

Report of Research Results
*Thailand***A Study for Behavior and Traffic Law Compliance of Motorcycles at Crosswalks****Researcher**

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Summary

According to the statistics from World Health Organization (WHO, 2015), Thailand was ranked second place for the country with highest fatality from traffic accidents. Among the overall traffic accidents in Thailand, the number of motorcycle related accidents has highest records compared to other vehicle types (Praongsana, 2003). The study by Suangka (2016) found common behaviors of motorcyclists including 1) overhanging in front of other vehicles, 2) cut off other vehicles, 3) not using turn signals, 4) not wearing helmet, and 5) aggressive overtaking. At mid-block crosswalk locations, Lin and Pin-Sun (1969) found that motorcyclists normally responded to active pedestrians in 3 ways including 1) changed lane and passed the pedestrians 2) reduced speed and 3) performed a sudden brake. Khunchareoan (2017) found that many Thai citizens were lack of emphasis on principles "Drive with caution" and "Cross the road with caution". Typical crosswalks in Thailand are categorized into non-signalized and signalized. The signalized crosswalks have been more of interest to researchers (Chanpittayanukoolkij, 2016) because both pedestrians and motorcyclists, particularly teenagers, were reported for high violation rate at this crosswalk type (Champangein, 2014).

This study evaluates profiles of motorcyclists at 8 crosswalk locations across Bangkok, which include 2-lane, 4-lane, and 6-lane crosswalks with and without signal. Yielding activity data were obtained through 86 hours of video records from the field. The results show that majority of motorcyclists failed to yield for pedestrians at crosswalks. The in-depth review on the profiles of the non-yielding group of motorcycles shows that most were motorcycle taxi with male drivers and no passenger. At multi-lane crosswalks, most drivers slowed down, made a lane change, and passed pedestrians without stopping. For smaller crosswalks, most drivers simply ignored pedestrians and cut in front of them. In addition, motorcyclists did not likely to yield to pedestrians with a party of 1-2 persons and those who were using mobile phone or being distracted. In case of 4-lane crosswalks, the pedestrian yielding rate at the signalized locations was lower than the non-signalized ones. At signalized crosswalks, pedestrians felt more confident to walk with the activated signal, while the approaching motorcyclists did not intend to yield to them regardless of the signal.

Aim of Research

This research is motivated by a severity of motorcycle-pedestrian related accidents at crosswalks in Bangkok. This research aims to identify profile of motorcycles related to a yielding decision at crosswalks and their compliance level with traffic law within crosswalk vicinity. It also intends to understand unique characteristics of a yielding and non-yielding group of motorcycles, which could be used as a starting point to improve safety at crosswalks.

Method of Research & Progression

The study was conducted following the research method below and Figure 1 shows progression of the tasks throughout the course of study.

- 1) Literature review: Review previous researches from different sources by focusing on behavior of motorcycles at crosswalks.
- 2) Data collection:
 - a. Select study locations: 8 locations with relatively high pedestrian crossing activity and high proportion of motorcycles (2-lanes/non-signalized: 2 sites, 4-lanes/non-signalized: 2 sites, 4-lanes/signalized: 2 sites, and 6-lanes/non-signalized: 2 sites).
 - b. Collect field data: using video recording (total of 86 hours) under normal traffic and weather conditions within peak crossing periods and high traffic flow conditions.
- 3) Data analysis & Reporting:
 - a. Analyze data by location type: signalized and non-signalized
 - b. Analyze data by crosswalk size: 2-lanes, 4-lanes, and 6-lanes
 - c. Analyze data by number of crossings
 - d. Examine and summarize for yielding activity by motorcycle profile
 - e. Examine and summarize for behavior of motorcycles related to their yielding decisions
 - f. Examine and summarize for pedestrian behavior during crossing

Activity	Duration												
	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Literature Review													
Pre-Survey													
Data collection													
Data Interpretation and Analysis													
Conclusion													
Final Report													

Figure 1: Research Schedule

Results of Research

The data used in this study consist of 2,230 pedestrian crossing records across 4 types of crosswalks, 943 records for 2-lane/non-signalized, 456 records for 4-lanes/non-signalized, 263 records for 4-lanes/signalized, and 568 records for 6-lanes/non-signalized crosswalks. Table 1 shows a yielding rate at each crosswalk type, which indicates that, on average, 86% of motorcycles struggled to yield to pedestrians at crosswalks.

Table 1: Percent Yielding at Crosswalks by Crosswalk Type

Type of crosswalk	Yielding to Pedestrians	
	Non-Stop (%)	Stop (%)
2 lanes / Non-Signalized	82	18
4 lanes / Non-Signalized	79	21
4 lanes / Signalized	84	16
6 lanes / Non-Signalized	94	6
Total	86	14

Table 2 shows profile of motorcycles and their yielding decision. It is found that, for 2-lane and 4-lane crosswalks, male drivers were not likely to yield (81-87%) while 66-74% of female drivers did not yield to pedestrians at this crosswalk type. For 6-lane/non-signalized crosswalks, 91-93% of male and

female drivers decided not to stop for pedestrians. When considering a compliance with helmet law, 41-96% of those who did not wear helmet also chose not to yield to pedestrians at crosswalks with an average non-yielding rate at 72%. However, when compared to those who wore helmets, the latter group appears to have higher non-yielding rate on average of 86%.

The number of passengers on motorcycles was also used to differentiate the yielding activity. For 2-lane and 4-lane crosswalks, the non-yielding rate was as high as 89-91% for motorcycles with no passenger compared to 56-62% for 1 passenger and 52-88% for at least 2 passengers. For 6-lane crosswalks, the non-yielding rate was 87-100% regardless of the number of passengers traveled on the motorcycles.

When categorized the yielding activity by use type of motorcycles, at 2-lane and 4-lane crosswalks, motorcycle taxi were subjected to highest non-yielding rate at 88-92% compared to 38-75% for personal ones and 33-67% for delivery ones. For 6-lane crosswalks, the non-yielding rate was at 91-92% for all 3 purposes of motorcycles.

The study also analyzed the yielding activity by transmission type, which is typically classified as gear, automatic, or clutch type. The difference between the three types is how ease drivers can control a gear change. The automatic transmission is the easiest one while the clutch type requires most efforts from drivers to operate. It is found that the non-yielding rate was in a range of 63-92% for all 3 transmission types at 2-lane and 4-lane crosswalks. For 6-lane crosswalks, the non-yielding rate was 92-98% for all 3 types of transmission.

Table 2: Yielding Activity at Crosswalks by Motorcycle Profile

Type of crosswalk	Number of Passengers						Gender				Helmet			
	No Passenger		1 Passenger		> 2 Passengers		Male		Female		Not Wear		Wear	
	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop
2 lanes / Non-Signalized	91	9	59	41	52	48	87	13	66	34	41	59	87	13
4 lanes / Non-Signalized	89	11	62	38	57	43	81	19	74	26	74	26	80	20
4 lanes / Signalized	87	13	56	44	88	12	82	18	71	29	75	25	81	19
6 lanes / Non-Signalized	95	5	87	13	100	0	91	9	93	7	96	4	91	9
Total	91	9	64	36	76	24	86	14	71	29	72	28	86	14

Table 2 (Cont.): Yielding Activity at Crosswalks by Motorcycle Profile

Type of crosswalk	Use Type						Transmission Type					
	Motorcycle Taxi		Personal		Delivery		Gear		Automatic		Clutch	
	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop
2 lanes / Non-Signalized	92	8	38	62	65	35	85	15	76	24	79	21
4 lanes / Non-Signalized	88	12	61	39	67	33	87	13	63	37	92	8
4 lanes / Signalized	89	11	75	25	33	67	74	26	89	11	80	20
6 lanes / Non-Signalized	91	9	91	9	92	8	95	5	92	8	98	2
Total	90	10	75	25	71	29	86	14	82	18	89	11

Table 3 shows results for the yielding activity associated with pedestrian profile including number of pedestrians in a party and their activities during the crossing. For smaller group of pedestrians crossing (1-2 persons), non-yielding rate was 61-92% while it decreased to 16-50% for a group of 3-5 persons and 0-58% for a group of more than 6 persons.

Besides already high non-yielding rate for pedestrians under normal walking conditions (average of 58%), it is also found that the non-yielding rate increased according to how pedestrians behaved in the crosswalks. Those who walked slowly would result in the non-yielding rate increased to 61%, and those who were distracted and occupied with their mobile would result in the non-yielding rate increased to 67% and 68%, respectively.

Table 3: Yielding Activity at Crosswalks by Pedestrian Profile

Type of Crosswalk	Group Crossing						Behavior while Crossing							
	1-2 Ped.		3-5 Ped.		>6 Ped.		Normal		Using Mobile Phone		Walk Slowly		Distracted	
	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop	%Non-Stop	%Stop
2 lanes / Non-Signalized	61	39	50	50	58	42	44	56	69	31	65	35	40	60
4 lanes / Non-Signalized	73	27	48	52	40	60	62	38	72	28	56	44	86	14
4 lanes / Signalized	92	8	16	84	0	100	68	32	60	40	61	39	77	23
6 lanes / Non-Signalized	83	17	48	52	3	97	63	37	65	35	56	44	95	5
Total	71	29	44	56	33	67	58	42	68	32	61	39	67	33

Speed data extraction for non-yielding motorcycles indicates that the approaching 85th percentile speed was in a range of 18-27 kilometers per hour at the study crosswalks (Figure 2). For smaller size crosswalks (2-lane), majority of the approaching speeds (65%) was in a range between 7 and 14 kilometers per hour. For 4-lane crosswalks, 30-41% is found to have approaching speeds of 7-14 kilometers per hour and 56-58% is found to have approaching speeds of 18-27 kilometers per hour.

And for 6-lane crosswalks, majority of the approaching speeds (89%) was in a range of 18-27 kilometers per hour.

Figure 3 shows results for reactions of non-yielding motorcycles. There are 7 common reactions found at the crosswalks under this condition including honking, flashing light, hand signalling, ignoring, lane changing, reducing speed, and cutting off. For 2-lane/non-signalized crosswalks, majority of the non-yielding motorcycles just ignored pedestrians in the crosswalks. For 4-lane crosswalks, majority of the non-yielding motorcycles reduced speed without stopping at the occupied crosswalks. For 6-lane crosswalks, majority of the non-yielding motorcycles took advantage from wider road to change a travel lane to avoid pedestrians at the crosswalks and proceeded without stopping.

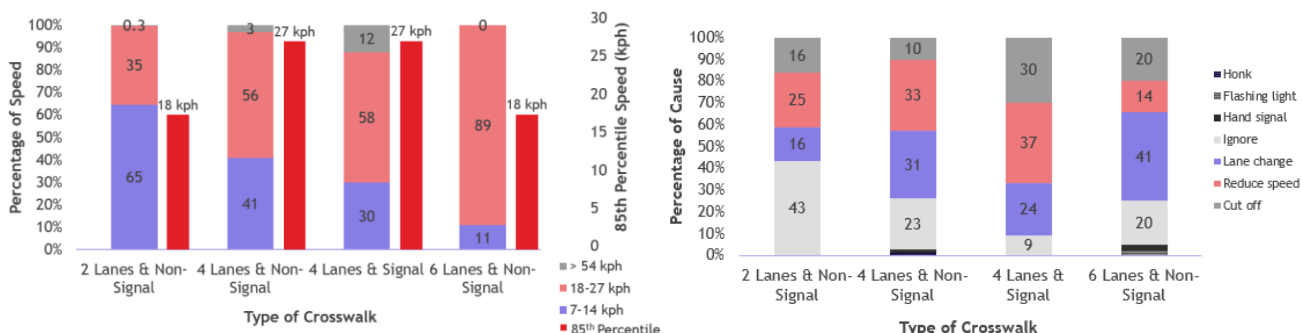


Figure 2: Speed of Non-Yielding Motorcycles

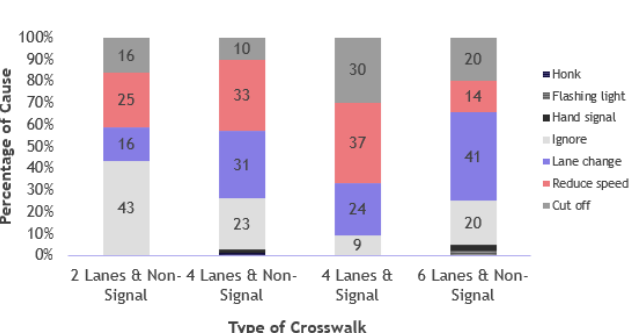


Figure 3: Reactions of Non-Yielding Motorcycles

Future Areas to Take Note of, and Going Forward

This study provides understanding on characteristics of the motorcycles that did not yield to pedestrians at different crosswalks. It is recommended that in-depth study for factors influencing the non-yielding decision should be further conducted. Possible factors could be related to drivers, vehicles, and/or road conditions. Knowing such factors could lead to a better crosswalk design and strategies that could effectively improve safety at crosswalks in a long-term.

References

- Champangein T. et al, 2014. Pedestrian's Behavior at Push-Button Crossings in Bangkok. 19th National Convention on Civil Engineering, pp.2515-2521.
- Chanpittayanukoolkij S., 2016. Differences in Pedestrian Behavior among Difference Kinds of Crosswalk. Thesis. Chulalongkorn University, pp.58-60.
- Khunchareon K.,2017. Legal Measures on Enhancing Road Safety: A Study of Pedestrian Using Crossing. Thesis. Sripatum University, pp.69-70.
- Lin and Pin-Sun, 1969. Pedestrian – Vehicle Interaction at a Marked Mid – Block Crosswalk in Bangkok. Master's thesis. Asian Institute of Technology. Thesis no.237.
- Prapongsana Y. et al, 2003. Department of Highways. Bureau of Highway safety. Pedestrian Accident Report, pp.3-22.
- Suangka K., 2016. A study of Young Driver Behaviour that Affect the Risk of Accidents from The Motorcycle. Suranaree University of Technology. Project ID SUT7-704-58-12-44, pp.66-70.
- World Health Organization. Global Status Report on Road Safety, 2015. Italy, pp. 235 and pp.266-267.