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Cover Page Footnote

This paper endeavors to present empirical evidence concerning the efficacy of speed reduction through the implementation of traffic management strategies and coordinated enforcement of traffic regulations by military police and traffic police. The study's objective is to provide scientific insights that could potentially lead to a reduction in vehicle speed and consequently, a decrease in traffic accident fatalities. It is anticipated that the findings of this research will offer valuable contributions to the field of traffic safety and management, and inform the development of evidence-based policies and interventions aimed at promoting road safety.

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EFFECTIVENESS OF INTEGRATED TRAFFIC MANAGEMENT OF MILITARY POLICE AND TRAFFIC POLICE IN REDUCING DRIVE SPEED ON ARTERIAL ROADS: AN EXPERIMENTAL STUDY

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ABSTRACT

The Indonesian National Police Traffic Corps (KORLANTAS POLRI) and Indonesian Army Command and General Staff College (SESKOAD) in 2023 have conducted a joint study to reduce the number of traffic accident victims by implementing traffic regulations by the Military Police and Traffic Police. One of the methods used by KORLANTAS POLRI is the installation of Electronic Traffic Law Enforcement (ETLE) speed cameras on Jakarta toll roads, such as Cikampek, Jagorawi, Bitung, and others. At the end of 2022, 75 additional speed cameras were installed on arterial roads in Jakarta. This study aims to analyze the effectiveness of traffic regulations by the Military Police and Traffic Police in reducing vehicle speed. Data was collected by comparing vehicle speeds before, during, and after passing through the control zone. Data analysis was conducted using N Gain Score and normal distribution statistical tests with a 5% error rate. The study's results showed that the slowdown in vehicle speed through traffic regulation by the Military Police and Traffic Police could reduce speed by 43.76%. Over 95% of road users comply with speed limits when passing through the control zone. Thus, it can be concluded that implementing traffic regulations by the Military Police and Traffic Police has met the planning objectives in reducing the number of traffic accident victims. This method has proven effective in reducing vehicle speed and increasing road user awareness of complying with speed limits. In addition to installing speed cameras, traffic regulation carried out by Military Police and Traffic Police officers can be an effective alternative in reducing the number of traffic accidents on the road. This study shows that the collaboration between KORLANTAS POLRI and SESKOAD can provide important insights into traffic safety issues in Indonesia. Implementing traffic regulations by Military Police and Traffic Police officers can reduce traffic accidents and save lives. Modern technology, such as speed cameras, is important in this effort. It is recommended that this study's findings be shared with other law enforcement agencies to promote greater cooperation in improving traffic safety nationwide. Public education campaigns should also raise awareness among road users about adhering to traffic rules and regulations.

Keywords: Effectiveness; Speed management; Technology transportation system; Security system

1. INTRODUCTION

Traffic management is the road's management and regulation of traffic flow to achieve safety, efficiency, and comfort for road users and ensure good mobility. Traffic management covers various aspects such as planning, design, operation, maintenance, evaluation, and improvement of transportation systems. Several steps are involved in traffic management, including data collection and analysis, planning and design, traffic regulation, maintenance and repair, and evaluation and improvement of transportation systems.

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Ensuring optimal traffic safety and efficiency is important to implement traffic management, thus helping reduce road accidents and traffic congestion. Therefore, traffic intervention refers to actions taken to improve or optimize traffic flow. These interventions can be carried out using techniques such as traffic lights, vehicle sensors, or through manual regulation by traffic officers. The goal is to optimize traffic flow, minimize congestion, improve traffic efficiency and safety, and ensure good mobility for road users. One example of traffic intervention is manual regulation by traffic police. A study conducted by Sam (2022) indicates that traffic police are very important in a successful road safety strategy. Available literature identifies both traditional and automated traffic enforcement. In Ghana, traditional traffic enforcement involving visible police officers enforcing traffic rules and roadway regulations is employed.

Traffic accidents in Indonesia have become a serious and increasing problem recently. Data from the Central Statistics Agency (BPS) shows that there were 332,019 cases of traffic accidents throughout Indonesia, resulting in 26,948 fatalities and 29,297 serious injuries. One of the main causes of these accidents is high driving speeds, especially on arterial roads. Therefore, appropriate and sustainable actions are needed to address this issue.

In Tangerang Selatan city, high traffic density has made several arterial roads accident-prone areas, such as Boulevard BSD, Raya Serpong, and Graha Raya Bintaro. High driving speeds are one of the main causes of traffic accidents on these arterial roads.

Currently, the Indonesian National Police, in collaboration with the Indonesian Army Command and General Staff College (SESKOAD), is conducting research to address the issue of speeding on arterial roads, one of which is the integration of traffic control between the Military Police and Traffic Police. This integration is expected to improve coordination between the two security forces and help reduce speeding on arterial roads. However, the effectiveness of this program in addressing the issue of speeding and traffic safety on arterial roads in the city of South Tangerang has yet to be fully revealed.

Therefore, this study aims to identify and evaluate the effectiveness of integrating traffic control between the Military Police and Traffic Police in reducing speeding on arterial roads in South Tangerang. This study will analyze the factors influencing the program's effectiveness, such as vehicle types, time, and location. Additionally, the results of this study are expected to provide useful information and recommendations for the government and security forces in improving traffic safety and user comfort on the roads in South Tangerang. References from the Central Statistics Agency and the Ministry of Transportation show many traffic accidents and accident-prone areas on arterial roads such as Boulevard BSD, Raya Serpong, and Graha Raya Bintaro, making this research increasingly relevant and important to conduct.

In this research, data collection will be conducted through surveys and direct observations at the research location. Surveys will be conducted by administering questionnaires to road users, including two-wheeled and four-wheeled vehicle drivers, to understand their views on the effectiveness of the traffic management integration program. Direct observation will be conducted to collect data on the types of vehicles, times, and locations where the traffic management integration program is implemented. This study uses a random observation method on vehicles passing through for three days on the arterial roads of South Tangerang City. Observations will be made on vehicles passing through Boulevard BSD, Raya Serpong Road, and Graha Raya Bintaro Road. The selected locations are areas with high traffic density and accident-prone points in South Tangerang City. Observations will be made during peak hours, namely from 07:00 to 09:00 AM and from 04:00 to 06:00 PM. During the observation, vehicle speed, type, and time of passing through the location point will be recorded. Data analysis will be conducted using quantitative research methods to identify results that can assess the program's

effectiveness. The analyzed data will be used to develop government and security agencies' recommendations for improving traffic safety and road user comfort in South Tangerang City.

The primary assumption of this research is that combining the efforts of the Military Police and Traffic Police to regulate traffic can lead to a reduction in driving speed on arterial roads in South Tangerang City. This study aims to generate suggestions and insights to enhance traffic management methods, improving road user safety within South Tangerang City.

2. LITERATURE STUDY

The following are some references and literature reviews from previous research that has been systematically and structurally reviewed to support this research in building strong critical thinking.

2.1. Average Speed

Average speed is a quantity that expresses the average speed of an object over a certain period. This concept is very important in physics and is often used to calculate the movement of objects. Average speed is the ratio of an object's total distance to the total time required to cover that distance (Halliday et al., 2020). Average speed is also used for car-following models that consider the average speed of preceding vehicles to influence drivers' behavior in maintaining their speed. This model also considers drivers' memory when following a vehicle before them (Sun et al., 2019).

2.2 Correlation between Speed and Safety Factors in Various Contexts

The higher the speed of a vehicle, the greater its kinetic energy (ITF, 2018). When a collision occurs, the kinetic energy will be converted into other potential or kinetic energy that can cause serious damage to the vehicle and injuries to the driver and passengers. The ideal inelastic collision refers to the understanding that colliding objects will stick together with the same velocity after the collision. All mechanical and kinetic energy within the collision system will be lost. The loss of all kinetic energy will be converted into the internal energy of the system when the collision occurs, such as plastic deformation energy and heat generation (Cao & Luo, 2021). If the passengers use seat belts and the collision is severe, the car sensors will send a frequency signal to deploy the airbags. Seat belts and airbags are installed to reduce the risk of passengers being injured and dying since both safety devices are specifically established to protect passengers from their inertia. Based on Newton's first law, passengers without seat belts will continue to move until an external force is applied, assuming that friction between the passengers and the car seats is ignored. The passengers will be thrown out of the vehicle and experience projectile motion, continuing their motion as projectiles.

2.3. Speed Control

"Vehicle speed management" is an approach that optimizes vehicle speed by utilizing real-time traffic data and vehicle information (IEEE Transactions on Intelligent Transportation Systems 2019). This concept includes using technologies such as sensors and monitoring systems to collect traffic data and adaptive speed control systems and cooperative systems to avoid accidents (Hall, 2022). The theory or reference related to speed control is the physics principle of Newton's law of motion, which states that an object will continue to move at a constant velocity if no force is acting upon it. Therefore, to control the speed of a vehicle, the use of an effective and timely braking system, as well as appropriate transmission gears, is necessary.

2.4. Determinant Variables of Speed

The effectiveness of fixed speed cameras with warning signs in critical areas, such as intersections and school zones, is seen for effective law enforcement. On the other hand, hidden speed cameras that are not visible can have a wider and more preventive effect because drivers do not know the location and timing of camera installations, making it more unexpected. Overall, visible fixed-speed cameras are more suitable for specific parts where law enforcement is crucial, while hidden speed cameras can have a wider impact. Research by Siregar (2018) discusses the effectiveness of enforcing speed limits through several interventions on Indonesian roads. This study used three intervention factors: police presence, rider training, and publicity of rider speed choices on the roadside. The results showed that police presence was the only factor that significantly reduced the average speed of riders and increased compliance. Combining these three factors reduced the average rate by 14% and 10% and improve compliance by 72% and 33% until the end of the test route. As an estimate, this intervention could reduce the number of fatalities by 52% and 33%.

The innovation of speed limit refers to the development of technology and methods that can effectively control the speed of vehicles on the highway. Some of these innovations include the collaboration and integration of law enforcement officers and the development of technological devices in law enforcement to warn drivers to reduce speed to reduce the potential for accidents. These innovations aim to improve road safety and reduce the number of accidents caused by excessive speed. "Military Police Traffic Surveillance Activity and Occurrence of Accidents in Israel" is a study conducted in 1984 on the Traffic Surveillance Activity of the Military Police and the Occurrence of Accidents in Israel (Saudry et al., 1984). The study examines the relationship between military and civilian vehicles or pedestrians involved in accidents in Israel between August 1978 and March 1982. The research shows an inverse correlation between two types of surveillance by the Military Police, namely speed radar monitoring and motorcycle patrols, with accidents resulting in injuries.

The study found that speed monitoring with radar and motorcycle patrols significantly reduces the number of accidents involving military and civilian vehicles or pedestrians. However, military patrol cars circulating do not have a significant impact on preventing accidents.

The study suggests that effective accident prevention methods involve speed monitoring with radar and motorcycle patrols by the Military Police. However, the study has limitations, such as using cross-sectional data and certain biases. Therefore, the results of this study need to be further tested in well-controlled prospective trials to ensure validity.

3. METHODS

3.1. Research Stages

The author selected methods by determining the sample size, observation, and data processing following the principles of good research. The technique used in conducting the survey conducted phases and stages of activities that are sequential and interrelated between the first stage and the next step begins with:

1. Problem Identification
   In this study, the author identified the problem by observing the arterial road and identifying the problem of high driving speed and potential hazards that may occur as a result.
2. Literature Review
   The author compares and contrasts previous research on the effectiveness of military police and traffic police traffic control in reducing driving speed to determine the concepts

and theories related to the research, such as traffic management theory, driving safety, and others.

3. Problem Formulation
   The author decided on the problem to be discussed in this study, namely, "How effective is the integration of military police and traffic police traffic control in reducing driving speed on arterial roads?"
4. Research Objectives
   The author then conducted an experimental study and analyzed the results to evaluate the effectiveness of integrating military police and traffic police traffic control in reducing driving speed on arterial roads.
5. Data Collection
   The author used observation and experimental methods in data collection. The data collected by the researcher were the speed of vehicles before and after traffic control was carried out and data on the number of accidents and traffic violations. Data was also collected through interviews with military police and traffic police officers.
6. Data Analysis
   The author processed and analyzed the data using statistical techniques, such as t-tests, ANOVA, and multiple linear regression, to determine the effectiveness of integrating military police and traffic police traffic control in reducing driving speed on arterial roads.
7. Results and Discussion
   The author will discuss the results of the data analysis to determine the effectiveness of integrating military police and traffic police traffic control in reducing driving speed on arterial roads by comparing research results and discussing practical and theoretical implications for traffic management concepts and driving safety on arterial roads. In addition, the author will discuss the limitations of this study and provide suggestions for future research that is more comprehensive and representative.

3.2. Research Instruments

A speed measuring device that uses the Doppler effect to measure the speed of vehicles and can function in any lighting condition. However, the speed gun must be used with a camera to take a photo as evidence (Hamelmann et al., 2019). Therefore, speed guns are usually used during the day. If used at night, a flashlight is needed for the camera. The flashlight for the speed gun should use infrared illumination with a wavelength of over 750 nm to ensure driver safety. In addition, the flashlight should have high power so that the camera can take photos from about 70 m to 100 m.

Speed or radar guns typically display the measured vehicle speed on the device screen. Some speed guns can also store speed data in their internal memory or transmit speed data to connected devices, such as laptops or tablets. Additionally, some speed guns can display the measurement time and the distance between the speed gun and the vehicle being measured

3.3. Data Analysis

The data evaluation process begins with examining all the collected data, including observation results and document studies, followed by data reduction, data grouping, and data interpretation. To assess the effectiveness of speed camera usage in Boulevard Bintaro Jaya, each vehicle's speed was recorded and recorded, allowing the effectiveness level of the traffic management integration between military police and traffic police in reducing driving speed on arterial roads to be determined. The lower the vehicle's speed following the city's speed limit after passing through

the research zone, the higher the effectiveness of using speed cameras. Conversely, the greater the vehicle's speed that exceeds the predetermined speed limit after passing through the research object, the lower the level of effectiveness. Survey data was collected and analyzed by conducting data validity tests. Data validation was carried out using a survey method by randomly selecting and determining a sample based on the same vehicle identity passing through the two predetermined zones, namely the before and after zones.

4. RESULTS AND DISCUSSION

4.1. Research Time and Location

The research was conducted on the Boulevard Bintaro Jaya in the city of South Tangerang, where the Boulevard Bintaro Jaya road serves as a main artery that connects two access points to the city, namely the Jakarta-Serpong toll road that connects Bintaro and Pondok Indah. The Boulevard Bintaro Jaya road is the central point of the Transit Oriented Development (TOD) concept. It serves as the lifeline for the development of the Bintaro Jaya residential area, connecting residential districts with educational facilities, healthcare facilities, shopping centers, office buildings, business centers, public transportation systems, and of course, two toll roads Viva.co.id. Therefore, the Tangerang city government has designated the Boulevard Bintaro Jaya road as a main artery that meets the criteria for a major road that serves inter-city or intra-city transportation needs and has a high traffic volume. The process started with a pre-test and a post-test. The research location was chosen considering the need for traffic speed data not disturbed by intervention on the road, and the data will be used to compare results. The survey was conducted for two days on March 3 and 4, 2023, between 1 PM and 4 PM, using a direct measurement method of vehicle speed and recording videos and photos using a speed camera within a 50-meter distance before and after the research zone, with the existing speed limit sign of 40 km/h. The researcher will group primary data according to the type of motor vehicle regulated in Article 47 of the Law Number 22 of 2009 concerning Traffic and Road Transportation (LLAJ, 2019). The following are the types of motor vehicles referred to:

1. Motorcycles: two-wheeled motorized vehicles with or without housing, sidecars, or three-wheeled vehicles.
2. Passenger cars: motorized vehicles for transporting people with a maximum of 8 seats or weighing no more than 3,500 kilograms.
3. Buses: motorized vehicles for transporting people with more than eight seats or weighing more than 3,500 kilograms.
4. Cargo vehicles: motorized vehicles used for transporting goods.
5. Special vehicles.

Figure 1 Location of the Research on the Map

Figure 2 Position of the Research

4.2. Data Collection

The data in this research was collected using quantitative methods. Quantitative data is obtained from vehicle speed. Data is obtained through a survey to measure the speed of vehicles before, during, and after the observation. The method used is a pre-test and post-test using a speed camera. Primary data is collected by observing both observation and supporting data. The observation and sample measurement include travel time, zone distance, and distance of Military Police and Traffic Police officer location. The next step is to analyze the vehicle speed data by comparing speed data and calculating the N-score as follows:

$$Average\ Speed\ = \frac{Total\ Distance\ Traveled}{Total\ Time\ Taken} \qquad \text{..... (1)}$$

In this formula, the total distance traveled is measured in meters or kilometers, while the total time taken to cover the distance is measured in seconds, minutes, or hours.

The formula for Paired Sample T-test is as follows:

$$t = \frac{\bar{X}_D}{s_D/\sqrt{n}} \qquad \text{..... (2)}$$

Where t is the value of the $t-test$ statistic, $\bar{X}_D$ is the mean difference between the paired samples before and after the treatment, between the paired samples before and after the treatment s_D is the standard deviation of the differences between the paired samples and n is the number of pairs of data being compared.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s \cdot \sqrt{\frac{1}{n_1}+\frac{1}{n_2}}} \qquad \text{..... (3)}$$

where $\bar{x}_1$ is the mean of sample 1, $\bar{x}_2$ is the mean of sample 2, s is the standard deviation of all the samples, n_1 is the sample size of sample 1 and n_2 is the sample size of sample 2.

The Paired Sample T-test method is used to compare the mean difference between two paired samples. These paired samples can be taken from the same subject before and after a treatment or different measurements. For example, in a study on a drug's effectiveness, the subject's condition is measured before and after being given the drug. This test can help determine whether the difference is statistically significant or just happened by chance (Sudjiono, 2010; Ghozali, 2016). The test result is determined based on the significance value (p-value) obtained. If the p-

value is less than alpha (usually 0.05), it can be concluded that there is a significant difference between the two samples. If the p-value is greater than alpha, it can be concluded that there is no significant difference between the two samples. It is an effective method for analyzing correlated data. According to Yu (2022), some commonly used statistical tools that consider the dependence of data are mixed-effects (ME) linear and generalized models, which include t-tests and ANOVA as special cases. However, the value of analyzing correlated data is increasingly recognized in many disciplines, including clinical research, genetics, psychology, and many others. N-gain Score is calculated as follows:

$$N - gain\ Score\ = \frac{(Posttest - Pretest)}{(Highest\ Possible\ Score - Pretest)} \times 100\% \quad \text{..... (4)}$$

Where post-test means the average score on the post-treatment test, pre-test mean the average score on the pre-treatment test, and the highest possible score means the highest score that can be achieved on the post-treatment test, usually calculated based on the number or difficulty level of the question.

Solikah & Novita (2022) found that the N-gain scores obtained were categorized as moderate to high, indicating an improvement in critical thinking ability. To evaluate the overall critical thinking ability, a paired T-test was conducted.

The N-gain Score method is used to evaluate the effectiveness of a treatment in a one-group pre-test and post-test design. This method yields an N-gain score, indicating the degree of improvement in subjects after receiving the treatment. The N-gain score is calculated based on the difference between the pre-test and post-test scores and then normalized using the score scale used. The N-gain score can range from -1 to 1, where 1 indicates the greatest improvement and a score of -1 indicates the greatest decline. A high N-gain score indicates that the treatment provided effectively improves subjects' performance in a measured area. This method can help identify whether a treatment significantly affects subjects.

In the study, the researcher used a purposive sampling method to select the vehicles that will be the object of the study. Purposive sampling is a non-probability sampling technique where the sample selection is based on certain considerations that are relevant to the research objectives. The researcher selected the sample based on the same characteristics of the vehicles previously so that the difference in driving speed before and after the treatment could be measured. A total of 113 samples were taken from the total population of 784 vehicles (Thomas, 2022).

By using the purposive sampling method, the researcher can select samples that are considered representative to be the object of the study and capture a diversity of views about the object of interest. This technique aims to collect different perspectives ranging from common to extraordinary. The purpose of this technique is to obtain a sample that represents the diversity that exists in the population. The data analysis used a pretest-posttest one-group design, which is a technique to determine the effect before and after treatment (Souisa, 2022).

4.3. Instantaneous Speed Reduction

4.3.1 Recapitulation of spot speed

There are two average speeds compared between the initial speed without speed limit intervention (Pre-test) and the intervention speed (Post-test) based on the police supervisor's notes.

Table 1 Comparison of Mean Speed

No	Average Vehicle Speed	Sample	Km/Hours	
			Pre-test	Post-test
1.	The average speed without the intervention of military police and traffic police.	113	65.7	68.8
2.	The average speed with the intervention of military police and traffic police.	113	61.9	38.7

Based on the data, there was a significant difference in the average speed before and after the traffic control intervention by the Military Police and Traffic Police. During the data collection, the authors placed Military Police and Traffic Police at specific positions along with speed cameras that were not visible to drivers. From the data, it can be concluded that the placement of the Military Police and Traffic Police has reduced the speed of vehicles. The data shows a significant difference in average speed between the pre-test, the speed without speed limit intervention, and the post-test, which is the speed after the intervention. The average speed during the pre-test was 61.90 km/h, while after the intervention of the police supervisors, the average speed decreased to 38.76 km/h. In other words, the average vehicle speed decreased by 37.47%. This indicates that traffic control interventions can reduce vehicle speed and improve road safety.

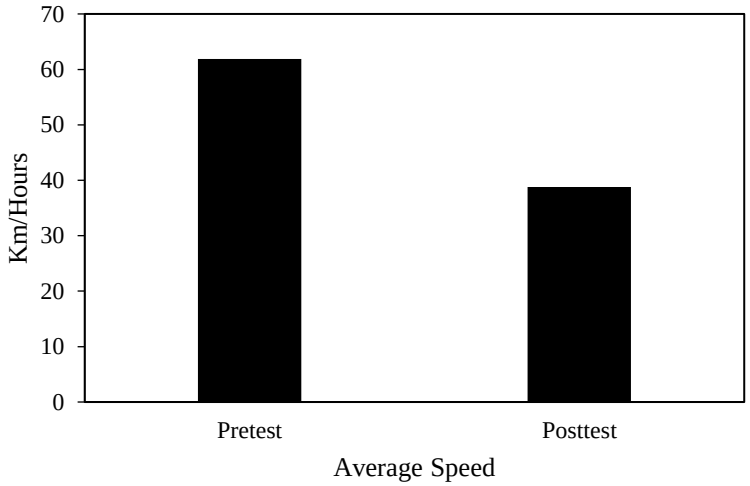

Figure 3 Speed Reduction Graph

From the information provided, it can be concluded that Figure 3 shows a significant change in speed from Zone 1 to Zone 2. If visualized in a graph, there will be a significant speed reduction, especially in zone 2, the control zone. The graph shows that the initial speed of 61.9 km/h in zone 2 decreased to 38.7 km/h after the traffic control intervention by Military Police and Traffic Police was implemented. This indicates that traffic control can effectively reduce vehicle speed in the control zone and improve road safety.

4.3.2 Summary of Average Speeds by Vehicle Type

From the information presented, it can be concluded that the placement of Military Police and Traffic Police officers has successfully reduced the speed of motor vehicle users in zone 2, or the control zone, for passenger cars, trucks, buses, and motorcycles. This is evident from the lower average speed data in Table 2 and the graph showing the decrease in speed in Figure 4.

Furthermore, field observations have shown that most road users have reduced their vehicle speed when passing through Zone 2, which may be due to the visible presence of Military Police and Traffic Police officers. Another reason for the change in road user behavior is the sudden presence

of Military Police and Traffic Police officers, which influences all road users to slow down their vehicles, read, pay attention, and understand the situation. These results indicate that traffic management interventions can effectively change user behavior and improve road safety.

Table 2 Summary of the Average Speeds by Vehicle Type

No.	Vehicle	Total Vehicle	Km/Hours	
			Pre-test	Post Test
1.	Passenger cars	57	61,2	37.6
2.	Buses	13	62.3	39.4
3.	Truck	6	61.5	41.6
4.	Motorcycle	37	62.8	39.8

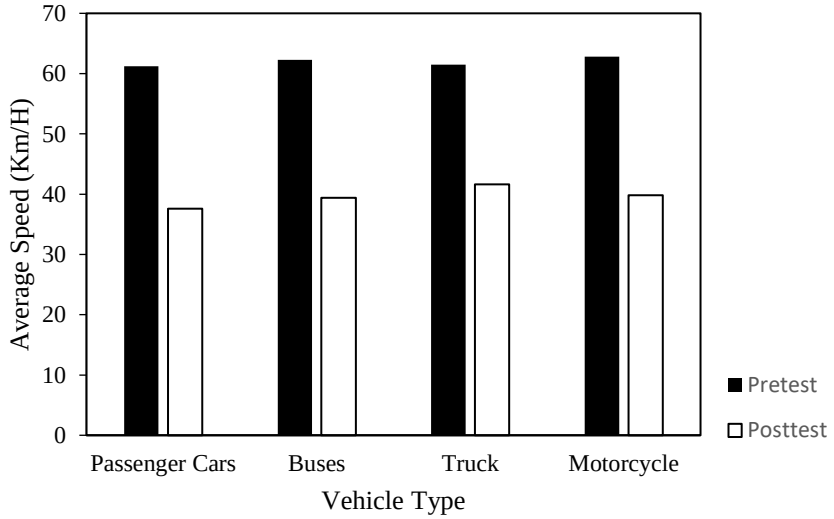

Figure 4 The Comparison of Speeds and Vehicle Types in the Area before and after the Intervention

4.3.3 Effectiveness of Speed Reduction on Arterial Roads

From 113 vehicles passing through zone 2, where the military police and traffic police interventions were installed, 108 vehicles, or 95.58%, have reduced their speed. In comparison, only five vehicles, or 4.42%, have accelerated their speed in the control zone/zone 2. Thus, it can be concluded that the placement of military police and traffic police interventions can significantly affect the speed reduction of vehicles in Zone 2. The percentage of vehicles reducing their speed by 95.58% indicates that the intervention has successfully influenced drivers' behavior to slow down their vehicles in the control zone.

Table 3 The Overall Speed Reduction Data

No	Vehicle	Total Vehicle	Zona 2	
			Deceleration	Acceleration
1.	Passenger cars	57	53	4
2.	Buses	13	13	0
3.	Truck	6	6	0
4.	Motorcycle	37	36	1
	Total	113	108	5

4.3.4 Effectiveness of N-Score

Table 4 Categories of N-Gain Effectiveness Interpretation

Percentage (%)	Estimate
< 40	Not Effective
40 - 50	Less Effective
56 - 75	Moderately Effective
>76	Effective

Source: Widodo, 2016

Table 5 N-Gain Result

No	Type	Sampling	Pre	Post	Post-Pre	Ideal score	N Gain	Conclusion
1.	Passenger cars	57	61	38	- 24	-11	210%	Effective
2.	Motorcycle	37	63	40	-23	-13	180%	Effective
3.	Buses	13	62	39	-23	-12	185%	Effective
4.	Truck	6	62	42	-20	-12	172%	Effective
5.	Overall	117	62	39	-23	-12	194%	Effective

The N-Gain Test found that the average speed after implementing speed signs and supervising police was lower than the average speed before the intervention. This indicates that the vehicle speed before the intervention was higher than after the intervention. Additionally, the N-Gain result exceeded 76%, indicating that the intervention of speed signs and supervising police effectively reduced vehicle speed on the arterial road.

4.3.5 T-Test

Table 6 shows that the t-value for four types of vehicles (car, motorcycle, bus, and truck) exceeds the t-value in the 0.05 table. This finding indicates that the slowing down vehicle speed on the road has complied with the maximum speed limit of 40-50 km/h with a 5% error rate. In other words, traffic regulation carried out by the military police and traffic police has effectively reduced vehicle speed on the road. It is crucial in reducing the risk of traffic accidents often caused by speeding.

Table 6 T-Test with a 5% Error Rate

T-test	Sample	T Count	T Table	Decision	Conclusion
Overall	113	20,76	1,98	Rejecting the null hypothesis	According to Plan
Passenger cars	57	14.75	2,00	Rejecting the null hypothesis	According to Plan
Motorcycle	37	13.30	2,03	Rejecting the null hypothesis	According to Plan
Buses	13	5.42	2,16	Rejecting the null hypothesis	According to Plan
Truck	6	3.95	2,45	Rejecting the null hypothesis	According to Plan

Based on the results of the research and discussions using a 5% error tolerance, several conclusions can be drawn as follows, the average speed on Boulevard Bintaro Jaya road through the placement of Military Police and Traffic Police is 38.7 km/h, which is more effective in

reducing speed compared to the average speed when passing through the Military Police and Traffic Police placement, which is 68.8 km/h. The average spot speed after passing through the Military Police and Traffic Police from north to south is 37.6 km/h for passenger cars, 39.4 km/h for buses, 41.6 km/h for trucks, and 39.8 km/h for motorcycles.

Based on the research results, it was found that 95.58% of the 117 sampled vehicles obeyed the rules to reduce vehicle speed when passing through the location guarded by Military Police and Traffic Police. The number of vehicles that complied with the rules was 108. The presence of traffic police and military police can contribute to reducing driver speed and minimizing traffic accidents. However, the deployment of these authorities on the roads should not be constant, as certain factors need to be considered. Firstly, mapping and analyzing traffic accident data is essential in determining the locations that require the presence of traffic police and military police. This approach can help ensure their effectiveness in reducing traffic accidents. Secondly, available human and financial resources must be considered, as the deployment of traffic police and military police requires significant resources. Thus, it is necessary to assess whether their presence on the roads is proportional to the benefits they provide. By considering these factors, the presence of traffic police and military police can be optimally managed to reduce driver speed and minimize traffic accidents effectively. The analysis of the planned speed limit design in the range of 40-50 km/h in zone 2 found that five vehicles or 4.42% increased their speed beyond the planned speed limit. This shows a mismatch between the expected speed in the design and the speed performed by some drivers.

The effectiveness of speed restriction through the placement of Military Police and Traffic Police has reached the maximum value, as seen from the percentage of speed reduction in Zone 2, which has an effectiveness rate above 50% for all types of vehicles. The research results show that the placement of Military Police and Traffic Police successfully reduced vehicle speed in Zone 2. Although some vehicles do not comply with the planned speed limit, the overall effectiveness rate is still above 50% for all types of vehicles. This indicates that applying speed restriction through the placement of Military Police and Traffic Police can be considered effective in influencing driver behavior and reducing the risk of accidents on the road. However, this system needs continuous evaluation and improvement to achieve its goals more optimally.

5. CONCLUSION

Speed guns are speed control devices current Indonesian traffic police record photos, videos, and the time of vehicles exceeding the maximum speed limit of 50 km/hour. Nevertheless, many vehicles still exceed the maximum speed limit. To address this issue, the active involvement of police officers and law enforcement officials is needed to impose penalties on those who violate the maximum speed limit. This is consistent with the latest guidelines from the World Health Organization (WHO, 2018), which states that law enforcement against speeding violations can help reduce traffic accidents.

Stopping sight distance is useful for determining the reaction distance or distance drivers need to respond and make decisions when facing obstacles ahead (Chen et al., 2019). Stopping sight distance consists of two parts: reaction and braking. The time required for the driver to react and make decisions is called PIEV time (Perception, Identification, Emotion, Volition). PIEV time is influenced by the driver's conditions, including habits, weather, lighting, and mental conditions, and is estimated to take about 1.5 seconds. After the decision to step on the brake, the driver needs about 0.5 to 1 second to step on the brake, and in planning, 1 second is taken. Therefore, the total time required is about 2.5 seconds.

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