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Driver Parking Behaviour: An Observational and Experimental Intervention Study

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Abstract. Illegal parking has become a major problem in Malaysia especially in urban area due to the increased traffic volumes and limited parking space. When the parking facilities are limited, driver factor thus has a significant effect on the formation of traffic congestion. Extensive work has been conducted to address this issue, however most studies did not incorporate the impact of driver behaviour at limited parking condition whereas it is understood that “cruising for parking” at limited parking facilities has a very strong influence on the road traffic jams. Thus, objectives of this study are to analyse drivers’ personality traits which focus on consideration and selfishness traits; and to investigate drivers’ personality traits and their impact on driver parking behaviour in Kuching, Sarawak. Analyzation of driver parking behaviour was based on observational study of driver, vehicle, and situational variables. Experimental intervention then conducted to different age groups of drivers. They were asked to respond to questions that related to the driver parking behaviour characteristic. Analyses of the data reported in this study revealed that most of the drivers are considerate enough but they become a selfish person when confront with difficult situation at the parking space and their action sometimes are susceptible to illegal parking. The findings significantly beneficial to the traffic engineer, policy maker and researcher in enhancing parking control and management system.

1. Introduction

Illegal parking has become a serious issue especially in dense area. Driving etiquettes is often ignored when some of drivers deliberately park their vehicle inappropriate way. Some of drivers tend to double parking, improvise their own parking, and others when supply and demand ratio of parking space is not balance. Land use has an impact on parking demand [1]. If the land use comprised of government service offices, retail stores, banks and others, these will generate a significant numbers of people to come to this area every day and they will demand for a parking space. Illegal parking occurs when the demand of parking space is high while the supply is limited in dense area due to unplan urban growth. This situation will lead to selfish driving behaviour when drivers tend to disobey road and traffic regulation and park their vehicle in appropriate way due to limited parking space.

Illegal parking may cause traffic congestion as claimed by Morillo and Campos [2]. Road will become narrow due to on-street illegal parking and may create a bottleneck. The blockage of lane due to illegal parking may reduce the road capacity and cannot accommodate high demand of traffic. According to Haslinda et al. [3], illegal parking occurs because lack of enforcement, insufficient



warning signage, lack of parking spaces especially in areas where activities are overwhelming and bad driving attitude. Driving behaviour will reflect to driving attitude.

Lin et al. [4] noted that each driver behaves differently depending to their ages, genders, driving experiences, situations, emotions and so on. Hence, their personality traits will influence their behaviour. Therefore, driver parking behaviour can be related as a reason of traffic congestion. Previous studies found that most of the drivers have experienced some form of parking violation and road congestion. Some of drivers who are the victim of parking violation and traffic congestion will respond with horn honking and rude gesture. Although the victims did not commit any offence, but their respond show the bad side of them too. Hence, it is important to look at the drivers' personality traits because it is vital to understand the possible causes leading to such act.

2. Illegal Parking Behaviour

Each vehicle needs a parking space for every trip that they are making. Less supply of parking space will trigger driver to park illegally. Hence, illegal parking is one of the critical issues that cause traffic congestion. Illegal parking will cause obstruction of roadway which will eventually making the road become narrow for traffic movement. In order to overcome traffic congestion, the governments has invested heavily in transportation and infrastructure as stated in the 11th Malaysian Plan (RMK 11). The government has drafted plans to increase the level of transport service to reduce traffic congestion. Meanwhile, under Government Transformation Programme (GTP) agenda, government tries to manage travel demand by enhancing parking control and management especially in urban area. Therefore, in order to overcome and find solution for illegal parking that occur throughout the world, abundance research on parking enforcement have been carried out such as parking enforcement policies for commercial vehicles [5], legalizing the illegal parking, a solution for parking scarcity in developing countries [6], enforcement of illegal parking under the new parking legislation [7] and others. However, it was found across several studies [8-9], level of enforcement towards illegal parked vehicles was low, although regulation and parking policy already exist. In both of their studies, drivers prefer to park illegally near the destination. This is very similar to the finding by Conway et al. as cited in [5], which concluded that drivers commonly park on the bike lane which results in conflict with cyclist.

My Thanh & Friedrich [6] conduct a research in Hanoi and found that illegal parking occurs in 80% where they tend to park their vehicles near the destination for short period and leave immediately after settle their business. They also found that illegal parking occurs more frequently near the sidewalk as it is wide enough for parking. Khan and Lourenco, as cited in [9] claimed that illegal parking creates obstacle for the pedestrian who feel discomfort to walk as the walkway become discontinue.

The different use of land also has significant impacts on driver parking behaviour. When the parking turnover rate is low, drivers tend to park illegally. Yin et al. [10] noted that the traffic condition, land use and economic factor should be considered in arrange parking facilities. For example, Spiliopoulou & Antoniou [8] found that the presence of the train station raises the demand for parking, and generally the illegal parking occurs when the legal spaces have been saturated. Overall, illegal parking is a topic that has been thoroughly studied. However further study of driver parking behaviour will lead to better understanding of why some drivers behave in such a way that cause traffic violation. Hence, in this study we address the issue of illegal parking that trigger traffic congestion with respect to human behaviour.

3. Methodology

Self-administrated questionnaire was used to measure driver parking behaviour. The questionnaire was design to collect the required information from the respondents for research purposes. The questionnaire was divided into three main aspects. The subjects contained in the questionnaire are as follows:

- i. PART A: Background respondents

- ii. PART B: Personality traits (which measure consideration and selfishness traits)
- iii. PART C: Roadside illegal parking behaviour (which consist of 3 situations)

Before the data collection activity was carried out, a pre-test of questionnaire was done to ensure that the questions forms are easy for the respondents to understand and full cooperation can be expected from respondents. According to Dikko [11], a preliminary study serves as a tool of helping to detect any mistake or error in the measurement. Hence, pre-testing the instrument on 30 samples of respondents having the same characteristic as those in the main study was executed to get the information and response on the questionnaire. It was found out that the overall respondents had understood the questions presented in the questionnaire.

In part A, five questions on background respondent such as gender, age groups, driving experiences, involvement in road accident and number of parking summonses received was asked as it may help researcher to relate the factors may influence a respondent's choice of answer. In part B, participants were asked to complete the questionnaires which assess their personality traits on parking behaviour. The questionnaire is conducted to measure selfishness (concern only for own interest regardless for others) and consideration (kindness and thoughtful regard for others). These two personality traits were selected in this study as, consideration trait can lead the driver to park their vehicle in designated parking space while selfishness trait will lead the driver to park their illegally. Seven questions are given which represent each consideration situation and selfishness situation.

Whereas, in part C, participants were evaluate through questions after watching a video that contains roadside illegal parking in three main roads within Kuching city. The video acts as a tool to trigger participant's reaction regarding the scenario. The participants were asked three questions which represent situation 1, situation 2 and situation 3. Situation 1 indicates that drivers will double park their vehicle which is parked legally if designated parking spaces have full. Situation 2 explains about drivers will park their vehicles illegally when valid parking space is full. Whereas situation 3 explains that the drivers do not think that they are selfish when they park their vehicles illegally on the roadside because other people do that also.

3.1. Sample and Data Collection

Data collection from respondents was conducted through questionnaires and distributed to local people who live in Kuching and has driving license. The majority of the respondents who participated in this study are those who always drive around the study area; Jalan Tun Abang Haji Openg, Jalan Main Bazaar and Jalan Gambir as shown in Figure 1 [12]. In this study, the questionnaire is conducted to measure selfishness (concern only for own interest regardless for others) and consideration (kindness and thoughtful regard for others). The questionnaire consists of a combination of questions which are developed specifically after reviewing process. Questionnaire with both version of English and Malay language is used. In this study, we had used random sampling method in the approach to obtain a sample of respondents. The reliability analysis of the instrument had a Cronbach Alpha value of 0.813 which indicated that the closer the Cronbach alpha value to 1, the greater the internal consistency of the items in the scale [13]. With a population in Kuching City between 325,135 to 1 million at 95% confidence interval for the estimation to be within $\pm 5\%$ error, the required sample size was around 384. A minimum sample size 384 were needed to reduce biases and sufficient to represent the general characteristic of the population in Kuching. Only 402 questionnaires manage to be collected and being considered for further action.



Figure 1. Three main roads for study area are labelled with red box [12].

4. Results

In this study, data analysis was conducted through SPSS using descriptive analysis, which includes measure of central tendency such as mean, standard deviation, and measure of frequency values. Once the data have been appropriately described, then inferential analysis was used to make reasonable analyses on driver parking behaviour. Non-parametric test such as Kolmogorov-Smirnov and the Shapiro-Wilk for normality test and Spearman rank correlation test were employed.

4.1. Demographic Result.

Sample of respondents consisted of 402 participants where 58.7% are males while 41.3% are females. There were four age groups in this survey specifically: 30 and below, 31 to 40 years, 41 to 50 years and 51 and above. Most of the drivers had 11-20 years of driving experiences. The summon result shows that 31.3% of respondents had received one and over traffic parking summon while the rest of them were not received any for the last 12 months. The majority of respondents 36.1% were in age group of 30 and below while the rest of them were older. Age of respondents can be interpreted as age group below than 50 years were dominated as they drive more than older drivers. All age groups were male dominated with the higher percentage of driver involved in collisions in the last 12 months as shown in Figure 2. However, there were more young male drivers involved in collision than older drivers. Tabibi [14] noted that rate of accident can be relate to driving behaviour where drivers with high risk behaviour and unsafe road practices often involved in road accidents. Therefore, accident involvement also can be relate to parking behaviour as well. The drivers with risky driving style and unsafe road practices also have tendency to park their vehicle illegally as they being selfish and refuse to obey traffic rule and regulation. This is compatible with the finding of Hu et al. [17].

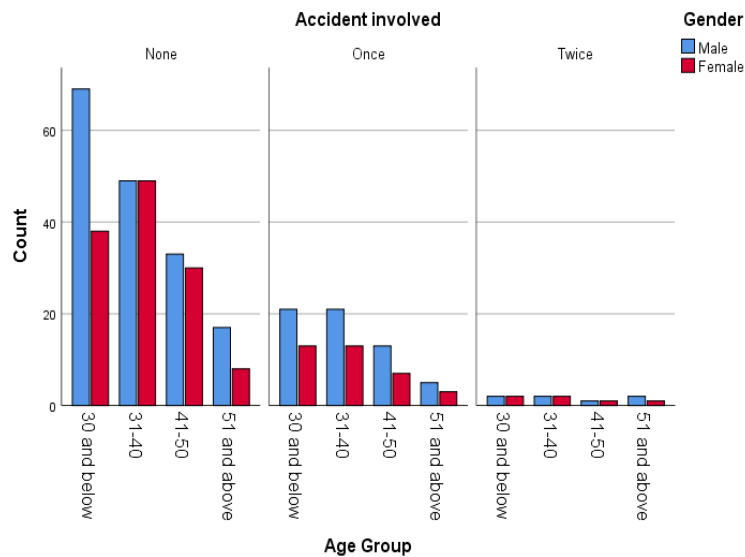


Figure 2. Respondent's age group involved in road accident in last 12 months.

4.2. Descriptive Analysis

The results of the survey have been tabulated based on mean and standard deviation of important survey factors. Respondent's personality traits was measured using 14-items which are divided into two subscales: consideration and selfishness. Consideration traits was measured using 7-items representing situation of kindness and thoughtful regard for other road users. Whereas selfishness traits also were measure using 7-items where seven potentially selfishness situations were asked and respondents were required to rate the statement of consideration and selfishness traits based on four-point Likert scale. (1= none of the description fits me), (2= only some of this fit me), (3= half of the description fits me) and (4=the statements describe me perfectly). Their responses were scored to provide overall measure of their propensity to become consider and selfish. The questions were designed to evaluate the consideration and selfishness traits among drivers. General situation related to driving behaviour on the road (not restricted to parking situation only) were asked. The analyses result from consideration and selfishness traits will be used to relate with the situation 1, situation 2 and situation 3 in part C.

The mean and standard deviation score for each item are listed in Table 1 and Table 2. Result of C1, C2, C3, C4 and C5 shows the score ranged between 2.88 to 3.16 suggesting that description of those consideration situations are half fits the respondents' behaviour. In addition, C6 showed that most of the respondents will never use their horn to indicate their annoyance to other road users. Meanwhile, C7 showed none of respondents claim that they are not considerate the needs of other driver. Most of respondents always consider and showing their empathy towards other drivers. Hence, based on the responses, it can be concluded that the average mean score for consideration traits was 2.85 out of 4 suggesting that drivers sometimes kindness enough and thoughtful regard for other road users.

Table 1. Means and standard deviation of consideration responses.

Item	Description	Frequency distribution of responses				Mean	SD
		1	2	3	4		
		Consideration (Mean =2.85)					
C1	You will give consideration to vehicles which have indicate their intention to change lanes	34 (8.5%)	57 (14.2%)	179 (44.5%)	132 (32.8%)	3.02	0.900
C2	When driving on the road, you will give consideration to other vehicles entering the road from the slip road	19 (4.7%)	94 (23.4%)	164 (40.8%)	125 (31.1%)	2.98	0.858
C3	You will give way to buses to move out from stops	27 (6.7%)	77 (19.2%)	215 (53.5%)	83 (20.6%)	2.88	0.809
C4	You will give way to pedestrians who crossing the road even there is no marked crossing	6 (1.5%)	98 (24.4%)	204 (50.7%)	94 (23.4%)	2.96	0.733
C5	You will slow down and move to the side and let the emergency vehicles overtake you	0	84 (20.9%)	169 (42%)	149 (37.1%)	3.16	0.745
C6	You will use your horn to indicate your annoyance to another road user	139 (34.6%)	131 (32.6%)	75 (18.7%)	57 (14.2%)	2.12	1.042
C7	I will always consider the needs of other drivers when driving	0	118 (29.4%)	228 (56.7%)	56 (13.9%)	2.85	0.645

The result of S3 declares that most of the respondents at least have tried to take chance and go through lights that have turned red. S5 is another proof that most of the drivers would become selfish when they attempted to overtake slow moving vehicle when they were queuing. In addition S2 prove that some of the respondents were intentionally drive in the emergency lane while most of them will not drive in the emergency lane. Based on all of these justifications, the mean score for selfishness traits was 1.97 indicated that most of the drivers have at least being selfish while driving depending on situation.

Table 2. Means and standard deviation of selfishness responses.

Item	Description	Frequency distribution of responses				Mean	SD
		1	2	3	4		
	Selfishness (Mean =1.97)						
S1	If you accidentally scratched, dented or damaged another car, no matter how minor the damage you will leave without admit your fault	156 (38.8%)	148 (36.8)	90 (22.4%)	8 (2%)	1.88	0.823
S2	You deliberately drive in the emergency lane	184 (45.8%)	137 (34.1%)	63 (15.7%)	18 (4.5%)	1.79	0.866
S3	You always take a chance and go through lights that have turned red	142 (35.3%)	203 (50.5%)	57 (14.2%)	0	1.79	0.672
S4	When you are crawling along in rush hour traffic, you will let someone in from a side road	116 (28.9%)	177 (44%)	85 (21.1%)	24 (6%)	2.04	0.860
S5	You attempted to overtake slow moving vehicle when they were queuing	96 (23.9%)	106 (26.4%)	122 (30.3%)	78 (19.4%)	2.45	1.057
S6	You always park where it is not allowed and risk a fine.	219 (54.5%)	156 (38.8%)	27 (6.7%)	0	1.52	0.620
S7	I am a selfish person when driving on the road	66 (16.4%)	177 (44%)	135 (33.6%)	24 (6%)	2.29	0.810

4.3. Correlation Analysis

Normality test were carried out to calculate the frequency of selfishness and consideration behaviours in other drivers. Result of Kolmogorov-Smirnov and the Shapiro-Wilk normality test for consideration and selfishness behaviour indicate that both tests have significant values less than 0.05. This value indicates that the frequency distribution of value for both behaviours did not show normal distribution. Therefore the correlation analysis using spearman rank correlation method is the most appropriate method for this study.

Spearman Rank correlation was used to test the correlation between consideration and selfishness personality with roadside illegal parking behaviour. The results showed that there was a significant strong relationship between selfishness trait and roadside illegal parking behaviour for situation 1, situation 2 and situation 3 with correlation coefficient 0.682, 0.751 and 0.745 respectively at the level 0.01. However as showed in the Table 3, the correlation between consideration trait and roadside illegal parking behaviour for situation 1, situation 2 and situation 3 is 0.089, 0.081 and 0.058 respectively. It shown that the correlation is not significant and the two variables are not linearly related as the value is approaching to 0 and $p > 0.05$.

Table 3. Correlation between personality trait and roadside illegal parking behaviour.

Correlations						
Variables		considerati on trait	selfishness trait	Roadside illegal parking behaviour (situation 1)	Roadside illegal parking behaviour (situation 2)	Roadside illegal parking behaviour (situation 3)
consideration trait	Correlation Coefficient	1.000	.032	.089	.081	.058
	Sig. (2-tailed)	.	.517	.075	.104	.246
selfishness trait	Correlation Coefficient		1.000	.682**	.751**	.745**
	Sig. (2-tailed)			.000	.000	.000
Roadside illegal parking behaviour (situation 1)	Correlation Coefficient			1.000	.671**	.688**
	Sig. (2-tailed)				.000	.000
Roadside illegal parking behaviour (situation 2)	Correlation Coefficient				1.000	.727**
	Sig. (2-tailed)					.000
Roadside illegal parking behaviour (situation 3)	Correlation Coefficient					1.000
	Sig. (2-tailed)					

** . Correlation is significant at the 0.01 level (2-tailed).

5. Discussions

The current study investigated the drivers' personality traits and their impact on driver parking behaviour in Kuching, Sarawak. There were two kinds of personality traits being focus in this study which were consideration and selfishness traits. Overall, majority of respondents claim that they are more considerate rather than being selfish while driving on the road. The result from Table 1 shows about 13.9% of respondents admit that they always consider the needs of other drivers when driving on the road. However, when they were being asked whether they are a selfish person when driving on the road, only 6% of them admitted. Majority of them claims that they will become selfish depending on the situation. The respondents refuse to admit that they are more selfish than considerate when being asked. However, results from correlation analysis prove that they are more selfish as the result show positive relationship with the given situation.

On the other hand, the result on consideration traits did not correlated with roadside illegal parking behaviour on the road. No significant correlations are shown with the frequency of illegal parking behaviour for all situations 1, 2 and 3. However, the findings contradict to the finding by Ismail et al. [15], as they found that low empathy traits correlate significantly with driving behaviour. Although the result showed that most of respondents think that they show enough empathy or considerate towards others, but there are situational variables such as mood, feeling, stress at the moment that play a role and may cause consideration trait change into selfishness trait when drivers confront with real situation. This finding is in line with the finding of Sucha et al. [16].

Meanwhile, the results from correlation analysis selfishness trait significantly correlated with roadside illegal parking behaviour for all situations 1, 2 and 3. When these three situations being asked to respondents, their respond towards the questions represent that they were selfish when come into this kind of situation. This is in line with the finding of Hu et al. [17], which mentioned that unsafe driving behaviour will lead to illegal parking. On top of that, traffic speed will be reduced while traffic density will be increased with the increasing number of unsafe driving behaviour. This finding also was supported by numerous studies [15-17], which found that personality traits were related to driving behaviour. Roadside illegal parking will reduce traffic speed, hence volume of traffic will increase and this scenario may lead to traffic congestion. Hu et al. [17] also claimed that roadside parking will cause subsequent vehicles waiting in line or deceleration while waiting the respective vehicle from drive way to park their vehicle.

Driver's behaviour is a very complex matter that is influence by human factors such as people's ability, skill, knowledge and personality traits (such as selfish, empathy, consideration and anger). This was supported by previous study [16, 18]. Personal characteristic such as gender, age, driving experience correlated to driving behaviour. The reason why driver are prone to getting selfish not only due to personal characteristic but can also be relate with situational factors such as road congestion, time constraint, competitiveness and others [19].

6. Conclusions

This study has highlighted the consideration and selfishness trait in affecting roadside illegal parking behaviours. Major conclusions drawn from this study are as follows;

- i. Number of accident involvement by driver can be relate to parking behaviour as driver with risky driving style and unsafe road practices have tendency to park their vehicle illegally.
- ii. Most drivers are considerate when driving on the road however they will turn into selfish person when they confront with difficult situation in parking space.
- iii. The results suggest that those drivers who become selfish when driving on the road are susceptible to illegal parking behaviour.

Hence, these findings can provide useful information for public transport providers in the efforts of improving road safety and traffic congestion. It is recommended to increase the supply of transportation facilities and strengthen the traffic management in order to properly guide and control the transportation demand. Besides that, driver's evaluation on personality trait should be proposed to be included in the process of taking license course at driving school.

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