

Measuring Traffic Enforcement Programme Efficiency using Perception of Being Caught (POBC)

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Abstract – Aside from being seen as the best indicator of an enforcement programme's efficiency, the "perception of being caught" (POBC) is also proven to be an effective means to gauge traffic law compliance among Malaysian road users. Therefore, the ultimate aim of this study is to produce a trend analysis of road users' POBC for committing traffic offences during festive seasons between the years 2008 and 2015. This study utilises secondary data from previous POBC studies covering the three main periods; i.e., before, during and after the implementation of OPS Bersepadu Enforcement Programme for Chinese New Year (CNY) and Hari Raya Aidilfitri (HRA) in Malaysia. Although the OPS Bersepadu programme has been around for years, this particular study shall only analyse the data from 2008 until 2015. Previous OPS Bersepadu studies have involved some 42,171 Malaysian road users and were conducted at selected locations along federal roads and expressways. The inferential statistics have documented significant difference and mean scores during the 8-year period. Further, the success of OPS Bersepadu has been at a moderate level, although such a programme is still being continued. Overall, this study finds that POBC is one of the most well-known tools for assessing an enforcement programme's efficiency. In addition, it also highlights the importance of enhancing current traffic enforcement programmes to increase the POBC level among road users.

Keywords: Perception of being caught (POBC), traffic offences, enforcement programme

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1.0 INTRODUCTION

There has been a growing interest in road traffic crashes in recent years. Such crashes have incurred the loss of life and property; with the government spending a lot of money to conduct awareness programmes and interventions. In 2015, the total losses in road traffic crashes were estimated at around RM8.6 billion (roughly equalling USD2 billion) (Abdullah, 2016). Among

the causes of road traffic crashes include speeding, beating traffic lights, as well as drowsiness and complacency while driving (Lee et al., 2017; Ahmed et al., 2016; Mark et al., 2014; Ramli et al., 2014).

In numerous developing countries, road traffic crashes have also been acknowledged as among the leading social problems. Drawing on statistics by the Association for Safe International Travel (2017), nearly 1.3 million people have perished in road traffic crashes each year. From the statistic, the impact of the road crashes has cost in average 3,287 deaths per day and 20 to 50 million road users are left injured or disabled. Specifically, in Malaysia, the statistic has shown a similar trend with the increasing number of deaths in traffic crashes recorded. Recent statistics by the Royal Malaysia Police (Royal Malaysian Police, 2017) indicated a total of 533,875 road crashes and 6,740 deaths in 2017. Similarly, the trend since the 1990s showed motorcyclist fatalities outnumbering other road users, and this seems to have continued in 2010.

Realizing the urgency to solve this matter, various initiatives and preventive measures with regard to enforcement are undertaken by the respective government agencies. For instance, during major festive seasons such as Chinese New Year and Hari Raya Aidilfitri, the Royal Malaysia Police, the Road Transport Department (RTD) and the Land Public Transport Commission (LPTC) will conduct OPS Bersepadu by combining several enforcement programmes including enforcement operations along expressways, federal roads and state roads; technical inspection of public vehicles in depots and bus terminals throughout Peninsular Malaysia; as well as curbing ticket touts and prohibiting freight vehicles from using the federal roads. Regardless, efforts to measure the effectiveness of these initiatives are still lacking. The question related to road users' perception of being caught (POBC) during festive seasons has remained unanswered, thus leading to little understanding of the issue.

Thus, this study is conducted to analyse the trend of road users' POBC for committing traffic offences during Chinese New Year (CNY) and Hari Raya Aidilfitri (HRA) festive seasons between the years 2008 and 2015. The study shall focus on road users' POBC covering the three main periods; namely before, during and after the implementation of OPS Bersepadu programme for CNY and HRA from 2008 to 2015. Additionally, it aims to identify significant differences of POBC for each festive season from 2008 until 2015.

1.1 POBC – Theoretical Framework and Literature Review

Consistent with previous studies, there is a growing body of literature that recognises the importance of POBC as an effective measurement tool as well as an important means to increase traffic law compliance among road users (Isah et al., 2016; Ministry of Transport, New Zealand Government, 2016, 2015; Isah et al., 2014; Beck et al., 2009; Mannering, 2009; Harrison and Pronk, 1998). In other words, POBC is considered the best indicator of an enforcement programme's efficiency.

An example of this is the study carried out by a MIROS team (Isah et al., 2016), which relied on POBC to increase compliance to road traffic laws. The study utilized secondary data (survey results of 25,891 licensed drivers and riders in Malaysia) from previous POBC studies conducted during 'OP Selamat' in the Chinese New Year (OPS CNY) festive season from 2008 until 2015. The data were used to explore the effects of 'OP Selamat' based on the mean score of road users' overall POBC, in relation to their perception of the chances of being caught by enforcers for committing specific traffic offences. The 'OP Selamat' programme conducted

from 2008 until 2015 was found to be effective in increasing the overall road users' POBC for committing traffic offences. However, the perception levels for traffic offences in the 'OP Selamat' eight-year duration were categorized as mediocre, in the range between 4.08 to 5.56.

Another example is the study by Isah et al. (2014) to determine the role of gender and POBC for driving beyond the speed limit. A total of 1,194 respondents with valid driving license were interviewed in the survey. The analyses performed clearly indicated a significant association between self-reported speed behaviour and level of POBC, $\chi^2(2, 659) = 4.08$, $p = 0.044$. The group with higher POBC were 1.5 times more likely to follow the speed limit compared to the group with lower POBC (with RR: 1.461, 95% CI: 1.03, 2.08). The study, therefore, concluded that the frequency of enforcement activities and high degree of POBC directly contributed to speed compliance.

On the other hand, the Ministry of Transport, New Zealand Government (2015; 2016) looked at public attitude to road safety and carried out periodic surveys since 1974, aside from annual surveys since 1994. The surveys are part of the ministry's tools for its evidence-based policy development and evaluation of road safety progress. Such surveys are also carried out to collect comparable measurements of public attitudes and self-reported behaviours to assess the effects of road safety legislation, enforcement, and publicity programmes. In terms of general enforcement and compliance, the perceived chance of being stopped by police for breaking the traffic law, other than for drink-driving or speeding, has indicated little improvements across time and has been fairly unchanged since 2010. In 1997, 23% of respondents thought it was likely or fairly likely to happen, before rising to 37% and 41% between 2010 and 2016.

The use of POBC as a measurement tool was also found in a study by Beck et al. (2009). In the findings, almost two-thirds of the respondents (72%) felt it was very unlikely that they would be stopped by the police if they drove after drinking too much (low-risk perceivers). Less than half (45%) of these low-risk perceivers also felt they would be arrested and convicted if they had driven under the influence. On the other hand, high-risk perceivers (28%) felt it was very likely that they would be stopped, with most of them (70%) believing that they would likely be arrested and convicted. The findings also suggested that high-risk perceivers were more likely to be non-white, less likely to drive 10 mph above the speed limit, but were more likely to have five or more tickets in their lifetime and believed that sobriety checkpoints are effective.

The purpose of such an investigation was to determine the difference between drivers who believe there was a reasonable chance they would be stopped by the police if they were to drive after having too much to drink, and that they would be arrested and convicted (i.e., high driving under the influence (DUI) risk perceivers); and those less worried about such consequences (low DUI risk perceivers). Data for the investigation were collected via a random-digit-dial telephone survey. In addition, the survey was done to monitor public knowledge, attitudes, and reported behaviours of licensed drivers. The respondents were told to imagine that they had driven after drinking too much, even if they suggested that they would never drink and drive. The response options ranged from "almost certain," "very likely," "somewhat likely," "somewhat unlikely," and "very unlikely."

Further, studies by Mannering (2008) showed the importance of the probability of being caught for speeding, with results indicating that on average the drivers believed they would only be fined for speeding if they drove 10.88 km/h past the speed limit. A probabilistic model

was estimated using data from 988 drivers in Indiana, United States. Mannering also found that drivers associated safety measurements with the likelihood to be fined. They believed that they would only be fined by the police if safety was under threat. The findings showed that drivers' perception of the speed above the limit at which they will receive a speeding ticket was a critical determinant of what they believed was a safe speed – suggesting that enforcement plays an important role in safety perception

In a similar study in Victoria, Australia, Harrison et al. (1998) emphasized the relationship between traffic enforcement and the perceived risk of detection for driving offences. The study comprised a survey of 3,700 licensed drivers concerning their experience of speed and drink-driving enforcement and their perception of the risk of detection for speeding and drink-driving. The survey questionnaire included items relating to: a) the perceived risk of detection for speeding during day time and night time hours separately; b) the perceived likelihood of being checked for alcohol during day time and night time hours separately; and c) the perceived risk of detection for drunk-driving during day time and night time hours separately. The items relating to the perceived risk of detection involved the use of a rating scale to estimate the detection likelihood. The scale ranged from zero to ten (an 11-point scale) with the endpoints anchored, such that zero was defined as there was no chance of a particular event happening and ten meant that the event in question was certain to happen.

Considering all the above examples, POBC among motorists is believed to be one of the tools to assess the effectiveness of OPS Bersepadu programme. POBC can play an important role in addressing the issue of changing driving behaviour, whereby in the absence of a clear and immediate threat of being caught by enforcers, a form of enforcement geared to tackle the problem should be formulated. Increasing the perceived risk of detection is one of the most important objectives of specific enforcement strategies, and the deterrent effect will discourage drivers from breaking traffic laws in the first place (Hu and McCartt, 2016; Retting et al., 2008; Østvik and Elvick, 1990).

2.0 METHODOLOGY

The research was carried out using a quantitative study using secondary data collected from previous POBC studies of OPS Bersepadu programme in Malaysia covering a period of eight years from 2008 until 2015. The studies involved a total of 42,171 respondents comprising motorists and motorcyclists and were conducted via a survey using self-reported questionnaire at selected locations along federal roads and expressways. The selection of sample was based on purposive sampling where the respondents must possess a valid driving or riding license.

Data were collected in three phases: (1) before, (2) during, and (3) after OPS Bersepadu programme for CNY from 2008 until 2012 and for HRA from 2008 until 2010. Starting from OPS HRA 2012, data collection was only carried out before and during OPS Bersepadu programme for all festive seasons. However, for OPS HRA 2011, data collection focused on two main periods, namely during the and after the OPS Bersepadu programme.

Ten items were included in the questionnaire to measure road users' POBC for specified offences, including speeding, red-light running, queue jumping, overtaking at double lines, illegal use of emergency lane, dangerously cutting into traffic, not wearing a front seatbelt while driving, not wearing a rear seatbelt, using mobile phone while driving, tailgating and etc. Using an 11-point Likert scale, the respondents were asked regarding their perceived chances

of being caught by the enforcer upon committing traffic offences. The respondents were also asked to rate according to a Likert scale from 0 to 10, with 0 indicating the perception of surely won't be caught while 10 representing a perception of sure to be caught. Based on the responses, descriptive analysis was performed to describe the overall POBC while inferential analyses, independent t-Test and ANOVA were performed to achieve the study objectives.

3.0 RESULTS AND DISCUSSION

3.1 Mean Scores of Overall POBC from 2008 until 2015 During Festive Seasons

The collected data was split into three main time periods, namely before, during and after the OPS Bersepadu programme in order to generate a pattern of the POBC. The mean scores of road users' overall POBC for committing traffic offences were then summarised for each festive season.

Figure 1 compares the mean scores of road users' POBC during the implementation of OPS Bersepadu for CNY and HRA from 2008 until 2015. Overall, the figure shows a downward curve for the 8-year period. The range of mean score of road users' overall POBC was from as low as 3.56 up to the highest point of 5.63. The majority of road users agreed that overall POBC for committing traffic offences was generally at medium level throughout the 8-year implementation of OPS Bersepadu programme.

As shown in the figure, the mean scores of road users' overall POBC during OPS Bersepadu programme rose to a high point and reached a peak compared to other periods (before and after OPS Bersepadu programme). This might be due to the simultaneous announcement of OPS Bersepadu programme implementation during the OPS. As a result, road users' perceived risk of being caught for committing traffic offences dropped as the OPS Bersepadu ended. This graph is projected to remain steady, with similar pattern for both during OPS CNY and OPS HRA, each year.

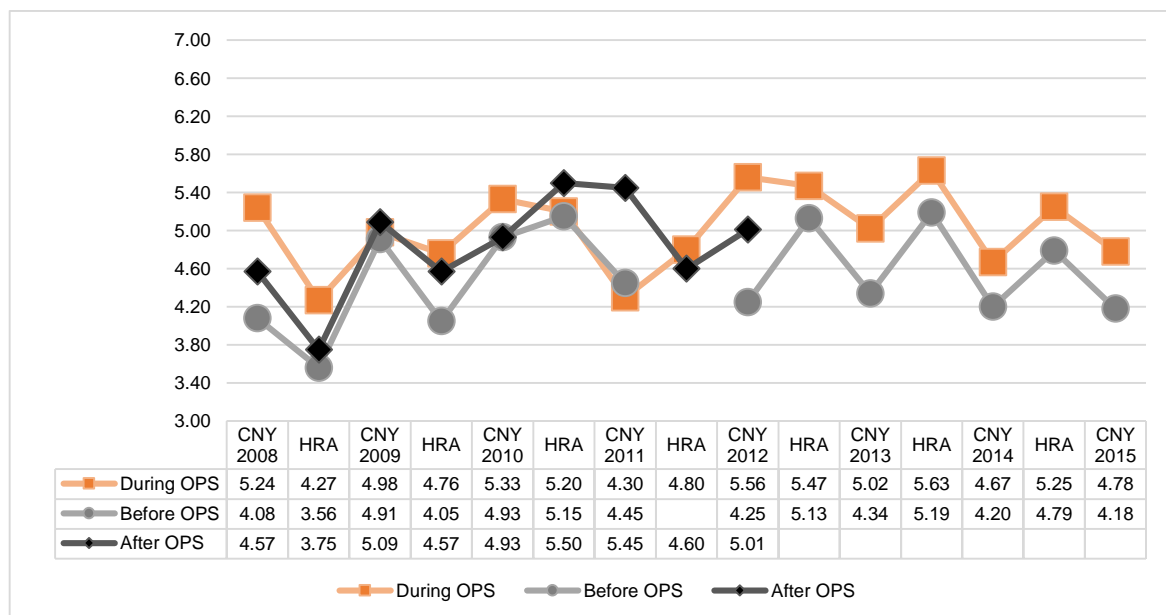


Figure 1: Mean scores of overall POBC for traffic offences during the implementation of the OPS Bersepadu programme from the year 2008 until 2015

3.2 Mean Scores of Overall POBC from 2008 until 2015 During Implementation of OPS Bersepadu CNY

Figure 2 provides an overview of the mean scores of road users' overall POBC for committing traffic offences during the OPS Bersepadu CNY period from 2008 until 2015. It can be seen that the mean scores of the road users' overall POBC for committing traffic offences range from 4.08 to 5.55.

Before the OPS, the mean scores of road users' overall POBC were very low for OPS CNY for the years 2008, 2010, 2012, 2013, 2014, 2015 compared to during and after OPS Bersepadu programme. In Figure 2, there is a clear trend of increment in the mean scores of road users' POBC for 2008, 2010, 2012 and 2013 during OPS Bersepadu programme; (5.24, 5.33, 5.56 and 5.02). This might be due to road users' awareness of the increased enforcement operations and the effectiveness of the road safety campaigns and announcements during the OPS Bersepadu programme. However, road users' overall POBC declined dramatically after the OPS CNY period ended.

As for the 2009 OPS CNY, the mean score of road users' POBC before the OPS Bersepadu programme (4.91) was the same as during the OPS Bersepadu programme (4.98). The mean score increased to 5.09 immediately after the OPS CNY ended.

Interestingly, for the 2011 OPS CNY, road users' perceived risk of being caught for traffic offences before the OPS Bersepadu programme (4.45) was slightly higher compared to during OPS Bersepadu programme (4.30). The mean score rose to 5.45 right after the OPS CNY ended.

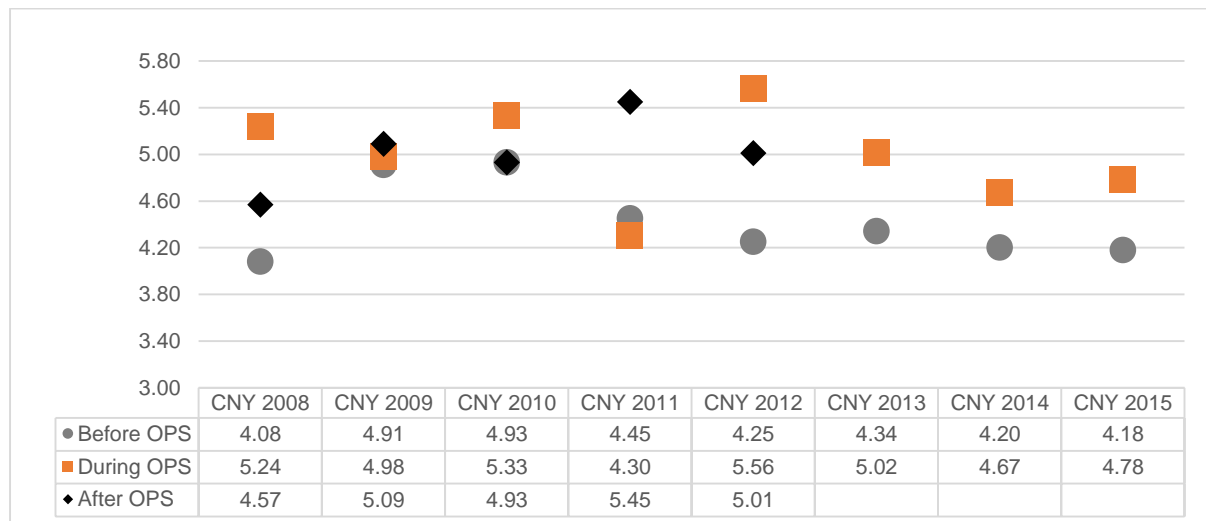


Figure 2: Mean scores of overall POBC for traffic offences during the implementation of OPS Bersepadu CNY from the year 2008 until 2015

The results obtained from the inferential statistics analysis of road users' POBC from 2008 until 2015 during OPS Bersepadu CNY are shown in Table 1. As indicated in the table (below), a one-way between-group analysis of variance was conducted to explore differences in mean scores of road users' overall POBC for committing traffic offences before, during and after the OPS CNY. Table 1 reveals there are statistically significant differences in the mean

scores of overall POBC for traffic offences before, during and after (OPS Bersepadu CNY from 2008 until 2012).

Post hoc comparison using Dunnett's procedures were used to determine which pairs of the three group means differed. The mean scores for POBC were higher during OPS Bersepadu programme compared to before and after OPS Bersepadu programme for the years 2008, 2010 and 2012. These findings further explain that the respondents' scores of overall POBC were significantly higher during OPS Bersepadu programme compared to before and after OPS Bersepadu programme for 2008, 2010 and 2012. In contrast, for 2009 and 2011, the mean scores before and after OPS Bersepadu programme were significantly higher than during OPS Bersepadu programme.

Likewise, an independent sample t-test revealed that there were statistically significant differences in the mean scores of overall POBC for traffic offences before and during OPS Bersepadu programme in 2013, 2014 and 2015. This indicates that Malaysian road users who had perceived risk of being caught during the OPS Bersepadu programme scored significantly higher with 5.02, 4.67 and 4.78 respectively. As discussed earlier, this might be due to simultaneous announcement of OPS Bersepadu programme implementation and enforcement operations during the OPS.

Table 1: Analysis in road users' overall POBC from 2008 until 2015 during OPS Bersepadu CNY

Year	OPS Bersepadu programme period (<i>Mean, SD</i>)			Mean Difference	p-value
2008	Before OPS (4.08, 2.46)	During OPS	(5.24, 2.53)	1.160*	0.0001
		After OPS	(4.57, 2.79)	0.491*	0.0001
2009	Before OPS (4.91, 2.38)	During OPS	(4.98, 2.40)	0.072	0.443
		After OPS	(5.09, 2.48)	0.174*	0.016
2010	Before OPS (4.93, 2.81)	During OPS	(5.33, 2.67)	0.402*	0.027
		After OPS	(4.93, 3.03)	-0.009	0.998
2011	Before OPS (4.45, 2.79)	During OPS	(4.30, 2.71)	-0.0193	0.525
		After OPS	(5.45, 2.95)	0.977*	0.0001
2012	Before OPS (4.25, 2.69)	During OPS	(5.56, 2.11)	1.299*	0.0001
		After OPS	(5.01, 2.53)	0.811*	0.0001
Independent Sample T-test					
2013	Before OPS (4.34, 2.19)	During OPS	5.02 (3.08)	$t(1198) = -3.864$, $p\text{-value} = 0.0001$	
2014	Before OPS (4.20, 2.55)	After OPS	-		
		During OPS	4.67 (2.16)	$t(1164) = -3.459$, $p\text{-value} = 0.001$	
2015	Before OPS (4.18, 2.82)	After OPS	-		
		During OPS	4.78 (2.68)	$t(798) = -3.059$, $p\text{-value} = 0.002$	
		After OPS	-		

3.2 Mean Scores of Overall POBC from 2008 until 2015 During Implementation of OPS Bersepadu HRA

Figure 3 documents the mean scores of road users' POBC in OPS Bersepadu HRA from 2008 to 2014. What stands out is the general pattern of mean scores of the road users' overall POBC for committing traffic offences which range from 3.56 to 5.63.

Before the OPS, the mean scores of road users' POBC were low for OPS HRA in 2008, 2009, 2013 and 2014 compared to during and after OPS Bersepadu programme. There were increments in mean score of road users' overall POBC for the years 2008, 2009, 2013 and 2014 during OPS Bersepadu programme; (4.27, 4.76, 5.63 and 5.25). This might be due to road users' awareness of the increased enforcement or the effectiveness of all the road safety campaigns during the OPS Bersepadu programme.

Conversely, the road users' POBC diminished dramatically after the OPS HRA ended. As for the 2010 OPS HRA, the mean score of road users' POBC before the OPS Bersepadu programme (5.15) was the same as during the OPS Bersepadu programme (5.20). The mean score rose to 5.50 right after the OPS HRA ended. For the 2012 OPS HRA, road users' perceived risk of being caught for traffic offences before the OPS Bersepadu programme (5.13) was slightly the same as during OPS Bersepadu programme (5.47). Still, for the 2011 OPS HRA, road users perceived that the probability of being caught for traffic offences was somewhat similar to that of during and after the OPS implementation.

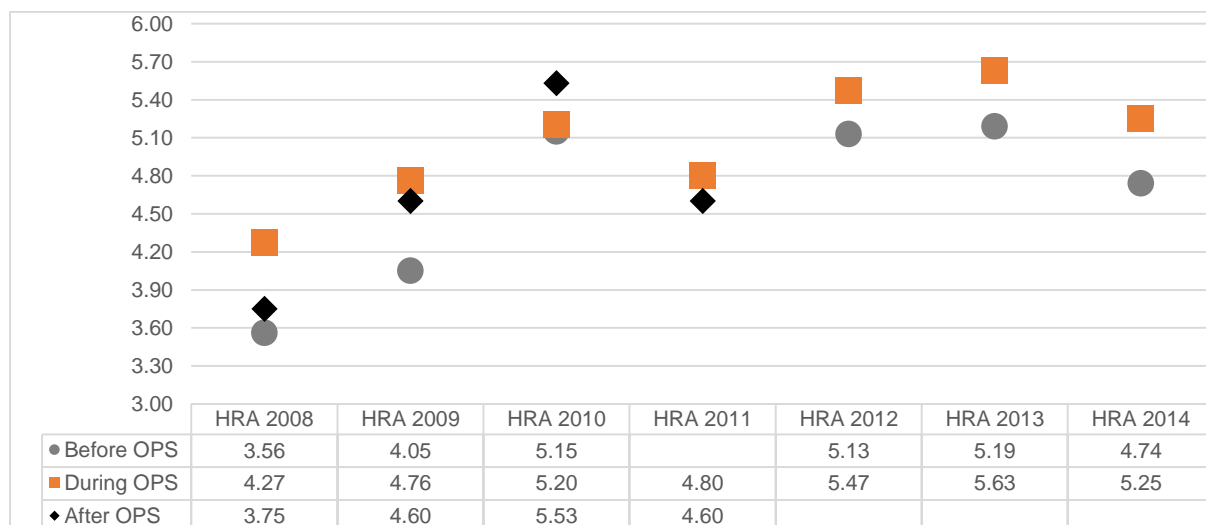


Figure 3: Mean scores of overall POBC for traffic offences during the implementation of OPS Bersepadu HRA from the year 2008 until 2014

Table 2 presents the results of the inferential statistical analysis of road users' POBC from 2008 until 2014 during OPS Bersepadu HRA. The results of the One-way between-group analysis of variance Test in the table below shows that there are statistically significant differences in the mean scores of overall POBC for traffic offences before, during and after (OPS HRA for 2008 and 2009).

Post hoc comparison using Dunnett's procedures were used to determine which pairs of the three group means differed. These results are shown in Table 2 and indicate that respondents who had perceived risk of being caught before and during OPS Bersepadu programme scored

significantly higher for both the years 2008 and 2009 than respondents who had perceived risk of being caught after OPS Bersepadu programme.

Also, an independent sample t-test revealed there were statistically significant differences in the mean scores of overall POBC for traffic offences before and during OPS Bersepadu programme in 2013 and 2014. This indicates that respondents who had perceived risk of being caught during the OPS Bersepadu programme scored significantly higher with 5.63 and 5.25 respectively. In contrast, there was no significant difference in the mean scores of overall POBC for traffic offences in OPS HRA 2010, 2011 and 2012.

Table 2: Analysis in road users' POBC from 2008 until 2014 during OPS Bersepadu HRA

Year	OPS Bersepadu programme period (<i>Mean, SD</i>)			Mean Difference	p-value
2008	Before OPS (3.56, 2.46)	During OPS	(4.27, 2.47)	0.710*	0.0001
		After OPS	(3.75, 2.27)	0.195*	0.028
2009	Before OPS (4.05, 2.57)	During OPS	(4.76, 2.70)	0.707*	0.0001
		After OPS	(4.57, 2.59)	0.521*	0.0001
2010	Before OPS (5.15, 2.85)	During OPS	(5.20, 2.91)	0.057	0.947
		After OPS	(5.50, 3.08)	0.357	0.155
Independent Sample T-test					
2012	Before OPS (5.13, 2.39)	During OPS	(5.47, 2.83)	$t(798) = -1.851$, $p\text{-value} = 0.064$	
2013	Before OPS (5.19, 2.85)	After OPS	-	$t(1190) = -2.654$, $p\text{-value} = 0.008$	
		During OPS	(5.63, 2.89)		
2014	Before OPS (4.74, 2.41)	After OPS	-	$t(1167) = -3.318$, $p\text{-value} = 0.001$	
		During OPS	(5.25, 2.85)		
		After OPS	-		

4.0 RECOMMENDATIONS

Based on the documented findings, several recommendations are therefore proposed. Foremost, enforcement agencies should use various approaches in disseminating enforcement activities during the OPS to road users, through various advertising and marketing initiatives. Also, any enforcement activities conducted must be significantly seen and felt by the road users. Updated news on road users committing traffic offences must be published and shared on the social media to create awareness on the importance to follow traffic rules and regulation. Lastly, enforcement agencies must think of a new mechanism to ensure all summons issued is taken seriously by the perpetrators as the perceived certainty of punishment is a powerful deterrent than the severity of penalty (Shinar and McKnight, 1985). Also, the enforcement programme conducted and supporting publicity must be fair and reasonable to be accepted by the public. They must be firmly and consistently carried out since the duration of the campaign has continued for many years.

5.0 CONCLUSION

The perception of being caught (POBC) can play an important role in addressing the issue of traffic law compliance among road users. It is considered one of the most well-known tools and indicator to gauge an enforcement programme's efficiency. The effects of enforcement intensity specifically during festive seasons as well as its publicity can enhance the subjective POBC. This study's findings reveal that there are differences in the level of POBC before, during and after the OPS Bersepadu programme during festive periods. In short, these results show that the level of POBC was significantly higher during OPS Bersepadu programme compared to before and after OPS Bersepadu programme. Conversely, road users generally indicated that the rate of overall POBC was at a moderate level in the eight years of OPS Bersepadu implementation spanning from 2008 until 2015. Taken together, these results suggest that although the level was moderate, the operation was still applicable since the OPS enforcement programme was found to be effective in increasing overall road users' POBC. Hence, the intensive enforcement programme combined with massive publicity during festive seasons must be sustained, albeit with introduction of new approaches to change the perception of road users towards following road traffic rules and regulation.

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