Uncovering the Risky Riding Behaviors among Young Motorcyclist in Urban Areas

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Abstract. In Malaysia, more than 50% of road traffic crashes involve motorcyclists, with motorcyclists being the main contributor to the road crashes. Thus, the traffic safety of motorcyclists is critical and must be given priority. Road traffic crashes showed a significant increase every year in Malaysia according to Department of Road Transport statistics. Numerous researches on the relationship between risky riding behaviours and traffic accidents has been identified, however, research focuses on young motorcyclists risky riding behaviours in urban areas were somewhat limited. To demonstrate that risky riding behaviours played a significant role in the number of motorcycle crashes among motorcyclists, a motorcycle-riding-behaviour questionnaire was distributed to groups of young motorcyclists in several schools and higher education institutions to assess their level of understanding and perception of risky riding behaviour. Two primary analyses, namely frequency and percentage, crosstabulation and test of independence (chi-squared), were adopted to assess their level of understanding on motorcyclists risky riding behaviours and its correlation to crashes. Findings have proven that failing to keep proper side to side movement with another vehicle and riding while tailgating with another vehicle at an unsafe distance were highly contributed to the motorcycle crashes among the secondary school students. A greater comprehension of motorcyclists' risky riding behaviour based on their self-reported behaviour and beliefs can influence motorcyclists to make positive changes in their riding style. Hence, this result will be beneficial for enforcement bodies to strategise their effort in curbing the crash issues involving riders.

Keywords: road traffic crashes, risky riding behaviours, urban areas.

1 Introduction

The road crash fatality rate in Malaysia is become the third highest in Asia, matching certain African countries. Furthermore, Malaysia was categorized as the growing country with the riskiest roads, behind just South Africa and Thailand, according to World Health Organization figures from 2013 with a rate of death of 23 per 100,000 population. Every year, 7,000 to 8,000 individuals in the country die on the roadways, despite the country's estimated population of 30 million [1]. This might be due to the fact that

motorcycles have become a popular method of transportation, particularly in many emerging and middle-income nations as they are the most prevalent mode of transportation in Asian countries, particularly among the low-income urban population.

2 Theoretical Background

Motorcycles have been a popular means of transportation in Malaysia due to their affordability in terms of purchase and maintenance [28]. It's also because of traffic, which makes riding a motorbike lot simpler and faster, especially in densely populated and crowded areas. In Malaysia, less developed states such as Kelantan and Perlis have a larger proportion of motorbike users than Selangor and Wilayah Persekutuan, which are more active in economic growth. Individuals begin to convert their method of transportation from motorcycle to passenger automobile as their wealth rises.

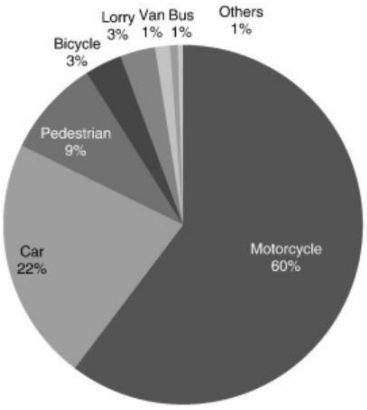

Fig. 1. The mortality distribution by mode of transport
Source: [2]

According to Figure 1, the number of individuals who died due to motorcycle crashes is three times higher than other type of vehicle and six times more than pedestrian mortality and nearly 50 times greater than bus passenger death [3]. In addition, nearly 1.25 million people die in road traffic collisions every year according to the World Health Organization (2018). Road traffic injuries are the primary factor of mortality among young people between 16-19 years old [4]. In 2018, nearly 1.25 million individuals suffered in traffic accidents.

Furthermore, according to Blackman (2012), motorcycle riders had a 20-40 greater probability of dying on the road than car passengers [5]. Hence, according to [6], he uncovered that the number of young motorcyclists is rising due to wounded in traffic collisions and it has enhanced their likelihood of incurring road traffic injuries. Between 2000 and 2008, the proportion of a 15-year-old teenage motorcyclists injured in traffic

collisions in Austria climbed from 6 to 32%. The Decade of Action for Road Safety (DARS) 2011-2020 is a United Nations-led worldwide campaign to increase road safety and decrease traffic accident and collision fatalities by 50%, particularly among those at high risk of road mortality, such as youngsters. The worldwide strategy is one of the important steps to meet the DARS 2011–2020 targets involves road users' conduct [7]. The UN's Decade of Action for road safety seeks to cut road fatalities by 50 percent by 2020. The aim is reached by a series of initiatives that concentrate on changing the conduct of road users such as young motorcyclists.

RoadTrafficdeathswithinvariousageamongmotorcyclists(2007-2017)											
Year	200	200	200	201	201	201	201	201	201	201	201
0-5	11	10	3	3	3	2	5	7	7	7	7
6-10	10	10	6	9	8	5	4	6	5	7	7
11-15	23	24	36	34	35	38	29	32	36	44	41
16-20	97	114	105	125	126	103	96	113	93	116	109
21-25	93	103	75	104	104	111	113	89	82	100	98
26-30	79	68	53	67	70	78	85	52	64	65	61
31-35	63	49	67	49	48	57	58	40	57	57	53
36-40	37	38	63	40	37	47	46	39	48	45	42
41-45	36	36	62	35	35	45	48	36	44	41	38
46-50	34	35	36	36	35	41	32	36	42	41	38
>50	34	35	33	39	39	35	37	33	41	39	37

Fig. 2. Road traffic within various age among riders in Malaysia from the year of 2007 to 2017

Source: [8]

According to Figure 2, the riders aged 16 to 20 have had the highest significant number of road traffic deaths over the last ten years, with 1090 deaths in 2017. Several organizations, including Jabatan Keselamatan Jalan Raya (JKJR) and the Malaysian Road Safety Research Institute (MIROS), have made significant attempts to solve this issue. However, initiatives look insufficiently structured to handle the issue altogether.

High-risk individuals such as young riders are often seen as the person who can contribute to a road traffic crash [3]. It is very crucial to be aware why these young riders are vulnerable to collisions, particularly on straight road portions. Figure 3 illustrates a trend in road traffic deaths among Malaysian motorcyclists, as stated in the Malaysian Institute of Road Safety Research (MIROS) status report.

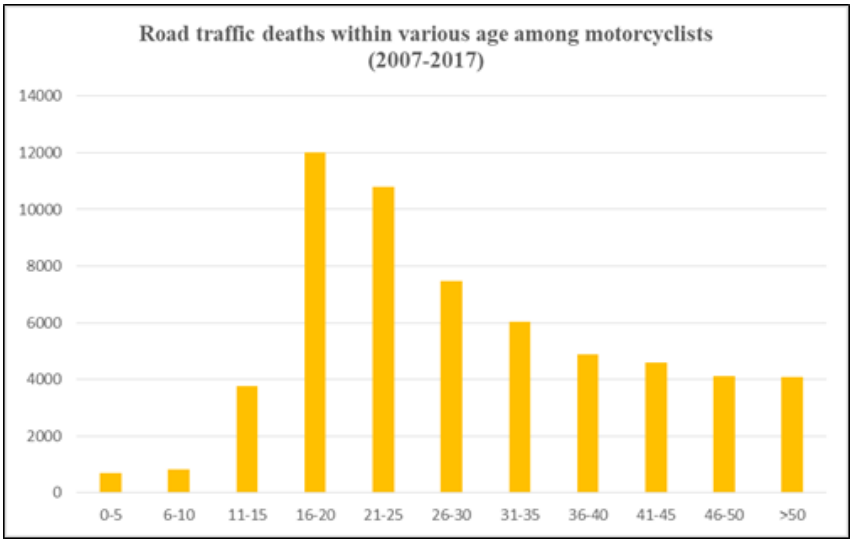

Fig. 3. Road traffic crashes trend among motorcyclists

Source: [9]

Figure 3 shows the trend of road traffic crashes among motorcyclists in Malaysia from 2007 to 2017. As shown in figure 3 above, the highest number of road traffic death, which is 12,013 from 2007 until 2017, is the motorcyclist in age from 16 years until 20 years old.

According to the National Highway Traffic Safety Administration [10], 60% of fatal motorcycle crashes occurred in urban areas, and 40% of motorcycle crashes occurred in rural areas. Various factors could contribute to the increased rate of crashes in urban areas instead of rural areas. For instance, urban areas often have significantly more traffic than rural areas, increasing the rate of motorcycle crashes [11]. Urban areas also may contain more pedestrians and bicyclists, which could cause motorcyclists to abruptly break or swerve to avoid them. Road conditions, such as potholes, construction, and debris, may be more prevalent on urban streets, leading to more crashes. Emergency vehicles also tend to be more common, leading to increased accidents. Most fatal motorcycle crashes, whether in an urban or rural area, occurred on major, non-interstate roads [27].

Nevertheless, considering that the factors that leading to road traffic crashes have been identified and as the leading cause of mortality worldwide, few factors related to the crashes were figured out. A few contributor factors such as the human, road environment, and vehicle factors caused road traffic crashes.

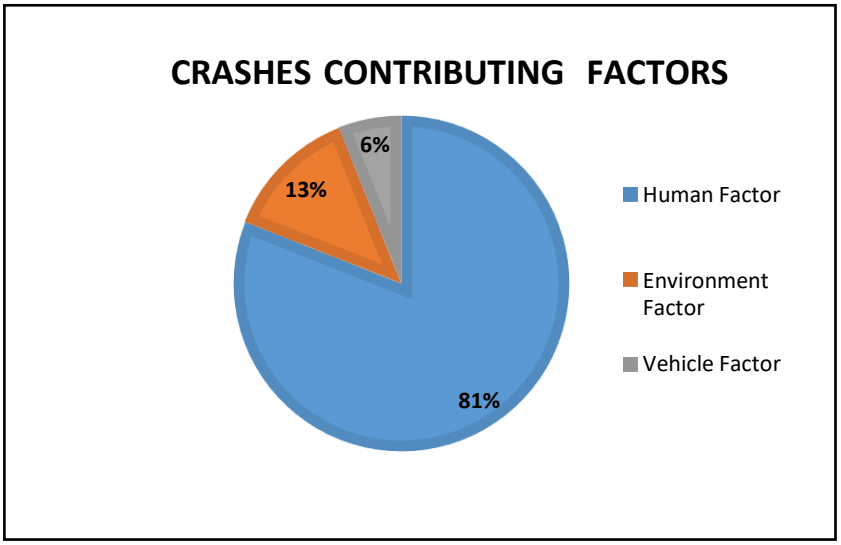

Fig. 4. Crashes Contributing Factors

Source: [14]

Figure 4 showed that the highest contributing factor was the human factor (81.0%), on the other hand, the second-highest contributing factor followed by the environment factor (13.0%). Furthermore, the vehicle factor with (6.3%) was following quite near to the environment factor. According to [15], the main contributing factor of road traffic crashes among those four factors was the human factor. This is reinforced by [16], who claimed that road traffic crashes prevention focused on human factors which contributed approximately 90% of the entire road traffic collision intervention program.

Young motorists are regarded as a high-risk traffic category. Due to their relatively low riding experience that seemed insubstantial, younger generations are tend to be involved in a motorcycle crash more than the experienced riders [12]. In previous study suggested that the high collision rate might be attributed to young riders' immature competence or inexperience. However, several studies have found that experienced young motorcyclists are still at significant risk of danger. Inexperience was not the only clarification for a collision; further research is needed to identify other elements distinguishing young motorists from other drivers [13].

3 Research Methodology

A questionnaire survey is extensively used to determine valuable insights into the respondents' subjective thoughts and beliefs, whereby it is hard to only extract them from the task's performance measures [18]. A questionnaire survey measures the risky

riding behaviors and focuses on young motorcyclists' perception and attitudes based on their respondent background.

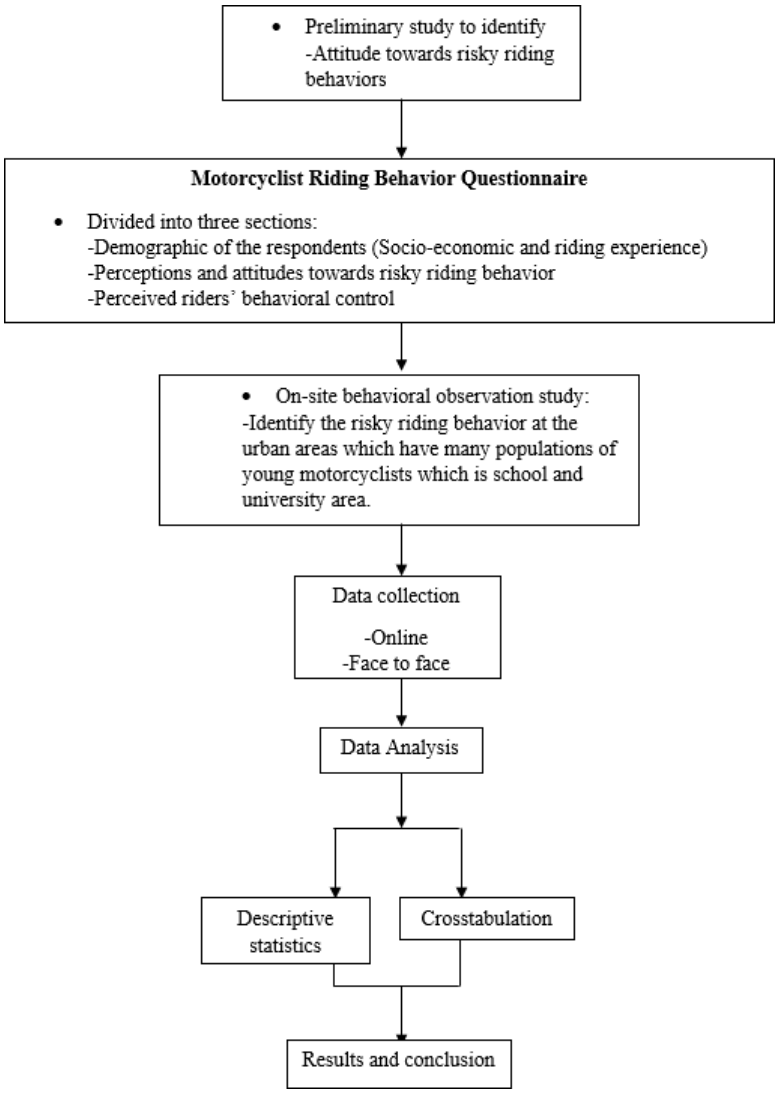

Fig. 5. Flowchart of study methodology

As shown in Figure 5, the risky riding behaviors of young motorcyclists were assessed through the questionnaire risky-riding-behavior survey conducted online and face to face. Students were the targeted respondents for the survey. The questionnaire was designed and constructed based on the existing literature and similar research conducted in Malaysia and other countries with a high volume of motorcyclists and similar riding behaviors such as the Philippines, Taiwan and Indonesia [19]. The questionnaire

was divided into three sections. For the first section, demographic information for the respondents, including age, gender, years of riding and type of motorcycle, was collected. Subsequently, the perceptions and attitudes towards risky riding behaviors were gathered in the second section. The third section was used to gather information about the risky riding behaviors of the respondents. In this section, respondents were required to select the risky riding behavior they most engaged in based on eight types of risky riding behaviors, as shown in Table 1. The study conducted by [20] used the same risky behaviors in which to assess the several factors that affecting the risky riding behaviors of riders in Malaysia.

Table 1. Risky Riding Behavior Factors

No	Risky Riding Behavior Factors
1.	Riding while breaking the speed limit
2.	Riding without crash helmet
3.	Riding while using phone
4.	Riding without using signal
5.	Riding while performing stunting acts
6.	Riding against traffic
7.	Riding while failing to keep proper side to side movement with another vehicle
8.	Riding while tailgating with another vehicle with unsafe distance

In order to determine the most dynamic risky riding behaviors in the urban area, a behavioral observation study was conducted. Following a discussion held with the local authority, a school area in the urban area of Bandar Baru Bangi was chosen. The local authority considered this site a black spot due to the number of recorded crashes, especially riders. The types of risky riding behaviors were identified using a video camera in the school area. Figure 6 shows the site conditions of the school area of SMK Bandar Baru Bangi.

Fig. 6. The school compound at Sekolah Menengah Kebangsaan Bandar Baru Bangi, Selangor

Consequently, after completing the questionnaire survey and identifying the risky riding behaviors at the school area, two primary analyses, namely, frequency and percentage, crosstabulation and descriptive statistics. The frequency of an occurrence is statistically defined as the number of times it occurs. One of the most common statistical methods for analyzing and interpreting primary data is the frequency in percentages, which deals with the number of responses to a specific question. It is measured as a percentage of the total population chosen for the study.

Crosstabulation analysis, also known as bivariate table analysis, is most often used to analyze categorical data. When performing crosstabulation analysis, the chi-squared statistic is generally used to evaluate tests of independence in which the test assesses whether any relationship exists.

This study also used the statistical software for social sciences (SPSS) version 18.0. This program created a model (equation) and investigated the relationship between risk behavior characteristics and students' background. The risky riding behavior characteristics were the independent variable in this study, whereas the respondent background was the dependent variable. Because the number of students' back-grounds was predicted to fluctuate over time, the number of students' backgrounds was given as a dependent variable.

All procedures or techniques used for data were vital for the researcher to guarantee the intended study went successfully. Microsoft Excel 2010 (MS Excel) and Statistical Packages for Social Sciences (SPSS) software were used to analyze the data. Finally, the correlation of the relationship among the set of risk-riding behavior within the students in urban areas and the students' background.

4 Results

4.1 Observed Risky Riding Behavior in Urban Areas

A total of 2438 motorcyclists were recorded, and 59.4% or 1448 motorcyclists were observed to have performed risky riding behavior. Table 2 shows the frequency of the risk-riding behavior observed at the school area. The highest risk-riding behavior was "R8: Riding while failing to keep proper side to side movement with another vehicle" with a substantial value of 29.1 %, followed by "R4: Riding without giving signal" with 26.4%, the most minor recorded risky riding behavior was "R5: Riding while performing stunting acts" with only 1.74%.

Table 2. Frequency of Risky riding behaviors observed in the school compound

Type	Description	Frequency (%)
R1	Riding without crash helmet	201(14.5%)
R2	Riding while breaking the speed limit	110(8.0%)
R3	Riding while performing stunting acts	24 (1.74%)
R4	Riding without giving signal	365 (26.4%)
R5	Riding while using phone	103 (7.5%)
R6	Riding against traffic	109 (7.9%)
R7	Riding while tailgating with another vehicle with unsafe distance	67 (4.85%)
R8	Riding while failing to keep proper side to side movement with another vehicle	403 (29.1%)
	Total	1382 (100.0%)

4.2 Demographic Profile of Respondents

A total of 337 respondents from the students and staff of SMK Bandar Baru Bangi participated in this survey, which was conducted from May 2021 to Oct 2021. All the students were notified about the aim of the survey that were hand out before asking for their consent and willingness to participate in this research. The completed questionnaires were screened and separated based on different types of risky riding behaviors according to the list in Table 2. Table 3 shows the demographic profile of the respondents. From the collected data, the age of respondents was categorized into four groups, as shown in table 3. Most of the participants were in the age group of 16-20 years old (32%), followed by 21-25 years old (26.5%), followed by above 45 years old (13.5%). Lastly, only 7 % of the respondents fell into the age group 31-35 years old.

Table 3. Demographic profile of respondents

Trip Information		Frequency	Percentage (%)
Age Group	16-20	201	59
	21-25	53	15.7
	26-30	23	6.8
	31-35	14	4.2
	36-45	19	5.6
	Above 45	27	8
Gender	Female	132	39.2
	Male	205	60.8
Riding License	Yes	285	84.6
	No	52	15.4
Riding Experience	None	50	14.8
	<2 years	122	36.2
	2-5 years	126	37.4
	>5 years	39	11.6

Results of crosstabulation between age groups (16-20 years old) with risky riding behavior as shown in Figure 7. Since this study focuses on the young motorcyclist, all the data will specifically focus on the age group (16-20 years old). For this age group, "R8: Riding while failing to keep proper side to side movement with another vehicle" engaged the most to the risky riding behavior. While "R3: Riding while performing stunting acts" engaged least in risky riding behavior. In addition, the chi-squared test for independence showed a significant association between age group and risky riding behavior ($X2 = 25.884$, $df=17$, $p=0.064$).

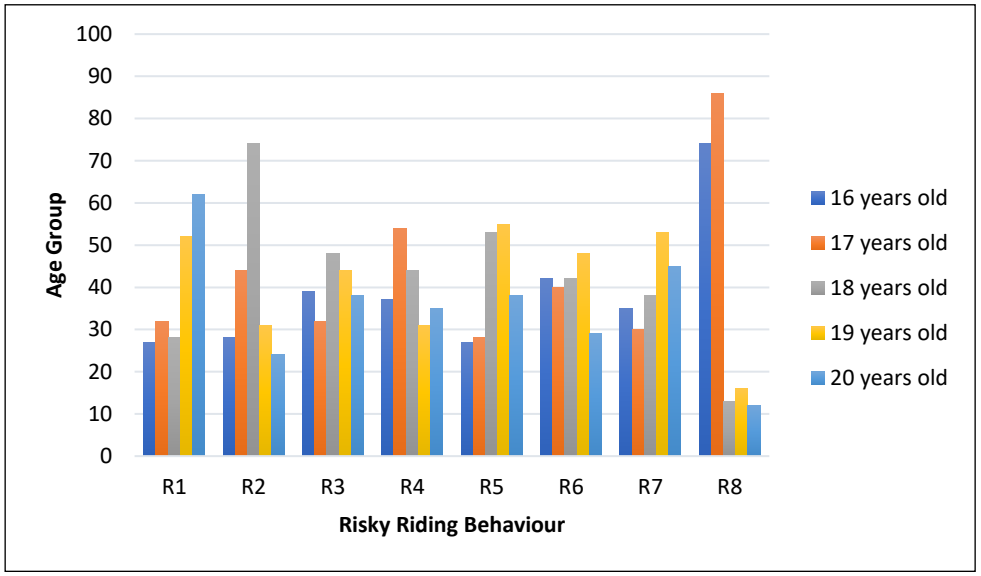

Fig. 7. Crosstabulation between age group and risk riding behaviors.

Subsequently, for the gender distribution of the respondents involved in the study, most of the respondents were male, with 59%, while female respondents were only 41%. Crosstabulation result gender with risky riding behavior is shown in Figure 8, and the results of the chi-squared test for independence showed that the gender has no significant association with risky riding behaviors (X2 =2.848, df=4, p=0.022)

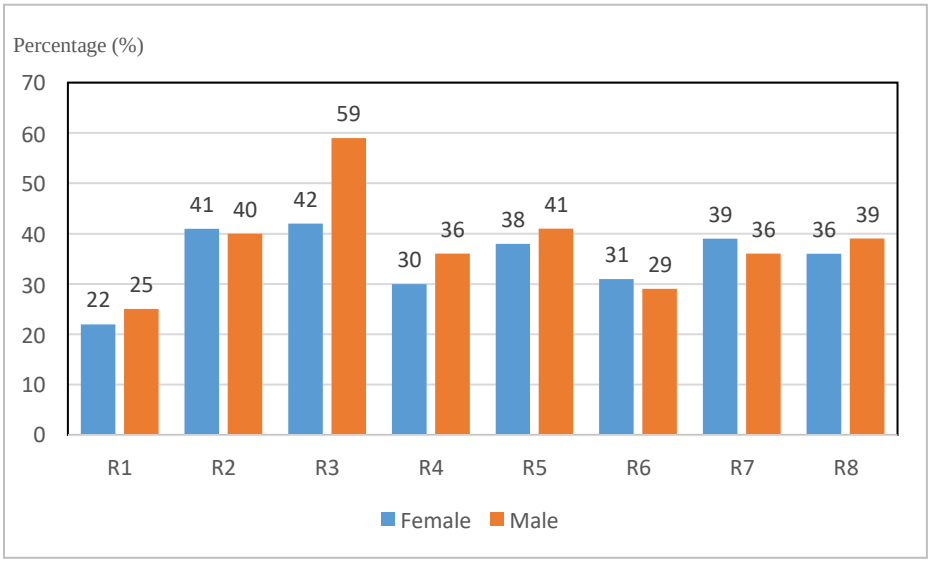

Fig. 8. Crosstabulation between gender and risky riding behaviors.

The majority of the respondents engaged more to "R8: Riding while failing to keep proper side to side movement with another vehicle" behavior, has the highest number, which is 52 %. While the "R4: Riding without signal" behavior engaged less to risky riding behavior turned out that the majority of the respondents had no valid riding license. The mean and standard deviation of having a valid riding license were 3.75 and 0.9225, respectively. Results of crosstabulations between having a valid riding license and risky riding behavior are shown in Figure 9. In addition, the results of the chi-squared test for independence showed that having a valid riding license has no significant association with risky riding behaviors (X2 =4.316, df=3, p=0.043)

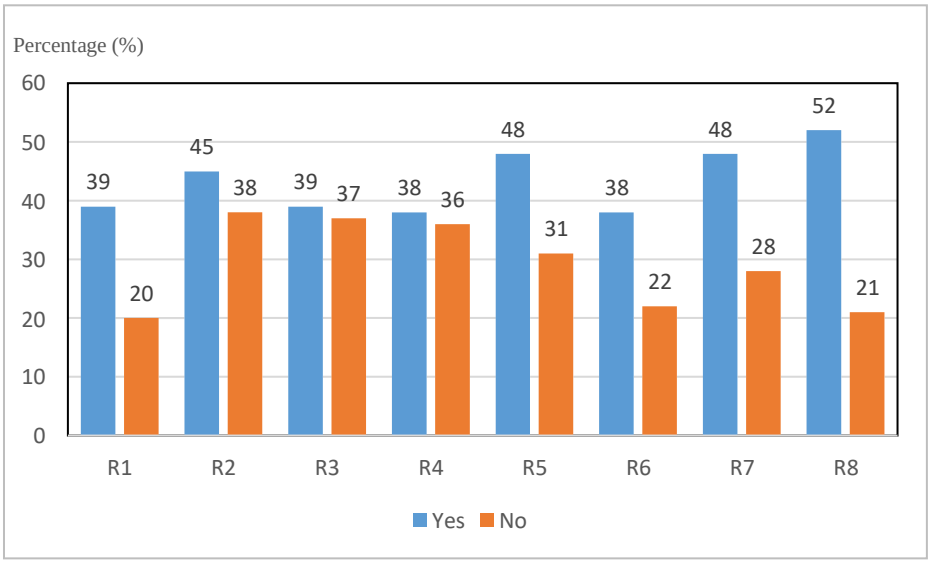

Fig. 9. Crosstabulation between having riding license and risky riding behaviors.

Regarding the riding experience, the majority of the 16-20 years old respondents had 2-5 years of ex- perience (29%) of riding experience, while only (8%) of respondents had less than two years of riding experience. The mean and standard deviation of riding experience was 4.338 and 1.002 years, respectively. Results of crosstabulation between riding experi- ence and risky riding behavior are shown in Figure 10. Generally, participants with riding experience of 2-5 years were more inclined to perform risky riding behaviors "R8: Riding while failing to keep proper side to side movement with another vehicle" behaviors and participants with riding experience of more than five years were more engaged to perform risky riding behaviors "R5: Riding while using a phone". Never- theless, the results of the chi-squared test for independence showed that riding experi- ence (X2 =10.897, df=11, p=0.045) had no significant association with risky riding behaviors.

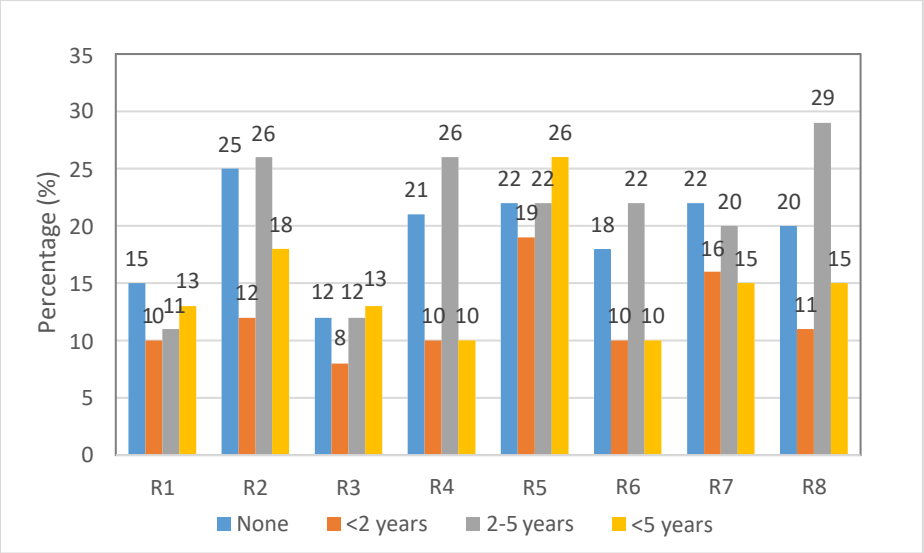

Fig. 10. Crosstabulation between riding experience and risky riding behaviors.

4.3 Descriptive Analysis for all variables

The eight numerical variables were engaged from 8 variables to the examination of the feature of numerical variables employed by descriptive analysis. In addition to that, the categories of unsafe riding activity were also assessed using descriptive statistics. The descriptive analysis reported here was based on the data gathered through questionnaire to assess general features of the variables. The acceptable range of skewness is between -1.96 and +1.96 were regularly distributed by all eight numerical variables. In addition, the values of skewness of eight variables were presented and regularly distributed.

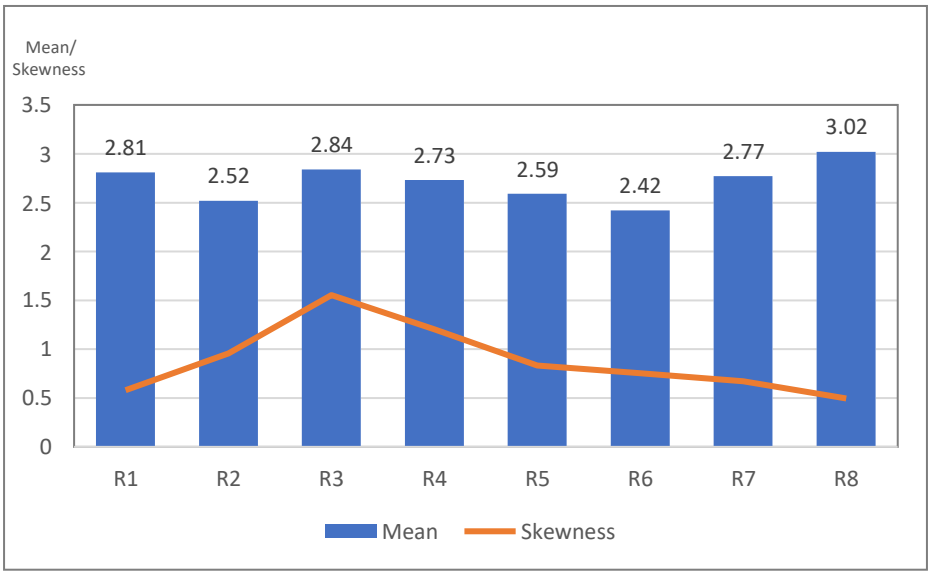

Fig. 11. The histogram of descriptive statistics between age (16-20 years old) and risky riding behaviors.

The curve line and histogram for secondary school students' risky riding behavior factors were shown in Fig 11. The values of mean and skewness was represented. Generally, Figure 11 showed that the risky riding behavior variables were skewed to the right and instead peaked. The positive skewed depicts that the behaviors, "R8: Riding while failing to keep proper side to side movement with another vehicle" behaviors limit has the highest mean among all the variables as shown in Figure 11 above. Hence, the mean and skewness of the behavior were 3.02 and 0.449, respectively.

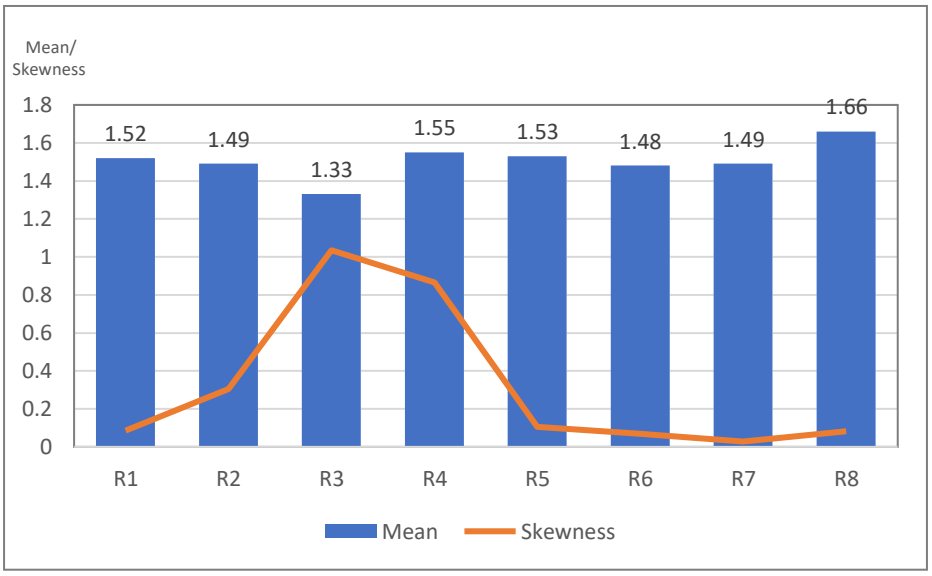

Fig. 12. The histogram of descriptive statistics between gender and risky riding behaviors.

As in shown in Figure 12, the histogram and curve line for the risky riding behavior factors among secondary school student. The figure for the values of mean and Skewness was represented. Generally, Figure 12 showed that the risky riding behavior variables is skewed to the right and instead peaked. The positive skewed depicts that the behaviors, "R8: Riding while failing to keep proper side to side movement with another vehicle" behaviors limit has the highest mean among all the variables as shown in the Figure 12 above. Hence, the mean and skewness of the behavior were 1.66 and 0.082, respectively.

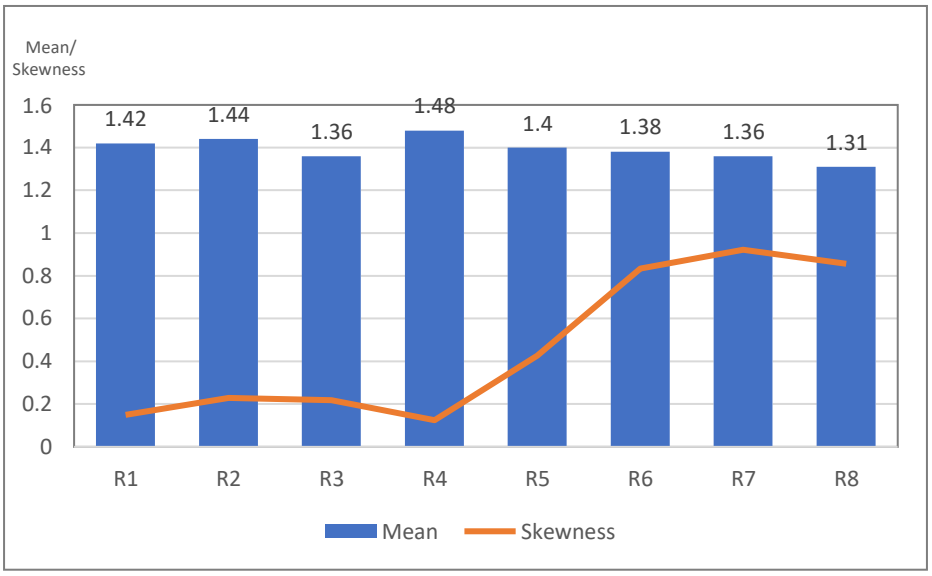

Fig. 13. The histogram of descriptive statistics between riding license and risky riding behaviors.

Figure 13, showed the curve line and histogram for the risky riding behavior factors among the young motorcyclist only. The figure for the values of mean and Skewness presented in figure 13 showed that the risky riding behavior variables is skewed to the left and instead peaked. The negative skewed depicts that “R4: Riding without signal” behavior has the highest mean among all the variables shown in the Figure 13 above. Hence, the mean and skewness of the behavior were 1.48 and 0.124, respectively.

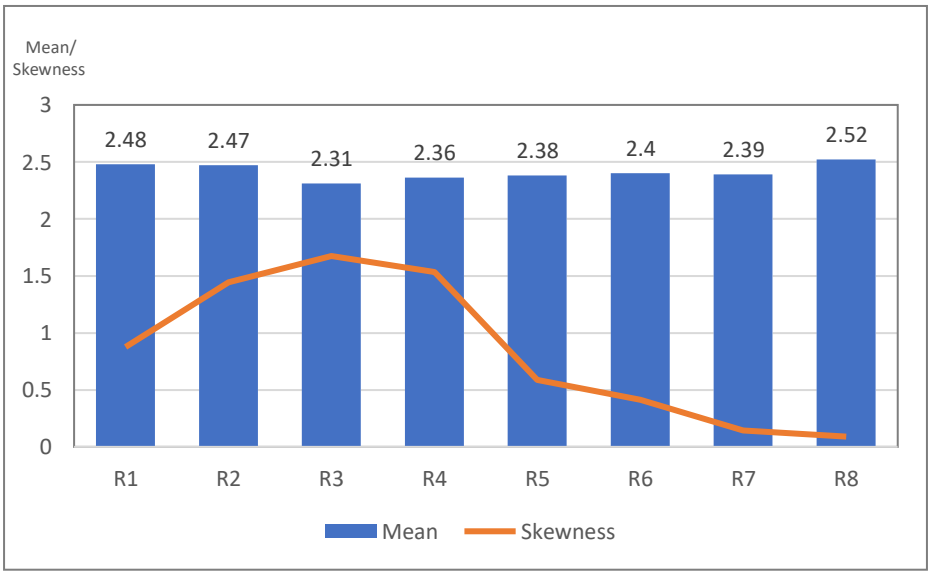

Fig. 14. The histogram of descriptive statistics between riding license and risky riding behaviors.

As shown in Figure 14, the curve line and histogram for the risky riding behavior factors among the students. The figure for the values of mean and Skewness was represented. Generally, Figure 14 showed that the risky riding behavior variables is skewed to the right and instead peaked. The positive skewed depicts that the behaviors, "R8: Riding while failing to keep proper side to side movement with another vehicle" behaviors limit has the highest mean among all the variables as shown in the Figure 14 above. Hence, the mean and skewness of the behavior were 2.52 and 0.089, respectively.

5 Discussion

Many studies on risky riding behaviors were either conducted using multivariate regression analysis or structural equation modelling. In this study, a more detailed study was conducted to understand the perceptions and attitudes of these young riders on the risky riding behavior in Malaysia using crosstabulation and correlation analysis. Based on crosstabulation analysis, young age group of 16-20 years old were associated with risky riding behaviors. Many studies have shown that adolescents tend to perform risky behavior than adults. They have a greater chance to ignore the consideration of risk perceptions in the decision-making process. A recent study by [21] mentioned that the most vulnerable group regarding deaths due to road crashes is the young age group, aged between 15 and 29. They stated that the young age group is usually related to a higher risk of being involved in a road crash, such as speeding, drunk riding, and a lack of observation in urban areas.

According to [12], young drivers are more prone to traffic-law violations, speeding, and more often engaging in risky behaviour. Furthermore, [22] mentioned those young riders are poor in engaging in safe riding behaviour. Therefore, in general young riders more frequently perform risky riding behaviours than adults or older riders. In general, the crosstabulation results between gender and risky riding behaviours revealed that male riders are more aggressive than female riders. This finding conforms with the conclusion by [22] Goh et al, they mentioned that male riders are generally more likely to violate traffic regulations than female riders because of the negligence of potential risk, violation, and vehicle examination. In addition, [23] concluded that male riders generally have higher scores in risky behaviour, accidents with damage, and accidents with personal injury than female riders.

Similarly, study by [12] found that nearly 60% of male motorcyclists displayed infractions, notably in speeding, which is greater than the statistical data of female riders (36.3%). They found that male motorcyclists are more inclined to seek experiences and be impatient. Furthermore, a study by [24] discovered that the percentage of female riders in the non-risk-taking category is higher than that of male riders. In other words, men motorcyclists are more prone to committing risky behaviours. However, the chi-squared test for independence obtained in this research demonstrated that gender had no significant connection with unsafe riding habits.

As for the riding experience, results of crosstabulation between riding experience and risky riding behaviour showed that riding experience of between 2 to 5 years is more predominant in performing risky riding behaviours. This observation conforms with the conclusion drawn by [25], who mentioned that novice or less experienced drivers have a lower tendency of not following the rules of overpassing another vehicle on perceived crash risk compared to medium-level experienced drivers. Additionally, a study conducted by [26] revealed that the rate of road crashes significantly declined with older age groups and years of licensure. Moreover, the driving experience is related to driving skills. Riding skills concern performance limitations concerning riding tasks that affect riders' risk perception.

Overall, this study provided perception of the consequences of risk-riding behaviours on motorcycle crashes among these young riders. By concentrating on unsafe riding behaviours, these behaviours have been validated as factors that might result in immediate crash risk for young riders. Initially, eight risky riding behaviours were needed to demonstrate actual secondary school student behaviour. According to crosstabulation, several behaviours are firmly and inversely associated depending on the demography of the respondents. To sum up, the determined results based on the investigation were outline below.

5.1 The selected Risk-Riding Behavior

The following are the main conclusions that can be derived from the findings:
1. Riding while failing to maintain safe side-to-side movement with another vehicle was the most common cause of motorcycle crashes among students in urban areas.

2. Riding experience influenced the young motorcyclist's stunting behavior and failure to maintain correct side-to-side movement with another vehicle.
3. Riding while intoxicated and performing stunts are the behaviors that have had the most negligible impact on the incidence of motorcycle accidents.
4. The relationships of riding without a crash helmet, riding while exceeding the speed limit, riding while performing stunts, riding without giving a signal, riding while using a phone, and riding against traffic are the weakest, with a non-significant small correlation and a negative correlation relationship achieved.

6 Conclusion and Recommendation

This research attempts to find the risky riding conduct that would contribute most to motorcycle collisions and evaluate the view of the young motorcyclists of their understanding of risk attitudes they may do while riding the motorbike. Results of crosstabulation among demographic characteristics such as age, gender, possessing a valid riding license, and riding experience on dangerous riding behaviors suggested that age and riding experience is substantially connected with risky riding behaviors. This study has effectively supplied a knowledge of the effects of risky riding conduct towards motorcycle crashes among young motorists in mostly metropolitan settings. By identifying a set of risk-riding behavior at the school area, the association between the set of risk-riding behavior among the students' background is based on the combination of risk-riding behaviors.

As most risky behaviours are due to the human factor, safety awareness within Malaysian motorcyclists should be applied on the policy-implementation level to generate an effective intervention. The findings of this study can provide authorities with a base to further understand factors affecting rider behaviour to improve road safety among Malaysian motorcyclists. In addition, findings from this study can streamline the authorities' operations in systematically capturing causes of motorcyclist crash incidents instead of evaluating every incident in an individualistic manner.

Further study can supplement this research by implementing more comprehensive structural equation modelling to determine the correlation among riders' demographic attributes and risk perception. Furthermore, secondary information such as crash data on frequency, type, and severity can be included in structural equation modelling to enhance the prediction capability of the model to anticipate better factors affecting Malaysian motorcyclists. The scalability of structural equation modelling can provide better insight for authorities to assist them in the decision-making process of generating an effective policy.

In a nutshell, to sum up, each risky riding behavior factor has a different effect on road safety among riders, especially the students in urban areas. Other than that, the estimated number of crashes can be a reference to authority to reduce the number of crashes in Malaysia.

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