European Commission

Fatigue 2015

Summary

European Road Safety Observatory
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Transport

Fatigue - Summary

What is the problem?

The concepts of "fatigue", "sleepiness" and "drowsiness" are often used interchangeably. Sleepiness is an aspect of fatigue that can be defined as the neurobiological need to sleep, resulting from physiological wake and sleep drives. On the other hand fatigue can be seen as a signal from the body that the on-going activity should be ended, whether it is physical or mental activity or just being awake. Although the causes of fatigue and sleepiness may be different, the effects of sleepiness and fatigue are very much the same, namely a decrease in mental and physical performance capacity.

How big is the problem?

Risk exposure: Survey research in Canada, Europe and USA indicates that driving while tired or sleepy occurs at least once a year for over half of the drivers population. 10-40% of drivers reported that they had actually fallen asleep briefly while driving at least once within the year prior to the interview.

Risk of accident involvement: Several studies suggest that fatigue is associated with increased accident risk. Naturalistic driving research indicates that driving while fatigued increases the risk of involvement in an accident or near-accident by nearly 4 times. Insufficient sleep in the night before a trip has been related to an increase in accident risk between 3 to 8 times.

Size of accident injury problem: Studies indicate that fatigue is involved in 10-25% of accidents. Furthermore, fatigue-related accidents are often associated with high injury levels.

What does science say?

Causes of fatigue

Lack of sleep or poor sleep: Lack of sleep can be either chronic (i.e. not having enough sleep during a long period), or acute (e.g. after just one night of little or no sleep). The quality of sleep, influenced by sleeping disorders, chronic diseases, medication, noisy or unpleasant environment etc., is also of great importance;
Internal body clock: The human body has a greater need for sleep at certain times in the 24-hour cycle (approximately between midnight and 4am and, to a lesser extent, 2pm- 4pm). At these moments there is a natural tendency to sleep.
Time-on-task: Prolonged activity inevitably leads to physical and mental fatigue.
Monotonous tasks: Driving for relatively long periods in a monotonous driving environment results in a decrease in driver vigilance, which is an expression of fatigue.
Individual characteristics including medical conditions: Age, physical condition, use of alcohol also influence how fast drivers get fatigued and how well they can cope with it.

Effects of fatigue on driving

Research indicates that fatigue leads to a deterioration of driving performance manifesting itself in slower reaction time, diminished steering performance, reduced ability to maintain headways and increased tendency to mentally withdraw from the driving task.

High risk groups
Compared to the average driver, professional drivers, long distance drivers, shift workers, young drivers, taxi drivers and drivers with a sleeping disorder have an increased risk of being involved in a fatigue-related accident. Especially drivers with obstructive sleep apnea syndrome may be 6 times more likely to be involved in a fatigue-related accident.

Quantification of increased accident risk
A person who drives after being awake for 17 hours has an accident risk equivalent to being at a 0,05 blood alcohol level (i.e. twice the normal risk). However, the increased risk often results from a combination of biological, lifestyle-related and work-related factors, and more scientific evidence is needed concerning the exact quantitative relationship between fatigue and risk.

What are the solutions?

Driver fatigue countermeasures may be directed at drivers, transport companies, roads, or vehicles. These include:

Publicity campaigns:
- Aiming to raise awareness about the problem of driver fatigue and possible countermeasures.
- However, campaigns work best when combined with other interventions, such as enforcement of traffic laws and regulations, or provision of other safety services and products.

Road infrastructure measures:
- Installation of rumble strips and profiled lane markings, safety barriers on the central reserve and/ or at the roadside etc.

Vehicle-based detection and warning devices:
- In-vehicle systems that monitor driver and/or vehicle behaviour and provide alerts or stimulation if the driver seems to be impaired.
- Studies in Germany, assuming 70% penetration of such devices in the passenger vehicle fleet, resulted in an estimation of a 35% reduction in fatigue-related accidents.

Legislation and Enforcement:
- Driving Time and Rest Period Regulation (EC 561/2006) introducing clearer and simpler rules about driving times, breaks and rest periods for professional drivers operating both in national and international transport.
- Legislation and roadside checks of recording equipment (tachographs).

Fatigue management programs within transport companies:
- Introduction of a set of inter-related measures, at different levels of the organization, directed at the management, the planning section, and the drivers.
- The measures typically include special driver training, new procedures, improved trip planning and feedback on accidents.

Notes

1. Country abbreviations

Belgium	BE	Italy	IT	Romania	RO		
Bulgaria	BG	Cyprus	CY	Slovenia	SI		
Czech Republic	CZ	Latvia	LV	Slovakia	SK		
Denmark	DK	Lithuania	LT	Finland	FI		
Germany	DE	Luxembourg	LU	Sweden	SE		
Estonia	EE	Hungary	HU	United Kingdom	UK		
Ireland	IE	Malta	MT				
Greece	EL	Netherlands	NL	Iceland	IS		
Spain	ES	Austria	AT	Liechtenstein	LI		
France	FR	Poland	PL	Norway	NO		
Croatia	HR	Portugal	PT	Switzerland	CH		

2. This 2015 edition of Traffic Safety Synthesis on Fatigue updates the previous versions produced within the EU co-funded research projects SafetyNet (2008) and DaCoTA (2012). This Synthesis on Fatigue was originally written in 2008 and then updated in 2012 and in 2015 by Charles Goldenbeld, SWOV.

3. All Traffic Safety Syntheses of the European Road Safety Observatory have been peer reviewed by the Scientific Editorial Board composed by: George Yannis, NTUA (chair), Robert Bauer, KFV, Christophe Nicodème, ERF, Klaus Machata, KFV, Eleonora Papadimitriou, NTUA, Pete Thomas, Un.Loughborough.

4. Disclaimer

5. Please refer to this Report as follows:
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