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An Overview of Risk Factors Related to Driver Distraction: Reviews and Meta-Analyses



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Results





Quantitative estimate

Abstract The objective of this study is the comparative assessment of driver distraction related risk factors with the explicit purpose of ranking their impact on road safety. The analysis was carried out within the SafetyCube project, which aims to identify and quantify the effects of risk factors and measures related to behaviour, infrastructure or vehicle, and integrate the results in an innovative road safety Decision Support System (DSS). Existing studies were selected and analyzed in a set taxonomy, of which distraction includes 11 risk factors. For each risk factor the applied methodology included rigorous literature search and selection, analysis of studies in terms of design, methods and limitations and synthesis of findings and meta-analyses, when feasible. 37 high quality studies were selected and analyzed. Results indicate that cellphone use in any form is the most detrimental type of distraction. Conversation with passengers, cognitive overload and inattention, and outside factors were found to have a

modest impact, while listening to music and operating devices were found to have an unclear impact. Three

meta-analyses were also conducted, determining the proportions of crashes that occur due to drivers conversing

Methodology

with passengers or operating devices.

- Studies were selected and analyzed in a set taxonomy which included hot topics after consulting with stakeholders
- Road user distraction was an explicit family of topics
- Studies published in scientific journals were **prioritized** over conferences over grey literature.
- **Specific criteria**: Study year: 1990 or newer, good overall quality, verification and transferability of results, existing meta-analyses prioritized at all times.
- Analysis of studies in terms of design, methods and limitations
- Synthesis of findings and meta-analysis when feasible

Distraction topics	Distraction within vehicle or within the riding or walking situation	Distraction outside vehicle (if car user)	Distraction through state of mind and cognitive overload
Specific distraction risk factors	 Cellphone use – handheld Cellphone use – hands-free Cellphone use – texting Music & Entertainment Systems Operating Devices Conversation with Passengers Animals, insects, others 	 Watching persons, situations Static objects (advertisement, traffic management information) Sun, other vehicles' lights 	 Distraction through state of mind (pondering etc.) and cognitive overload Inattention, daydreaming

- Road system element (Road User, Infrastructure, Vehicle) and level of taxonomy so that users of the DSS will find information they are interested in.
- Basic information of the study (title, author, year, source, origin, abstract)
- Road user group examined
- Study design / Limitations
- Measures of exposure to the risk factor Measures of outcome (e.g. number of injury crashes)
- Type of effects (quantified exposure to a risk factor or a measure and road safety outcome)
- Effects (including corresponding measures e.g. confidence intervals)
- Summary of information relevant to SafetyCube (may be different from original abstract).



Quantitative review

- More than **37 studies** on driver distraction related risk factors have been coded
- 78 instances of input for the examined risk factors
- 8 synopses have been authored for inclusion in the DSS (3 distraction factors were merged)
- Comprehensive results are presented on the Table on the left side.
- It is obvious that most distraction activities are detrimental to numerous road safety indicators, both straightforward (ex. crash count and indirect (reaction times).

Meta-analysis for specific distraction risk factors

Some studies only conducted descriptive statistical analyses. While it was not possible to determine distraction impact at first, they formed the database for various meta-analyses. Several criteria have to apply for a meta-analysis:

- A minimum required number of studies is required (3 in particular).
- Studies must use the same methodology (absolute proportion of accidents).
- The sampling frames for the studies have to be similar.

Two risk factors met those criteria: operating devices and conversation with passengers (analyses for all passengers and adults only).

Conclusions

Identification and evaluation of driver distraction related risk factors was conducted, resulting in their ranking regarding road safety. All types of cellphone use were found to be particularly risky, while conversation with passengers, cognitive overload and outside vehicle factors had a modest detrimental impact. Music and operating devices presented unclear impacts. New results were found for some risk factors regarding respective crash percentages from relevant meta-analyses.

Acknowledgement

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Key: ↑ negative effect on road safety; - not significant; ↓ positive effect Note: An asterisk (*) denotes that the outcome is the most predominant from a number of relevant outcomes

6 Berthie et al., 2015

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Meta-analyses results for operating devices and conversation with passengers

Number	Variable	Estimate	Std. Error	p-value	95% CI					
1	Proportion of crashes due to operating devices (IVIS, navigation devices, etc.)	0.0107	0.0045	0.0186	(0.0018, 0.0195)					
2	Proportion of crashes due to conversation with passengers - all passengers	0.0437	0.0258	0.0907	(-0.0069, 0.0943)					
3	Proportion of crashes due to conversation with passengers - adult passengers only	0.0746	0.0343	0.0294	(0.0075, 0.1418)					

Driver distraction related risk factors ranking by color code

	The contract of the contract o												
Red (Risky)			Yellow (Probably risky)	Grey (Unclear)									
!	Cellphone use (hand held)	!	Conversation with passengers	?	Music – entertainment systems								
!	Cellphone use (hands free)	!	Cognitive overload and Inattention	?	Operating devices								
!	Cellphone use (texting)	!	Outside Vehicle Factors (Watching persons, Static objects, Sun/other vehicles' lights)										