

An empirical study on the influence of on-road static obstacles on driver behaviour

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Understanding the influence of static obstacles on driver behaviour is important because drivers' instinctual reactions may pose serious hazards to safety and mobility. The effects of road geometry, road-side infrastructure and static objects near the road on driver behaviour have been studied extensively. However, no studies discuss the influence of two variables that are to likely to affect driver behaviour: obstacle size (width and length) and the side on which the static obstacle is present (driver's side or passenger's side). Controlled experiments were conducted using an instrumented vehicle to collect instantaneous driver behaviour data in the presence of on-road static obstacles. The results show that the side on which the obstacle is present influences the lateral gap. The results also show that obstacle size, both in terms of width and length, affects driving speed and the lateral gap. The results of this study can aid in the analysis of safety and mobility issues related to partial lane closures, stopped vehicles and similar obstacles.

Keywords: Driver behaviour, obstacle size, on-road static obstacles, lateral gap, vehicle speed.

VEHICLES frequently stop on roads for a variety of reasons, including mechanical failure, flat tires or police intervention. If shoulders are present, vehicles can pull over without obstructing the roadway. However, in many instances, vehicles stop on road segments without shoulders, resulting in full or partial blockage of the carriageway. Similarly, there are often lane closures following a vehicle crash that may block the carriageway. Since these events are unplanned, there is no way to provide sufficient advanced warning to drivers. Obstacles present on the carriageway influence drivers significantly, especially when they are introduced without advanced warning. The behaviour of a driver in the presence of an obstacle on the carriageway also has cascading effects on upstream traffic and can lead to serious consequences, such as dangerous driving or traffic bottlenecks. Understanding drivers' actions in the presence of various obstacles is therefore important for both safety and mobility considerations.

The visual field is the fundamental display for drivers. The drivers gather most information visually. Different objects subtend different visual angles based on their size. Perceived risk depends on the size of the obstacle; the larger the obstacle, higher is the anticipated risk^{1,2}. Once drivers detect an object, they determine its hazard potential. Whether an object is sizeable enough to constitute a hazard depends on the road width and relative size of the object with other familiar objects³. Additionally, the side of the static obstacle can influence the lateral gap maintained from the obstacle. When the obstacle is present on a vehicle's near side (the driver's side), the drivers can clearly see the obstacle and estimate its lateral gap. On the other hand, when the obstacle is present on the far side (the passenger's side), the drivers may not be able to estimate the lateral gap accurately. However, no studies exist that discuss either the influence of different dimensions of obstacle size or the side on which the static obstacle is present.

The objective of the present study is to understand the influence of static obstacles on speed and lateral gap, with the side on which the obstacle is present and two dimensions of obstacle size (width and length) serving as the key independent variables.

Literature review

Driver behaviour is influenced by various factors such as driver experience, and attitude as well as road environment. The different elements of road environment include geometric and infrastructure elements, lane closures, static objects near the road, etc.

Influence of road geometric elements (road width and shoulder width)

Researchers have studied the influence of narrow roads and road width reduction on speed profiles and lateral placement⁴⁻⁶. These studies reported that road width reductions resulted in a significant reduction in vehicle speed. On narrow roads, drivers prefer to drive closer to the road's centre and avoid overtaking other drivers. Green *et al.*⁷ observed that the standard deviation in

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lateral position increased when the roads became wider as drivers tend to become more relaxed.

Some studies have reported that narrow roads reduce driving speed and thus increase road safety⁸⁻¹⁰, whereas wide roads provide drivers with the opportunity to accelerate to dangerous speeds¹¹⁻¹³ and thus increase the likelihood and magnitude of accidents.

Influence of static objects near the road edge

Studies have been conducted to examine whether different types of objects (parked vehicles, barricades), located at different distances from the road edge on multilane highways, have an effect on lateral position, reduction in speed and lateral gap from other vehicles^{14,15}. It was observed that narrower the road and closer the object (for example, equilateral triangle in the study by Michaels and Cozan¹⁴, and car, truck and barricade in the study by Taragin¹⁵) to the road edge, greater was the displacement of the vehicles from their normal paths. Vehicle speed was little affected by the presence of roadside objects on wide roads and in low to moderate traffic conditions. There was a diminishing influence of the roadside object as the number of lanes on the road increased. The type of object did not have a significant influence on the amount of lateral displacement. In a driving simulator study, Van der Horst and de Ridder¹⁶ observed that the type of safety barrier had no impact on travel speed and lateral displacement; only its presence affected the driver.

Influence of specific features of static objects on driver behaviour

Much research has been conducted on the presence and location of static obstacles on safety and driving performance. However, there has only been limited research on the influence of certain specific features of the object, such as its type, orientation and direction of appearance (static and dynamic). Michaels and Cozan¹⁴ analysed different factors of static obstacles on lateral displacement and vehicle speed. One of the factors was orientation of the obstacle. In the first orientation, the base of an equilateral triangle was closer to the pavement, while in the second orientation the apex of the triangle was closer to it. Results from the study indicated that the lateral displacement of the vehicle was higher when the apex of the triangle was closer to the pavement. The difference increased with increase in travel speed and decreased as the object distance increased from the travel path. Participant's age and direction of appearance of obstacle (front or periphery) also influenced the minimum braking distance towards the obstacle. In a simulator study by Martin *et al.*¹⁷ the authors found that older drivers maintained

larger lateral gaps than younger drivers. In their study, the obstacle was on-road pedestrians. The minimum distance was larger when the pedestrian appeared from the periphery compared to the front. However, minimum distance was not significantly different when the pedestrian appeared from the left or the right.

Understanding the influence of object size on the perceived likelihood of collision is important for the analysis of safety and design of interception mechanisms. Several studies have been conducted to understand the effect of size-arrival of objects on collision avoidance and interception mechanisms^{1,18,19}. The studies found that participants viewed larger object to be closer and anticipated that a larger object would arrive first, even if it was farther away. Similar observations were recorded when different sizes of objects had the same heights and were approached from the same distance at the same speed. During the experiments, both width and length of the objects were varied. Caird and Hancock²⁰ studied participants' reactions in a traffic scenario in which different sizes of vehicles approached a left turn. They found that participants perceived that larger vehicles could reach the left turn sooner than smaller vehicles. Similarly, Levulis *et al.*²¹ used a driving simulator to examine whether overtaking judgements depend on the size of the oncoming vehicle. The results showed that more accepted gaps and false alarms occurred when the oncoming vehicle was a motorcycle than when it was a car or truck.

Objectives

Although there are several studies on the influence of the presence, type and location of static objects in the road environment, there are no studies on the influence side of presence of static obstacle and influence of different dimensions of size of the obstacle. Hence, in the present study we examine the following: (i) the influence of side of the static obstacle on gap-to-width ratio. (ii) The influence of width of the static obstacle on driving speed and gap-to-width ratio. (iii) The influence of length of the static obstacle on driving speed and gap-to-width ratio.

Experiment

The method of data collection, experimental design and participants are discussed below.

Method of data collection

Data were collected using an instrumented vehicle, which allows for detailed and accurate collection of instantaneous driver and vehicle response data. The vehicle was equipped with VLP-16 Lidar, four video cameras, IMU-GPS and



Figure 1. *a*, Instrumented vehicle. *b*, Lidar and video cameras mounted on the roof of the vehicle. *c*, IMU-GPS unit. *d*, OBD scanner.

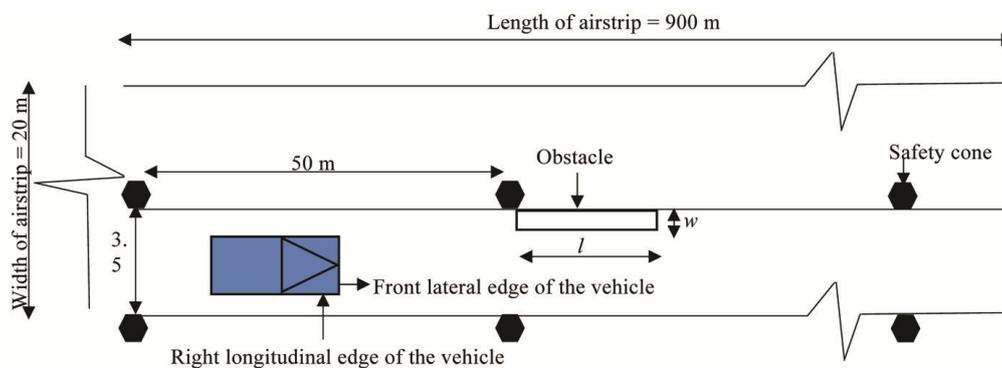


Figure 2. Schematic of test track.

on-board diagnostics (OBD) scanner. The position coordinates (x, y, z) of various objects in the surrounding can be obtained with the help of Lidar; the position of the vehicle and its lateral acceleration can be obtained from the IMU-GPS unit, and speed of the vehicle can be obtained from the OBD scanner. Data collection was done by recording with the help of video cameras. To track objects detected by the Lidar, an object tracking and data extraction algorithm was written in Matlab. The rest of the information (instrumented vehicle position, lateral acceleration and speed) were recorded in .csv files.

The instrumented vehicle was a sports utility vehicle (SUV), 3.98 m long and 1.85 m wide. The Lidar and

video cameras were mounted on the roof of the vehicle. Figure 1 *a–c* provides a snapshot of the vehicle, location of the video cameras and Lidar, OBD scanner and IMU-GPS unit. The sampling frequency of the sensors was 10 Hz.

Experimental design

Drivers are influenced by various factors, which makes it difficult to interpret driver behaviour in specific cases. To avoid uncontrollable external factors, the experiments were conducted on a test track, an airstrip that is 900 m

long and 20 m wide. A 3.5 m wide track was developed with traffic safety cones, which were placed at an interval of 50 m along the length of the track. Two static obstacles were placed using traffic safety cones to reduce the track width in two sections by 0.5 and 1 m. The track width was reduced for lengths of 25 and 100 m, making four static objects of different dimensions. To study the influence of the side of the static object, these four objects were first placed on the driver’s side and then on the passenger’s side. Figures 2 and 3 show the schematic diagram and snapshot of the prepared test track for the experiment respectively.

From previously conducted trial experiments, it was observed that at least 100 m of length from the start of the test track is required to attain the desired speed. Hence, the first obstacle was introduced after a distance of 150 m from the start point.

Participants

Five male drivers, with a minimum of five years of driving experience, participated in the experiment. The participants had no prior knowledge of the purpose of the experiment. Besides the driver, an analyst was also present in the vehicle during data collection. The drivers were instructed to drive within the 3.5 m wide track at speeds of 30 km/h (8.4 m/s), 40 km/h (11.2 m/s) and 50 km/h (14 m/s), as instructed by the analyst. No further instructions were given to the drivers and the analyst had no further interactions with them.

Definition of variables

Drivers perceive obstacles as a risk. The magnitude of risk may depend on the size of the obstacle, driving speed



Figure 3. Snapshot of test track.

and duration of exposure. As the size of the obstacle, driving speed and duration of exposure increase, the perceived risk may also increase. Based on the hazard potential of the obstacle, a driver undertakes suitable countermeasures such as lateral displacement or speed reduction. It is expected that drivers choose a speed and lateral position corresponding to their risk perception.

The side of the vehicle on which the driver’s seat is located is referred to as the driver’s side and the other side (laterally) is referred to as the passenger’s side. In India, where this study was conducted, the driver’s side is on the right-hand side of the vehicle (RHS) when facing forward.

In the present study, track width was reduced from 3.5 to 3 m and 3.5 to 2.5 m for obstacles of 0.5 and 1 m width respectively. The hazard potential of an object depends on the road width and relative size of the object with other familiar objects³. Hence, in order to normalize the lateral gap for different track widths in the presence of different obstacle widths, the gap-to-width ratio, $g_w(t)$, is calculated. In addition, the deviation in instantaneous speed from the instructed speed, $\Delta V(t)$, is calculated.

Box 1 provides a list of the variables used in this study.

Analysis and results

Analyses were done to achieve the objectives of this study.

Influence of static obstacle’s location on gap-to-width ratio

When an obstacle is on the driver’s side, the driver can clearly perceive the lateral gap. However, when the obstacle is on the passenger’s side, the driver may not be able to estimate the lateral gap accurately since the

Box 1. Variables used in the study	
l	Length of the obstacle
w	Width of the obstacle
$g_w(t)$	Gap-to-width ratio at time t .
	$g_w(t) = \frac{S_o(t)}{W_R}$
$S_o(t)$	Lateral distance gap between the static obstacle and the longitudinal edge of the vehicle.
$V_{\text{instantaneous}}$	Instantaneous speed of the vehicle at time t .
$V_{\text{instructed}}$	Speed at which the driver was instructed to drive.
$\Delta V(t)$	$\Delta V(t) = V_{\text{instructed}} - V_{\text{instantaneous}}(t)$
W_R	Reduced track width in the presence of the obstacle. $W_R = 3$ and 2.5 m for 0.5 and 1 m wide obstacles respectively.

Table 1. One-tailed t -test on the influence of side of obstacle on gap-to-width ratio $g_w(t)$

l (m)	$V_{\text{instructed}}$ (m/s)	w (m)	$g_w(t)$ when the obstacle is on left hand side (LHS; m)		$g_w(t)$ when the obstacle is on right hand side (RHS; m)		t -Value	Decision
			Mean	Std. dev	Mean	Std. dev		
25	8.4	0.5	0.35	0.07	0.28	0.02	6.45	Reject H_0
			0.32	0.05	0.31	0.08	2.84	Reject H_0
	11.2	1	0.28	0.08	0.25	0.08	1.78	Do not reject H_0
			0.29	0.06	0.25	0.03	4	Reject H_0
			0.22	0.06	0.21	0.04	0.93	Do not reject H_0
			0.20	0.06	0.18	0.06	1.58	Do not reject H_0
100	8.4	0.5	0.34	0.06	0.27	0.03	7	Reject H_0
			0.33	0.05	0.28	0.06	4.29	Reject H_0
	11.2	1	0.36	0.07	0.31	0.07	3.39	Reject H_0
			0.30	0.07	0.24	0.05	4.68	Reject H_0
			0.26	0.1	0.22	0.08	2.1	Reject H_0
			0.29	0.07	0.24	0.08	1.91	Reject H_0

obstacle is farther from him/her. Because of the diminished ability to perceive the lateral gap, the driver may maintain a higher $g_w(t)$ when the obstacle is present on the passenger's side of the vehicle. To determine if this holds true, a one-tailed t -test was performed to evaluate the influence of the location of the obstacle on $g_w(t)$. The null and alternate hypotheses are provided in eq. (1). Table 1 shows the results of the t -test.

H_0 : Mean $g_w(t)$ when the obstacle is on the left-hand side (LHS) of the vehicle = mean $g_w(t)$ when the obstacle is on RHS of the vehicle. (1a)

H_1 : Mean $g_w(t)$ when the obstacle is on LHS of the vehicle > mean $g_w(t)$ when the obstacle is on RHS of the vehicle (1b)

At 95% confidence level, H_0 can be rejected in all but two observations, supporting the claim that drivers tend to maintain a higher lateral gap, $S_0(t)$, when the obstacle is laterally located farther from them.

The interception mechanisms adopted by drivers were to modify either the speed or the lateral gap.

Influence of static obstacle width

In this study, the two obstacles were 0.5 and 1 m wide.

Influence on gap-to-width ratio: Drivers tend to veer towards the centre of the road when its width decreases^{4,5}, likely because the road edge poses a threat to safety⁴. As drivers position themselves laterally away from an obstacle, they also consider its position with respect to the available road width. It is expected that, in the presence of a wide obstacle, drivers will tend to offset the increased risk of being closer to the road edge by maintaining a lower $S_0(t)$ with the obstacle. That is, $g_w(t)$ near the 1 m wide obstacle will be lower than that near the

0.5 m wide obstacle. To validate this assumption, the hypotheses given in eq. (2) were tested with a one-tailed t -test. Table 2 shows the results of the t -test. At 95% confidence level, H_0 can be rejected in all but one observation, supporting this claim.

H_0 : Mean $g_w(t)$ in the presence of 0.5 m wide obstacle = mean $g_w(t)$ in the presence of 1 m wide obstacle. (2a)

H_1 : Mean $g_w(t)$ in the presence of 0.5 m wide obstacle > mean $g_w(t)$ in presence of 1 m wide obstacle. (2b)

Influence on deviation in instantaneous speed: A driver's manoeuvring space on the road decreases with increase in obstacle width. In order to safely manoeuvre around a wide obstacle, drivers might reduce the speed more than they would for a narrow obstacle. Hence, it was expected that $\Delta V(t)$ for a 1 m wide obstacle would be greater than that for a 0.5 m wide obstacle. To validate this assumption, the null and alternate hypotheses given in eq. (3) were tested with a one-tailed t -test. Table 3 shows the results. At 95% confidence level, H_0 could be rejected in all but one observation, which supports this claim.

H_0 : Mean $\Delta V(t)$ in the presence of 0.5 m wide obstacle = mean $\Delta V(t)$ in the presence of 1 m wide obstacle. (3a)

H_1 : Mean $\Delta V(t)$ in the presence of 0.5 m wide obstacle < mean $\Delta V(t)$ in the presence of 1m wide obstacle. (3b)

Influence of static obstacle length

The perception of threat posed by an obstacle increases with increase in vehicle speed, size of the obstacle and duration of exposure. For the same width of obstacle, $g_w(t)$ values for 25 and 100 m lengths were compared.

Table 2. One-tailed t -test on the influence of width of obstacle on $g_w(t)$

l (m)	Side of obstacle	$V_{instructed}$ (m/s)	$g_w(t)$ for 0.5 m wide obstacle		$g_w(t)$ for 1 m wide obstacle		t -Value	Decision
			Mean	Std. dev	Mean	Std. dev		
25	LHS	8.4	0.35	0.07	0.29	0.06	4.37	Reject H_0
		11.2	0.32	0.05	0.22	0.06	8.59	Reject H_0
		14	0.28	0.08	0.20	0.06	5.37	Reject H_0
	RHS	8.4	0.27	0.02	0.26	0.03	1.86	Do not reject H_0
		11.2	0.31	0.08	0.20	0.04	8.25	Reject H_0
		14	0.25	0.08	0.18	0.06	4.7	Reject H_0
100	LHS	8.4	0.34	0.06	0.30	0.07	2.91	Reject H_0
		11.2	0.33	0.05	0.26	0.10	4.2	Reject H_0
		14	0.36	0.07	0.29	0.07	4.74	Reject H_0
	RHS	8.4	0.27	0.03	0.24	0.05	3.45	Reject H_0
		11.2	0.28	0.06	0.22	0.08	4.02	Reject H_0
		14	0.29	0.07	0.24	0.08	3.16	Reject H_0

Table 3. One tailed t -test on the influence of width of obstacle on deviation in instantaneous speed $\Delta V(t)$

l (m)	Side of obstacle	$V_{instructed}$ (m/s)	$\Delta V(t)$ for 0.5 m wide obstacle		$\Delta V(t)$ for 1 m wide obstacle		t -Value	Decision
			Mean	Std. dev	Mean	Std. dev		
25	LHS	8.4	0.29	0.51	0.59	0.83	-2.07	Reject H_0
		11.2	0.18	0.49	0.54	0.89	-2.38	Reject H_0
		14	0.8	0.43	1.36	0.46	-5.97	Reject H_0
	RHS	8.4	-0.05	0.73	0.74	1.11	-3.99	Reject H_0
		11.2	0.58	0.28	-0.06	0.59	6.57	Reject H_0
		14	0.66	0.42	0.94	0.57	-2.65	Reject H_0
100	LHS	8.4	0.06	0.28	0.93	1.52	-3.78	Reject H_0
		11.2	0.12	0.5	0.99	2.05	-2.77	Reject H_0
		14	1.5	2.61	2.57	3.28	-2.11	Reject H_0
	RHS	8.4	0.43	0.89	0.51	0.62	-0.49	Do not reject H_0
		11.2	1.17	1.98	1.48	1.89	-0.76	Do not reject H_0
		14	1.29	2.13	3.31	3.31	-3.44	Reject H_0

Similarly, $\Delta V(t)$ values for 25 and 100 m lengths were compared.

Influence on gap-to-width ratio: The null and alternate hypotheses related to the influence of obstacle length are given in eq. (4). These were tested with a one-tailed t -test. It is intuitive that an increase in exposure time with a larger obstacle causes higher threat perceptions. Given that the duration of exposure with a 100 m long obstacle is greater than with 25 m long obstacle, $g_w(t)$ should be greater for the 100 m long obstacle and hence H_1 was chosen. Table 4 shows the results of the t -test.

$$H_0: \text{Mean } g_w(t) \text{ in the presence of 25 m long obstacle} = \text{mean } g_w(t) \text{ in the presence of 100 m long obstacle.} \tag{4a}$$

$$H_1: \text{Mean } g_w(t) \text{ in the presence of 25 m long obstacle} < \text{mean } g_w(t) \text{ in the presence of 100 m long obstacle.} \tag{4b}$$

An interesting observation can be made from Table 4. At 95% confidence level, H_0 is always rejected when $V_{instructed}$ is 14 m/s, indicating that obstacle length influences $g_w(t)$ only at higher driving speed. This is evident because the perceived risk in the presence of an obstacle

increases with increase in vehicle speed. Hence, it can be inferred that at higher speeds, drivers prefer to position themselves laterally farther away from a longer obstacle compared to a shorter obstacle of the same width. Again, H_0 is rejected when the 1m wide obstacle is present on the LHS of the vehicle and $V_{instructed}$ is 14 m/s. This might be attributed to greater width of the obstacle, because such behaviour was not observed when the obstacle was 0.5 m wide.

Influence on deviation in instantaneous speed: Larger obstacles result in higher levels of perceived risk^{1,20}. Hence, it was expected that $\Delta V(t)$ would be greater for the 100 m obstacle than for the 25 m obstacle. The hypotheses shown in eq. (5) reflect this assumption, and they were tested with a one-tailed t -test. Table 5 shows the results. At 95% confidence level, H_0 can be rejected in all but two observations, which supports this claim.

$$H_0: \text{Mean } \Delta V(t) \text{ in the presence of 25 m long obstacle} = \text{mean } \Delta V(t) \text{ in the presence of 100 m long obstacle.} \tag{5a}$$

$$H_1: \text{Mean } \Delta V(t) \text{ in the presence of 25 m long obstacle} < \text{mean } \Delta V(t) \text{ in the presence of 100 m long obstacle.} \tag{5b}$$

Table 4. One-tailed t -test on the influence of length of obstacle on $g_w(t)$

w (m)	Side of obstacle	$V_{\text{instructed}}$ (m/s)	$g_w(t)$ for 25 m long obstacle		$g_w(t)$ for 100 m long obstacle		t -Value	Decision
			Mean	Std. dev	Mean	Std. dev		
0.5	LHS	8.4	0.35	0.07	0.34	0.06	0.73	Do not reject H_0
		11.2	0.32	0.05	0.33	0.05	-0.95	Do not reject H_0
		14	0.28	0.08	0.36	0.07	-5.05	Reject H_0
	RHS	8.4	0.28	0.02	0.27	0.03	1.86	Do not reject H_0
		11.2	0.31	0.08	0.28	0.06	2.01	Reject H_0
		14	0.25	0.08	0.31	0.07	-3.79	Reject H_0
1	LHS	8.4	0.29	0.06	0.30	0.07	-0.73	Do not reject H_0
		11.2	0.22	0.06	0.26	0.1	-2.3	Reject H_0
		14	0.2	0.06	0.29	0.07	-6.55	Reject H_0
	RHS	8.4	0.25	0.03	0.24	0.05	1.15	Do not reject H_0
		11.2	0.21	0.04	0.22	0.08	-0.75	Do not reject H_0
		14	0.18	0.06	0.24	0.08	-4.02	Reject H_0

Table 5. One-tailed t -test on the influence of length of obstacle on $\Delta V(t)$

w (m)	Side of obstacle	$V_{\text{instructed}}$ (m/s)	$\Delta V(t)$ for 25 m long obstacle		$\Delta V(t)$ for 100 m long obstacle		t -Value	Decision
			Mean	Std. dev	Mean	Std. dev		
0.5	LHS	8.4	0.29	0.51	0.06	0.28	2.8	Reject H_0
		11.2	0.18	0.49	0.13	0.5	0.51	Do not reject H_0
		14	0.80	0.43	1.50	2.61	-2.07	Reject H_0
	RHS	8.4	-0.05	0.73	0.43	0.89	-2.95	Reject H_0
		11.2	0.58	0.28	1.17	1.98	-2.09	Reject H_0
		14	0.66	0.42	1.29	2.13	-2.05	Reject H_0
1	LHS	8.4	0.59	0.83	1.04	1.52	-1.96	Reject H_0
		11.2	0.55	0.89	0.99	2.05	-1.39	Do not reject H_0
		14	1.35	0.46	2.57	3.28	-2.6	Reject H_0
	RHS	8.4	0.74	1.11	0.51	0.62	1.28	Do not reject H_0
		11.2	-0.06	0.59	1.49	1.89	-5.54	Reject H_0
		14	0.94	0.57	3.31	3.31	-4.99	Reject H_0

Conclusion

Few studies have examined the influence of the position of a static obstacle (driver's side versus passenger's side) and its dimensions (width and length) on lateral gap and speed. The objective of the present study was to gain further understanding of the influence of on-road static obstacles on driver behaviour. An experiment was conducted using an instrumented vehicle on a test track in which the static obstacles caused a reduction in the track width.

The finding indicates that driver behaviour is influenced by the side on which the obstacle is present; drivers prefer to maintain a larger lateral gap when the obstacle is located on the passenger's side. This behaviour could be attributed to the fact that the driver's ability to judge the lateral gap becomes poorer when he/she is laterally farther away from the obstacle, i.e. when the obstacle is located on the passenger side of the vehicle. The impact of the influence of the side of the obstacle can be used to study driver response in different instances, such as when a vehicle approaches a left-hand and right-hand road turnings, and when it approaches pedestrians and other

vehicles on the road. The findings from these studies can be used in lateral control models of microscopic traffic flow.

Most of the existing literature discusses the influence of overall size of the obstacle. However, the influence of individual dimensions of on-road obstacles has not been studied. From the present study, it can be inferred that both obstacle width and length influence vehicle speed and the lateral gap. However, the influence of obstacle length on the lateral gap is prominent only at higher vehicle speed. The impact of different dimensions can be used to study the size-arrival effect while determining collision potential in traffic safety analysis.

In this study we evaluate the influence of width and length of an on-road static obstacle individually. However, only two different widths, two different lengths and three different speeds are considered. In order to get qualitative insights, it is important that other combinations of widths, lengths and speeds should also be considered. The original track width is 3.5 m. The track width can be varied gradually in order to evaluate the track width at which the influence of obstacle vanishes. The influence of height of obstacle can also be studied. Besides, the number of

drivers can be increased in order to collect data from a larger pool of drivers. This study was conducted with only five drivers. In order to get a better insight, the analysis can be done with more number of drivers.

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