



Intelligent speed adaptation as an assistive device for drivers with acquired brain injury: A single-case field experiment

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ABSTRACT

Intelligent speed adaptation (ISA) was tested as an assistive device for drivers with an acquired brain injury (ABI). The study was part of the “Pay as You Speed” project (PAYS) and used the same equipment and technology as the main study (Lahrman et al., *in press-a*, *in press-b*). Two drivers with ABI were recruited as subjects and had ISA equipment installed in their private vehicle. Their speed was logged with ISA equipment for a total of 30 weeks of which 12 weeks were with an active ISA user interface (6 weeks = Baseline 1; 12 weeks = ISA period; 12 weeks = Baseline 2). The subjects participated in two semi-structured interviews concerning their strategies for driving with ABI and for driving with ISA. Furthermore, they gave consent to have data from their clinical journals and be a part of the study. The two subjects did not report any instances of being distracted or confused by ISA, and in general they described driving with ISA as relaxed. ISA reduced the percentage of the total distance that was driven with a speed above the speed limit (PDA), but the subjects relapsed to their previous PDA level in Baseline 2. This suggests that ISA is more suited as a permanent assistive device (i.e. cognitive prosthesis) than as a temporary training device. As ABI is associated with a multitude of cognitive deficits, we developed a conceptual framework, which focused on the cognitive parameters that have been shown to relate to speeding behaviour, namely “intention to speed” and “inattention to speeding”. The subjects’ combined status on the two independent parameters made up their “speeding profile”. A comparison of the speeding profiles and the speed logs indicated that ISA in the present study was more efficient in reducing inattention to speeding than affecting intention to speed. This finding suggests that ISA might be more suited for some neuropsychological profiles than for others, and that customisation of ISA for different neuropsychological profiles may be required. However, further studies with more subjects are needed in order to be conclusive on these issues.

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1. Introduction

Intelligent speed adaptation (ISA) has been studied extensively in the past two decades. The first line of research within the field tended to focus on technologies that aimed to reduce the subjects’ mean speed when driving with active ISA, and most of these technologies were successful in doing this (reviews: Regan et al., 2006; Warner, 2006). A second line of research within the ISA field is now appearing, dealing with the more user-centred issues. ISA problems relating to the user, e.g. poor acceptance of ISA equipment and difficulties in recruiting subjects for ISA-studies, have proven difficult to be solved. From this, it has been concluded that the drivers

who need ISA the most may not be willing to use it voluntarily (Lahrman et al., *in press-a*, *in press-b*; Jamson, 2006).

The idea to test ISA with drivers having acquired brain injury (ABI), which is a narrower inclusion criterion than seen in other studies, arose in the wake of the above conclusion. Given that ISA has a potential for reducing (a) the cognitive workload of driving by demanding less attention for monitoring speedometer and speed limit signs, and (b) decision making processes associated with choosing an appropriate speed (if the driver complies with the system), then drivers with ABI compose a group of users who might not only need the equipment, but also might voluntarily want it as an assistive device that facilitates post-injury driving. The prevalence of persons with ABI is growing due to medical advances leading to improved survival rates. Since the ability to drive after an ABI has been associated with high measures of autonomy and quality of daily life (Fisk et al., 1998; Edwards et al., 2006), it seems a new and promising field of implementation to use ISA as an assistive device. However, the inherent problem of most assistive devices is

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