

Factors Influencing Traffic Accidents Involvement: A Case Study of Online Motorcycle Taxi Drivers in Banda Aceh

Fikri Sumardi^{1*}, Renni Anggraini¹, M. Isya¹⁾,

¹Department of Civil Engineering, Universitas Syiah Kuala, Banda Aceh, Indonesia

*c)Corresponding author: b) renni.anggraini@usk.ac.id

Abstract. In Indonesia, online transportation or motorcycle taxi is often used because they can take passengers to their destination at an affordable cost. Still, along with the rise of online motorcycle taxi facilities that are not balanced with safety facilities, human factors significantly influence traffic accidents. This study aims to identify personal characteristics and driver behavior related to anxiety, aggressive driving, impatience, and violations of accident involvement in Banda Aceh city. Data collection in this study was carried out by distributing questionnaires using Google Forms aimed at online transportation drivers, as many as 200 respondents, to determine the characteristics and driving behavior. Structural Equation Modeling (SEM) method with Confirmatory Factor Analysis (CFA) model to analyze the relationship between driving behavior variables on accident involvement in Banda Aceh city. The results of respondents' perceptions of unsafe driving behavior towards traffic accident involvement show that all indicators have a value above 2.5 on a Likert scale of 1-4. The results of CFA modeling showed that the relationship between variables Anxiety, aggressive driving, and impatience has a positive correlation value with a significant effect on accident involvement. From the modeling, the most significant indicator is the indicator "Taking the opportunity and accelerating the speed of the vehicle when the yellow light before turning red?" with a t-value of 6.996, while the impatience variable is "Feeling impatient or angry at slow drivers and wanting to get ahead of them?" with a t-value of 6.592 and "Feeling worried if you suddenly feel sleepy while driving" with a t-value of 3.598. Based on the results, it can be stated that impatience and aggressive driving lead to accident involvement.

1 Introduction

In the contemporary era, maintaining safe driving habits has become increasingly essential. With the exponential growth in the population and human mobility each year, urban areas often encounter congestion due to various activities. This congestion is further exacerbated by the widespread use of transportation, especially in significant metropolitan areas like Banda Aceh. The rapid advancement of information technology has significantly impacted various aspects of human life. According to the World Health Organization (WHO), the Global Status Report on Road Safety reveals that approximately 1.25 million individuals become road accident victims yearly, with 20 to 50 million people suffering injuries. A significant portion of these victims includes children, with an average of 1,000 deaths per day among those aged 10 to 24, which is a pressing concern. WHO also highlights that 54% of road traffic accident deaths occur in low- and middle-income countries. After analyzing data from the Banda Aceh Police Department, it is evident that traffic accidents have surged, with 589 cases recorded in 2022 compared to 516 in 2021. However, the case resolution rate has decreased by 18%, which is alarming. While severe injuries have been limited to one person yearly, minor injuries have increased by 14%, from 665 in 2021 to 761 in 2022. Nonetheless, material losses due to traffic accidents decreased by four percent, reaching IDR 229 million in 2022.

According to research by the Indonesian Ministry of Transportation, a staggering 85% of accidents are caused by driver-related factors. Dangerous driving habits such as impatience, recklessness, and speeding are the primary culprits, with the majority of accidents being caused by drivers who refuse to yield (52%), overtake (17%), and speed (11%). The advent of online-based services, particularly motorcycle ride-hailing services, has revolutionized transportation by providing convenient solutions for daily activities. While ride-hailing services have been linked to increased accidents in some developing countries worldwide, in Indonesia, they are appreciated for their ability to tackle urban congestion and improve passenger safety. However, the proliferation of online transportation services has also brought about challenges such as worsening traffic congestion and safety concerns. The rise in vehicles on the roads has resulted in more severe congestion, while the lack of proper safety equipment for drivers and passengers is a pressing concern. This research addresses this issue by investigating unsafe driving behaviors among online motorcycle ride-hail drivers in Banda Aceh. The study will examine various factors contributing to

traffic accidents, including personal characteristics, driving behaviors, and driver attitudes. The research aims to establish correlations and implications for road safety by understanding these factors. Ultimately, the results of this study can help enhance the knowledge and awareness of online motorcycle ride-hail drivers, with the ultimate goal of promoting safer driving practices and contributing to improved road safety in Banda Aceh.

2 Methods

2.1 Data Processing Methods and Data Analysis

This research aims to collect, process, and analyze data related to unsafe driving behaviors among online motorcycle ride-hail drivers in Banda Aceh. The required data is categorized into two types: primary data and secondary data. This study assesses "unsafe riding behaviors" among online motorcycle ride-hail drivers in the city. Primary data is obtained through an online Google Forms survey with 200 respondents. The sampling method employed is simple random sampling. The questionnaire consists of two parts: Questionnaire A, which contains questions about the socio-demographic characteristics of the respondents, and Questionnaire B, which comprises questions regarding perceptions of unsafe driving behaviors related to anxiety, aggressive behavior, impatience, and accident involvement. Secondary data in this study includes location maps of the Banda Aceh area and previous research data. The analysis encompasses descriptive statistics and the Structural Equation Modeling (SEM) method with Confirmatory Factor Analysis (CFA) modeling. Data is analyzed using Microsoft Excel, IBM SPSS, and IBM AMOS software. The primary data analysis will elucidate the personal characteristics of online motorcycle ride-hail drivers and driving behaviors related to anxiety, aggression, impatience, and accident involvement. Meanwhile, secondary data analysis will provide contextual information about the research location and other supporting data. This research will test model hypotheses and measure the relationships between latent variables and related indicators by employing the SEM and CFA models. The ultimate objective is to estimate parameters and evaluate the goodness of fit of the constructed model. By integrating primary and secondary data, this research aims to provide deeper insights into the driving behaviors of online motorcycle ride-hail drivers in Banda Aceh and the factors influencing these behaviors.

2.2 Hipotesis

This study builds upon previous research and puts forth hypotheses, as illustrated in **Fig. 1**. This research examines the impact of unsafe driving behaviors - specifically anxiety, aggressive driving, and impatience - on accident involvement. These hypotheses aim to gain insight into whether these behavioral factors play a significant role in causing traffic accidents among online motorcycle ride-hailing drivers in Banda Aceh. Berikut hipotesis pengaruh dalam penelitian ini yang telah dikembangkan untuk di uji adalah sebagai berikut:

- H1 : Does anxiety have a positive influence on accident involvement? This means that the higher the level of anxiety, the higher the level of accident involvement among online motorcycle ride-hail drivers in Banda Aceh.
- H2 : Does aggressive driving have a positive influence on accident involvement? This means that the higher the level of aggressive driving behavior, the higher the level of accident involvement among online motorcycle ride-hail drivers in Banda Aceh.
- H3 : Does impatience have a positive influence on accident involvement? This means that the higher the level of impatience, the higher the level of accident involvement among online motorcycle ride-hail drivers in Banda Aceh.

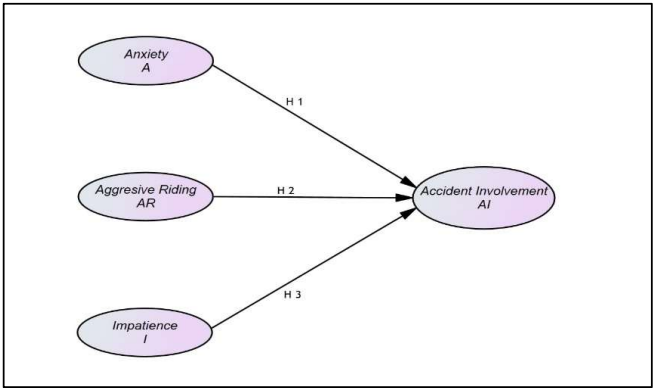


Fig. 1. Overall Model Hypothesis

3 Results And Discussion

3.1 Respondent Characteristics

The following descriptive statistics are based on a sample of 200 online motorcycle ride-hail drivers. **Fig. 2** shows an even distribution of questionnaires with all male respondents. This indicates that male drivers are more dominant as online motorcycle ride-hail drivers in Banda Aceh. **Fig. 3** displays the age ratio of the respondents, with the age group of 21-30 years being the most dominant, followed by the age group of 31-40 years. These results suggest that the average age of online motorcycle ride-hail drivers in Banda Aceh falls between 21-30 years. **Fig. 4** presents the variation in the respondents' highest level of education, with high school or equivalent being the most common. **Fig. 5** illustrates the marital status of the respondents, with being married as the most dominant status. **Fig. 6** provides information on the respondents' income, with an income range of Rp.1,500,000-Rp.3,500,000 being the most dominant. **Fig. 7** shows the respondents' types of employment, with the majority not having additional jobs. **Fig. 8** presents the ownership of private vehicles, with motorcycles being the main vehicle owned by nearly all respondents. **Fig. 9** illustrates the respondents' possession of a Class C driving license, with the majority having one. **Fig. 10** provides information on the respondents' accident experience, with most having never experienced an accident. **Fig. 11** displays the respondents' experience in riding motorcycles, with the majority having more than six years of experience. **Fig. 12** describes the daily motorcycle riding duration, with most riding for over 6 hours daily. **Fig. 13** presents the online ride-hailing company platforms used by the respondents, with Gojek being the most dominant, followed by Grab.

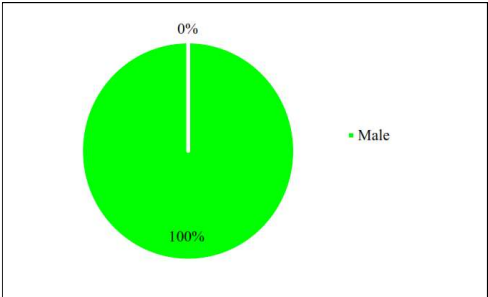


Fig. 2. Characteristics of Respondents by Gender

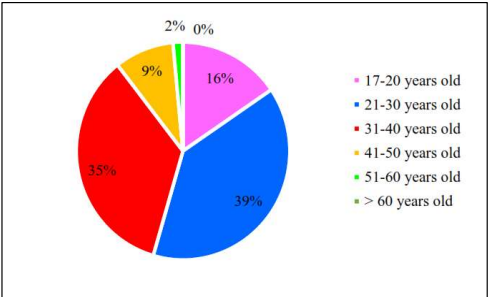


Fig. 3. Characteristics of Respondents by Age

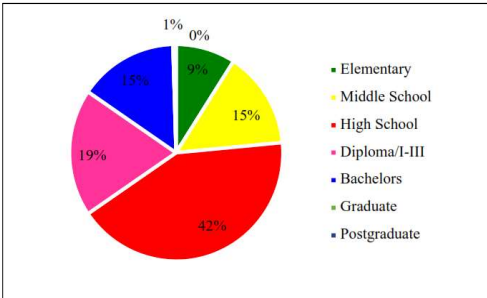


Fig. 4. Characteristics of Respondents by Highest Education Attained

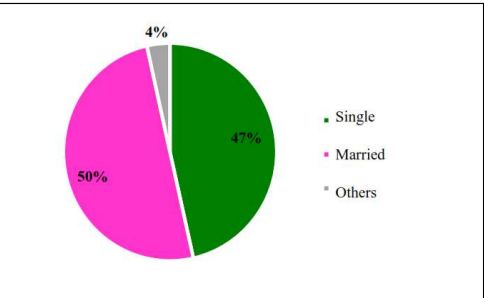


Fig. 5. Characteristics of Respondents by Marital Status

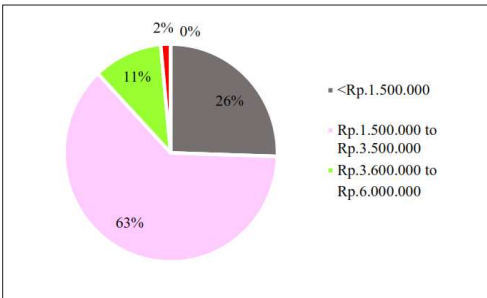


Fig. 6. Characteristics of Respondents by Income

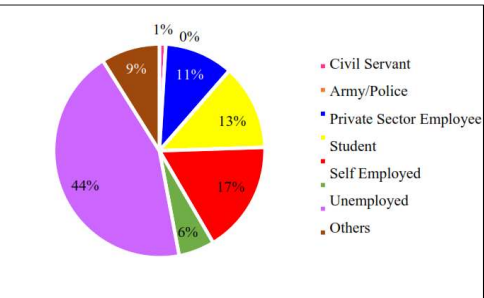


Fig. 7. Characteristics of Respondents by Occupation

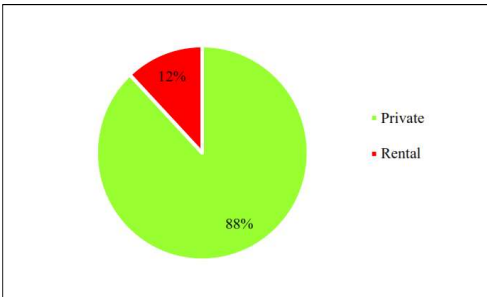


Fig. 8. Characteristics of Respondents by Vehicle Ownership

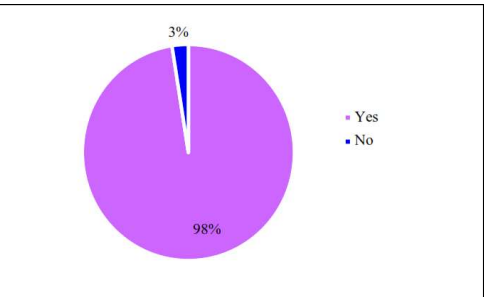
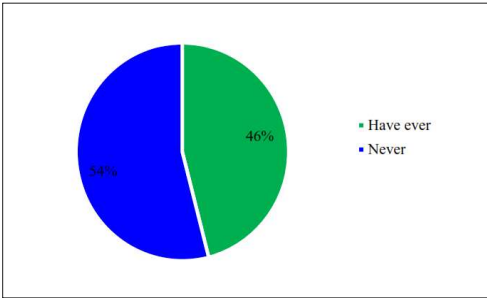


Fig. 9. Characteristics of Respondents by Possession of a Class C Driver's License



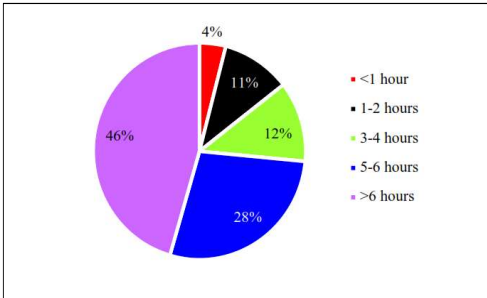


Fig. 12. Characteristics of Respondents by Daily Driving Duration

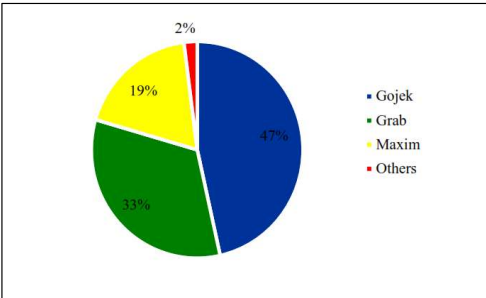
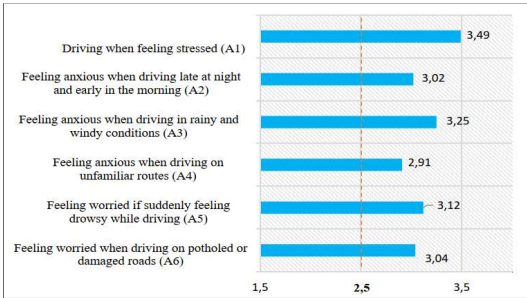


Fig. 13. Characteristics of Respondents by Company Platform

3.2 Perceptions of Online Motorcycle Ride-Hail Drivers

According to Sugiarto et al. (2017), a detailed analysis of the respondents' perceptions regarding online motorcycle ride-hailing drivers revealed that all the indicators scored values of more than 2.5 on the Likert scale of 1-4. This indicates that the respondents' perceptions of driving safety are remarkably positive. The study results pave the way for further research and analysis. According to **Fig. 14**, respondents experience the highest anxiety (A) level while driving in stressful conditions, with an average score of 3.49. Notably, all indicators reveal an average perception of unsafe driving above 2.5, demonstrating a positive awareness of driving safety. **Fig. 15's** analysis of the Aggressive Riding (AR) variable suggests that respondents tend to engage in aggressive driving habits, such as accelerating when another driver attempts to overtake, with an average score of 3.58. Notably, the average scores for all questions related to aggressive driving surpass 2.5, indicating recognition of these behaviors. It's essential to note that accelerating when being overtaken by another vehicle could heighten the likelihood of traffic accidents. Based on the data presented in **Fig. 16** about Impatience (I), it is apparent that survey participants tend to experience impatience in specific circumstances, such as navigating through narrow streets, during peak traffic periods, or when attempting to pass slower-moving vehicles. The average scores for these scenarios exceed 3.00, while some scores exceed 2.5. However, the results indicate a noteworthy lack of patience with slower-moving vehicles, with an average score of 2.92. This finding highlights the potential for unsafe behavior that could jeopardize the well-being of drivers and other individuals using the roadways. Based on the findings presented in **Fig. 17** regarding the Violation (V) variable, it is evident that a significant number of drivers have engaged in various violations while on the road. These violations include carrying multiple passengers, utilizing sidewalks during traffic congestion, attempting to pass on narrow roads, and more, with average scores exceeding 3.00. Notably, carrying more than one passenger received the highest score, with an average of 3.66, suggesting a tendency to commit violations in response to passenger demands. It is crucial to address these potential violations to ensure the safety of all drivers and road users. Based on the findings in **Fig. 18**, it is evident that motorcycle ride-hail drivers who operate online have encountered accidents while driving, notably those involving front-front and front-rear collisions, with an average score of 2.5 or higher. Front-front collisions appear to be the most severe of these accidents, with an average score of 3.71, indicating a significant risk associated with this type of incident. Furthermore, the severity and intensity of other accidents highlight the importance of promoting safety awareness among online motorcycle ride-hail drivers.



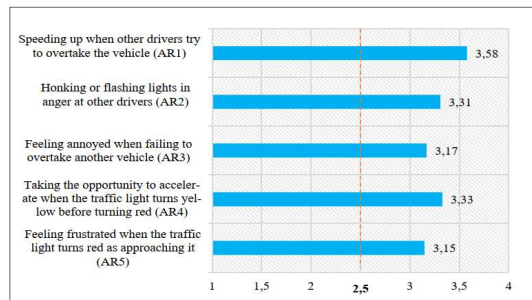


Fig. 15. Average Aggressive Riding Score in Unsafe Driving Behavior

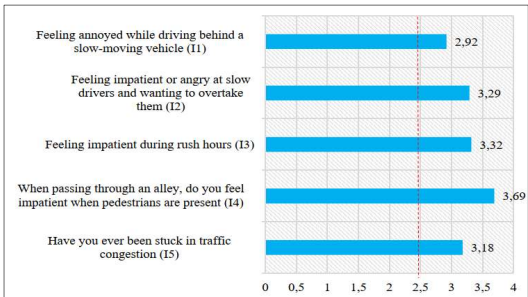


Fig. 16. Average Impatience Score in Unsafe Driving Behavior

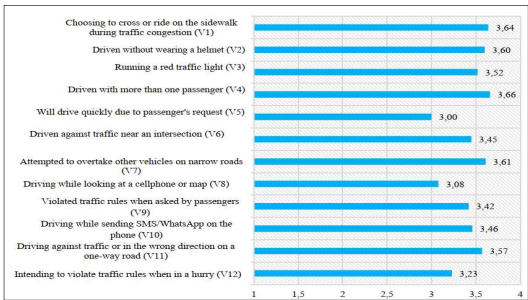


Fig. 17. Average Violation Score in Unsafe Driving Behavior

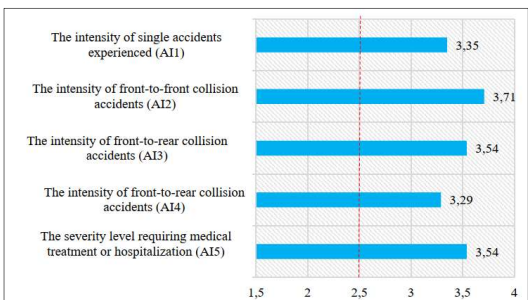


Fig. 18. Average Accident Involvement Score in Unsafe Driving Behavior

3.3 Measurement and Structural Model

Based on the Confirmatory Factor Analysis (CFA) results, the model fit test in **Fig. 19** shows a positive correlation between unsafe driving behavior and accident involvement. The Goodness of Fit test revealed a Chi-square value of 58.040 and a probability of 0.152, which exceeds 0.050. Additionally, the values for GFI, CFI, AGFI, TLI, and RMSEA all meet the minimum threshold of 0.900 and demonstrate a good fit for the overall model. Therefore, the assessment criteria confirm that the model fits well and satisfies the requirements for goodness of fit.

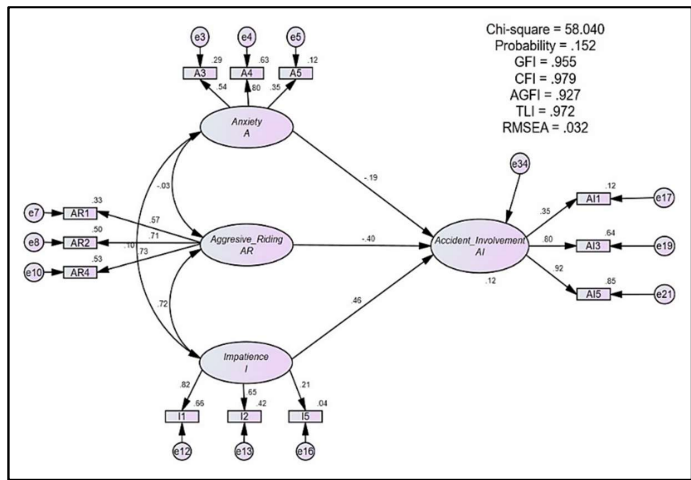


Fig. 19 CFA Model Measurement

Table 1. The results of the measurement model with CFA (Confirmatory Factor Analysis)

Latent Variables	Lable	Estimate	t-value
Anxiety	Feeling anxious when driving in the rain and strong winds. (A3)	1	
	Feeling anxious when driving on a route you've never taken before (A4)	1.329	2.813
	Feeling worried if you suddenly feel drowsy while driving (A5)	0.697	3.598
Agresive Riding	Honking or flashing lights out of anger towards other drivers (AR2)	1	
	Speeding up when another driver attempts to overtake your vehicle (AR1)	0.653	6.675
	Taking the opportunity to accelerate when the traffic light turns yellow before it becomes red (AR4)	0.993	6.996
Impatience	Feeling frustrated when driving behind a slow-moving vehicle (I1)	1	
	Feeling impatient or angry at a slow driver and wanting to overtake them (I2)	0.790	6.592
	Having been stuck in traffic congestion (I5)	0.219	2.605
Accident Involvement	The intensity of single accidents you have experienced (AI1)	1	
	The intensity of front-rear collisions (AI3)	1.864	4.704
	The severity level requiring medical treatment or hospitalization (AI5)	2.431	3.890

* significant level 5%

According to the findings presented in **Table 1**, as reported by Sugiarto et al. (2020), the variable "Anxiety (A)" was analyzed with a significance level of 5% and standardized loading factors of 1. The indicator "Feeling anxious when driving in the rain and strong winds (A3)" was used as the reference (comparator) variable. The indicator "Feeling anxious when driving on an unfamiliar route (A4)" had the highest coefficient and showed the greatest influence on the anxiety

opportunity to accelerate when the traffic light turns yellow before it becomes red (AR4)" has a coefficient of 99% influence, and "Speeding up when another driver attempts to overtake your vehicle (AR1)" has a lower coefficient of influence at 65%. Within the Impatience variable, the Feeling of frustration when driving behind a slow-moving vehicle (I1) indicator acts as the reference or comparator variable. This reference indicator holds the highest coefficient and significantly influences the Impatience variable (I). On the other hand, the Feeling impatient or angry at a slow driver and wanting to overtake them (I2) indicator has a coefficient of 79% influence, while the Having been stuck in traffic congestion (I5) indicator holds a lower coefficient of influence at 22%. Within the "Accident Involvement (AI)" variable, the reference or comparator variable is denoted as the "The intensity of single accidents you have experienced (AI1)." Notably, "The severity level requiring medical treatment or hospitalization (AI5)" holds the most significant coefficient in influencing the Accident Involvement variable (AI), with a percentage of 243%. Additionally, "The intensity of front-rear collisions (AI3)" has an impact of 186%.

Table 2 presents the results of the structural model analysis using CFA with a significance level of 5% (0.05) and t-value > 1.96 to determine the causal relationships between Anxiety (A), Aggressive Driving (AR), Impatience (I), and Accident Involvement (AI) variables. There are four latent variables constructed with several predefined indicators for use.

Table 2. Results of the measurement model with CFA

Variable			Estimate	t-value	P
Accident Involvement	< ---	Anxiety	-0,264	-2,005	0,045
Accident Involvement	< ---	Aggressive Riding	0,258	2,207	0,027
Accident Involvement	< ---	Impatience	-0,151	-1,729	0,084

In **Fig. 20**, the path diagram of the structural model displays the relationships between latent variables and their influences. The Anxiety variable has a significant influence of 0.19 with a t-value of 2.005 > 1.96 at a probability level of 0.045 < 0.05. Similarly, the Aggressive Driving variable significantly influences 0.19 with a t-value of 2.005 > 1.96 at a probability level of 0.045 < 0.05. However, the Impatience variable's influence on Accident Involvement is deemed insignificant at 0.46 since the t-value is 1.729 < 1.96 at a probability level of 0.084 > 0.05.

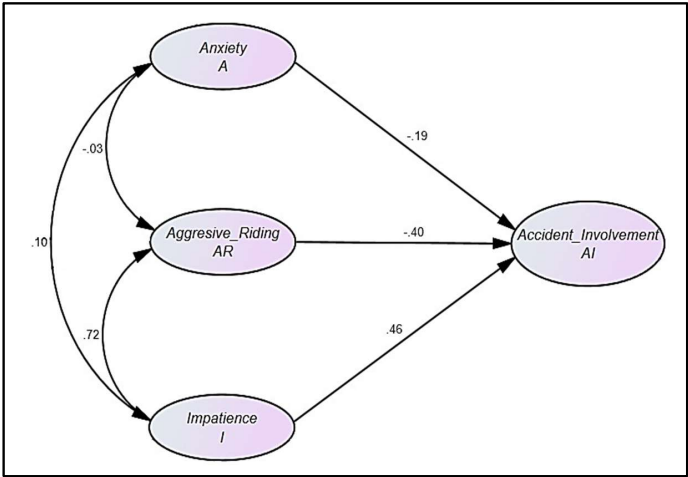


Fig. 20 CFA Model Measurement

4 Conclusion

Based on the research results that have been conducted, the following conclusions can be drawn:

1. A positive correlation exists between impatience while driving and involvement in accidents, with a significant positive influence of 0.46 on accident involvement. Anxiety exhibits a significant negative

- influence of 0.19 on accident involvement, while aggressive driving has a significant negative influence of 0.40.
2. The "Anxiety (A)" factor is largely influenced by the indicator "Feeling anxious when driving on unfamiliar routes (A4)."
 3. The "Aggressive Driving (AR)" factor is strongly affected by the indicator "Honking or flashing lights in anger at other drivers (AR2)."
 4. The "Impatience" factor is greatly influenced by the indicator "Feeling frustrated when driving behind slow-moving vehicles (I1)."
 5. The "Accident Involvement (AI)" factor is significantly impacted by the indicator "Severity requiring medical treatment or hospitalization (AI5)," as well as the indicators "Intensity of rear-end collisions (AI3)" and "Intensity of single-vehicle accidents experienced (AI1)."

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