VRU-Proxi-05-03

Study on the Devices for Presenting Rear-Vision Aid Information and Their Effectiveness in Supporting the Driver

JAPAN

Agenda

1. Obtainment of driving action data
   - Purpose and Method
   - Result: Pedestrian target avoidance rate
   - Result: Devices that contributed to finding pedestrian targets
   - Result: Participants' comments

2. Study on the effectiveness of the rear-situation presentation devices in supporting the driver

Introduction

Purpose:

To clarify, based on data obtained from tests performed on a test course and participated by drivers, how effective the devices for presenting rear situations at the time of reversing a car (monitors and sonars) are expected to be in supporting the driver.

How the test setup was designed:

- The case where a car that was parked in the forward position backs up to exit from the parking space was assumed. (This is one of the typical parking methods used especially in Europe and North America and can be seen occasionally in Japan as well.)
- To obtain highly general results, a typical parking lot where many people and cars come and go was assumed.

Method

Test procedures (instructions):

- At the parking space (test site), participants were instructed to drive imagining being at a parking lot of typical commercial facilities where people and cars come and go.

Fig.1 Image for the Test Site Presented to Participants

Method

Test procedures:

- 32 participants (The average age is 39.0 years old.)
- Participants were told that pedestrian manikins might appear behind the vehicle.
- Beforehand, participants were informed of how the targets would be seen and how each device would work, for each device condition.
- While the testing personnel was moving the pedestrian target, etc., participants would wait looking down so that they would not be able to see the outside.
- The personnel on board the test vehicle would give an oral cue to start the test.
- Upon hearing the cue, participants would open the outside mirrors and start reversing the vehicle.
- In the case where a participant noticed the pedestrian target before starting to reverse the vehicle (before the vehicle moved), he/she would tell this to the personnel on board the vehicle.
- In the case where a participant noticed the pedestrian target after starting to reverse the vehicle (after the vehicle moved), he/she would apply the brake immediately to stop the vehicle.

Field

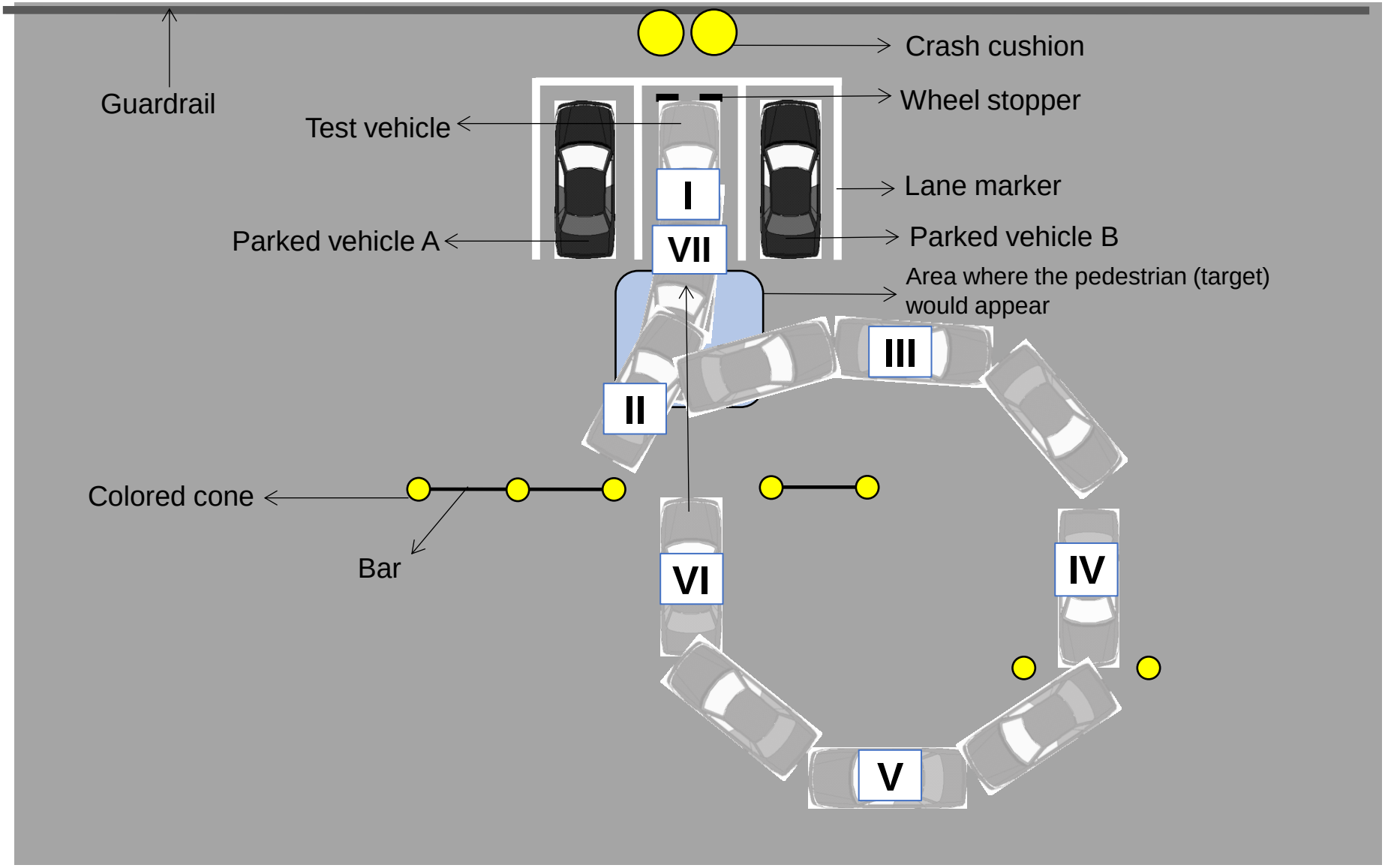


Fig.2 Parking Space Setup on the Test Course

Test Conditions

Device conditions (4 conditions):

Monitor, Sonar, Monitor+sonar, No device

Pedestrian conditions (2 conditions):

Child in proximity, Adult in proximity

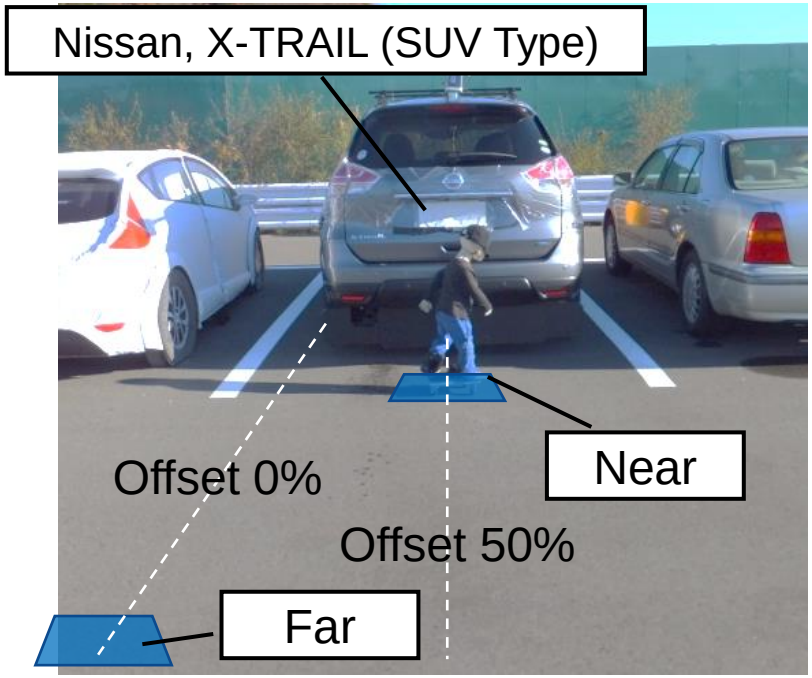


Fig.3 Image of the Pedestrian Target Setup

Child (height: 100 cm)

Adult (height: 160 cm)

Fig.4 Pedestrian Targets

Test Example

Fig.5　Test Example (Child in Proximity; No Device)

Measurement Items

Tab.1　Measurement Items

Measurement item		Measurement method	Sampling frequency
Vehicle behavior	Vehicle position	VBOX (RTK-type GPS)	100 Hz
	Traveling speed	VBOX (RTK-type GPS)	100 Hz
	Vehicle rear situation	Small camera (on-board)	30 Hz
	Monitor presentation condition	Small camera (on-board)	30 Hz
	Sonar presentation condition	Small camera (on-board)	30 Hz
Driving action	Pedal application	Small camera (on-board)	30 Hz
	Direction of the driver's gaze	Small camera (on-board)	30 Hz
Participants' comments	Noticing the target	Hearing	-

Pedestrian Target Avoidance Rate

Pedestrian conditions

Device conditions	Child in proximity	Adult in proximity
Monitor	100%	100%
Sonar	100%	100%
Monitor+sonar	100%	100%
No device	0%	94%

Test Example

Contact

Fig.6 Test Example (Child in Proximity; Monitor+Sonar)

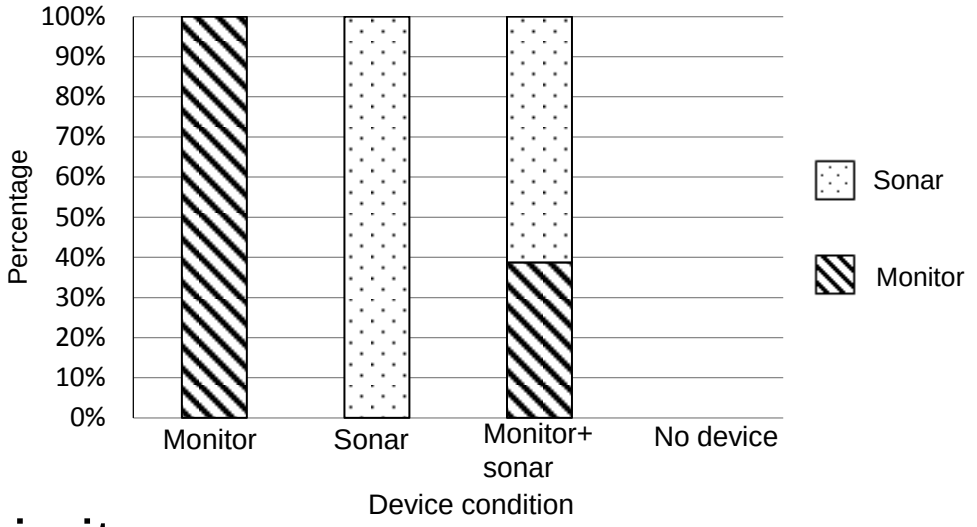
Test Example

Avoidance

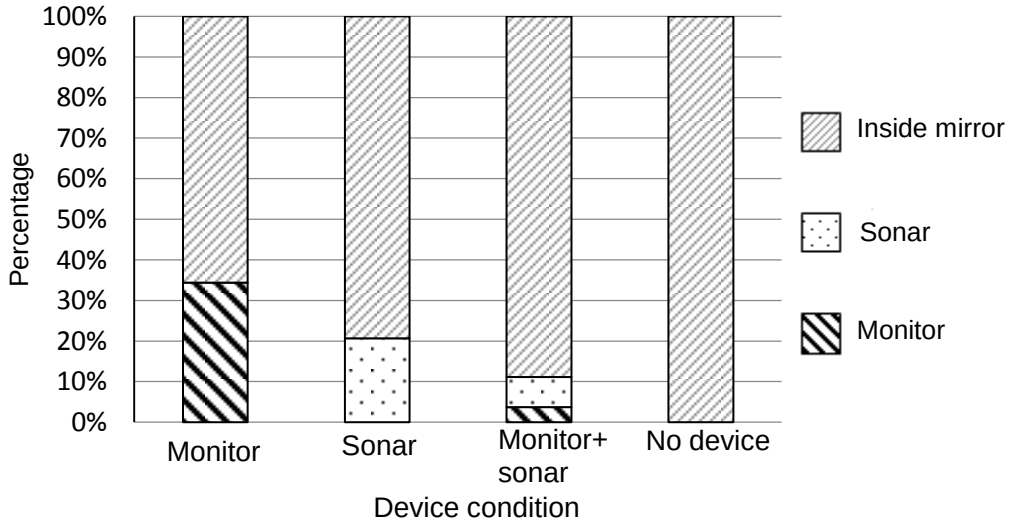
Fig.7　Test Example (Child in Proximity; Monitor+Sonar)

Devices that Contributed to Finding Pedestrian Targets

Child in proximity



Adult in proximity



Summary of Results

- Under the “No rear-situation presentation device” condition, all participants contacted the pedestrian target under the “Child in proximity" condition, whereas two participants contacted the pedestrian target under the “Adult in proximity" condition because they failed to check the inside mirror.
- However, under the conditions where the vehicle was equipped with one or both of the rear-situation presentation devices, all participants avoided contacting the pedestrian target under both pedestrian conditions. Thus, no difference in the contact avoidance rate was found among the device conditions in this study.
- These results show that equipping the vehicle with one of the rear-situation presentation devices, i.e., either the monitor or the sonar, will contribute to avoiding accidents where the vehicle contacts pedestrians, etc. when backing up or to mitigating damage.
- Under the “Child in proximity” and “Monitor+sonar” conditions, the percentage of participants who noticed the pedestrian target using the sonar was higher than the percentage of those using the monitor.
- From a participant ‘s comment “I looked at the monitor after hearing the sonar’s alarm sound (to know what the sonar had detected)”, we can expect that presenting audible information (the sonar’s alarm sound) while the driver is gazing at things other than the monitor’s display (direct vision, mirror, etc.) will help the driver to pay attention to the monitor’s display.
- On the other hand, the report of a study stated that, since drivers look at both the sonar’s indicator and the monitor display to know what the sonar has detected, the crash rate in the case of using both the monitor and the sonar was higher than in the case of using the monitor alone. (study on FMVSS 111)