

## Cruise control and speed limiters impact driver vigilance

The VINCI Autoroutes Foundation has published the results of an original study carried out as part of its scientific research programme focused on low vigilance and drowsiness at the wheel. The laboratory research was conducted by the University of Strasbourg's Centre d'Investigations Neurocognitives et Neurophysiologiques (Ci2N - Centre of Neurocognitive and Neurophysiological Investigations). It measured the effects of cruise control and speed limiter use on driver vigilance and behaviour.

The study revealed a decline in driver attention capacity, and thereby driver ability to respond to danger, as reflected in two findings with different causes:

- a. reduced ability to merge into traffic due to greater difficulty in modulating speed;
- b. reduction in alertness when using cruise control, and to a lesser degree the speed limiter – probably as a result of reduced driver workload.

- Reduced control of the vehicle when overtaking
- Reduced control of vehicle direction
- Longer reaction times

### Automated constant speed: atypical driver behavior

Cruise control and speed limiters generate a number of atypical behaviours as revealed by reduced driver control of the vehicle.

A number of risk-taking behaviours were noted during overtaking, due to greater difficulty in modulating vehicle speed: cruise control causes drivers to remain in the overtaking lane for longer periods of time and to move back into the slow lane less often. Moreover, **safe distances** from overtaken vehicles are **reduced by an average 5% before moving back into the slow lane and 10% (about 4 metres) when moving back.**

### Reduced driver workload: decreased vigilance

The study also showed **reduced control of vehicle direction in a straight line** when cruise control and speed limiters are used. The driver corrects the direction of travel less often (-25%) when using these devices, and this increases the amplitude of lateral adjustment (+22% with speed limiter and +33% with cruise control). The phenomenon increases with the duration of the trip, especially when using cruise control.

**Reaction time, especially in emergencies, is also substantially reduced** when cruise control and speed limiters are activated. Reaction time in an event (for example, slowed traffic or an accident) is **lengthened by an average of one second** - i.e., when travelling at 130 km/h, an **additional 40 metres are covered before braking.**

Here too, as duration of travel increases, reaction time is lengthened more with cruise control than with the speed limiter.

This reduction in reaction capacity can be attributed to reduced vigilance due to automated driving, as confirmed by physiological indicators and an analysis of subjective driver perception. When cruise control is used, self-reported fatigue and attentiveness (KSS test<sup>1</sup>) reveal a **more pronounced reduction in attentiveness after 30 minutes of driving, particularly in young drivers**, who are more sensitive to fatigue than 40-year olds and seniors. Electroencephalographic measurement of alpha rhythm<sup>2</sup> also confirmed this reduced attentiveness. **Episodes of drowsiness are significantly more frequent** when cruise control is used than when the driver controls vehicle speed (**+25% after one hour of driving**) or uses the limiter (+16%).

### Proper use of cruise control and speed limiters

*"The idea is not to simply advise drivers to refrain from using these driving aids, which provide real benefits in terms of speed limit compliance and comfort,"* says Bernadette Moreau, General Delegate of the VINCI Autoroutes Foundation. *"However, these aids should not be used systematically, but rather advisedly, and a number of precautions should be taken."*

Professor André Dufour, who headed the study, sums it up as follows: *"We can advise drivers to turn off the cruise control device when traffic is dense or they are approaching special signposted areas such as construction zones or toll stations. Increased vigilance is also necessary during long trips. When making extended use of these driving aids, drivers should increase the frequency of rest breaks, and thus the periods during which they can recover their level of attentiveness."*

*"More generally, this study shows the need for the driver to master the use of driving aids, which may, by automating control of the vehicle, deprive the driver of part of his or her attention and control capacity. The driver must remain in control of the vehicle and responsible for his or her driving under all circumstances,"* says Bernadette Moreau by way of conclusion.



#### Methodology:

*The study examined 90 subjects using a driving simulator. They were divided into three groups of 30 drivers by age (18-30, 40-50, over 60). Each age group was made up of equal numbers of men and women. Participants were asked to perform a task consisting in driving 120 km on a motorway. The trip began and ended at a motorway rest area. Four scenarios prompted drivers to alter their speed in response to events along their trajectory (approach to a toll station, coach accident in the overtaking lane, construction work in the slow lane, presence of radar). Each participant carried out the task in three sessions under different driving conditions. In the first case, they used the speed limiter; in the second, non-adaptive cruise control; and in the third, they controlled the vehicle, i.e. used no driving aids.*

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<sup>1</sup> **KSS Test:** Karolinska Sleepiness Scale

<sup>2</sup> **Alpha rhythm:** brain rhythm, i.e. electroencephalographic (EEG) oscillation caused by electrical activity in the brain. Alpha rhythm occurs when a subject who is awake closes his or her eyes and relaxes or when he or she enters a state of reduced attentiveness and/or drowsiness.

### **The VINCI Autoroutes Foundation for Responsible Driving**

Created in February 2011, the VINCI Autoroutes Foundation for Responsible Driving is a laboratory, an observatory and an information resource focusing on road safety. Its goal is to help change driver behaviour and to enable drivers to become proactive participants in ensuring their own safety. The Foundation's activities include awareness campaign; funding for innovative scientific research on a number of hazardous driving behaviours that have so far been insufficiently explored or are poorly identified by road users; and funding for initiatives by civic associations and groups aimed at fostering responsible driving.

<http://fondation.vinci-autoroutes.com/>

<http://roulons-autrement.com/>

### **The University of Strasbourg's Centre d'Investigations Neurocognitives et Neurophysiologiques (Ci2N)**

The CI2N centre, headed by Professor André Dufour, is a laboratory operated under auspices of the University of Strasbourg and the CNRS (Centre national de la recherche scientifique, France's state-owned scientific research centre). It carries out research relating to human cognition in the broad sense of the term, with a particular focus on perception, memory and attention. The laboratory's researchers have more than 20 years experience in designing experimental protocols and build on their knowledge of the working of the human brain to propose innovative driving and road safety studies and applications.

[www.ci2n.fr](http://www.ci2n.fr)

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