Evaluating Acceptance of a More Strict Plate Control Policy among Motorcycle Riders in Tehran

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Abstract

Dramatic growth in motorcycle usage coupled with the riders' high-risk driving behavior calls for a reform in motorcycle monitoring schemes in developing countries. In Tehran, Iran, about one million motorcycle license plates are registered in the city, of which more than 35% are unreadable, proving the existing monitoring schemes fall short in regulating motorcycle operations. A More Strict Plate Control (MSPC) is proposed to address the issue. While there is no question about the necessity of this policy, Tehran policymakers are concerned about the acceptance level of this policy. This study investigates its acceptance among motorcyclists, the major potential opponent population, in Tehran. To this end, 400 riders have been surveyed. Data analysis shows that subjective factors, such as driving behavior and attitudes, highly impact acceptance. Also, aggressive riders are more likely to disagree with the policy, but most of the motorcyclists did not disagree with a More Strict Plate Control (MSPC) Policy.

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1. Introduction

1.1. The Growth of Motorcycle Use in Iran and Other Developing Countries

Motorcycle use has been increased in recent years in developing countries, with motorcycles accounting for 45, 54, 73, and 93% share of total vehicles in Malaysia, Thailand, Pakistan, and Vietnam, respectively [WHO, 2018]. Also, motorcycle use for private transportation has increased in Iran over the past two decades, with the number of registered motorcycles increasing from 1500000 in 2001 to 11600000 in 2019, accounting for 38% of all registered vehicles [Tehran Urban Research & Planning Center, 2020]. Additionally, according to UN research, the world's urban population will rise by nearly 2.5 billion people by the year 2050, with developing countries accounting for 90% of this growth [UN, 2018]. In other words, this trend may impact the growth of motorcycle use in these countries. Since postponing these control policies could aggravate the precarious situation, appropriate strategies should be taken to ameliorate the predicament.

1.2. Motorcycle Challenges in Developing Countries

The increase in motorcycle usage has led to various challenges in developing countries. Due to their physical configurations and level of protection, motorcycles are more vulnerable than cars [Chen, 2009; Chen et al., 2018; Rowden et al., 2016]. Although the rate of car crashes and fatalities reduced noticeably, motorcycle casualties remain significant [Subirats & Dupuis, 2015]. This portion is 28 times higher than car accident casualties per mile traveled [Antoniazzi & Klein, 2019]. According to WHO reports, more than half of casualties due to accidents are related to vulnerable users, and motorcyclists are one of the main ones.

In the same way, Motorcycles have caused similar issues in Iran, accounting for 24% of all accident fatalities in the country. Furthermore, regarding a municipality report from 2019,

approximately 590 people died in traffic accidents in Tehran, 371 of whom were motorcycle riders or died due to motorcycle-related accidents [Iranian Student's NEWS Agency, 2020]. From an environmental perspective, these vehicles contribute 30% to air pollution and 50% to noise pollution in Tehran [Mirbaha & Mohajeri, 2019]. Regarding the city administration, motorcycles have degraded the quality of urban spaces by occupying the sidewalks in terms of parking spaces. According to Tehran police, more than 60% of crimes in Tehran are committed by motorcycle riders, making motorcycle management crucial. With the increasing use of this vehicle in developing countries, these concerns are likely to grow further.

1.3. The Objective and Approach Presented by the Current Study

The primary objective of the study at hand is to assess the acceptance of transportation policies since decision-makers are concerned about the possible reactions of motorcyclists to the MSPC. The initial stage toward favorably implementing a policy is evaluating the acceptance of that particular policy, referred to as "the positive attitude of individuals towards an issue during a certain time that represents a distinct idea or behavior, for instance, approval and consent" [Jansson & Rezvani, 2019]. In terms of transportation policy, this concept expresses the people's agreement about implementing a certain policy and displays their support.

The current study assesses motorcycle riders' acceptance of the MSPC; the significance of this case is that as a result of insufficient monitoring, a large number of motorcyclists in Tehran attempt to manipulate the license plates of their motorcycles in various manners. These aggressive motorcyclists engage in high-risk traffic behaviors due to the unfortunate inability to identify and determine such manipulated license plates. These behaviors lead to an increase in the number of accidents. In addition, they might jeopardize the lives of fellow

citizens. Furthermore, as such manipulated license plates are illegible, the owners feel no responsibility to acquire a technical inspection license [that examines the amount of pollution produced by motorcycles] for their vehicles, increasing environmental pollution. Moreover, a significant number of unlawful behaviors such as mugging and purse-snatching are carried out by using motorcycles [Mizan News Agency, 2019]. Since monitoring over motorcyclists is required, motorcycle riders' acceptance of the policy mentioned above is crucial. If the riders do not comply with this policy and bear in mind the growing use of these vehicles in developing countries, the hindrances caused by motorcycles will be further exacerbated.

1.4. Policy Acceptance in the Literature

While several studies have examined the acceptance of different transportation policies[Hirschi, Schenkel et al. 2002, Chen and Zhao 2013, Khalilikhah, Habibian et al. 2016, Moula, Nyári et al. 2017, Li and Zhao 2019, Romero, Gomez et al. 2020], acceptance of the more Strict plate control has not been investigated until recently. Various studies have investigated the relationship between subjective and objective variables and the acceptance of different policies of transportation. Börjesson et al. [2012] evaluated public acceptance of congestion charges in Stockholm. This paper assessed the rate of change in social acceptance over the first five years of the project's implementation. They discovered that objective and subjective factors, such as environmental and political beliefs, influence public acceptance of this policy. Yusuf and Oluwatoyin [2019] investigated the acceptance of helmet use in Malaysia. It showed that attitude and subjective factors play a significant role in the intention to use a helmet. In addition, the paper suggested that policymakers should improve peoples' attitudes to improve safety. Romero et al. [2020] examined Madrid's acceptance of congestion-alleviating measures. This study found that socioeconomic and demographic variables directly relate to policy acceptance reinforcement. Siddiqa et al.[2021] Evaluated factors that affect the use of helmets and the relationship between using helmets and injuries. The result showed that gaps in awareness, knowledge, attitudes, motivation, skills, opportunities and behaviors indicate the low helmet use in motorcyclists. Jansson and Rezvani [2019] examined two primary responses to alternative fuel policies [public support as well as public acceptance] and concluded that environmental beliefs and prior experiences influenced the policy's adoption. Moula et al. [2017] investigated public acceptance of biofuels in transportation and established a correlation between policy awareness and public acceptance. Abulibdeh [2020] explored the acceptance of two types of congestion pricing, high occupancy toll [HOT] lanes and cordon pricing. He found out that different factors such as trip conditions, age, employment status, income, and car ownership impact HOT lanes. At the same time, age, average monthly income, car ownership, employment status, and saving in travel time influence acceptance of cordon pricing.

1.5. The Research Question

The research aims to find significant variables that affect acceptance of a more strict plate control (MSPC) policy. It's crucial for policymakers to have a more profound knowledge of the different characteristics of potential opponents of the new policy. The analysis may help them to plan a more devised case-specific action plan. Data collection has been investigated in the second section to find an answer to this hypothesis, divided into three subsets: designing the questionnaire, data collection method, and data overview. The fourth section describes the research method, which was Binary Logistic Regression. Section five contains the study's findings, and the final section includes a conclusion and a summary of the research.

2. Data collection

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In this section, data collection is discussed. This section is divided into three categories. In the first part, questionnaire design is presented, the second part discusses data collection. In the last part, general information regarding the data is presented.

2.1. Questionnaire Design

The questionnaire is divided into three parts: motorcycling behavior, lifestyle, and attitude. The Motorcycle Rider Behavior questionnaire (MRBQ) was used to investigate motorcyclists' behavior, which Elliott designed in 2007 considering the Driving Behavior Questionnaire (DBQ) [Elliott et al., 2007]. This questionnaire targets motorcycle riders, including questions about traffic violations, controlling the motorcycle, speeding violations, stunt-like behavior, and helmet used while riding a motorcycle. To measure the lifestyle of motorcyclists, a lifestyle questionnaire was designed with the contribution of previous studies [Lööv & Miegel, 1989; Gregersen & Berg, 1994]. It is presented in the form of a 5-point Likert scale. This questionnaire asked various motorcyclists' cultural, social, religious, moral, and recreational backgrounds. The design of the lifestyle questionnaire is based on Miguel's lifestyle theory which was divided into four parts: moral, religious, materialistic, as well as aesthetic [Lööv & Miegel, 1989]. It also considered the items of the lifestyle questionnaire in the study of Berg and Greigerson [Gregersen & Berg, 1994]. Moreover, some ethical items and attitudes of motorcyclists under the local conditions of Iran have been added to it. 30 questionnaires were gathered to examine the probability ambiguities in a pilot survey. After revising the initial questionnaire, the final version was ready to use.

2.2. Data Collection

In the fall and winter of 2019, we gather data from the Tehran Motorcycle License Plate Replacement Center. Although motorcyclists were eager to cooperate with the researchers, the officials and security refused to collaborate and impeded the data collection process. While efforts were made to collect data from the public space, that was unsuccessful due to the outbreak of COVID-19. Concerning these predicaments and complying with health protocols, the online questionnaire was designed in the summer of 2020. This method has been one of the most common methods of data collection that were the only reliable and practical option due to the spread of COVID-19. In the next step, people who use motorcycles were identified with the help of social media such as Instagram and Telegram channels. After contacting motorcyclists, the questionnaire and its explanation were sent to them. The accuracy of these people was investigated by questions such as price and motorcycle models. Finally, a total of 426 questionnaires were obtained.

2.3. Overview of Data

Since women in Iran cannot ride a motorcycle, all obtained samples contained men. There were 426 questionnaires in total, 26 of which were removed because of deficiencies they had. Finally, 400 questionnaires were prepared for the modeling process. Table 1 illustrates that motorcyclists are generally young people with a medium level of education and are self-employed. The age range is divided into 18 to 29 years old, 30 to 39 years old, and people over 40 years of age. For education, the sample was categorized into five types. Those holding a bachelor's degree comprised the most considerable portion, with 41.5 percent, and 31.5 percent of the sample did not have an academic education. In terms of employment, users of motorcycles are mainly employed in the private sector, which is close to 65.25 percent of the sample. Furthermore, 319 individuals own a motorcycle, while 81 motorcyclists borrow others' vehicles. Regarding the motorcycle driving license, 167 people had no motorcycle driver's license, including 41.75 percent of the sample.

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Table 1. Overview of Data

Type	Demographics	Frequency	Relative frequency (%)
Age	18-29	232	58
	30-39	131	32.75
	+40	37	9.25
Education	Under-diploma	27	6.75
	Diploma	99	24.75
	Associate	27	6.75
	Bachelor	166	41.5
	Master	81	20.25
Occupation	Private Sector	261	65.25
	Public sector	55	13.75
	Students	51	12.75
	Unemployed	22	5.5
	Retired	6	1.5
	Others	5	1.25
Own motorcycle	yes	319	79.75
	no	81	20.25
License	Both car and motorcycle	217	54.25
	Only Motorcycle	16	4
	Only Car	130	32.5
	None of them	37	9.25

The collected subjective data has been divided into two types of motorcycle rider behaviors and the attitude of motorcyclists. Figure 1 shows the distribution of motorcyclists' behavior that indicates their opinion toward the questions. These questions have examined different aspects of the behavior of motorcyclists. One of the most critical findings in this section is that 19 percent of people parked their motorcycles on the sidewalk when they were in a hurry. Also, 43.75 percent of people never crossed the intersection when the red light was on, and the path was deserted. In addition to this, 30.25 percent of motorcyclists reduced their speed when they thought they were too fast. Moreover, questions regarding the use of the helmet in winter have been asked in the 'yes' or 'no' format since it was strongly pivotal and different from other types of questions. It was revealed that 36.5 percent of people do not use helmets in winter. Moreover, Table 2 presents the definitions of driving behavior indicators.

Table 2. Definition of Driving Behavior Indicators

Indicators	Definition
Helmetw	I do not wear a helmet in winter.
Intersec	I have passed passage quickly when the traffic light is turning red.
Speed	I do not reduce my speed when I doubt that I ride too fast.
Redlight	I carefully pass the intersection when the red light is on, and the path is deserted.
Secluded	I move with illegal speed on deserted streets.
Hurry	I park my motorcycle on the sidewalk when I am in a hurry.
Greenlig	I compete with other motorcyclists to move faster when the traffic light is turning green.

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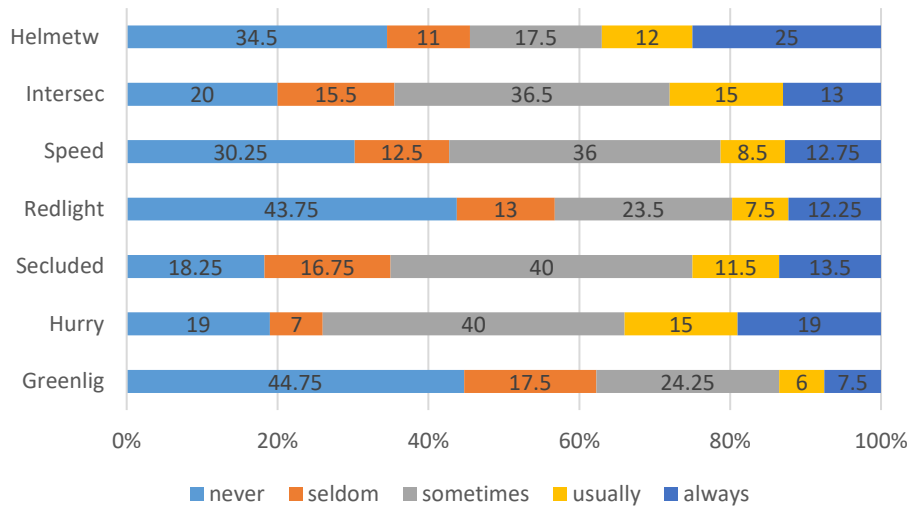
Figure 1. Driving Behavior Data Descriptive

In the second category of subjective variables, several questions have been investigated on the attitude of motorcyclists. In figure 2, it is noteworthy that only 5.25 percent of people do not care about environmental circumstances. It is also interesting to note that 81.75 percent of people were dissatisfied with the riding of others on the motorcycle. Also, 80.5 percent of people believe that most crimes, such as bag snatching, are committed by a motorcycle. In addition to this, if there were training courses for motorcycles to reduce the risk of accidents, 54.75 percent of people would be willing to enroll in them. 42.25 percent of people said the noise of this vehicle bothers them. Moreover, Table 3 presents the definition of attitude indicators.

Table 3. Definition of Attitude Indicators

| Indicators	Definition
Eco	Is the environment important to you?
Dissatisfaction	Are you dissatisfied with the riding of others?
Crimes	Do you think that most crimes, such as bag snatching are carried out by motorcycles?
Training	Do you want to participate in training courses for motorcycles to reduce accident risks?
Safety	Do you think more monitoring could serve as a solution to the safety of motorcyclists?
Noise pollution	Does the sound caused by a motorcycle bother you?
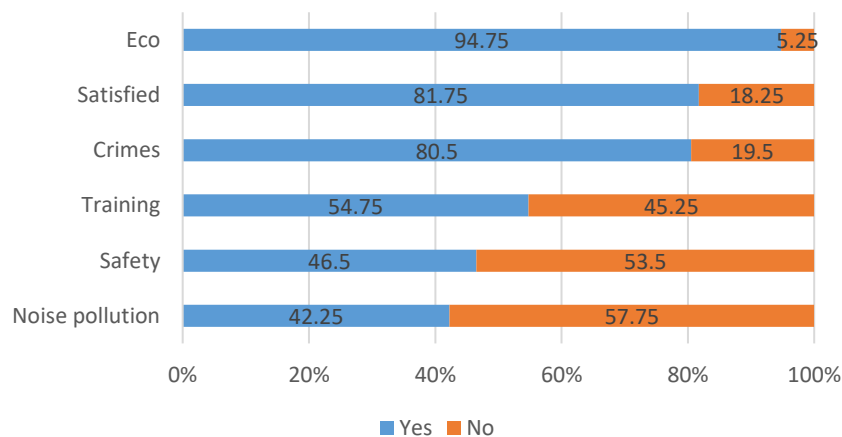
Figure 2. Attitude Data Descriptive

3. Methodology

Today, the theory of discrete choice is adopted in many studies on identifying the transportation behavior of individuals. The conventional theoretical principles in the construction of behavior models are based on the maximum utility theory. This theory assumes that the decision-maker chooses an alternative with higher utility [Manski & McFadden, 1981]. The utility of alternative i to decision-maker n is represented as:

$$U_{ni} = V_{ni} + \varepsilon_{ni} \qquad (1)$$

Where V_{ni} denotes the observed utility component of alternative i to decision-maker n, while ε_{ni} is the unobserved component or the random error of utility. Also, the observed utility component V_{ni} is a function of the characteristics of decision-maker n and of alternative i.

3.1. Binary Choice Models

When there are two alternatives in the choice set, the choice probability of the first alternative by decision-maker n is calculated as:

$$P_{n1}=P(U_{n1}\geq U_{n2})=P(V_{n1}+\varepsilon_{n1}\geq V_{n2}+\varepsilon_{n2}) \qquad (2)$$

And the choice probability of the second alternative for decision-maker n is:

$$P_{n2} = 1 - P_{n1} \qquad (3)$$

The discrete choice model is determined based on the probability density function of ε_{ni}. If the unobserved component is assumed to have a Gumbel distribution, the difference of ε_{ni} has a logistic distribution, and the model turns to the Binary logit. Due to the closed-form of the logit model integral, the probability of the logit model simplifies into:

$$P_{n1} = \frac{e^{V_{n1}}}{e^{V_{n1}} + e^{V_{n2}}} \qquad (4)$$

Which can be rewritten by multiplication $(\frac{1}{e^{V_{n1}}})$ into:

$$P_{n1} = \frac{1}{1 + e^{V_{n2}-V_{n1}}} \qquad (5)$$

The present study calculated the correlation between the decision variable [i.e., the acceptance of more Strict plate control Policy] and independent variables [i.e., driving behavior, socioeconomic information, attitude, and lifestyle] to estimate the model. Subsequently, we started the modeling procedure with NLogit Software, and this model improved by assessing the significant level of variables.

4. Result

Table 4 presents the model results regarding the characteristics of individuals who agree or disagree with the MSPC. The results confirm the hypothesis indicating the more significant impact of subjective variables on the adoption of the MSPC as these variables are more scattered than the objective variables. Moreover, $\rho^2= 0.210$ suggests that the model can explain 21 percent of the data variation.

In the final model, factors affecting acceptance of the MSPC are classified into two subjective and objective categories. In this regard, subjective factors involve two types of motorcycle riding behaviors and attitudes. Considering the motorcycle riding behaviors, the coefficient of the variable "wearing helmets in winter" (-0.68) suggests that by increasing the frequency of not wearing helmets in winter, individuals are more likely to disagree with the MSPC, since they are outlawed and use no safety equipment. Another variable, "riding beyond the speed limit in deserted streets" (-0.81), illustrates that increasing the frequency of such behavior makes these individuals more likely to disagree with this policy as they constantly repeat the same behavior. Moreover, the coefficient of variables "entering an intersection any time after the signal light has turned red". "The path is deserted" (-0.83), and "parking motorcycles on sidewalks" (-0.81) show that, by increasing the frequency of such behaviors, the individuals are more likely to oppose the implementation of the MSPC since they disregard the laws and are outlawed.

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Table 4. Result of Binary logit

Category		Variable	Coefficient	P-value
Subjective		Constant	2.726***	0.000
	Driving behavior	Helmetw	-0.685**	0.028
		Secluded	-0.813**	0.034
		Redlight	-0.837**	0.010
		Hurry	-0.816*	0.070
	Attitude	Training	0.804**	0.011
		Safety	1.714**	0.040
		Crimes	0.981***	0.005
		Dissatisfaction	1.146***	0.000
Objective	Personal information	Ownmotor	-0.907**	0.049
		Over40	1.434*	0.069
Note: ***, **, * ==> Significance at 1%, 5%, 10% level.				
Number of observation				400
Log likelihood function				-138.865
Chi squared [10 d.f.]				74.005
Significance level of Chi squared test				0.000
McFadden Pseudo R-squared				0.210

Attitude is another subcategory of subjective factors in this section. The coefficient of the variable "participating in training courses for motorcycles to reduce risk" (0.8) implies that the individuals taking such courses are more likely to agree with the MSPC because they are more cautious about safety. The following variable is related to those who suppose that lack of applicable rules and the monitoring system are the leading cause of problems aroused by motorcyclists (1.71), suggesting that they are more likely to agree with the MSPC. These individuals believe that the rules and the monitoring system are not implemented appropriately and have aggravated motorcycles' problems. The next variable refers to those feeling that most crimes, such as bag snatching, are carried out by motorcyclists (0.98). The variable coefficient indicates that this policy is more likely to be a compatible strategy for them. This is because they are more cautious about one of the significant problems caused by motorcycles in cities. Finally, the last variable in this category represented those who are not satisfied with others' motor riding (1.14), implying that these individuals are more likely to favor the implementation of the MSPC as they are not pleased with the current situation.

Regarding the objective variables, "owning a motorcycle" and being "aged above 40" years may affect the acceptance of the CPP. The variable "owning a motorcycle" (-0.9) shows that individuals who possess a motorcycle are more likely to oppose the MSPC since this policy concentrates on these individuals and reinforces the monitoring system. Furthermore, another variable, "aged above 40 years" (1.43), reveals that they are more likely to agree with the MSPC policy since they are more experienced and ride safer than their younger counterparts. Several studies have examined the correlation between age and the acceptance of different policies and reported their direct correlation [Rentziou et al., 2011; Zhou & Dai, 2017; Ziegler, 2019; Abulibdeh, 2020].

After estimation of coefficients, the collinearity of the variables was checked. The results showed that all variables had a VIF coefficient of less than 1.3, which indicates they are not collinear. Table 5 shows more details about the VIF statistics.

Table 5. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	0.776	0.108		7.165	0		
Speed	-0.047	0.041	-0.059	-1.162	0.246	0.855	1.17
Hurry	-0.047	0.042	-0.056	-1.13	0.259	0.874	1.144
Secluded	-0.067	0.038	-0.086	-1.73	0.084	0.878	1.138
Redlight	-0.112	0.039	-0.151	-2.907	0.004	0.808	1.238
Overtake	0.014	0.053	0.014	0.263	0.792	0.825	1.213
Intersec	0.062	0.047	0.067	1.318	0.188	0.835	1.198
Helmetw	0.082	0.037	0.107	2.203	0.028	0.922	1.085
Eco	0.002	0.077	0.001	0.029	0.977	0.951	1.052
Safety	0.082	0.053	0.073	1.532	0.126	0.954	1.048
Noise pollution	0.043	0.036	0.058	1.197	0.232	0.926	1.08
Training	0.092	0.036	0.125	2.536	0.012	0.9	1.111
Dissatisfaction	-0.125	0.045	-0.13	-2.739	0.006	0.961	1.041
Ownmotor	-0.053	0.044	-0.058	-1.216	0.225	0.953	1.049
Crimes	0.116	0.044	0.125	2.612	0.009	0.955	1.047

(Model column label "1" spans the data rows)

a. Dependent Variable: Plate

5. Conclusion

There has been increasing growth in the utilization of motorcycles in developing countries. Tehran, the capital city of Iran, has not been an exception. This has caused numerous challenges such as air pollution, noise pollution, safety issues, as well as social issues (mugging and bag-snatching). Among the targeted samples in Tehran, 37 percent of motorcycle plates were eligible, which might deteriorate the related challenges. Therefore, enforcing the MSPC is the first move for reducing the challenges. However, the succession of this policy highly depends on its acceptance. In the present study, economic and social data, driving behaviors, people's attitude, and lifestyle have been gathered to evaluate the acceptance of this policy.

Using the Binary Logit model, it was specified that subjective factors have more influence than objective factors. In the subjective factors, it is conspicuous that people with law-breaking tendencies are more likely to oppose this policy. This result describes that the MSPC has been properly designed, for its opponents are only law-offender individuals, and law followers support this policy. Regarding the findings of this study, the decision-makers can plan for applying this policy and pave the way for reducing the unwanted challenges because they will not encounter any resistance from the majority of the motorcycle riders.

The second part of the findings illustrates that people with a higher level of awareness about the existing situation who care about education are more likely to support the MSPC. This shows that individuals' attitudes and opinions are influential in the acceptance of policies. Thus, correcting people's attitudes and behavior is a crucial factor. Since the corrections are costly and time-consuming, cultural development and education should be considered, therefore a safer condition would be created for future generations. Nowadays, new tools such as social media and other technologies can assist and accelerate the changing process of viewpoints and attitudes. Considering that this issue is not solely solved by transportation concepts and has become a multidisciplinary argument, it is required that psychological experts propose approaches for

modifying motorcyclists' attitudes in future studies.

6.   References

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