



## What happens when drivers face hazards on the road?



Petya Ventsislavova<sup>a</sup>, Andres Gugliotta<sup>b</sup>, Elsa Peña-Suarez<sup>b</sup>, Pedro Garcia-Fernandez<sup>b</sup>, Eduardo Eisman<sup>b</sup>, David Crundall<sup>a</sup>, Candida Castro<sup>b,\*</sup>

<sup>a</sup> Nottingham Trent University, UK

<sup>b</sup> CIMCYC, Mind, Brain and Behavior Research Center, Faculty of Psychology, University of Granada, Spain

### ARTICLE INFO

#### Article history:

Received 15 February 2015

Received in revised form 16 February 2016

Accepted 19 February 2016

Available online 5 March 2016

#### Keywords:

Signal Detection Theory

STD

Fuzzy Signal Detection Theory

Multiple choice

Hazard Perception

Hazard Prediction Test

$d'$  prime

Criterion  $\beta$

Driving

Hazard Detection

Sensation

Sensitivity

Discrimination

Recognition

Location

Prediction

Decision making

Cautiousness

Situation Awareness

### ABSTRACT

The current study aims to obtain knowledge about the nature of the processes involved in Hazard Perception, using measurement techniques to separate and independently quantify these suspected sub-processes: Sensation, Situation Awareness (recognition, location and projection) and decision-making. It applies Signal Detection Theory analysis to Hazard Perception and Prediction Tasks. To enable the calculation of Signal Detection Theory parameters, video-recorded hazardous vs. quasi-hazardous situations were presented to the participants. In the hazardous situations it is necessary to perform an evasive action, for instance, braking or swerving abruptly, while the quasi-hazardous situations do not require the driver to make any evasive manoeuvre, merely to carry on driving at the same speed and following the same trajectory. A first Multiple Choice Hazard Perception and Prediction test was created to measure participants' performance in a What Happens Next? Task. The sample comprised 143 participants, 47 females and 94 males. Groups of non-offender drivers (learner, novice and experienced) and offender drivers (novice and experienced) were recruited. The Multiple Choice Hazard Perception and Prediction test succeeded in finding differences between drivers according to their driving experience. In fact, differences exist with regard to the level of hazard discrimination ( $d'$  prime) by drivers with different experience (learner, novice and experienced drivers) and profile (offenders and non-offenders) and these differences emerge from Signal Detection Theory analysis. In addition, it was found that experienced drivers show higher Situation Awareness than learner or novice drivers. On the other hand, although offenders do worse than non-offenders on the hazard identification question, they do just as well when their Situation Awareness is probed (in fact, they are as aware as non-offenders of what the obstacles on the road are, where they are and what will happen next). Nevertheless, when considering the answers participants provided about their degree of cautiousness, experienced drivers were more cautious than novice drivers, and non-offender drivers were more cautious than offender drivers. That is, a greater number of experienced and non-offender drivers chose the answer "I would make an evasive manoeuvre such as braking gradually".

© 2016 Elsevier Ltd. All rights reserved.

### 1. Introduction

Traditional Hazard Perception (HP) tests are used to discriminate between safe and less safe drivers on the basis of their ability to respond quickly to developing hazards in video clips of driving and now form a part of the driver-licensing procedure for the UK and parts of Australia. Many studies have explored the ability of Hazard Perception tests to discriminate between safe and less

safe drivers across a wide range of road users, including novice and learner drivers (e.g. [Horswill and McKenna, 2004](#)), older drivers (e.g. [Horswill et al., 2008](#)), motorcyclists ([Crundall et al., 2013](#); [Vidotto et al., 2011](#)), emergency vehicle drivers ([Crundall et al., 2003, 2005](#); [Johnston, 2014](#)), driving offenders ([Castro et al., 2014](#); [Castro et al., 2016](#)) and even pedestrians ([Rosenbloom et al., 2015](#)). Materials have also been developed into training interventions (e.g. [Helman et al., 2012](#); [Horswill et al., 2013, 2015](#); [McKenna et al., 2006](#)).

Many studies have demonstrated the ability of hazard perception tests to discriminate safe from unsafe drivers, despite using very different tests created in different laboratories across the world. While there have also been some studies which have failed to replicate these successes (see [Horswill and McKenna, 2004](#) for a

\* Corresponding author at: Faculty of Psychology, Cimcyc-Mind, Brain and Behaviour Research Centre, Universidad de Granada, Room 330, Campus Cartuja, 18011 Granada, Spain. Fax: +34 958 246239.

E-mail address: [candida@ugr.es](mailto:candida@ugr.es) (C. Castro).

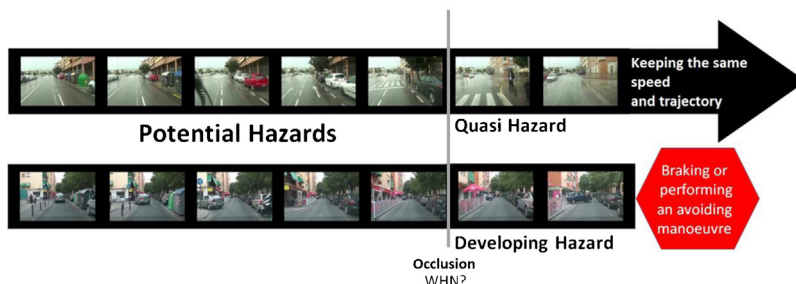


Fig. 1. Film-strip showing an example of quasi-hazards and hazards, defined by the manoeuvre that the car performed: (a) for quasi-hazards keeping the same speed or trajectory; (b) For hazards braking or performing an avoiding manoeuvre.

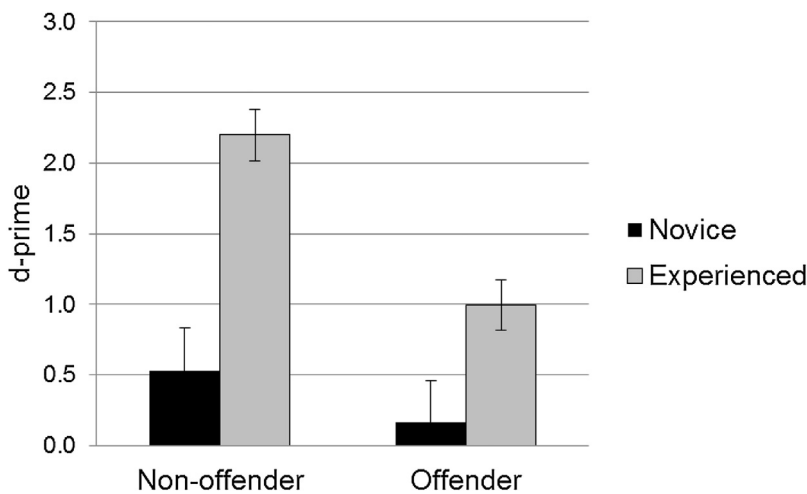


Fig. 2. Mean of d-prime by experience and offender-status.

Table 1  
A breakdown of participants socio-demographic information by experience and offender-status.

Complete sample	Learner drivers					Novice drivers					Experienced drivers				
	N	Min	Max	Mean	SD	N	Min	Max	Mean	SD	N	Min	Max	Mean	SD
Socio-demographic information															
Age	34	18	29	19.31	2.50	43	18	31	21.40	2.86	64	23	66	39.48	10.14
Gender <sup>a</sup> percentage	34	1 = M 23,5%	2 = F 76,5%	1.76 <sup>a</sup>	0.43	43	1 = 59,1%	2 = F 40,9%	1.42 <sup>a</sup>	0.49	64	1 = M 93%	2 = F 6,3%	1.06 <sup>a</sup>	0.24
Level of education <sup>b</sup> mean values	34	3	6	4.03 <sup>b</sup>	0.38	43	1	5	3.67 <sup>b</sup>	0.77	64	1	6	3.75 <sup>b</sup>	1.52
Years driving regularly	-	-	-	-	-	36	0	11	3.92	2.82	54	7	54	20.33	10.28
Years since obtaining driving license	-	-	-	-	-	36	0	11	3.92	2.82	54	7	54	20.33	10.28
Driving frequency in the last 12 months <sup>c</sup>	-	-	-	-	-	43	1	5	2.11 <sup>c</sup>	0.89	64	1	5	1.23 <sup>c</sup>	1.18
Kilometres driven last 12 months	2	0	9,999	4,999	7,070	27	1	175,000	13,303	34,443	40	0	120,000	33,347	26,698
Accidents-material damage last 12 months <sup>d</sup>	-	-	-	-	-	27	0	1	0.22 <sup>d</sup>	0.42	40	0	2	0.33 <sup>d</sup>	0.52
Accidents with victim last 12 months <sup>d</sup>	-	-	-	-	-	27	0	1	0.04 <sup>d</sup>	0.19	40	0	1	0.05 <sup>d</sup>	0.22
Quasi-accidents last 12 months <sup>d</sup>	2	0	3	1.50 <sup>d</sup>	2.12	27	0	3	1.15 <sup>d</sup>	1.06	40	0	3	1.53 <sup>d</sup>	1.39
Traffic incidents- Insurance company <sup>d</sup>	-	-	-	-	-	27	0	3	0.41 <sup>d</sup>	0.97	40	0	3	0.47 <sup>d</sup>	1.32
N <sup>d</sup> of times losing driving license <sup>d</sup>	-	-	-	-	-	0	1	1	0.06 <sup>d</sup>	0.23	0	2	2	0.28 <sup>d</sup>	0.52
Traffic tickets received <sup>d</sup>	-	-	-	-	-	27	0	3	0.52 <sup>d</sup>	0.52	40	0	3	1.28 <sup>d</sup>	1.28
Offender drivers	Learner drivers					Novice drivers					Experienced drivers				
Socio-demographic information	N	Min	Max	Mean	SD	N	Min	Max	Mean	SD	N	Min	Max	Mean	SD
Age	-	-	-	-	6	18	31	23.83	5.56	40	26	66	41.88	11.03	
Gender percentage	-	-	-	-	6	1 = M 83,3%	3	1.17 <sup>a</sup>	0.40	40	1 = M 100%	2 = F 0%	1 <sup>a</sup>	0	
Level of education <sup>b</sup>	-	-	-	-	6	1	5	3 <sup>b</sup>	1.54	40	1	6	3.78 <sup>b</sup>	1.70	
Years driving regularly	-	-	-	-	4	4	11	7.75	3.77	21	7	54	20.67	11.44	
Years since obtaining driving license	-	-	-	-	4	4	11	7.75	3.77	21	7	54	20.67	11.44	
Driving frequency in the last 12 months <sup>c</sup>	-	-	-	-	4	0	1	1 <sup>c</sup>	0	21	1	5	1.38 <sup>c</sup>	1.20	
Kilometres driven last 12 months	-	-	-	-	4	5,000	60,000	22,250	26,017	21	0	120,000	32,738	28,103	
Accidents-material damage last 12 months <sup>d</sup>	-	-	-	-	4	0	1	0.50 <sup>d</sup>	0.57	21	0	1	0.33 <sup>d</sup>	0.48	
Accidents with victim last 12 months <sup>d</sup>	-	-	-	-	4	0	3	0.60 <sup>d</sup>	1.34	21	0	1	0.05 <sup>d</sup>	0.21	
Quasi-accidents last 12 months <sup>d</sup>	-	-	-	-	4	0	3	1.50 <sup>d</sup>	1.73	21	0	3	1.38 <sup>d</sup>	1.35	
Traffic incidents- Insurance company <sup>d</sup>	-	-	-	-	4	0	2	0.75 <sup>d</sup>	0.95	21	0	3	0.90 <sup>d</sup>	1.09	
N <sup>d</sup> of times losing driving license <sup>d</sup>	-	-	-	-	4	0	1	0.50 <sup>d</sup>	0.57	21	0	2	0.52 <sup>d</sup>	0.60	
Traffic tickets received <sup>d</sup>	-	-	-	-	4	0	3	2.5 <sup>d</sup>	1.11	21	1	3	2.60 <sup>d</sup>	0.43	

Median valued reported: (a) 1 = Male 2 = Female. Median value reported. (b) 1 = Primary, 2 = Secondary (compulsory), 3 = Secondary (non-compulsory), 4 = Vocational, 5 = Grade, 6 = Master. (c) 1 = Every day or almost every day 2 = Once or more than once per week 3 = Once or more than once per month 4 = Once or more than once per year 5 = Never or almost never Median value reported. (d) 0 = 0, 1 = 1, 2 = 2, 3 = 3 or more.

Download English Version:

<https://daneshyari.com/en/article/571979>

Download Persian Version:

<https://daneshyari.com/article/571979>

[Daneshyari.com](https://daneshyari.com)