

IMPACT OF MOBILE PHONE USE ON DRIVING PERFORMANCE:

FINDINGS FROM A SIMULATOR STUDY

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INTRODUCTION

Although traffic casualties, mainly seriously injured and killed, have been reduced significantly over the past years, further reduction is required to reach the goals set by the EU and the national strategies. Driver distraction plays a dominant role in road accidents where the driver is at fault, and may arise from sources inside or outside of the vehicle. One such source is mobile phone use while driving, which results in both physical and cognitive distraction, and has been found to increase accident probability by three or four times.

The objective of the present study is to analyse the effect of mobile phone use while driving, considering different mobile phone use modes (handheld, handsfree and speaker mode) and at the same time different environments (urban vs rural) on specific elements of the driving behaviour, employing discrete choice models.

METHODOLOGY

- 1

Driving Simulator Questionnaires

2

Discrete Choice Analysis

3

Results

DRIVING SCENARIOS

The experiment consisted of **6 different driving scenarios** (3.5 km each one). 2 km were driven while having a conversation on the mobile phone and rest were driven with no distraction. Out of the six drives three were in a **rural** road environment and three in an **urban** one.

Three different ways of using the mobile phone were investigated:

- Handheld (HH)
- Handsfree (with wired headphones) (HF)
- Speaker mode (Sp)

To measure drivers’ reaction time, a “STOP” sign appeared (twice in each scenario) at the windscreen at different points along the route, and drivers were instructed to make a sudden stop upon its appearance.

SAMPLE CHARACTERISTICS

50 adults, 32 men and 18 women, between the ages of 20 to 60 years old (mean value 31 years old) participated in the simulator experiment.

All of the participants held a driver’s license and owned a mobile phone device which they used during the experiment.

ANALYSIS

Ordered probit models with random effects were developed for each of the investigated parameters. The examined variables were classified into three categories: low, normal and high. Maximum speeds in the urban and rural area differed greatly, and hence, further analysis in the two different road environments was conducted.

Classification	Investigated Parameters				
	Maximum Speed (km/h)			Reaction Time (sec)	St. Dev of Lateral Position
	All roads	Urban	Rural		
Low	< 60	< 50	< 70	< 0.88	< 0.23
Medium	60 – 80	50 – 70	70 - 85	0.88 – 1.00	0.23 – 0.30
High	> 80	> 70	> 85	> 1.00	> 0.30

Probit model of reaction time (all environments)

Parameters estimates of reaction time		
Variables	Estimate	t- value
(Intercept)	1.229	3.197
Distraction (HH)	0.508	2.414
Distraction (HF)	0.512	2.432
Distraction (Sp)	0.627	2.942
Road environment (Urban)	0.461	3.087
Frequency of mobile phone use while driving in rural area (rarely/sometimes)	-1.211	-3.190
Frequency of mobile phone use while driving in rural area (often /always)	-1.341	-3.486
Frequency of over speeding in rural area (often/always)	-0.415	-2.063
Frequency of over speeding in urban area (always)	-1.531	-3.888
Age (25-45)	-0.330	-1.825
Gender (Female)	1.269	5.378
Car owner (No)	1.173	3.005
Road accident in last 3years (No)	0.994	4.673
mu_1	2.183	13.927
Sigma	1.752	7.981
Free parameters	390	
Degrees of freedom	15	
Initial log-likelihood	-348.854	
Final log-likelihood	-238.036	
AIC	506.072	

CONCLUSIONS

- ✓ HH and Sp conversation result in a reduction of the maximum driving speed.
 - ✓ In rural areas both HH and Sp conversation affect drivers’ maximum speed, with HH conversation exhibiting the highest affect.
 - ✓ In urban areas, only the HH conversation exhibits a reduction of the maximum driving speed.
 - ✓ Drivers exhibit higher reaction times when using their mobile phone. All types of mobile phone use examined, found to affect reaction time significantly.
 - ✓ HH, HF and Sp conversation cause higher levels of standard deviation of the lateral position.
 - ✓ Increased familiarity of mobile phone use while driving improves reaction times.