

Evaluating the On-Street Bicycle Lane and Bicyclist Safety in Malaysia

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Abstract – Cycling is getting a trend as one of the physical activities in Malaysia. In line with that, the government introduced a morning car-free day and enhanced bicyclist facilities, especially in the residential area in 2014. Though facilities like bicycle lanes are provided, bicyclists do not use them. This study was designed to observe and analyze bicyclist perceptions of the underutilization of bicycle facilities. Two types of data collection were conducted; (i) observation at five (5) selected on-street bicycle lanes in Klang Valley, and (ii) online survey ($n=520$, and out of this 85% were bicyclists). The observation found that only 7% of bicyclists cycle in the residential area during the study period. Meanwhile, the study also found the sharing path between the motorway and bicycle lane may increase the number of misuses (motorized parked or driving through the bicycle lane) which in turn reflects the utilization rate of the bicycle lane. Bicyclist safety continues the main obstacle to promoting bicycle lanes in Malaysia. The bicyclist denies the drivers always giving way and priority to them.

Keywords: Bicyclist, on-street bicycle lane, safety

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1.0 INTRODUCTION

Nowadays, cycling is seen as a trend among Malaysians. The KL Car Free Morning was one of the initiatives to encourage a healthier lifestyle as well as create awareness about alternative modes of transportation (Shokoohi & Nikitas, 2017). This also is expected to decrease the number of motorized vehicular crashes, reduce road congestion, and promote sustainable low-carbon transport mode. It has personal and population health benefits which can be used as the main transport mode as well as a feeder to mass public transit systems (Agarwal et al., 2020).

The first Kuala Lumpur dedicated bicycle path – a 5.5 km stretch from Mid Valley to Dataran Merdeka – was opened in 2015 to support the abovementioned healthy trend (Lee, 2015). It is also to encourage a cycling culture among Malaysians. On the other hand, the state of Selangor also aims to develop a 1,000km bicycle lane in 2022 (Madfa, 2017). However, insufficient, or unplanned infrastructure and lack of adequate cycling infrastructure could

contribute to a significant number of bicycle-vehicle crashes (Vanparijs et al., 2016).

Several studies conducted show that most motor vehicle users were not ready to consider cycling as an alternative (Nasrudin et al., 2013). It might be affected by the topography and the weather constraints (Jalalkamali & Ghraei, 2012). According to Malaysia's national road crash statistics, 70% of the total number of reported bicycle-related crashes were fatal cases (PDRM, 2018). This number contributed to about 2% of total road fatalities in Malaysia.

The introduction of the new infrastructure has increased bicycle share mainly on direct, continuous routes and on routes with a better cycling landscape (Law et al., 2014). Making effective bicycle lanes has become a critical task for governments promoting the cycling lifestyle, as well-planned cyclist tracks can reduce traffic congestion and decrease risks for cyclists and other vehicles by between 9% and 50% (Jie Bao, 2017; Elvik et al., 2009; Reynolds et al., 2009), which in turn make cyclists feel more secure on the roads (Jensen, 2006).

There were a few types of bicycle lanes and signs in Malaysia, which designate an exclusive space, a buffered bicycle lane or lane separating from other vehicles, a contra-flow bicycle lane, and a left-side bicycle lane (NACTO, 2011). Bicycle lanes should be designated using signs or painted symbols and other vehicle parking restrictions (SRTS, n.d.). Previous research indicates that the effectiveness of bicycle lanes differs according to roadway characteristics, and that bicycle lane types are differentially associated with reduced crash risks (Morrison et al., 2019). Figure 1 below shows a few samples of designs of bicycle lanes in Malaysia. It shows most of the bicycle lane in Malaysia was painted and on-street bicycle lane, are shared with a motorway. A study by Wall et al. (2016) indicates that increased injury severity is most severe with shared bicycle routes.



Figure 1: Design of on-street bicycle lanes and signs found during the observation

PLANMalaysia recommended bicycle lane in the housing area (residential) must be at least 1.5m (5 feet) in width as shown in Figure 2 to guarantee comfort for enabling two (2) bicyclists to cycle along at the same time (PLANMalaysia, n.d.). Besides, this bicycle lane must be wider in the neighborhood center area or city center.



Figure 2: Bicycle lanes in housing area (residential) must be at least 1.5m (5 feet)

The largest Canadian study on cycling injuries led by Ryerson University suggests cyclists are at risk of injury due to the lack of cycling infrastructure in large urban centers (Ryerson University, 2013). Therefore, to identify how bicycle lanes can reduce the risk among bicyclists, this study is aimed to evaluate the utilization of the existing bicycle lane in Malaysia. Hence, this paper appeals to the government to consider safety concerns due to interactions between bicycles and motorized traffic.

2.0 METHODOLOGY

The data in this study consists of bicycle and motor vehicle position, speed and traffic composition, lane width, and public acceptance of a bicycle lane. To obtain the data, two methods in this study were carried out: on-site observation and an online survey.

2.1 Observation

Five different locations on-street bicycle lanes in Selangor and Kuala Lumpur were selected for this study. All locations selected were similar characteristics, i.e., residential areas. Observers were located at selected points to collect data manually on-site to identify the utilization rate of the bicycle lane. Other aspects of data collection in this observation consist of traffic composition from both directions including bicycles and pedestrians, bicycle lane width, vehicle speed, and positioning to identify the misuses rate. Misuses in this study consist of the vehicle parked or driving thru the bicycle lane. Data collection was collected during the morning peak hour (0700 to 0900 hrs.) on weekdays and weekends.

2.2 Survey Approach and Respondents

To evaluate the acceptance of on-street bicycle lanes, the online survey was conducted in a one-month period using Google Forms. The total number of respondents for this study was 520. The questionnaire was designed to obtain the perception of on-street bicycle facilities in

Malaysia. Respondents’ perceptions about the convenience of the facilities were measured by asking them how well the existing facilities are, their safety feeling, and knowledge or exposure to any road regulations about bicyclists. Respondents’ demographics such as age, gender, income, etc. were also recorded. The survey form was disseminated using the snowball method – gathering information to access specific groups of people (Ghaljaie et al., 2017).

2.2.1 Survey Design

The questionnaires were designed based on a 5-point Likert scale – a type of psychometric response scale in which responders specify their level of agreement to a statement typically in five points: (1) Strongly disagree (SD); (2) Disagree (D); (3) Neutral (N); (4) Agree (A); (5) Strongly agree (SA). The question was divided into demographic information and a sub-section of questions regarding bicyclist and bicycle lane safety.

2.2.2 Respondents’ Demographic

Survey results reflect the opinions of highly more males than females (82% compared to 18%) (Table 1). Most respondents were aged below 45 years (72%). Most respondents indicated that they were well educated: 84.6% of respondents received tertiary education, 14.8% obtained a secondary education and less than 0.5% had primary or never had any education. Despite this overall advanced level of education, they were more respondents who said they earn less than RM5,000 in annual income (43%) than said they earn incomes of at least RM5,000 to RM10,000 (37%) and 20% said to earn more than RM10,000. A large majority of respondents said they live in the urban area (86%). Survey results also reflect the opinions of highly more bicyclists than not bicyclists (85% compared to 15%) involve in this study.

Table 1: Characteristic of respondents (N=520 (%))

Gender		Age Group	
(1) Male	429 (82)	(1) < 45 years	377 (72)
(2) Female	91 (18)	(2) > 45 years	143 (28)
Residential Area		Level of Education	
(1) Urban	443 (85)	(1) Primary	3 (1)
(2) Rural	77 (15)	(2) Secondary	79 (15)
		(3) Tertiary	438 (84)
Household Monthly Income		Group	
(1) < RM5,000	223 (43)	(1) Bicyclist	443 (85)
(2) RM5,001 – RM10,000	193 (37)	(2) Not bicyclist	77 (15)
(3) > RM10,000	104 (20)		

Respondents also asked about their perception of the on-street bicycle lane. Furthermore, the same respondents were asked about the availability of bicycle lanes in their area. As shown in Figure 3 below, the availability of bicycle lanes in Malaysia was low when only 24.04% of respondents stated the availability of the bicycle lane in their area. While 76.1% stated “No” bicycle lane in their area. Most of the respondents (93.27%) give a positive response (Yes) when asked about the necessity of the bicycle lane in their area and agreed to utilize it (96.15%).

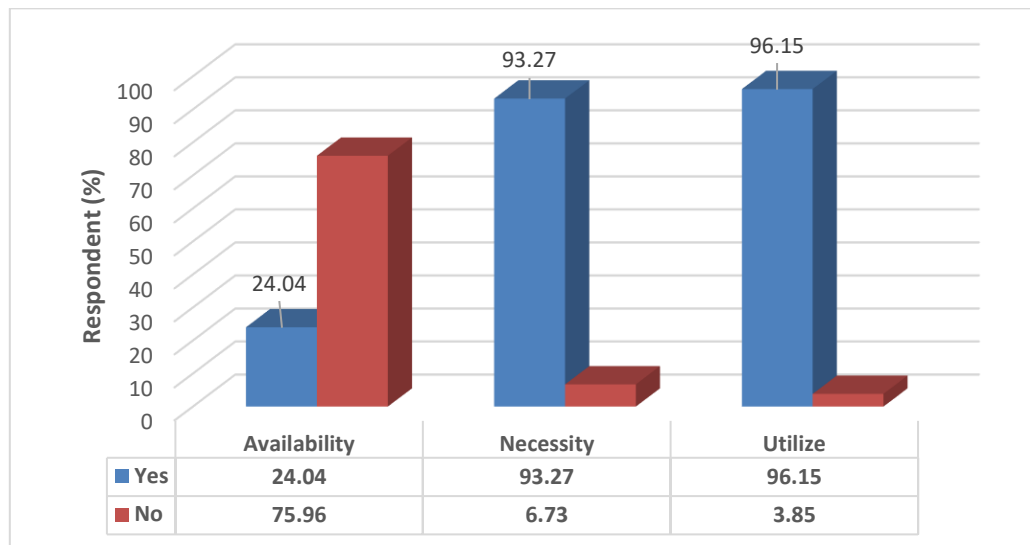


Figure 3: Availability, necessity, and utilization of bicycle lanes from the responses

3.0 RESULTS AND DISCUSSION

3.1 Effectiveness of On-street Bicycle Lane

Table 2 below shows most of the on-street bicycle lane in the study area was designated between 1.0m to 1.2m wide which did not comply with the recommendation from PLANMalaysia except at Putra Height (2.0m) and follow the motor vehicle direction. Even though studies show that 3 to 6-feet wide on-street bicycle lanes provide adequate space for interaction safety between bicycles and motorized, there is a lack of enough evidence on the effectiveness of these on-street bicycle lanes in enhancing the safety of bicyclists on roads (Pulugurtha & Thakur, 2015). This can reduce their perception of comfort when bicycle traffic becomes large (Li et al., 2012).

Traffic composition during weekdays shows a higher number of motor vehicles as compared to bicyclists and pedestrians. The study also found the average number of bicyclists was low during the weekday as compared to other vehicles except at Bukit Indah (2%). This shows the difference during the weekend when the number of motor vehicles was slightly decreased as compared to a weekday. Thus, the presence of bicyclists shows an increase on the weekend as compared to the weekday.

Results also found the utilization rate shows low at Bukit Indah during the weekday (31%) and Melawati during the weekend (59%). Whereas full underutilization of on-street bicycle lanes shows at Putra Height when the result shows the utilization rate was 44% and 39% during weekdays and weekends respectively. This might be reflected by the number of misuses when the result shows the misuse of bicycle lanes at Putra Height was show higher during the weekday (27%) and weekends (15%) as compared to other locations.

This study also found the presence of bicyclists among motor vehicles show risky to the bicyclist when the speed shows a huge gap between the speed of a bicyclist and motor vehicles. The speed of bicyclists shows up to 34km/h during weekdays meanwhile motor vehicles show up to 94km/h. More shocking when motor vehicles' speed shows up to 107km/h during the weekend as compared to bicyclists only 36km/h. A study by Wall et al. (2016) also stated that

“sharrows” (painted arrows indicating shared bicycle and motor vehicle use) are less effective than bicycle lanes marked with painted lines.

Table 2: Characteristics of bicycle lane

VARIABLE	LOCATION = N (%)				
	Melawati	Pandan Indah	Bukit Indah	Putra Height	Sungai Long
Bicycle Lane Width (m)	1.2	1.0	1.2	2.0	1.0
Follow the Traffic Direction	Yes	Yes	Yes	Yes	Yes
Type	Painted	Painted	Painted	Painted	Painted
Traffic Composition:					
Weekday					
Motor Vehicle	1,926 (99)	4,035 (100)	1,204 (89)	6,380 (100)	3,273 (100)
Bicycle	5 (0)	11 (0)	32 (2)	18 (0)	13 (0)
Pedestrian	10 (1)	0 (0)	112 (8)	2 (0)	9 (0)
Weekend					
Motor Vehicle	805 (91)	1,375 (99)	567 (81)	2,881 (99)	1,557 (97)
Bicycle	61 (7)	10 (1)	21 (3)	36 (1)	25 (2)
Pedestrian	18 (2)	3 (0)	109 (16)	2(0)	15 (1)
Utilization Rate:					
Weekday					
Weekday	5 (100)	11 (100)	10 (31)	8 (44)	12 (92)
Weekend	36 (59)	10 (100)	20 (95)	14 (39)	25 (100)
Misuse:					
Weekday					
Weekday	70 (4)	37 (1)	38 (3)	1,713 (27)	51 (2)
Weekend					
Weekend	40 (5)	0 (0)	3 (1)	435 (15)	15 (2)
Max Speed (km/h):					
Weekday					
Motor Vehicle	82	61	73	94	80
Bicycle	34	10	20	13	12
Weekend					
Motor Vehicle	80	72	71	107	89
Bicycle	36	29	26	15	26

3.2 Assessed Risks to Bicyclists at Bicycle Lane

Figure 4 below shows bicyclist safety concerns are the main obstacles to boosting the bicycle as a mode of transport (Sallis et al., 2013). It shows that 81.04% of bicyclists “strongly agree” traffic laws relating to the safety of cyclists should be enhanced. They also feel unsafe when 32.28% of them stated “neutral” meanwhile 30.93% stated “disagree” when asking “the other driver was driving slowly when saw bicyclist”. Most of the bicycle lane in Malaysia was designed to share the path with other motor vehicles. Unfortunately, this can bring a sense of unsecured among cyclists when 71.78% of them stated they “strongly agree” feel comfortable cycling on a path with no other vehicles. Bicyclists also stated that other road users did not give priority to bicyclists (24.38%). They also stated get less concern from other road users (23.93%) and feel unsafe when cycling at the intersection (27.31%).

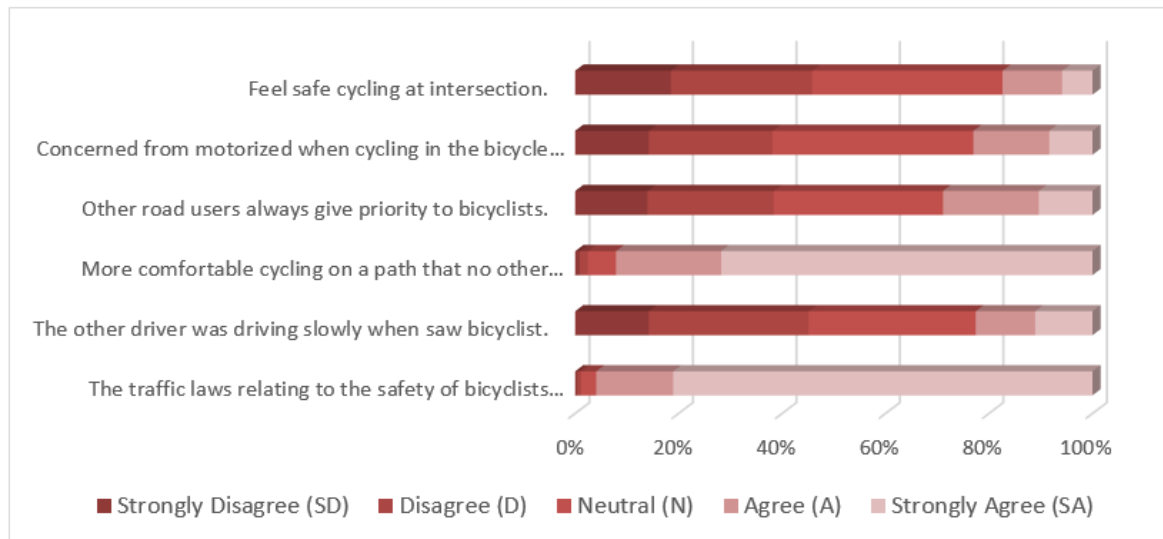


Figure 4: Safety assessment in bicycle riding

3.3 Perception of Bicycle Lane Safety

The problem of bicycle lane facilities continues to increase the frequency and leads to the need for improvement. Figure 5 below shows only 2.93% of the respondents “strongly agree” bicycle lane is well maintained and 15.12% stated it is safe to use. Likely, most of the respondents were familiar with the bicycle lane in Malaysia when 28.89% stated neutral and 23.48% agree. However, when asking either the bicycle lane is equipped well with facilities and convenience to use, the result did not show any difference between agreeing and disagree when 41.76% and 33.27% respectively stated “neutral”. Respondents also strongly agree and agree bicycle lane signage is easy to understand, 32.88% and 38.85% respectively. Unfortunately, respondents feel the bicycle lane is unclear seen when only 21.54% agree and 10.58% strongly agree that bicycle lane can be seen. They also feel the bicycle lane in Malaysia should have the appropriate design (72.69% strongly agree).

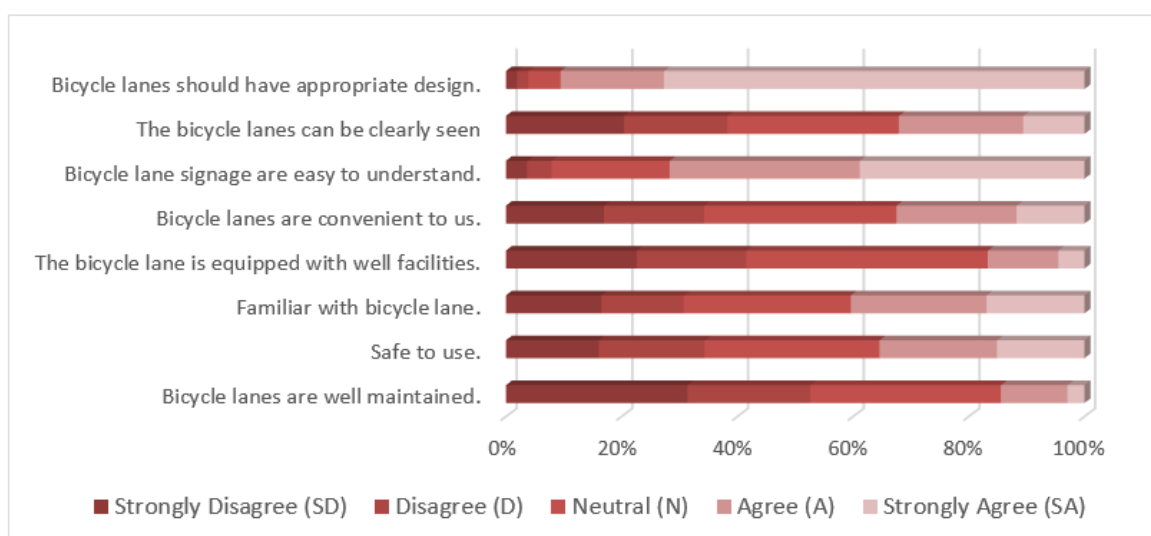


Figure 5: Perception of safety at the bicycle lane

3.4 Drivers' View towards Bicyclist at Bicycle Lane

Most of the drivers stated they “agree” (30.00%) and “strongly agree” (18.08%) bicyclist was easy to recognize at the intersection (Figure 6). Besides, they are also easy to see when cycling using the bicycle lane (35.38% agree and 24.23% strongly agree). The result has also been denied from the bicyclist perception when drivers stated the 37.12% “agree” and 47.50% “strongly agree” when asking about giving way to the bicyclist. Drivers highly “agree” and “strongly agree” easy to see bicyclists, which cycling follow the traffic flow, 32.88%, and 31.54% respectively. As a driver, they also stated they understand the laws and regulations for a bicyclist (31.54% agree and 41.54% strongly agree).

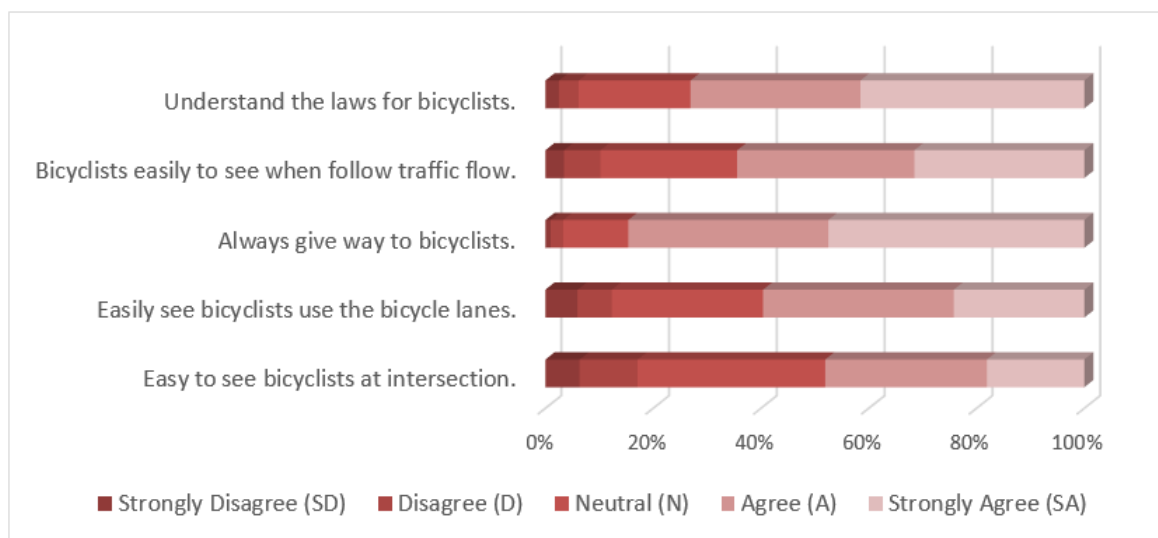


Figure 6: Drivers' perception

4.0 CONCLUSION

Bicycle lanes should be designed to enhance the safety of bicyclists and increase safety perception toward road users. At the same time, it also needs to guarantee comfort and encourage bicyclists to fully utilize it. Even though guidelines stated the bicycle lane must be wider in the neighborhood area, study shows otherwise. The government should assess the level of safety of cyclists as it is the main obstacle to promoting bicyclists' use of bicycle lanes in Malaysia.

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