.[8,9] Based on the information listed, it can be understood that an improvement is needed to improve the condition of safe driving in Indonesia. This is evident from the low level of vehicle feasibility in Indonesia.[10]

In previous studies, a lot of information was obtained, one of which explained that traffic accidents are dominated by victims of productive age.[11,12] The highest rate of traffic accidents was observed among the 15-25 years population in one study and the 20-29 years population in another.[13,14] When linked to conditions in Indonesia, the data proves that traffic accidents occur among Senior High School and University students.[8,13]

This study aimed to analyze the level of students' safe driving in the Special Region of Yogyakarta, Indonesia. This location was chosen because Yogyakarta is known as the city of scholars in Indonesia.[15] Yogyakarta is in the top 10 provinces with the highest traffic accident rate with 5,262 accident cases in 2021.[8] This is also supported by the high number of accidents involving motorcycles.[8,16] The purpose of this study is to assess awareness of driving safety, with the subject of research on University students.

Methods

This research was conducted using a cross-sectional survey study. Data collection was carried out by direct interaction with 97 students as participants. This descriptive cross-sectional study was conducted among university students in the Special Region of Yogyakarta, Indonesia. The selection of participants used a simple random sampling method and was collected between January 2023 to February 2023. The study was conducted at the Department of Industrial Engineering, Universitas PGRI Yogyakarta, Indonesia. Discussions and questionnaires were the main methods for collecting the data. Students who meet the criteria were asked beforehand in the process if they would be willing to consider participating in the study. Without any compulsive components, it hopes to be able to uphold the ethics of research. Participants were given questions to fill in based on their experience. The data collection process is allocated for ±10 minutes to each participant. The inclusion criteria were: 1) Participants are students in the Special Region of Yogyakarta, indicated by a Student ID Card; 2) Using a Motorcycle as the main vehicle to campus; 3) Be physically and mentally healthy. All participants must determine that they meet the criteria before participating in the study.

Impact	Likelihood				
	Rare (1)	Unlikely (2)	Possible (3)	Likely (4)	Certain (5)
Catastrophic (5)	Low (5)	Medium (10)	High (15)	High (20)	High (25)
Major (4)	Low (4)	Medium (8)	Medium (12)	High (16)	High (20)
Moderate (3)	Low (3)	Low (6)	Medium (9)	Medium (12)	High (15)
Minor (2)	Low (2)	Low (4)	Low (6)	Medium (8)	Medium (10)
Insignificant (1)	Low (1)	Low (2)	Low (3)	Low (4)	Low (5)

Figure 1: Risk assessment matrix [17]

The collected data is then analyzed using a risk assessment matrix.[17] The goal is to be able to provide an objective picture from experts related to student driving attitude data. The question expert enlisted the services of two resort police personnel from Yogyakarta and Purworejo, who

possess over 15 years of work experience. The risk assessment matrix is linking likelihood criteria to severity criteria. The likelihood criterion is the possible frequency of danger occurring, while the severity criterion is the severity of an accident occurring. The results of this matrix infer the level of risk divided into low risk, medium risk, and high risk (Figure 1).

Results

Among the 97 students, 81.4% were male and 18.6% female. The mean ± standard deviation of their age was 21 ± 1.8 years.

Table 1. Recapitulation of variables related to student safe driving

No.	Variable	Participants		Risk Assessment			
		N	%	Expert 1		Expert 2	
				Score	Risk	Score	Risk
1	Safety Attribute						
	Helmet	90	92.78	25	High	20	High
	Long Pants	88	90.72	2	Low	4	Low
	Shoe	85	87.63	8	Medium	12	Medium
	Jacket	66	68.04	9	Medium	6	Low
	Mask	65	67.01	1	Low	1	Low
2	Motorcycle Inspections						
	Rim & Tire	77	79.38	10	Medium	8	Medium
	Panel instrument	15	15.46	1	Low	2	Low
	Rear-view mirror	83	85.57	6	Low	6	Low
	Brake	69	71.13	20	High	16	High
	Lamps	48	49.48	9	Medium	9	Medium
3	Driving Attitude						
	Driving in fatigued physical condition	80	82.47	16	High	16	High
	Driving in sick physical condition	60	61.86	20	High	25	High
	Using gadget	33	34.02	15	High	12	Medium
	Chat with other drivers while driving on the highway	37	38.14	12	Medium	12	Medium
	Traffic sign violation	28	28.87	12	Medium	15	High
	Overspeed	52	53.61	20	High	20	High
	Driving in bad weather and at night	76	78.35	4	Low	4	Low

Helmets are a mandatory safety attribute for motorcyclists. In Indonesia, the application of helmets when driving is regulated in Law No. 22 of 2009 concerning Road Traffic and Transportation.[18] The data collection results showed that a total of 93.2% of students were aware of the importance of wearing helmets. In this regard, most students reasoned that the use of helmets was for safety standards. As for the other, helmets are used to avoid the police. In addition, students also have an awareness of additional safety attributes such as long pants (90.72 %), shoes (87.63 %), jackets (68.04 %), and masks (67.01 %) (Table 1). In the discussion session, students did not fully apply safety attributes, but the use of helmets was the main one used. The use of trousers and shoes is a culture of discipline applied by universities in Indonesia. The trend of using jackets is because of the distance of more than 1 km from home/boarding to campus.

The results from this research showed that students checked the rear-view mirror (85.57%), rim and tire conditions (79.38%), brakes (71.13%), lamps (49.48%), and instrument panels (15.46%). Rear-view mirror inspection aims to see the condition of the vehicle behind. Rim and tire

inspection to prevent the motorbike from slipping and leaking while on the road. Brake inspection provides a sense of safety for the driver in reducing and stopping the motorcycle speed. Lamps are applied when in rainy weather, dark conditions, and cue lights. As for the inspection of the instrument panel, it contains symbols and instructions on the level of speed, gear, fuel, and position of the turn signal lamp. In general, students realize that not all motorcycle safety inspections are carried out. Most students conduct inspections at least 1 time every 3-7 days. Under conditions such as rear-view mirror, brake, and instrument panel checks are performed daily per travel. As for the condition of the rim, tire, and lamps, it is checked if there is a problem with attributes such as dim/dead lights, and the tire condition is very thin. Consistent inspection of the viability conditions of the motorcycle has the effect of reducing traffic accidents.[19]

From the results of data collection, it is known that the bad attitudes of students are driving in conditions of fatigue (82.47%) and sickness (61.86%). The driving attitude that also often occurs in university students is driving in heavy rainy weather (78.35%). Driving in this condition, can reduce visibility and requires concentration in controlling the motorcycle. Possible accidents that can occur as a result of this condition include: Slippery highways make it easier for motorcycles to slip; Visibility being reduced so that there is a risk of sudden brakes; and, being less proficient in controlling the brakes of the motorcycle, which has an impact on the slipping or hitting other vehicles.

Another bad attitude that also occurs in students is overspeed (53.61%) which is more than 60 km/h. The risk of accidents that often arise as a result of this attitude is that the driver loses concentration and cannot regain control. Chatting when driving with other vehicles (38.14%) and using a smartphone (34.02%), there is also a risk of loss of concentration. Research conducted by Jiang et al., (2021), shows that 90% of accidents occur due to human factors, where traffic signs violation is a common cause.[20] This was followed by 28.87% of

students who still had an attitude toward traffic sign violations (Table 1). The risk of accidents that arise as a result of this attitude is to hit the vehicle from the other direction.

Table 1 shows the results of the risk assessment are high risk with as many as 6 variables (each Expert 1 and Expert 2), medium risk with as many as 6 variables for Expert 1 and 5 variables for Expert 2, low risk with as many as 5 variables for Expert 1 and 6 variables for Expert 2. The results of the expert assessment show that, the 7 highest risks can be experienced by drivers if they do not follow traffic safety standards, namely, helmets, inspection on the brakes, driving in fatigued physical condition, driving in sick physical condition, using gadgets when driving, traffic sign violation and over speed. High risk indicates the urgency of repairs as soon as possible, due to the impact on the safety of drivers with high fatalities in the event of an accident.[17,21]

Discussion

Traffic accidents are cases of particular concern nationally and internationally. This research focuses on human factors that are associated with attitudes when driving. The common cause of many cases of traffic accidents is caused by human error.[4] Poor driving attitude has a high potential for traffic accidents. In this case, motorcycle control, the use of safety attributes, and awareness are considerations to create safe driving.[7,22–24] The type of vehicle most involved in road accidents is motorcyclists.[16,19,25]

Globally, traffic accidents are dominated by male college students and motorcyclists.[26–29] This is in line with the results of the study, with the number of participants based on gender being 81.4% male and 18.6% female. The average student age is 21 ± 1.8 years, with an age distribution between 18-23 years. Internationally, traffic accident cases involve students.[25,27,30,31] As for the highest rate of traffic accidents in Indonesia, it occurs at a productive age, with the victim being a University Student.[8,31] Discussions related to human error in this research, focused on the level of university students' awareness when driving. This is due to

the high number of accidents involving students.[5] The number of motorcyclists in Indonesia is 81.78% of other types of vehicles.[8] Student experience is used as a measuring value to find out their attitudes and behaviors in using motorcycles on the road. Students are aware that safety attributes are important during driving, such as helmets, long pants, shoes, jackets and masks. This is in line with research by Lao & Lukusa (2023),[30] stating that as many as 99% of motorcyclists are protected by the use of helmets. Helmets effectively protect the head area from brain injury trauma.[7] The use of jackets, pants, boots, and gloves can prevent motorcyclists from abrasions and bruises.[1,16] The areas of the body that can be protected by such attributes are the torso, hands and arms, and legs. Masks are a safety attribute capable of protecting motorcyclists from dust and pollution on the streets.[32]

Concerning vehicle feasibility, students conduct inspections on Rim & Tire, Instrument panel, Rear View Mirror, Brake, and Lamps. The inspection process is adjusted according to the time and conditions. Inspections are daily on the rearview mirror and brake attributes. Inspections are also carried out periodically at least 1 time in 3-7 days. And some inspections are carried out if the quality of certain attributes that are visually degraded. Consistent and periodic checks of vehicle feasibility have the effect of reducing the risk of traffic accidents.[6,19]

The condition of highways in Indonesia good condition is 53.15%; moderate condition is 23.54%; damaged and severely damaged condition is 23.31%.[8] Concern from the Indonesian government is needed to improve and improve the quality of highways. This is because good road conditions can reduce the potential risk of traffic accidents. In adverse weather conditions and nighttime, the driver's concentration will be focused on vehicle control, low visibility, and work fatigue factors.[30,33] If this is not supported by good road quality conditions, then the probability of an accident will be even higher.[34]

The driving attitude in this study, explains that there are still many university students driving in

poor conditions. This condition is inseparable from the activities and tasks on campus. This makes many students drive with fatigue and sick conditions, as well as drive during heavy rain and at night. Driving in these conditions results in a lack of concentration and awareness of driving, confusion, and focus.[3] Other adverse conditions include traffic sign violations, the use of gadgets while driving, overspeed, and chatting with another driver on the road. This condition affects the lack of awareness of the surrounding environment, focus, and concentration.[5,27,35] Research by Atmawati et al., (2021), shows that 84.5 % of accidents in university students are caused by poor driving attitudes.[25] In another study, by Yousif et al., (2020), stated that there are three things related to driving attitudes and safe driving, namely speeding issue, visibility issue, and alertness issue.[25]

Risk assessment was carried out in this study to be able to compare and provide an overview of field conditions and expert analysis. In addition, these results are a reinforcement of previous studies. Expert assessment is based on the experience of accident cases that have been faced in the field. Experts become parties who can connect theory and practice. The results of the risk assessment show that students are aware of the high risk of not using helmets, checking brake systems, health conditions, driving attitudes, speed control, and complying with traffic safety. This is because, if this high-risk variable is not observed, it will have an impact on the high fatality rate.[6,29,36]

Conclusions
The objective of the research is to determine the degree of safety associated with student driving. The findings indicate that safety characteristics, inspection of motorcycles, and driving attitude are variables that require attention. The present study's findings suggest that the utilization of safety attributes, motorcycle feasibility checks, and driving attitudes are influential factors that impact the safety of driving. The previous statement is supported by the findings of a risk evaluation conducted by experts, which indicates that failure to take into account these variables

while operating a motorcycle significantly increases the likelihood of traffic accidents.

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