ATTITUDES AND DRIVING BEHAVIOR FACTORS ON THE TRAFFIC ACCIDENTS AMONG YOUNG MOTORCYCLIST IN SURABAYA CITY

Dimas P. Santosa[a], Hera Widyastuti[a*]

***Abstract**: The majority of traffic accidents in Surabaya are dominated by motorcycles and drivers who had accidents mostly were teenagers. This study aims to examine the relationship between attitudes, driving behavior, and traffic accidents among young motorcyclist in Surabaya. The study used a primary dataset of 435 motorcyclists from 17 to 25 years of age. This study uses a Structural Equation Modeling (SEM) approach to determine the relationship between attitudes towards risky driving behavior, driving behavior, and traffic accidents. The driving behavior parameters used are divided into six parameters: traffic errors, speed violations, control errors, traffic violations, safety violations, and stunts. The results of this study indicate that all driving behavior parameters are significantly influenced by the driver's attitude towards risky driving behavior. Meanwhile, attitudes towards risky driving behavior have no direct or indirect influence on accidents. Then, the driving behavior parameters that have a significant effect on traffic accidents are traffic errors and traffic violations.*

Keywords: *Attitude, driving behavior, traffic accident, motorcycle, SEM*

INTRODUCTION

In Indonesia, the total death due to traffic accidents in 2020 reached 23,529 people [1]. In other words, road traffic accidents kill three people every hour. The most common type of vehicle involved in accidents is motorcycle [2][3], reached 73.5% in 2019 [4]. Then, drivers aged 16-25 years ranked highest in traffic accidents [5], especially male [6]. This also happened in Surabaya as the research location. Where Surabaya is listed first as Indonesia's largest number of motorcycles in 2020, at 79.74% [7]. Another fact states that the vehicles involved in the highest number of traffic accidents in Surabaya are motorcycles [8]. That coincides with the accident data from the big city resort police of Surabaya in 2020 which states that the most vehicles involved in accidents were motorcycles reaching 76.98% with males aged 16-30 years being dominated both as victims and subjects.

The human or driver factor is the main factor causing accidents, these factors contribute more than 90% in influencing accidents [9][10]. More specifically, the driver's behavior factor which is part of the human factor is the main cause of accidents [11]. Traffic accidents are positively related to poor traffic behavior [12]. Another study suggests that there was a significant relationship between attitudes, driving behavior, and accident involvement [13]. It was also found that attitudes are the mediator between personality and risky driving behavior, and young drivers' attitudes towards road safety have a direct influence on risky driving behavior [14].

RESEARCH SIGNIFICANCE

This study aims to determine the relationship between attitudes towards risky driving behavior, driving behavior and traffic accidents on young motorcyclist in Surabaya. Human factors have been recognized as the main cause of accidents, especially driving behavior factors [9-11]. By studying driving behavior in this research and its effect on traffic accidents, it is hoped that it can be an input to reduce the number of accidents in Surabaya.

[a]Department of Civil Engineering, Institut Teknologi Sepuluh Nopember, ITS Campus, Sukolilo, Surabaya 60111, Indonesia. Corresponding author email address: hera.widyastuti@yahoo.co.uk

METHODOLOGY

This research is a research behavior therefore it uses a measuring instrument in the form of questions or statements which are considered as indicators of behavior [15]. The data used is primary data from the results of filling out questionnaires distributed online using google form. The respondents' criteria were determined, namely the age 17-25 years, driving using a motorcycle (having experience driving using a motorcycle or being able to ride a motorcycle and also own a motorcycle), and living in the city of Surabaya. The first step is to filter the data according to predetermined criteria, then test the questionnaire, the validity test using Pearson correlation and reliability test using Cronbach's Alpha. The provisions used for the validity test are the calculated r value > r table [16] and the reliability test is the value of Cronbach's Alpha > 0.6 [17]. The next step is to perform SEM analysis to determine the relationship between attitudes, driving behavior, and traffic accidents. The research flow chart can be seen in Figure 1 and Figure 2 below.

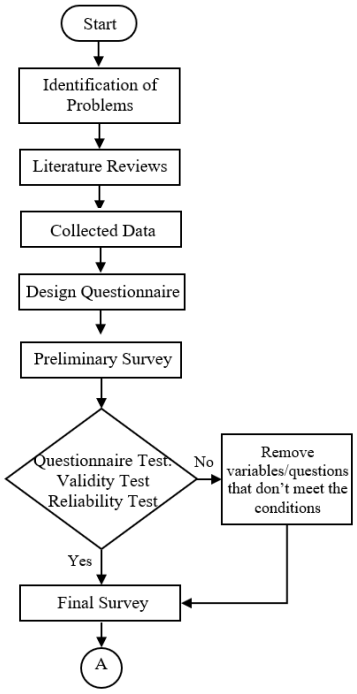

Figure 1 Flowchart

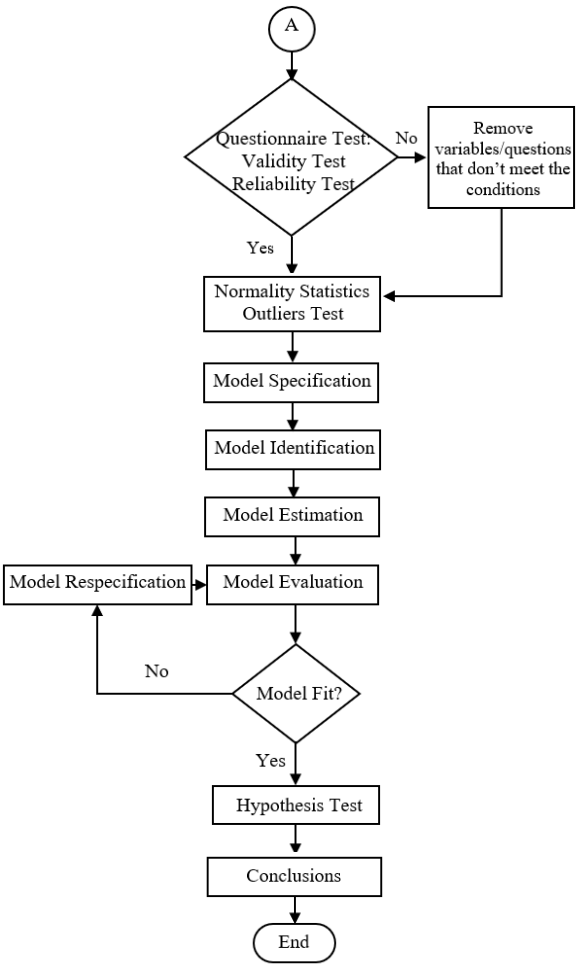

Figure 2 Flowchart (continued)

A. QUESTIONNAIRE

The questionnaire in this study was arranged in three parts. Part 1 includes socioeconomic questions, travel patterns, and accident involvement using a 5-point scale (1 = never; 2 = 1 time; 3 = 2 times; 4 = 3 times; 5 = more than 3 times). Section 2 includes questions about personal attitudes toward risky driving behavior using a 5-point scale (1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; 5 = strongly agree). Section 3 includes questions about driving behavior using a 5-point frequency scale (1 = never; 2 = once; 3 = sometimes; 4 = often; 5 = very often).

The questions of the research variables are detailed in Table 1. The online survey in Indonesian, and the average time to complete the survey was 10-15 minutes. A preliminary survey was conducted before conducting the final survey to obtain primary data. A preliminary survey was conducted on 30 respondents. In the preliminary survey questionnaire test, namely the validity test, there were two questions that were issued because they had calculated r value < r table, namely TE2 and SPV8 as shown in Table 1 with a sign.

Attitude questions were 10 questions from the literature [18][19], while questions about driving behavior are 38 questions using the literature [20]. In the literature [20], questions about driving behavior were the result of FGD (focus group discussions) to adjust the Persian MRBQ developed by Motevalian et al (2011) with conditions in Indonesia. The categories of driving behavior are divided into six categories: traffic errors, speed violations, control errors, traffic violations, safety violations, and stunts. Then, there are 3 questions about accident involvement from the literature [13].

Questions about attitudes towards risky driving behavior from the references obtained related to driving behavior were divided into six categories. Questions about attitudes towards risky driving behavior mostly contain questions about risky driving behavior accompanied by an explanation of the behavior, such as the purpose of the behavior, for example the SK1 question, namely everyday I ride a motorcycle at high speed to shorten the travel time or accompanied by causation of the behavior, such as SK9 question, namely in traffic jams, I choose to drive on the sidewalk. Also, the answer given is in the form of agreement to the question. While the driving behavior questions from the references obtained were mostly in the form of questions about risky driving behavior without an explanation for the behavior. The answer given is the frequency of the behavior.

B. STRUCTURAL EQUATION MODEL

This study uses a structural equation model (SEM) to determine the relationship between attitudes, driving behavior, and traffic accident. SEM has been recognized as a robust technique for measuring linear relationships between observed and unobserved variables [21][22]. Structural equation model (SEM) consists of two parts [23]: the first is a measurement model, connecting indicator variables with latent variables through a confirmatory factor model. This significance test is called the confirmatory factor analysis (CFA) test; the second is structural models, connecting latent variables both independent and dependent through simultaneous equations. This significance test uses the goodness of fit index (GOFI) criteria. The model estimation method used is the Maximum Likelihood (ML) estimation method which is the most commonly used method [22].

After going through the questionnaire test, conducting prerequisite tests according to the recommended values. After that, perform the CFA test using the provisions of the loading factor ≥ 0.5, construct reliability (CR) ≥ 0.7, and average variance extracted (AVE) ≥ 0.5 [23]. Only those items that show good results are left and put in the model. The next step is to develop a structural model, and assess the model with goodness-of-fit. Three fit indices are used [24], namely absolute, incremental, and parsimony fit indices. Absolute fi indices include goodness of fit index (GFI ≥ 0.90), root mean square of approximation (RMSEA ≤ 0.05 or 0.08). Then, incremental fit indices are adjusted goodness of fit index (AGFI ≥ 0.90), tucker lewis index (TLI ≥ 0.90), comparative fit index (CFI ≥ 0.90). Furthermore, parsimony fit indices include parsimonious comparative fit index (PCFI ≥ 0.50), parsimonious goodness of fit index (PGFI ≥ 0.50) [21][24].

ANALYSIS AND DISCUSSIONS

From the results of the online questionnaire, there were 435 respondents who met the predetermined criteria. Then from the results of the questionnaire test there are two indicators that are issued as shown in Table 1 (mark a). Furthermore, in the CFA test process there are several indicators that are

excluded from the model because they have a loading factor value below the specified limit as shown in Table 1 (mark b).

The outcome of the CFA test can be seen in Table 7 and Table 7. From Table 7 it can be seen that all items in the model are valid because they have a loading factor value (Std. R.W.) ≥ 0.5. Then from Table 7, it can be seen that the values of CR ≥ 0.7 and AVE ≥ 0.5 in all constructs, so it can be said that all latent constructs are reliable. Table 7 also shows that each latent construct has good discriminant validity, this is because all the correlation values between constructs (which are not located on the diagonal of the table) are lower in value than the square root value of the AVE of each latent construct (which is located on the diagonal of table/mark *).

Table 1 Questions from the research variable

Category	Statements
Attitude towards risky driving behavior	
SK1[b]	Everyday I ride a motorcycle at high speed to shorten the travel time
SK2	Shortening my trip by driving in opposite directions, making the trip more effective
SK3[b]	I can concentrate while driving using mobile phone
SK4[b]	Wearing a helmet while driving makes my hair messy
SK5[b]	I ride a motorcycle in a hurry, if I feel I will be late to my destination
SK6	By running a red light, my travel time becomes faster
SK7	Often trails too closely behind other vehicles because I have the ability to take quick action
SK8	Changing lanes and following each other is normal for me
SK9	In traffic jams, I choose to drive on the sidewalk
SK10	I often increase my speed when I see the traffic lights are yellow
Traffic Errors	
TE1	Fail to notice that pedestrians are crossing when turning into a side street
TE2[a]	Realize that vehicle in front has slowed and have to brake hard to avoid collision
TE3	Attempt to overtake a vehicle that has turned on the right turn signal
TE4	Attempt to overtake someone that you had not noticed to be signaling a left turn
TE5	Not notice someone stepping out from behind a parked vehicle
TE6	Find it difficult to stop in time when a traffic light has turned against you
TE7	Ride so close to vehicle in front that it would be difficult to stop in an emergency
TE8	Pull out on to a main road in front of a vehicle that you had not noticed
TE9	Run wide when going round a corner
TE10	Queuing to turn left on a main road, you nearly hit the vehicle in front
TE11	Fail to notice or anticipate that another vehicle might pull out in front of you
Speed Violations	
SPV1	Ride so fast into a corner that you feel like you might lose control
SPV2	Exceed the speed limit on a country/rural road
SPV3	Exceed the speed limit on a residential road
SPV4	Race away from traffic lights with intention of beating the driver/rider next to you
SPV5	Ride so fast into a corner that you scare yourself
SPV6	Ride between two lanes of fast moving traffic

Table 2 Questions from the research variable (continued)

Category	Statements
Speed Violations	
SPV7	Disregard the speed limit late at night or in the early hours of the morning
SPV8[a]	Get involved in unofficial "races" with other riders or drivers
Control Errors	
CE1	Find that you have difficulty controlling the bike when riding at speed
CE2	Skid on a wet road or manhole cover
CE3	Carry a large carriage with motorcycle
CE4	Delay in noticing to in front car when opening door suddenly
CE5[b]	Driver deliberately annoys you or puts you at risk
Traffic Violations	
TV1	Cross junction when traffic light is red
TV2	Riding in opposite direction of road way
TV3	Riding in sidewalk
TV4	Using mobile phone while riding
TV5	Smoking while riding
Safety Violations	
SFV1[b]	Ride when taking drugs or medications which might have effects on your riding
SFV2	Carry more than one passenger with your motorcycle
SFV3[b]	Using helmet without chin straps or not fastening it
SFV4	Riding without helmet
SFV5	Carry a passenger who have not worn helmet
SFV6	Riding with an impaired motorcycle
Stunts	
ST1	Attempt to do, or actually do, a wheelie
ST2	Intentionally do a wheel spin
ST3	Crashed with a parked vehicle, make damage to it, but escape from crash scene
Accident Involvement	
ACC1	Number of traffic citations
ACC2	Number of accidents (at fault)
ACC3[b]	Number of accidents (not at fault)

[a] Variables are dropped from the questionnaire validity test due to the calculated r value < r table

[b] Variables are dropped from the measurement model due to loading factor < 0.5

Table 3 Results of the measurement model (CFA)

Constructs	Items	R.W.	Std. R.W.	S.E.	P value
Attitude (SK)	SK1	0.848	0.577	0.091	***
	SK2	0.975	0.704	0.089	***
	SK3	0.864	0.559	0.095	***
	SK4	0.865	0.535	0.098	***
	SK6	0.942	0.692	0.086	***
	SK7	1.030	0.758	0.088	***
	SK8	1.017	0.658	0.097	***
	SK9	0.886	0.733	0.080	***
	SK10	1.000	0.628	—	
Traffic errors (TE)	TE3	1.293	0.696	0.135	***
	TE1	1.000	0.541	—	
	TE3	1.293	0.696	0.135	***
	TE4	1.165	0.600	0.132	***
	TE5	1.047	0.567	0.123	***
	TE6	1.095	0.565	0.130	***
	TE7	1.130	0.634	0.125	***
	TE8	1.346	0.760	0.133	***
	TE9	1.016	0.545	0.124	***
	TE10	1.252	0.695	0.130	***
	TE11	1.157	0.653	0.125	***

Table 4 Results of the measurement model (CFA) (continued)

Constructs	Items	R.W.	Std. R.W.	S.E.	P value
Speed violations (SPV)	SPV1	1.000	0.661	–	
	SPV2	1.058	0.533	0.127	***
	SPV3	1.142	0.616	0.120	***
	SPV4	1.183	0.674	0.113	***
	SPV5	1.171	0.702	0.091	***
	SPV6	1.154	0.706	0.107	***
	SPV7	1.216	0.640	0.122	***
Control errors (CE)	CE1	1.000	0.688	–	
	CE2	0.975	0.634	0.081	***
	CE3	0.839	0.582	0.091	***
	CE4	0.934	0.673	0.086	***
Traffic violations (TV)	TV1	1.132	0.751	0.082	***
	TV2	0.998	0.740	0.072	***
	TV3	0.912	0.785	0.059	***
	TV4	0.818	0.576	0.076	***
	TV5	1.000	0.767	–	
Safety violations (SFV)	SFV2	1.000	0.532	0.167	***
	SFV4	1.532	0.847	0.159	***
	SFV5	1.466	0.761	0.112	***
	SFV6	0.873	0.554	0.167	***
Stunts (ST)	ST1	1.237	0.941	0.078	***
	ST2	1.057	0.916	0.051	***
	ST3	1.000	0.843	–	
Accident (ACC)	ACC1	1.000	0.783	–	
	ACC2	0.742	0.732	0.078	***

(R.W.) Regression Weight, (Std. R.W.) Standardized Regression Weight, (S.E.) Standard Error
*** $p \leq 0{,}00$

After analyzing the level of unidimensionality of the dimensions and indicators forming latent variables or exogenous and endogenous constructs tested by confirmatory factor analysis, the next step is a full model analysis (structural test). Analysis of data processing at full model was carried out by performing goodness of index tests and statistical tests. The results of goodness of index tests can be seen in Table 6 and statistical tests can be seen in Table 7. From Table 6, indicating that the model fits quite well with the existing data. Almost all indices meet the specified threshold. There are two indices that meet the marginal fit criteria, GFI (0.830) and AGFI (0.800).

Overall, the model explained 49.7% of the variance in the occurrence of accidents. The results of the path model analysis confirm the conceptual framework developed and support several proposed hypotheses as detailed in Table 7. Hypothesis testing is carried out using a probability value (P-value) of 0.05 (α=95%).

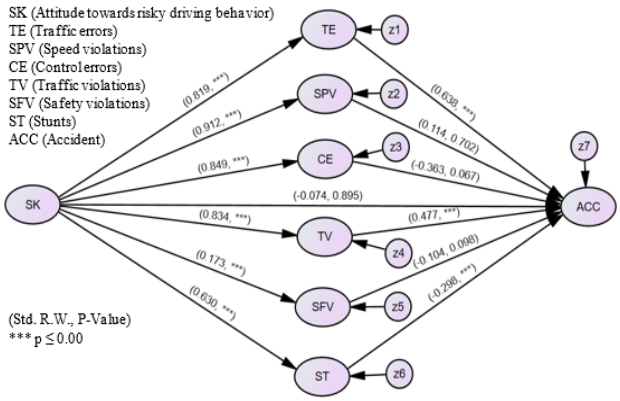

Figure 3 Path analysis

The results of the statistical test of this study (Table 7) show that all attitudes towards risky driving behavior on categories or parameters of driving behavior have a positive and significant effect. So, it can be concluded that H1 can be supported. The largest influence on speed violations (Std. R.W. = 0.912) and the smallest effect on safety violations (Std. R.W. = 0.173). That coincides with previous study that state there is a relationship between driving attitude and driving behavior in young age [14], [25], [26]. The driver's attitude towards traffic safety has a significant effect on aggressive and speeding driving behavior [13]. Then, respondents who have negative driving attitudes are at risk of having poor driving behavior

Table 7 Construct reliability, discriminant validity, convergent validity

Construct	CR	AVE	MSV	SK	TE	SPV	CE	TV	SFV	ST	ACC
SK	0.869	0.742	0.440	0.861*							
TE	0.866	0.722	0.582	0.530	0.850*						
SPV	0.835	0.684	0.587	0.663	0.763	0.827*					
CE	0.740	0.544	0.214	0.550	0.757	0.787	0.737*				
TV	0.848	0.749	0.476	0.600	0.739	0.689	0.620	0.865*			
SFV	0.774	0.627	0.054	0.233	0.131	0.214	0.051	0.110	0.792*		
ST	0.928	0.913	0.019	0.515	0.478	0.541	0.463	0.690	0.033	0.956*	
ACC	0.729	0.608	0.000	0.248	0.600	0.378	0.291	0.458	-0.004	0.137	0.780*

(CR) Construct Reliability, (AVE) Average Variance Explained, (MSV) Maximum Shared Variance
* Square root of AVE

Table 6 Model goodness of fit

Fit Indices	Fit Summary	Model	Recommended Threshold
Model Summary	Chi square	738.685	–
	Degree of freedom	376	–
	CMIN/DF	1.965	Less than 2
Absolute of fit indices	RMSEA	0.052	Less than 0.08
	GFI	0.830	0.90
	AGFI	0.800	0.90
Incremental fit indices	CFI	0.906	0.90
	NFI	0.827	0.90
Parsimony fit indices	PCFI	0.809	0.50
	PGFI	0.738	0.50

Constructs	R.W.	Std. R.W.	S.E.	P-value	Hypothesis	Results
Positive attitude towards risky driving behavior has a significant positive impact on unsafe driving behavior					H1	Supported
TE ← SK	0.685	0.819	0.091	***		
SPV ← SK	0.906	0.912	0.113	***		
CE ← SK	0.903	0.849	0.111	***		
TV ← SK	0.780	0.834	0.094	***		
SFV ← SK	0.143	0.173	0.054	***		
ST ← SK	0.466	0.630	0.058	***		
Positive attitude towards risky driving behavior has a significant positive impact on increasing accident involvement					H2	Not supported
ACC ← AK (Direct)		-0.074		0.895		
ACC ← AK (Indirect)[a]		0.679		0.330		
Each driving behavior category has a distinct significant impact on increasing traffic accident					H3	Partially supported
ACC ← TE	1.014	0.638	0.250	***		
ACC ← SPV	0.153	0.114	0.400	0.702		
ACC ← CE	-0.454	-0.363	0.248	0.067		
ACC ← TV	0.679	0.477	0.243	***		
ACC ← SFV	-0.167	-0.104	0.098	0.088		
ACC ← ST	-0.537	-0.298	0.155	***		

Table 7 Results of the path analysis

(R.W.) Regression Weight, (Std. R.W.) Standardized Regression Weight, (S.E.) Standard Error

*** $p \leq 0{,}00$

[a] Indirect impact was calculated using Bootstrap

twice as large as those who have positive driving attitudes [27].

Based on Table 7, it can be said that attitudes towards risky driving behavior have no direct or indirect effect on traffic accidents (p-value > 0.05). So, it can be concluded that H2 is not supported. Thus, it is possible that accidents that occur in Surabaya are influenced by other factors that do not involve attitudes towards risky driving behavior.

In this study, the parameter or category of driving behavior used is unsafe driving behavior. The results of this study as shown in Table 7 show that there are two parameters of driving behavior that positively and significantly affect traffic accidents, namely traffic errors (Std. R.W. = 0.638), and traffic violations (Std. R.W. = 0.477). While other parameters show different results. So, it can be concluded that H3 can be partially supported. The stunts parameter affects traffic accidents negatively and significantly (Std. R.W. = -0.298), while the control errors, speed violations, and safety violations do not affect the occurrence of accidents among young motorcyclists in Surabaya (p-value > 0.05). From previous research, it has been found that traffic errors are the main predictor of traffic accidents [28].

CONCLUSIONS

Structural equations model was performed to test conceptual models. The conceptual model was developed based on some evidence from the literature, that relates personal attitudes and driving behavior with accident involvement. The results of this study concluded that the behavior of young motorcyclists (aged 17-25) in Surabaya which was classified into six parameters, namely traffic errors, speed violations, control errors, traffic violations, safety violations, and stunts, was found to be influenced by attitudes towards risky driving behavior. With the largest effect on speed violations (Std. R.W. = 0.912) and the smallest effect on safety violations (Std. R.W. = 0.173). Negative attitude towards risky driving behavior may significantly reduce the possibility of unsafe driving behavior.

In addition, several parameters of driving behavior have been shown to influence traffic accidents differently. Traffic errors were reported as the largest contributor to accidents (Std. R.W. = 0.638), followed by traffic violations (Std. R.W. = 0.477). Meanwhile, the stunts parameter had a significant negative effect on accidents (Std. R.W. = -0.298). On the other hand, the parameters of speed violations, control errors, safety violations, and attitudes towards risky driving behavior show no significant effect on the occurrence of accidents (p-value > 0.05).

REFERENCES

[1] CNN Indonesia, "One hundred thousand traffic accidents in 2020, most high school students," Mar. 11, 2021. https://www.cnnindonesia.com/teknologi/20210310124314-384-615978/100-ribu-kecelakaan-lalin-pada-2020-pelajar-sma-terbanyak (accessed Apr. 23, 2021).

[2] G. Sugiyanto and Y. S. Mina, "Characteristics of traffic accidents and traffic safety education from an early age: a case study in Purbalingga district," *Semesta Teknika*, vol. 18, no. 1, pp. 65–75, 2015.

[3] P. J. Romadhona and S. Ramdhani, "The effect of vehicle speed on the safety of motorized vehicle users at unsignalized intersections," *Jurnal Rekayasa Sipil*, vol. 11, no. 1, pp. 31–40, 2017.

[4] Directorate General of Land Transportation, *Land transportation in figures for 2019*. Jakarta: Ministry of Transportation Directorate General of Land Transportation, 2020.

[5] M. R. Saputra and E. Buchari, "Behavioral analysis of

motorcyclists against congestion that occurs in Palembang city," in *Proceedings of the 19th International Symposium of FSTPT*, 2016, pp. 1881–1888.
[6] D. L. Setyowati, A. R. Firdaus, and N. R. Rohmah, "Factors causing traffic accidents in high school students in Samarinda city," *The Indonesian Journal of Occupational Safety and Health*, vol. 7, no. 3, pp. 329–338, 2019.
[7] Central Statistics Agency of East Java Province, *East Java Province in Figures for 2021*. Surabaya: Central Statistics Agency of East Java Province, 2021.
[8] H. Widyastuti and A. Utami, "Factors causing traffic accidents: a case study of several roads in Surabaya city," *Journal of Indonesia Road Safety*, vol. 1, no. 3, pp. 175–185, 2018.
[9] Purnawan and T. Kurniati, "Speeding behavior and perception of West Sumatran riders," *Journal of Indonesia Road Safety*, vol. 2, no. 2, pp. 101–109, 2019.
[10] P. Hardini, N. Hidayati, and E. W. Indriyati, "Comparative study of vehicle speed figure selection in Purwokerto and Semarang," *Journal of Indonesia Road Safety*, vol. 2, no. 2, pp. 87–100, 2019.
[11] P. Hongsranagon, T. Khompratya, S. Hongpukdee, P. Havanond, and N. Deelertyuenyong, "Traffic risk behavior and perceptions of Thai motorcyclists: A case study," *IATSS Research*, vol. 35, no. 1, pp. 30–33, 2011.
[12] S. H. Pangestika, G. Sugiyanto, and P. Hardini, "Analysis of accident costs for users of two-wheeled motorized vehicles in the Purbalingga area using the gross output method," *Transportation Journal*, vol. 16, no. 3, pp. 193–202, 2016.
[13] M. Mohamed and N. F. Bromfield, "Attitudes, driving behavior, and accident involvement among young male drivers in Saudi Arabia," *Transportation Research Part F: Traffic Psychology and Behaviour*, vol. 47, pp. 59–71, 2017.
[14] P. Ulleberg and T. Rundmo, "Personality, attitudes and risk perception as predictors of risky driving behaviour among young drivers," *Safety Science*, vol. 41, no. 5, pp. 427–443, 2003.
[15] W. Budiaji, "The measurement scale and number of responses in likert scale," *Journal of Agriculture and Aquaculture*, vol. 2, no. 2, pp. 127–133, 2013.
[16] S. Azwar, *Reliability and Validity: Interpretation and Computing*. Yogyakarta: Pustaka Pelajar, 1986.
[17] I. Ghozali, *Multivariate analysis application with SPSS program*. Semarang: Diponegoro University Publishing Agency, 2011.
[18] N. Utami, "Relationship between accident risk perception and aggressive driving of teenage motorcycle drivers," Syarif Hidayatullah State Islamic University Jakarta, 2010.
[19] D. Maharani, "Factors associated with teenagers' behavior of motorcycle riding along the Matraman-Rawamangun road, East Jakarta," Syarif Hidayatullah State Islamic University Jakarta, 2016.
[20] L. S. Putranto, N. L. P. S. E. Setyarini, Rostiana, and R. Bunawan, "Motorcycle rider behaviour of Tarumanagara University Lecturer and employee," in *The 17th FSTPT International Symposium of Jember University*, 2014, pp. 1038–1044.
[21] J. F. Hair, W. C. Black, B. J. Babin, and R. E. Anderson, *Multivariate data analysis (7th edition)*. Upper Saddle River: Prentice Hall, 2010.
[22] R. B. Kline, *Principles and practice of structural equation modeling*. New York: Guilford Press, 2011.
[23] I. Ghozali, *Structural equation model, concept and application with AMOS 16.0 program*. Semarang: Diponegoro University Publishing Agency, 2008.
[24] K. A. Bollen, *Structural equations with latent variables*. Wiley, 2014.
[25] M. Asdar and D. Sidik, "Safety riding behavior in high school students in Pangkep regency," 2013, Accessed: Jul. 02, 2021. [Online]. Available: https://adoc.pub/perilaku-safety-riding.html.
[26] D. W. Prima, B. Kurniawan, and Ekawati, "Factors relating to safety riding behavior in students of Faculty X Diponegoro University," *Journal of Public Health*, vol. 3, no. 3, pp. 370–381, 2015.
[27] D. Dwinanda and O. Wijaya, "The Relationship between millennial knowledge of road safety, driving attitudes and driving facilities with driving behavior in FKM UAD students," 2020, Accessed: Mar. 13, 2021. [Online]. Available: http://eprints.uad.ac.id/16305/.
[28] M. A. Elliott, C. J. Baughan, and B. F. Sexton, "Errors and violations in relation to motorcyclists' crash risk," *Accident Analysis and Prevention*, vol. 39, no. 3, pp. 491–499, 2007.