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***Assessment of Driving Simulator Studies
on Driver Distraction***

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Objective

- A critical assessment of the strengths and limitations of driving simulator studies on driver distraction

Outline

- Definitions and types of driver distraction
- Advantages and limitations of driving simulator experiments
- Literature review of driving simulator studies on driver distraction
- Comparative assessment of the examined driving studies
- Conclusions



Review of Driving simulator experiments



- Driver distraction factors can be subdivided into those that occur inside the vehicle and those that occur outside the vehicle.
- **Basic characteristics** have been identified and analysed for each experiment reviewed:
 - **Distraction source examined** (mobile phone, conversation with passenger, music, eating, visual, cognitive etc.)
 - **Sample characteristics** (size, gender, age distribution, benefits, questionnaire)
 - **Experiment design** (Practice trial, trial duration, counterbalancing, road environment, traffic conditions)
 - **Driving related Outcomes**



Assessment of Driving simulator experiments



- Most experiments are based on very small samples, limited to rural road environment and no explicit (if at all) simulation of ambient traffic
- Participants in almost all driving simulator experiments implemented a practice scenario, but no specific performance measures were used to assess the driver's familiarization
- No pattern could be identified as regards the selection of number and duration of trials
- In 30% of studies no counterbalancing in the different trials was reported

| Paper details | | Distraction Source | | | | | | | Sample Characteristics | | | | | | |
|---------------------|------|--------------------|--------------|--------------------|-------|------|---------------------|---------------------|------------------------|------------|-----|-------|-----|----------|---------------|
| Authors | year | cell phone | conversation | visual - cognitive | music | I/VS | advertisement signs | eat, drink, alcohol | sample size | % male | 25- | 26-55 | 55+ | benefits | questionnaire |
| 1 Laberge et al | 2004 | • | • | | | | | | 80 | 50% | • | • | • | • | |
| 2 Drews et al | 2008 | • | • | | | | | | 96 | 25% | • | • | • | • | |
| 3 Charlton | 2009 | • | • | | | | | | 112 | 50% | • | • | • | • | |
| 4 Yanniss et al | 2011 | • | • | | | | • | | 42 | 48% | • | • | • | • | |
| 5 Horbery et al | 2006 | | | • | | | | | 31 | - | • | • | • | • | |
| 6 Reed-Jones et al | 2008 | | | | • | | | | 32 | 44% | • | • | • | • | |
| 7 Yanniss et al | 2011 | • | | | • | | | | 48 | 50% | • | • | • | • | |
| 8 Rakauskas et al | 2004 | • | | | | | | | 24 | 50% | • | • | • | • | |
| 9 Kass et al | 2007 | • | | | | | | | 49 | 49% | • | • | • | • | |
| 10 Bruyas et al | 2009 | • | | | | | | | 30 | 50% | • | • | • | • | |
| 11 Reimer et al | 2010 | • | | | | | | | 60 | 60% | • | • | • | • | |
| 12 Schlehofer et al | 2010 | • | | | | | | | 69 | 36% | • | • | • | • | |
| 13 White et al | 2010 | | • | | | | | | 40 | 50% | • | • | • | • | |
| 14 Maciej et al | 2011 | | • | | | | | | 33 | 52% | • | • | • | • | |
| 15 Noy et al | 2004 | | | • | | | | | 24 | 63% | • | • | • | • | |
| 16 Donmez et al | 2006 | | | • | | | | | 28 | - | • | • | • | • | |
| 17 Donmez et al | 2008 | | | • | | | | | 48 | 52% | • | • | • | • | |
| 18 Liang et al | 2010 | | | • | | | | | 16 | 50% | • | • | • | • | |
| 19 Fofanova et al | 2011 | | | • | | | | | 20 | 80% | • | • | • | • | |
| 20 Muhrer et al | 2011 | | | • | | | | | 28 | 50% | • | • | • | • | |
| 21 Metz et al | 2011 | | | • | | | | | 40 | 55% | • | • | • | • | |
| 22 Chan et al | 2012 | | | • | | | | | 30 | - | • | • | • | • | |
| 23 Kaber et al | 2012 | | | • | | | | | 20 | 50% | • | • | • | • | |
| 24 Zhang et al | 2012 | | | • | | | | | 24 | 50% | • | • | • | • | |
| 25 Hatfield et al | 2008 | | | • | • | | | | 27 | 48% | • | • | • | • | |
| 26 Chisholm et al | 2008 | | | • | • | | | | 19 | 53% | • | • | • | • | |
| 27 Garay-Vega et al | 2010 | | | • | • | | | | 17 | 71% | • | • | • | • | |
| 28 Young et al | 2012 | | | • | • | | | | 37 | 46% | • | • | • | • | |
| 29 Hughes et al | 2012 | | | • | • | | | | 21 | 5% | • | • | • | • | |
| 30 Jamson et al | 2005 | | | | • | | | | 48 | - | • | • | • | • | |
| 31 Donmez et al | 2007 | | | | • | | | | 29 | 48% | • | • | • | • | |
| 32 Reyes et al | 2008 | | | | • | | | | 12 | 50% | • | • | • | • | |
| 33 Jamson et al | 2010 | | | | • | | | | 18 | 50% | • | • | • | • | |
| 34 Benedetto et al | 2011 | | | | • | | | | 15 | 80% | • | • | • | • | |
| 35 Birrell et al | 2011 | | | | • | | | | 25 | 56% | • | • | • | • | |
| 36 Terry et al | 2008 | | | | • | • | | | 78 | 55% | • | • | • | • | |
| 37 Young et al | 2009 | | | | • | • | | | 48 | 60% | • | • | • | • | |
| 38 Bendak et al | 2010 | | | | • | • | | | 12 | 100% | • | • | • | • | |
| 39 Edquist et al | 2011 | | | | • | • | | | 48 | 63% | • | • | • | • | |
| 40 Rakauskas et al | 2008 | | | | • | • | | | 45 | 100% | • | • | • | • | |
| 41 Young et al | 2008 | | | | • | • | | | 26 | 62% | • | • | • | • | |
| 42 Harrison et al | 2011 | | | | • | • | | | 40 | 50% | • | • | • | • | |
| Average | | | | | | | | | 37.8 | 54% | | | | | |



- The most common distraction sources examined are mobile phone use, conversation with passengers and visual distraction, as well as their comparisons
- The design and implementation is still inconsistent and often does not conform to experimental design principles
- Large consensus on less critical components (e.g. practice drive, use of questionnaires), and large variability in the more critical components (e.g. number and duration of trials)
- Need for larger scale, more standardised rigorous experiment designs and more uniform measures of driver distraction

