

Road User's Perceptions towards Motorcycle Safety with Regards to Conspicuity in Malaysia Road Traffic

Muhamad Syukri Abdul Khalid^{a,b*}, Nor Kamaliana Khamis^a, Mohd Radzi Abu Mansor^a, Mohd Hafzi Md Isa^c & Zulhaidi Mohd Jawi^c

^aFaculty of Engineering & Built Environment, Universiti Kebangsaan Malaysia, Bangi, Malaysia

^bVehicle Safety & Biomechanics Research Centre (VSB), Malaysian Institute of Road Safety Research (MIROS), Kajang, Malaysia

^cMalaysian Institute of Road Safety Research (MIROS), Kajang, Malaysia

*Corresponding author: muhamadsyukri@miros.gov.my

Received 28 November 2019, Received in revised form 22 May 2020

Accepted 13 June 2020, Available online 30 September 2020

ABSTRACT

Motorcycles are the top contributor in road crashes in Malaysia with more than 60% of fatal road crashes involved motorcyclists. Conspicuity issue has been one of the major factors of motorcycle crashes especially when travelling at night in rural road areas. Nevertheless, conspicuity issues also contribute to motorcycle crashes in urban road areas where road and vehicle lightings affect the alertness of other road users towards motorcycle presence in the traffic. This study aims to assess road users' perception of motorcycle safety levels in terms of its conspicuity, at different riding or driving situations at night in the rural and urban areas. A set of questionnaires was developed with experts' validation, pilot-tested for its reliability and distributed to road users who commute between Klang Valley and Melaka areas. Preliminary analysis from 78 collected data shows that respondents were able to observe better and be more alert of motorcycle presence in road situations when driving in the urban areas compared to the rural areas. Over 80% believe that wearing bright-coloured attires and helmet can enhance motorcycle's conspicuity and alertness towards other road users. In addition, more than 80% of the respondents agreed that using reflective tapes on the side body of a motorcycle can improve motorcycle visibility, especially at road junctions. These findings could be used as a future initiative by responsible parties in order to reduce motorcycle conspicuity related crashes in Malaysia.

Keywords: Motorcycle safety; motorcycle conspicuity; motorcycle visibility; road safety

INTRODUCTION

Motorcycles can be considered as the main mode of transportation used to commute in Malaysia. Despite the higher risks of fatal crashes compared to other vehicles due to its vulnerability and low detectability (De Craen et al. 2014; Law et al. 2016), road users in Malaysia still prefer to use motorcycles especially to accommodate their commute within city areas with daily congested traffic since the size of the vehicle allows it to manoeuvre freely and flexibly in the traffic.

However, the size of a motorcycle which is smaller than other vehicles on the road has also contributed to its low detectability (Law et al. 2016; Rogé et al. 2018) making them less conspicuous especially when being ridden at night. Motorcycle's conspicuity can be described as the ability of motorcycles and motorcyclists to be seen and detected by other road users (Mohammad Saad Shaheed, Konstantina Gkritza, and Dawn Marshall 2012) and it has always been one of the main issues in cases of motorcycle crash (Mohd Khairudin Rahman et al. 2014; Rogé et al. 2018, 2017). In Malaysia, it was reported that the majority of motorcycle

crashes occur on the two-way straight and intersection roads at night time in rural areas where the presence of road lights is very low (Royal Malaysian Police 2017). This explains that conspicuity may have been a factor of the crashes.

Government bodies and responsible parties have employed many initiatives in solving motorcycle conspicuity issues such as enforcing motorcycles to be fitted with daytime running light for head and tail lights, requiring usage of reflective strips at rear body of motorcycles and encouraging high visibility jacket usage at night (Solah et al. 2013; Wells et al. 2004). However, the conspicuity issue is yet to be solved as observations showed that several motorcyclists still ride their motorcycles with malfunctioning head and tail lights, besides the lack of awareness in wearing appropriate apparel when riding at night.

Nonetheless, conspicuity of motorcycles and motorcyclists can be enhanced in many ways. For example, a motorcycle can be fitted with additional head or tail light and even installed with retro-reflective tapes in order to increase conspicuity among other road users. While for motorcyclists, brighter appearances such as wearing bright-coloured helmet or attire can significantly improve their conspicuity.

Previous studies in Malaysia have discussed motorcycle conspicuity issues with most of the studies mentioning motorcycle daytime running light (DRL) for head and tail lights while some other studies arguing about appropriate helmet and attire colours (Law et al. 2015, 2016; Lee and Sheppard 2018; Mohd Khairudin, Mohd Hafzi, and Azhar 2013; Mohd Khairudin Rahman et al. 2014; Mohd Syazwan Solah et al. 2013). All of the studies were focused on solving the conspicuity issues for the front and rear areas of motorcycle and also motorcyclists. Nevertheless, the perception of other road users or even from motorcyclists towards motorcycle conspicuity in terms of its safety on the road has never been discussed before despite all the initiatives employed by the responsible parties that may or may not improve the conspicuity issues.

Therefore, this study aims to assess road users' perception of motorcycle safety levels in terms of its conspicuity in different driving situations at night in the rural and urban areas in Malaysia. This study will explain how new safety features installed to a motorcycle may help in enhancing motorcycle conspicuity. A subjective assessment of driving situations with different motorcycle and motorcyclist configurations will be discussed based on the collected data from the selected respondents.

METHODOLOGY

DEVELOPMENT OF QUESTIONNAIRE

A self-constructed questionnaire was developed based on the current issues related to motorcycle conspicuity in Malaysia including the DRL, colour of helmet and attire worn and also additional safety features that may enhance motorcycle and motorcyclist's conspicuity. The questionnaire consists of three sections as described in Table 1.

In section A, the demographic profile of the respondents was collected whereas, in section B and C, perceptions and opinions on motorcycle safety with regards to conspicuity issues were discussed. As explained in the figure/table, sections B and C were divided into two sub-sections whereby each sub-section represents the perception and opinion from

motorcyclists and/or drivers and the selection of the sub-section was subjected to respondent's primary vehicle used for everyday travel.

In the section B1, all questions were ranged using the 10-point scale (Lowest to Highest) in order to evaluate motorcyclists' perception of their own and other motorcyclists' safety on the road related to conspicuity. For section B2, part 1 of the questions were also ranged using a 10-point scale to determine drivers' perceptions of motorcyclists' safety and in part 2 was specified to collect data of drivers' experience involving near-miss incidents or accidents with motorcycles at night in order to capture the patterns and factors of the occurred incidents.

For sections C1 and C2, both were ranged using the 10-point scale (from Strongly Disagree to Strongly Agree) to determine the opinions from both motorcyclists and drivers on motorcycle safety before and after enhancing its conspicuity.

EXPERT VALIDATION & PILOT TEST

The questionnaire was handed to five experts including academicians, industrial practitioners and professional engineers specialising in motorcycle safety in order to check and verify the appropriateness and relevance of the survey contents and structures. The comments and feedback from the experts were then collected and used to modify the questionnaire. The revised questionnaire was then distributed to the selected respondents for the purpose of the pilot test.

The pilot test performed is aimed to identify respondents' understanding of the questions and contents based on their feedback from the survey. The collected data from the pilot study were used to analyse the survey particularly on its reliability and relevancy using Cronbach's alpha reliability analysis and the result is shown in Table 2. The reliability of a questionnaire is considered acceptable if the Cronbach's coefficient is higher than 0.7 (Bland and Altman, 1997; Shahbazi et al. 2019). Based on the analysis, the questionnaire is considered as highly reliable due to the calculated alpha value is more than 0.8.

TABLE 1. Questionnaire instruments details

Sections	Description	Details
Section A	Demography Information	Respondents' demographic profile including personal details, driving license ownership, experience, and vehicle ownership.
Section B1	Motorcyclists' Perception of Motorcycle Safety	Respondents' perception as a motorcyclist on motorcycle safety when riding at night in rural road areas at different motorcycle configurations.
Section B2	Drivers' Perception of Motorcycle Safety	Respondents' perception as a driver on motorcycle safety at night, awareness of motorcycle presence and experience in near-miss incident and accident with a motorcycle.
Section C1	Motorcyclists' Opinion of Motorcycle Safety	Respondents' opinion as a motorcyclist on motorcycle safety before and after conspicuity enhancement.
Section C2	Drivers' Opinion of Motorcycle Safety	Respondents' opinion as a driver on motorcycle safety before and after conspicuity enhancement and factor of motorcycle crashes.

TABLE 2. Cronbach's Alpha analysis on questionnaire reliability.

Reliability Statistics	
Cronbach's Alpha	N of Items
0.894	30

The result from the pilot test and the feedback on the questionnaire were analysed and recorded. The outcome showed that 95% of the respondents can easily understand the questions and answer correctly based on their perceptions and experiences.

QUESTIONNAIRE DISTRIBUTION & DATA COLLECTION

The final questionnaire was translated into online forms via Google Forms platform and distributed randomly among road users (motorcyclists and non-motorcyclists) who commute within Klang Valley up until the Melaka areas. The target sample size is 500 respondents as determined based on Krejcie and Morgan (1970). Detailed explanations and instructions on the questionnaire were included on the first page prior to the answering parts. The survey is only valid for motorcyclists and drivers of a passenger vehicle. All of the collected data were tabulated and analysed using Statistical Package for Social Science (SPSS) and the graphical presentation was drawn using Microsoft Excel.

RESULTS AND DISCUSSION

The data collection is still undergoing. Nevertheless, a preliminary analysis was done with 78 responses which were successfully collected, tabulated and analysed in order to predict the overall findings and outcomes from all 500 targeted responses.

DEMOGRAPHIC PROFILE

78 respondents' preliminary demographic data were tabulated and shown in table 3. The respondents' age range is from 19 to 65 years old with a mean age of 35.71 and a standard deviation value of 8.73. The majority of the respondents are male (70.5%) and from Malay ethnic (92.3%). Furthermore, 43.6% of the respondents are bachelor's degree graduates.

Most of the respondents own both motorcycle and driving license (B2 and D class of driving license) (39.7%), followed by driving license only (24.4%) and motorcycle license only (14.1%). Moreover, 42.3% of motorcyclists and 65.3% of drivers have more than 10 years of experience in riding and driving. 43.6% of the respondents own both motorcycle and passenger vehicle. Owners of the Malaysian national vehicle brand, PROTON, tops the vehicle brand chart with 30.8%.

In addition, 38.5% of the respondents prefer to use motorcycles as their primary vehicle to commute to work and other places while other 61.5% of respondents choose other than motorcycles as their mode of transport to commute. The respondents who prefer motorcycles as their primary

vehicle had then answered the question in section B1 and C1 only while the remaining had answered the question in section B2 and C2.

MOTORCYCLE PERCEPTION ON THEIR SAFETY ON THE ROAD

In section B1, motorcyclists were asked how they would rate their safety level when they are riding on a rural road at night, with a very low presence of road lighting and visibility at the different types of configurations. 30 respondents who are motorcyclists had answered the question and the results are tabulated in Table 4.

The results suggested that either at straight roads or road junctions, motorcyclists believe their safety is at a low level. The safety level drops further when they are riding with malfunctioning motorcycles' head and tail lights. Even when they are equipped with a bright-coloured helmet and attire, motorcyclists still believe they are in danger when riding on rural road areas at night. The perceived safety level drops as expected when they ride motorcycles with dark-coloured helmet and attire.

From Table 4, it can be explained that motorcyclists believe that they are always in danger when they are riding on rural roads at night. It gets worse when their motorcycle's head and tail lights are not functioning and when they are not wearing bright-coloured attires as these would affect their visibility and conspicuity.

MOTORCYCLE OPINION ON CONSPICUITY ENHANCEMENT

In section C1, motorcyclists were asked for their opinions on conspicuity enhancement as suggested by the author and the results are tabulated in Table 5.

As shown in Table 5, the majority of motorcyclists believe that wearing helmet and attire of brighter colours will enhance their conspicuity level for other road users and confident that they are safer when riding roads in rural areas at night when they are equipped with it. Motorcyclists also agreed that adding retro-reflective tapes on the side body of motorcycles may improve motorcycle's visibility and conspicuity. They also agreed that if the motorcycle decals were made of reflective materials, it may also enhance motorcycle visibility and conspicuity. This result is tallied with the results from section B1 whereby motorcyclists feel safer when they are equipped with brighter appearances and more conspicuous to other road users.

DRIVERS' PERCEPTION OF MOTORCYCLE SAFETY ON THE ROAD

In section B2, drivers were asked how they would rate their ability to observe road conditions at night, awareness of the motorcycle presence and motorcyclists' safety level at different road areas. 48 respondents who are among drivers had answered the questions. The results were tabulated in Table 6.

From Table 6, the data explains that drivers believe that they can observe the road conditions at night in urban road areas way better than in rural road areas. Drivers also believe

TABLE 3. Demographic profile of respondents

Description	Category	Frequency (N)	Percentage (%)
Age	20 and below	1	1.3
	21 – 30	27	34.6
	31 – 40	25	32.1
	41 – 50	21	26.9
	51 and above	4	5.1
Gender	Male	55	70.5
	Female	23	29.5
Ethnic	Malay	72	92.3
	Chinese	2	2.6
	Indian	2	2.6
	Others	2	2.6
Education	Primary – Secondary School	6	7.7
	STPM – Foundation – Diploma	13	16.7
	Bachelor Degree	34	43.6
	Master – PhD	21	26.9
	Others	4	5.1
License ownership	B2	11	14.1
	B full	7	9.0
	D	19	24.4
	B2 & D	31	39.7
	B full & D	7	9.0
	Others	3	3.8
Riding Experience (N = 69)	Less than 1 year	11	15.9
	1 – 5 years	10	14.5
	6 – 10 years	15	21.7
	More than 10 years	33	47.8
Driving Experience (N = 75)	Less than 1 year	1	1.3
	1 – 5 years	9	12.0
	6 – 10 years	16	21.3
	More than 10 years	49	65.3
Vehicle ownership	Motorcycle	6	7.7
	Car-SUV-MPV	28	35.9
	Motorcycle & Car-SUV-MPV	34	43.6
	Car-SUV-MPV & Others	1	1.3
	Others	9	11.5
Vehicle brand owned	Proton	24	30.8
	Perodua	17	21.8
	Big 3 ¹ (Honda-Toyota-Nissan)	20	25.6
	Others	17	21.8
Primary vehicle used (for everyday travel)	Motorcycle	30	38.5
	Other than motorcycle	48	61.5

Big 3 is the term used to describe a combination of top 3 non-national car makers in Malaysia which are Honda, Toyota and Nissan (Khalid et al. 2018; Jawi et al. 2017).

that they are more aware of the presence of the motorcycle in the urban areas compared to the rural areas.

Furthermore, drivers believe that motorcycle safety in rural areas is very low compared to urban areas. This is most probably due to the presence of road light in the urban areas is higher compared to the rural areas which may affect the visibility and conspicuity of the motorcyclists.

The next part of the questions is regarding drivers' experience in near-miss incidents and road accidents involving motorcycles. The respondents were also asked to explain the situation if they had experienced any incident. The results were tabulated accordingly as displayed in Table 7.

More than 50% of the drivers have experienced a near-miss incident on the road with motorcycles at different road types and areas. Most near-miss incidents happened at road junctions for both rural and urban areas in which urban areas recorded a slightly higher percentage than in rural areas.

Only a few claimed to experience road crash involving motorcycles in which the highest percentage of the crashes happened at road junctions in urban areas. Remarkably, the percentage of crashes in rural areas is lower than in urban areas. It may be due to drivers' awareness in the rural areas is higher than in the urban areas as reported in Table 6.

TABLE 4. Motorcyclists' perception on motorcycle safety (N = 30)

Configurations (motorcyclist riding at)		Ratings	
Junction road	Lowest safety level	56.70% 43.30%	Highest safety level
Straight road	Lowest safety level	60% 40%	Highest safety level
Without head light at junction road	Lowest safety level	83.30% 16.70%	Highest safety level
Without head light at straight road	Lowest safety level	76.70% 23.30%	Highest safety level
Without tail light at junction road	Lowest safety level	83.30% 16.70%	Highest safety level
Without tail light at straight road	Lowest safety level	80% 20%	Highest safety level
With bright color of helmet and attire at junction road	Lowest safety level	60% 40%	Highest safety level
With bright color of helmet and attire at straight road	Lowest safety level	66.70% 33.30%	Highest safety level
With dark color of helmet and attire at junction road	Lowest safety level	66.70% 33.30%	Highest safety level
With dark color of helmet and attire at straight road	Lowest safety level	73.30% 26.70%	Highest safety level

TABLE 5. Motorcyclists' opinion on motorcycle safety with regards to conspicuity enhancement (N = 30)

Description	Ratings		
Bright color of helmet and attire improve motorcyclist conspicuity	<i>Strongly Disagree</i>	10% 90%	<i>Strongly Agree</i>
Bright color of helmet and attire increase motorcyclist level of safe feeling	<i>Strongly Disagree</i>	6.70% 93.30%	<i>Strongly Agree</i>
Motorcycle fitted with retro-reflective tape on side of the motorcycle body can improve motorcycle conspicuity	<i>Strongly Disagree</i>	13.30% 86.70%	<i>Strongly Agree</i>
Motorcycle brand decals made of reflective materials will improve motorcycle conspicuity	<i>Strongly Disagree</i>	13.30% 86.70%	<i>Strongly Agree</i>

TABLE 6. Drivers' perception on motorcycle safety (N = 48)

Description		Ratings		
Driver's ability to observe road condition at night on rural road area	Lowest	20.80%	79.20%	Highest
Driver's ability to observe road condition at night on urban road area	Lowest	60.40%	39.60%	Highest
Driver's awareness towards the presence of motorcycle at night on rural road area	Lowest	18.80%	81.20%	Highest
Driver's awareness towards the presence of motorcycle at night on urban road area	Lowest	58.30%	41.70%	Highest
Motorcycle safety when riding at night on rural road area	Lowest	45.80%	54.20%	Highest
Motorcycle safety when riding at night on urban road area	Lowest	77.10%	32.90%	Highest

TABLE 7. Drivers' experience in near-miss incidents and road crashes with motorcycle at night

Description	Near-Miss Incident		Road Crash	
	Yes (%)	No (%)	Yes (%)	No (%)
Driving at junction road on urban road area	79.2	20.8	25.0	75.0
Driving at straight road on urban road area	54.2	45.8	12.5	87.5
Driving at junction road on rural road area	72.9	27.1	10.4	89.6
Driving at straight road on rural road area	52.1	47.9	6.3	93.8

TABLE 8. Drivers' opinion on motorcycle safety with regards to conspicuity enhancement.

Description		Ratings		
Motorcycle and motorcyclist conspicuity is one of the main causes of motorcycle crashes at night	Strongly Disagree	4.20%	95.80%	Strongly Agree
Bright-coloured helmet and attire improve motorcyclist conspicuity	Strongly Disagree	4.20%	95.80%	Strongly Agree
Bright-coloured helmet and attire increase road users' awareness of motorcycle	Strongly Disagree	0%	100%	Strongly Agree
Motorcycle fitted with retro-reflective tape on the sides of the motorcycle body can improve motorcycle conspicuity	Strongly Disagree	0%	100%	Strongly Agree
Motorcycle brand decals made of reflective materials will improve motorcycle conspicuity	Strongly Disagree	10.40%	89.60%	Strongly Agree

From the drivers' feedback on the incidents or crashes data, it can be explained that most of the near-miss incidents and crashes happened in urban areas due to motorcyclists' carelessness such as lane filtering, excessive lane changing, no signal turns and malfunctioning brake lights. As for the crashes in rural areas, more than 60% of the drivers reported that conspicuity is the issue as riders found to have ridden with malfunctioned lights, improper attire colours, and no signal turns.

DRIVERS OPINION ON CONSPICUITY ENHANCEMENT

In section C2, drivers were asked for their opinions of conspicuity factor on road crashes, the importance and enhancement of motorcycles and motorcyclists' conspicuity suggested by the authors. The results were tabulated in Table 8.

Most of the drivers believe that conspicuity issues have always been one of the major factors of road crashes at night and they believe that wearing proper attire may help in enhancing motorcyclists' conspicuity and thus may help to avoid motorcycle crashes.

Drivers also agreed that they will be more aware of motorcycles equipped with brighter appearances. Furthermore, drivers concurred that adding retro-reflective tapes on the sides of the motorcycle body may enhance motorcycle conspicuity and similar results recorded if the motorcycle decals are made from reflective materials.

The findings are similar to opinions from motorcyclist respondents who agreed that wearing bright-coloured helmet and attire on top of adding new safety features at the motorcycle body will help and improve motorcycle visibility and conspicuity.

CONCLUSION

The preliminary findings from this study explained that motorcyclists believe that they are always in danger when riding on the road especially at night. Furthermore, they believe that they are further at risk when they are riding with malfunctioning head and tail lights on top of darker appearances as this will reduce their visibility and conspicuity at night. As a result, near-miss incidents or even high-profile crashes may occur due to their own carelessness.

Nevertheless, preliminary results also suggested that drivers are more aware of motorcycles in rural road areas compared to in the urban areas. This may be due to the lack of road lights in the rural areas which enhances their awareness and focus. Furthermore, drivers also believe that motorcyclists' safety level is higher in rural areas than in urban areas due to motorcycle vulnerability in the urban areas as the urban road design is bigger and equipped with more lanes. This finding relates to drivers' awareness as they are more alert in rural areas with smaller roads which makes them feel that motorcyclists are safer in rural areas.

In addition, from drivers' experience in near-miss and road crashes with motorcycles, most incidents that happened

in urban areas are due to motorcyclist's carelessness. However, the majority of the incidents that happened in rural areas are due to the visibility and conspicuity of the motorcycle.

Furthermore, both motorcyclists and drivers agreed that adding new safety features such as retro-reflective tapes on the side body of motorcycles will help and improve motorcycle visibility and conspicuity, especially at road junctions.

To conclude, the final findings of this study can be used as a reference for the responsible parties to develop new policies in order to help and enhance motorcycle conspicuity and safety in which will lead to reducing motorcycle crashes. For future recommendation, this study suggests an experiment to be conducted with video or photographic view of motorcyclists with new safety features as suggested by the authors in order to determine its effectiveness in enhancing motorcycle conspicuity.

DECLARATION OF COMPETING INTEREST

None.

ACKNOWLEDGEMENT

The authors would like to thank Universiti Kebangsaan Malaysia for their financial support under the grant GGPM-2018-016.

REFERENCES

- Bland, J. M., and Altman, D. G. 1997. Statistics notes: Cronbach's alpha. *BMJ* 314 (7080): 572–572. <https://doi.org/10.1136/bmj.314.7080.572>.
- Saskia de, C., Doumen, M. J. A. and van Norden, Y. 2014. A different perspective on conspicuity related motorcycle crashes. *Accident Analysis & Prevention* 63 (February): 133–37.
- Jawi, Z. M., Solah, M. S., Ariffin, A. H., Shabadin, A., Ali, A., Osman, M. R., & Wong, S. V. 2017. Automotive consumerism: A study of car user's practices & behaviour in Klang Valley, Malaysia.
- Krejcie, R. V. and Morgan, D. W. 1970. Determining sample size for research activities. *Educational and Psychological Measurement* 30 (3): 607–10.
- Khalid, M. S. A., Jawi, Z. M., Isa, M. M., Solah, M. S., Hamzah, A., Paiman, N. F. & Osman, M. R. 2018. The use of safety warning triangle among Malaysian private vehicle users. *Journal of the Society of Automotive Engineers Malaysia* 2(2).
- Law, Teik Hua, Mahshid Ghanbari, Hussain Hamid, Alfian Abdul-Halin, and Choy Peng Ng. 2015. Examining the effect of visual treatments on truck drivers' time-to-arrival judgments of motorcycles at t-intersections. *Transportation Research Part F: Traffic Psychology and Behaviour* 33 (August): 66–74.
- Law, Teik Hua, Mahshid Ghanbari, Hussain Hamid, Alfian Abdul-Halin, and Choy Peng Ng. 2016. Role of sensory and cognitive conspicuity in the prevention of collisions between motorcycles and trucks at t-intersections. *Accident Analysis & Prevention* 96 (November): 64–70.

- Lee, Yee Mun, and Sheppard, E. 2018. The effect of lighting conditions and use of headlights on drivers' perception and appraisal of approaching vehicles at junctions. *Ergonomics* 61 (3): 444–55. <https://doi.org/10.1080/00140139.2017.1364790>.
- Mohammad Saad Shaheed, Gkritza, K. and Marshall, D. 2012. Motorcycle Conspicuity – What Factors Have the Greatest Impact. MTC Project 2011-01. Iowa State University.
- Mohd Khairudin, Rahman, M. I., Mohd Hafzi and Hamzan Azhar. 2013. Amber position lamp as daytime running light for motorcycle. *Advanced Engineering Forum* 10 (December): 357–60.
- Mohd Khairudin Rahman, Mohd Syazwan Solah, Azhar Hamzah, Noor Faradila Paiman, Mohd Firdaus Siam, Aqbal Hafeez Ariffin, Norlen Mohamed, and Wong Shaw Voon. 2014. Visual masking of motorcycle turn signals by amber position lamps. *Australian Journal of Basic and Applied Sciences* 8 (14): 1–6.
- Mohd Syazwan Solah, Azhar Hamzah, Aqbal Hafeez Ariffin, Mohd Khairudin Rahman, and Norlen Mohamed. 2013. 'Prevalence Study of Motorcycle Lightings and Conspicuity'. Proceedings of the Southeast Asia Safer Mobility Symposium 2013, October, 64–67.
- Rogé, J., Laurent, S., Ndiaye, D., Aillerie, I. and Vienne, F. 2018. Does a yellow jacket enhance cyclists' sensory conspicuity for car drivers during daylight hours in an urban environment? *Safety Science* June. <https://doi.org/10.1016/j.ssci.2018.06.023>.
- Rogé, J., Ndiaye, D., Aillerie, I., Aillerie, S., Navarro, J. and Vienne, F. 2017. Mechanisms underlying cognitive conspicuity in the detection of cyclists by car drivers'. *Accident Analysis & Prevention* 104 (July): 88–95.
- Royal Malaysian Police. 2017. Malaysia Road Accident Statistical Report 2017.
- Shahbazi, Mehri, Abdolhossein Farajpahlou, Farideh Osareh, and Alireza Rahimi. 2019. Development of a scale for data quality assessment in automated library systems. *Library & Information Science Research* 41 (1): 78–84.
- Wells, S., Mullin, B., Norton, R., Langley, J., Connor, J., Jackson, R., & Lay-Yee, R. 2004. Motorcycle rider conspicuity and crash related injury: Case-control study. *Bmj*. 328(7444): 857.