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The Influence of Rider Concentration, Vehicle Completeness and Traffic Discipline on Motorcycle Rider Safety

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Abstract

Transportation plays a crucial role in driving development, particularly in developing countries such as Indonesia. This study aims to analyze the concentration of riders, vehicle equipment, traffic discipline on the safety of motorcyclists on the lasem-rembang pantura road. In this study, researchers used two types of data, including Qualitative Data and Quantitative Data. The results show that rider concentration, vehicle completeness, and traffic discipline have a positive and significant influence on motorcyclist safety. The results of the simple regression test show that the three variables have a positive coefficient, which means that the higher the concentration, vehicle equipment, and traffic discipline, the higher the level of rider safety.

Keywords

Transportation Development, Motorcyclist Safety, Rider Concentration, Vehicle Equipment, Traffic Discipline

1. Introduction

Transportation plays a crucial role in driving development, particularly in developing countries such as Indonesia. Transportation significantly impacts economic, social, and political aspects (Sun & Cui, 2018). However, transportation development also brings negative effects such as accidents, violations, and congestion (Jusuf et al., 2017). Indonesian Law No. 22 of 2009 on road traffic and transportation states that traffic accidents can be caused by several factors, including road user negligence, vehicle inadequacy, road inadequacy, and the environment.

A traffic accident is an unforeseen and unintentional incident involving a vehicle that can lead to human casualties and property damage. The high number of traffic accidents in Indonesia and other countries is of international concern. Every year, millions of people lose their lives due to

traffic accidents worldwide (CDC, 2023). Motorcycles are the vehicles that cause the most traffic accidents. Motorcyclists often violate traffic rules, such as zigzagging, changing lanes without using turn signals, and driving at high speeds. Motorcycle equipment, including mirrors, brake lights, turn signals, and helmets, is often disregarded (Pai, 2011).

To prevent traffic accidents, the government has taken proactive measures, including the construction of pedestrian bridge designs (Indrosaptono & Triastity, 2021). However, their effectiveness in reducing accidents largely depends on the cooperation and discipline of citizens, riders, and drivers. While these structures aim to enhance safety for pedestrians, their impact can be suboptimal if pedestrians choose not to use them due to inconveniences or if riders and drivers do not prioritize safety. Additionally, factors such as placement, accessibility, and maintenance play a significant role in determining the success of these bridges in accident prevention.

Traffic discipline is a crucial element for the safety and efficiency of transportation systems, especially in developing countries undergoing rapid urbanization and economic growth (Johansson, 2009). In nations like Indonesia, where urbanization has led to a surge in vehicle numbers, ensuring traffic discipline is a daunting task. The consequences of inadequate traffic discipline include traffic congestion, accidents, and a general disregard for traffic rules. Common issues observed include reckless driving, disobedience of traffic signals, improper lane usage, and a lack of respect for pedestrian rights (Mikler, & Almakadma, 2016).

One of the main roads on the island of Java is National Road Route 1, also known as the North Coast Line (*Jalur Pantai Utara* or *Pantura*). The Lasem-Rembang Pantura Road is part of this route and is often nicknamed the Tengkorak Road (High-Risk Road) due to the high number of accidents that occur there. This Pantura route is always crowded with various types of vehicles, and accidents often occur on this road. In dealing with the problem of traffic accidents, it is important to realize the significance of traffic safety and to obey traffic regulations. The government must continue to make efforts to regulate, control, and supervise traffic to ensure safe, orderly, and smooth traffic and reduce the number of accidents and victims caused by them. The purpose of this study was to analyze the concentration of riders, vehicle equipment, and traffic discipline concerning the safety of motorcyclists on the Lasem-Rembang Pantura Road.

2. Literature Review

2.1. Driving Safety

Safety, as elaborated by Weber (2014), is a multifaceted and encompassing concept that extends beyond the mere avoidance of disasters. It encompasses the achievement of overall well-being, prosperity, the absence of deficiencies, the effective maintenance of good health, protection against interference, and the proactive prevention of damage. This holistic perspective on safety spans various dimensions of life, including physical, social, spiritual, financial, political, emotional, occupational, psychological, and educational safety, all working in concert to avert potential threats and ensure a secure and thriving existence.

Wegman and Oppe (2010) introduce three distinct safety conditions. Normative safety pertains to products or product designs conforming to established design standards. Substantive safety underscores the importance of safety, even when it may not fully meet prescribed standards. Perceived safety reflects how individuals perceive safety, which may not always align

with the actual level of safety in reality. Indonesian Law No. 22/2009 on Road Traffic and Transportation defines road traffic and transportation safety as the state of avoiding every person's risk of accidents during traffic caused by humans, vehicles, roads, or the environment.

According to research by Woratanarat et al. (2013), driving safety is an effort to minimize danger and increase safety while driving. The goal is to create conditions where drivers do not endanger others, are aware of potential hazards around them, and understand how to prevent and handle these potential hazards. The implementation of driving safety involves self-awareness and maintaining safety for both oneself and others. The increase in road accidents emphasizes the importance of implementing safe riding as the fundamental premise for riders. Understanding and awareness of the importance of safe riding must be internalized so that every driving activity prioritizes safety. This approach makes the implementation of safe riding easier to apply, benefiting both oneself and others.

2.2. Concentration on Driving

Concentration, in accordance with the definition provided by Koo et al. (2015), is a multifaceted term that denotes the focused attention of the mind on a particular subject or the strategic gathering of energy, strength, troops, or various resources in a singular location or purpose. This concept extends its application to diverse scenarios, such as the strategic concentration of troops in a border area to bolster security or the consolidation of multiple publications under a single authoritative entity for more effective management and dissemination. Additionally, concentration finds relevance in scientific contexts, where it signifies the proportion or percentage of a particular material within a solution, illustrating its adaptability and wide-ranging implications across various domains.

Law No. 22 of 2009 on Road Traffic and Transportation stipulates that driving under conditions that impair concentration, such as using a cell phone, being intoxicated, using drugs, or experiencing drowsiness, can lead to criminal sanctions. Article 283 and Article 106, paragraph 1 of the law state that any person who operates a motor vehicle on the road in an unreasonable manner, engages in other activities, or is influenced by a situation that impairs concentration while driving on the road can be penalized with a maximum of 3 months imprisonment or a fine of up to Rp 750,000.

Awareness of concentration while driving is of paramount importance. A momentary lapse in concentration can result in a fatal road accident. Distractions while driving encompass three factors: visual distractions that divert the eyes from the road, manual distractions that cause the hands to leave the steering wheel, and cognitive distractions that divert the mind to various things. Therefore, maintaining concentration while driving is critically important for the safety of both yourself and others on the road.

2.3. Vehicle Completeness

Motorcycles are often the cause of traffic accidents because many riders overlook the equipment and completeness of their motorcycles, such as mirrors, brake lights, turn signals, and the use of SNI standard helmets. Traffic laws regulate the completeness of vehicles, including the obligation of motorcyclists to adhere to technical and roadworthy requirements and to use SNI standard helmets (Seo et al., 2015).

Article 285 and Article 106, paragraph 8, of Law No. 22/2009 on Road Traffic and Transportation state that every person who rides a motorcycle on the road must meet technical and roadworthy requirements, including mirrors, horns, headlights, brake lights, direction lights, reflective devices, speed measuring devices, mufflers, and tire groove depth. Riders are also required to wear Indonesian national standard helmets.

Loss of concentration while driving, such as using a cell phone, being intoxicated, using drugs, or experiencing drowsiness, can also lead to impaired concentration and result in an accident. Law No. 22 of 2009, Article 283, regulates criminal sanctions for those who drive with impaired concentration. For safe driving, it is crucial for riders to ensure that their vehicles are equipped with complete and functioning equipment while also complying with the rules for using Indonesian national standard helmets. Maintaining concentration while driving is also vital to prevent fatal road accidents.

2.4. Traffic Discipline

Discipline, In the context of traffic, discipline encompasses an individual's capacity and disposition to regulate their behavior in accordance with established rules, encompassing both intrinsic principles and societal norms. The factors influencing discipline include genetics, environmental influences, and educational experiences. Traffic discipline, as it pertains to road safety, denotes the adherence to laws, regulations, rules, and societal norms governing road traffic. It requires strict compliance with the signs, regulations, and prohibitions outlined in Law No. 22/2009 on Road Traffic and Transportation.

Individuals who embody a disciplined approach to traffic consciously align their behaviors and actions with established norms and rules. They do so with the objective of maintaining order and regularity on the roads. Ideally, traffic discipline is a voluntary and sincere disposition, driven by an internal commitment to adhere to traffic regulations. This negates the necessity for law enforcement or surveillance cameras at every juncture. Dewi et al. (2022) emphasize the importance of motorcyclists adhering to several key regulations stipulated in Law No. 22/2009 on road traffic and transportation. These regulations aim to enhance motorcyclist safety and reduce accidents.

Respecting traffic lights is of paramount importance. Running red lights, classified as traffic signal devices under Law Number 22 of 2009 concerning Road Traffic and Transportation, is strictly prohibited. The definition of red lights is articulated in government regulation number 79 of 2013 concerning Road Traffic and Transportation Network, which describes them as electronic systems employing light and, optionally, sound signals to regulate the flow of pedestrians and vehicles at intersections or along road segments.

Another crucial regulation mandates the use of headlights during the daytime. Article 107 of Law No. 22 of 2009 outlines these regulations, requiring drivers of motor vehicles to use headlights during the night and specific daytime conditions. Motorcycle operators, in addition to complying with these provisions, are required to use their headlights during daylight hours. Additionally, effective lane utilization is fundamental to traffic discipline. This includes adhering to regulations regarding lane usage, particularly the requirement to use the left lane. This provision, introduced as part of the 2009 Traffic Law, aims to ensure smooth traffic flow and reduce the risk of accidents involving vehicles with higher speeds (Article 108). Adhering to these

regulations is not only a legal obligation but also a crucial component of promoting road safety and reducing accidents.

3. Methods

In this research, two types of data were employed: Qualitative Data and Quantitative Data. Quantitative data, in this context, encompasses the responses provided by the study participants, primarily motorcyclists traveling along the Lasem-Rembang Pantura Road. These responses were subsequently converted into numerical scores or values using the Likert Scale, a commonly used method in research (Mason, 2002; South et al., 2022).

This quantitative data analysis approach allowed the researchers to gain a comprehensive understanding of the motorcyclists' perspectives, experiences, and attitudes related to various aspects of road safety and discipline on the Lasem-Rembang Pantura Road. By converting qualitative insights into quantitative data, the study facilitated the use of statistical methods and analytical tools to identify patterns, trends, and correlations within the dataset. As a result, this data-driven approach enhanced the research's robustness and enabled a more systematic and objective exploration of the research questions.

4. Results and Discussions

Table 1. Respondents' Responses Regarding Rider Concentration (X₁)

Answer	X _{1.1}		X _{1.2}		X _{1.3}	
	F	%	F	%	F	%
Strongly Agree	60	62.5%	58	60.4%	57	59.4%
Agree	33	34.4%	38	39.6%	35	36.5%
Moderately Agree	3	3.1%	0	0%	4	4.2%
Disagree	0	0%	0	0%	0	0%
Strongly Disagree	0	0%	0	0%	0	0%
Total	96	100%	96	100%	96	100%

Description: X₁ = Rider concentration; X_{1.1} = No cell phones while driving; X_{1.2} = Driver is not intoxicated; X_{1.3} = Rider does not interact with other riders; F = Frequency; % = Percentage

Based on the information presented in Table 1, respondents answered strongly agree regarding not using cellphones while driving as many as 60 respondents (62.5%), motorists were not drunk 58 respondents (60.4%), motorists did not interact with other motorists 57 respondents (59.4%). Respondents answered agree about not using cellphones while driving by 33 respondents (34.4%), the rider was not drunk by 38 respondents (39.6%), the rider did not interact with other drivers by 35 respondents (36.5%). Respondents answered moderately agreed regarding not using cellphones while driving by 3 respondents (3.1%), the driver was not drunk by 0 respondents (0%), the driver did not interact with other drivers by 4 respondents (4.2%). Respondents answered disagree and strongly disagree by 0 respondents (0%).

Based on the information presented in Table 2, the respondents answered strongly agree regarding the completeness of the rearview mirror of 38 respondents (39.6%), the completeness of the lights (brake lights, turn signals) of 50 respondents (52.1%), the use of SNI Hlem of 38 respondents (39.6%). Respondents answered agree regarding the completeness of the rearview mirror of 53 respondents (55.2%), the completeness of the lights (brake lights, turn signals) of 41

respondents (42.7%), the completeness of the SNI Hlem of 58 respondents (60.4%). Respondents answered quite agree regarding the completeness of the rearview mirror by 5 respondents (5.2%), the completeness of the lights (brake lights, turn signals) to 5 respondents (5.2%), the use of SNI hlems by 0 respondents (0%). Respondents answered disagree and strongly disagree by 0 respondents (0%).

Table 2. Respondents' Responses Regarding Vehicle Completeness (X₂)

Answer	X _{2.1}		X _{2.2}		X _{2.3}	
	F	%	F	%	F	%
Strongly agree	38	39.6%	50	52.1%	38	39.6%
Agree	53	55.2%	41	42.7%	58	60.4%
Simply Agree	5	5.2%	5	5.2%	0	0%
Don't agree	0	0%	0	0%	0	0%
Strongly Disagree	0	0%	0	0%	0	0%
Amount	96	100%	96	100%	96	100%

Description: X₂ = Vehicle completeness; X_{2.1} = Rearview mirror completeness; X_{2.2} = Light fittings (brake lights, turn signals); X_{2.3} = Use of SNI Clamps; F = Frequency; % = Percentage

Table 3. Respondents' Responses Regarding Traffic Discipline (X₃)

Answer	X _{3.1}		X _{3.2}		X _{3.3}	
	F	%	F	%	F	%
Strongly Agree	25	26%	47	49%	60	62.5%
Agree	53	55.2%	45	46.9%	36	37.5%
Moderately Agree	18	18.8%	4	4.2%	0	0%
Disagree	0	0%	0	0%	0	0%
Strongly Disagree	0	0%	0	0%	0	0%
Total	96	100%	96	100%	96	100%

Description: X₃ = Traffic Discipline; X_{3.1} = Not running red lights; X_{3.2} = Turning on the headlights in daytime; X_{3.3} = Using the left lane; F = Frequency; % = Percentage

Based on the information provided in Table 3, the respondents answered strongly agree regarding not running red lights by 25 respondents (26%), turning on the main lights during the day by 47 respondents (49%), using the left lane by 60 respondents (62.5%). Respondents who answered agree about not running a red light were 53 respondents (55.2%), turning on the main lights during the day were 45 respondents (46.9%), using the left lane were 36 respondents (37.5%). Respondents who answered moderately agreed about not running red lights were 18 respondents (18.8%), turning on the main lights during the day were 4 respondents (4.2%), using the left lane were 0 respondents (0%). Respondents who answered disagree and strongly disagree were 0 respondents (0%).

Based on the information presented in Table 4, the respondents answered strongly agree regarding checking the vehicle before traveling by 70 respondents (72.9%), not sharing more than one person by 62 respondents (64.6%), skilled and good driving style by 62 respondents (64.6%). Respondents answered agree about checking the vehicle before traveling by 24 respondents (25%), not sharing more than one vehicle by 34 respondents (35.4%), skilled and good driving style by 34 respondents (35.4%). Respondents who answered moderately agreed to check the vehicle before traveling were 2 respondents (2.1%), did not ride more than one person by 0 respondents (0%), skilled and good driving style by 0 respondents (0%). Respondents who

answered disagree and strongly disagree about checking the vehicle before traveling were 0 respondents (0%), not riding more than one person by 0 respondents (0%), skilled and good driving style by 0 respondents (0%).

Table 4. Respondents' Responses Regarding Motorcycle Rider Safety (Y)

Answer	Y ₁		Y ₂		Y ₃	
	F	%	F	%	F	%
Strongly Agree	70	72.9%	62	64.6%	62	64.6%
Agree	24	25%	34	35.4%	34	35.4%
Moderately Agree	2	2.1%	0	0%	0	0%
Disagree	0	0%	0	0%	0	0%
Strongly Disagree	0	0%	0	0%	0	0%
Total	96	100%	96	100%	96	100%

Description: Y = Motorcyclist safety; Y1 = Checking the vehicle before traveling; Y2 = No more than one person sharing the same vehicle; Y3 = Skillful and good driving style; F = Frequency; % = Percentage

Table 5. Validity Test Results

Research Indicator	r count	r table	Conclusion
X1.1	0.806	0.200	Valid
X1.2	0.781	0.200	Valid
X1.3	0.816	0.200	Valid
X2.1	0.823	0.200	Valid
X2.2	0.853	0.200	Valid
X2.3	0.795	0.200	Valid
X3.1	0.870	0.200	Valid
X3.2	0.825	0.200	Valid
X3.3	0.761	0.200	Valid
Y1	0.874	0.200	Valid
Y2	0.873	0.200	Valid
Y3	0.669	0.200	Valid

Based on the information presented in Table 5, all research indicators (X₁, X₂, X₃, X1.1, X1.2, X1.3, X2.1, X2.2, X2.3, X3.1, X3.2, X3.3, Y1, Y2, Y3) used in the Rider Concentration variable show significant results, for the conclusion that all research indicators are valid.

Table 6. Reliability Test Results

No	Variabel	Alpha count	Standard alpha	Conclusion
1	Rider Concentration (X1)	0.733	0.7	Reliable
2	Vehicle completeness (X2)	0.762	0.7	Reliable
3	Traffic Discipline (X3)	0.752	0.7	Reliable
4	Motorcyclist safety (Y)	0.730	0.7	Reliable

In the reliability test in Table 6, both the independent variables (rider concentration, vehicle completeness, and traffic discipline) and the dependent variable (motorcyclist safety), are said to be reliable or reliable, so that the research variables are worth testing the next hypothesis testing.

The test results obtained the t value for the Rider Concentration variable (X1) shows the t-value = 3.016 with a significance level of 0.003. By using the significance limit = 0.05, the t table value with df = n - k - 1 = 96 - 3 - 1 = 92 is obtained at 1.986. Thus, t count (3.016) > t table (1.986) is obtained, which means that H1 is accepted. Thus, the first hypothesis (H1) which states

that motorcyclist concentration has a positive and significant influence on motorcyclist safety can be accepted. The hypothesis testing graph can be depicted in Figure 1.

Table 7. Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients		T	Sig.
	B	Std. Error	Beta			
1 (Constant)	3.526	1.070			3.296	.001
Rider Concentration	.278	.092	.308		3.016	.003
Vehicle Completeness	.280	.088	.327		3.164	.002
Traffic Discipline	.225	.063	.272		3.566	.001

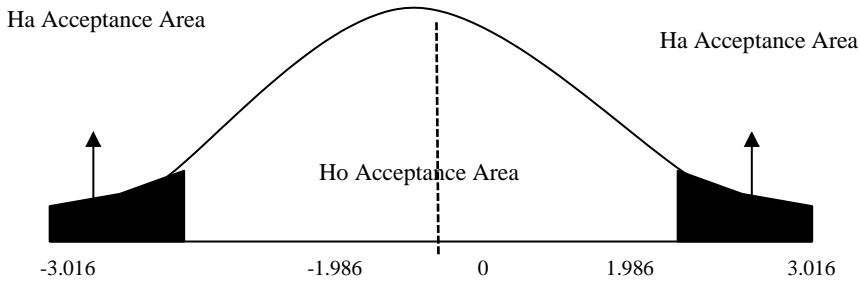


Figure 2. Vehicle Completeness Variable t-Test curve

The test results obtained the t value for the Traffic Discipline variable (X3) show the t value = 3.566 with a significance level of 0.001. By using a significance limit of 0.05, the t table value with $df = n - k - 1 = 96 - 3 - 1 = 92$ is obtained at 1.986. Thus obtained t count (3.566) > t table (1.986). Thus, the third hypothesis (H3) which states that traffic characteristics have a positive and significant influence on motorcycle rider safety is well accepted. The hypothesis testing graph can be depicted in Figure 2.

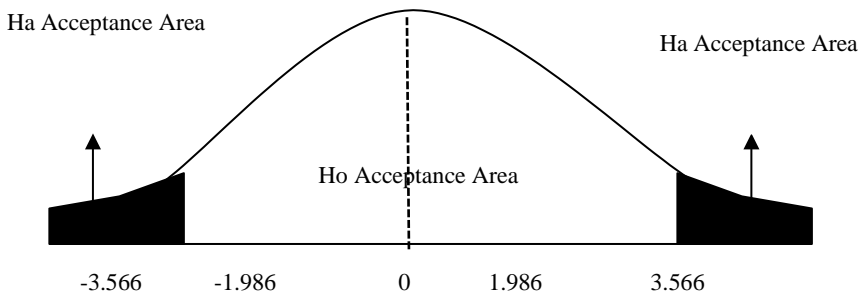


Figure 2. Traffic Discipline Variable t-Test Curve

The regression test in Table 8 obtained a coefficient of determination (Adjusted RSquare) of 0.505. This means that 50.5% of variations in the dependent variable (Y), namely motorcycle rider safety, can be explained / caused by the independent variables, namely rider concentration

(X1), vehicle completeness (X2), traffic discipline (X3). While the remaining 100% - 50.5% = 49.5%, is explained by other causes outside the variables studied.

Table 8. Test Results of the Coefficient of Determination

Model Summary ^b					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.722 ^a	.521	.505	.829	1.792
<ul style="list-style-type: none"> • Predictors: (Constant), Traffic Discipline, Driver Concentration, Vehicle Completeness • Dependent Variable: Motorcyclist Safety 					

6. Conclusion

This study demonstrates that rider concentration, vehicle equipment, and traffic discipline exert a positive and significant influence on motorcyclist safety. The results of the simple regression test reveal that all three variables yield positive coefficients, indicating that higher levels of concentration, improved vehicle equipment, and enhanced traffic discipline are associated with increased rider safety. Significance testing using the t-test indicates that the p-values (Sig.) for all three variables are smaller than the significance level of 0.05, confirming the statistical significance of the test results. Consequently, the null hypothesis (Ho) is rejected, and the alternative hypothesis (Ha) is accepted. In summary, this study affirms the pivotal role played by rider concentration, vehicle equipment, and traffic discipline in enhancing the safety of motorcyclists. These findings underscore the importance of understanding and promoting awareness regarding these factors to mitigate the risk of traffic accidents involving motorcycles.

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