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The pros and cons of Intelligent Speed Adaptation as a restrictive measure for serious speed offenders

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ABSTRACT

In 2011 in the Netherlands a field operational test was performed to investigate the possibility of using restrictive Intelligent Speed Adaptation (ISA) as a penalty system for serious speed offenders. This paper presents the overall results of the research focusing on the pros and cons of the use of ISA as a restrictive measure for serious speed offenders, and on the preconditions for deployment. The results showed that the ISA systems tested have a huge effect on driver behavior and have the potential to improve road safety by reducing the level of speeding, mean speed, as well as the standard deviation of speed. However, there are also cons: the behavioral change in driving behavior was only temporary. In addition the tested technology proved too easy to override, raised issues of equity, and a substantial back office is required when implementing the system for serious speed offenders.

1. Introduction

It is estimated that 1/3 of the fatalities caused by traffic is due to inappropriate speed (OECD, 2006). In the past a wide range of policy options have been considered to address this speeding behavior. These measures (speed management measures) are often categorized using the three E's: Engineering (related to both vehicle and infrastructure), Education, and Enforcement (for examples of these measures and effects see Elvik and Vaa, 2009). However, the category of vehicle engineering is still structurally underused. In contrast, vehicle design is more focused on making vehicles faster rather than making speeding more difficult. For example, research from Sweden shows that the mean top speed of all newly sold passenger vehicles in Sweden increased significantly over recent decades (Sprei et al., 2008).

ISA is an in-vehicle driver support system that assists the driver to comply with the legal speed limit at a certain location. As such ISA is a solution to the problem of inappropriate speed. ISA technology utilizes the functionality of systems that are already available in most vehicles (e.g. a GPS device, digital maps, engine management systems, etc.). There are three categories of ISA depending on how permissive they are (Carsten and Tate, 2005):

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(1) Informative or advisory ISA: These systems provide the driver with feedback using visual or audio signals.
(2) Supportive or assisting ISA: These systems actively intervene when the driver exceeds the speed limit (e.g. by providing increasing counter pressure on the accelerator pedal when the driver attempts to drive faster than the speed limit).
(3) Restrictive or intervening systems: These systems prevent the driver from exceeding the limit (the driver cannot overrule the system).

ISA systems are not new and the effects have been increasingly studied using different methodologies and data collection techniques, including traffic simulation, driving simulators, and instrumented vehicles (see e.g.: Almqvist and Nygard, 1997; AVV, 2001; Lahrmann et al., 2001; Biding and Lind, 2002; Saad and Dionisio, 2007; Vlassenroot et al., 2007; Carsten et al., 2008; Van der Pas et al., 2010; Van der Pas, 2011; Doecke and Woolley, 2011; and Jimenez et al., 2012).

Recent ISA research has focused on the implementation-related aspects of ISA, for example target groups for ISA. Some scholars argue that ISA implementation should start in niches, for instance for young drivers (Van der pas, 2011; Lahrman et al., 2012a), or as a sanction for speed offenders (Lahrman et al., 2012b, Van der Pas et al., 2011). This paper presents the results of the first field operational test (FOT) which combines this specific target group with different types of ISA. Two types of ISA systems were defined by the Ministry: a Speedlock and a Speedmonitor. Over 50 drivers participated in the FOT that took place in 2011 and lasted 7 months. In total the participants drove over 650,000 km with a Speedlock or a Speedmonitor, which was active whilst the vehicle was being driven in the Dutch provinces of Noord- and Zuid-Holland. The systems were not only tested by the participants but also by a group of experts (with expertise regarding traffic safety and serious speed offenders) who drove with each system for 4 weeks and assessed the systems in a focus group. The main research question addressed was "what are the pros and cons of the use of a Speedlock and a Speedmonitor as a restrictive measure for serious speed offenders, and what are the preconditions for deployment"? This resulted in several sub questions (also see Van der Pas et al., 2014):

- What are the (behavioral) effects of the systems on serious speed offenders?
- What are the effects of the system on the other road users (non-ISA users)?
- What is the attitude and level of acceptance of ISA amongst serious speed offenders?
- Does the ISA technology work (technically)?
- To what extent is the technology sensitive for fraud?
- What are the effects of the systems on traffic safety?

This paper presents the test design, and the overall results with respect to the driving behavior based on in-vehicle data, self-reported behavior and an expert focus group. A more detailed and in-depth evaluation of the effects on speed and traffic safety can be found in a separate paper (Van der Pas et al., 2014).

Section 2 presents the characteristics of the FOT. In Section 3 the methodological background of the FOT is presented. Section 4 discusses the results with respect to each of the sub questions. Finally, in Section 5 we compare the results with the findings from other trials and in Section 6 the syntheses, discussion, and conclusions are presented resulting in an answer to the main research question.

2. The set-up of the Dutch field operational test

2.1. The design of the FOT

In 2011 a monitoring device (Speedmonitor), and a more restrictive speed limiting system (Speedlock) were tested (see Section 2.2) as part of a FOT (each participant tested one type of system). A "within subject design" for each of the systems was adopted, see also Fig. 1 (this is a common research design for this type of FOT (see e.g. Lai et al., 2012).

2.2. The Speedlock and the Speedmonitor

During the trial two types of system were tested: a Speedlock and a Speedmonitor:

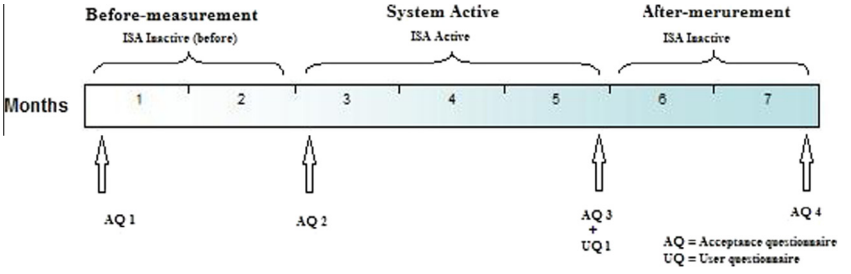

Fig. 1. Design of the field operational test.