Available online at www.sciencedirect.com

ScienceDirect

Transportation Research Procedia 22 (2017) 115–123

Transportation Research Procedia

www.elsevier.com/locate/procedia

19th EURO Working Group on Transportation Meeting, EWGT2016, 5-7 September 2016, Istanbul, Turkey

A Comparative Study between Vehicle Activated Signs and Speed Indicator Devices

Diala Jomaa*, Siril Yella and Mark Dougherty

Department of Computer Engineering, Dalarna University, Borlänge, 78170 Sweden
Email: djo@du.se, sye@du.se, mdo@du.se

Abstract

Vehicle activated signs and Speed indicator devices are safety signs used to warn and remind drivers that they are exceeding the speed limit on a particular road segment. This article has analysed and compared such signs with the aim of reporting the most suitable sign for relevant situations. Vehicle speeds were recorded at different test sites and the effects of the signs were studied by analyzing the mean and standard deviation. Preliminary results from the work indicate that both types of signs have variable effects on the mean and standard deviation of speed on a given road segment. Speed indicator devices were relatively more effective than vehicle activated signs on local roads; in contrast their effectivity was only comparable when tested on highways.

Peer-review under responsibility of the Scientific Committee of EWGT2016.

Keywords: Vehicle activated signs; speed indicator devices; trigger speed; effect on drivers

1. Introduction

Vehicle activated signs (VASs) and Speed indicator devices (SIDs) are safety signs used to warn and remind drivers that they are exceeding the speed limit on a particular road segment. VAS and SID are activated by the speed of approaching vehicles (referred to as trigger speed from this point forward). In practice the threshold that activates the message to the driver is set to a constant value that corresponds to traffic agencies' recommendations for the particular road segment.

*Corresponding author: Tel.: +4623778618. *Email address*: djo@du.se

2214-241X
Peer-review under responsibility of the Scientific Committee of EWGT2016.
10.1016/j.trpro.2017.03.017

Such practices however do not consider the fact that an optimal trigger speed might exist, i.e. a trigger speed that has the most beneficial impact on driver behaviour. It is our belief that each sign may need a different setting of the trigger speed for different road segments. The signs display a warning message when drivers exceed a particular trigger speed. Note that the warning messages displayed by the VAS and SID signs are slightly different. VAS displays a warning message, typically a 'slow down' in combination with the current speed limit whereas SIDs displays vehicle speed in green or red colours to notify driver behaviour (Figure 1). Usage of either a smiley or a sad face on a SIDs is also not uncommon (Walter and Knowles 2010). Several studies have evaluated the effectiveness of the SID and VAS on driver behaviour. However studies reporting the effect of the different types of signs on different road segments are missing. Investigations studying the impact of different trigger speeds on road segments is yet another issue. Previous research studies have reported a speed reduction between 2 and 7 mph when the VASs and SIDs are used (Winnett and Wheeler 2003, Walter and Knowles 2008, Pesti and McCoy 2001, Sandberg et al. 2006, Walter and Broughton 2011, Poulter and McKenna 2005 and Cruzado and Donell 2009). Studies investigating trigger speed values of the signs are few. A recent study on the topic has shown that the optimal trigger speed of a VAS needs to be pre-determined according to the nature of the site and to the traffic conditions (Jomaa et al 2014). The aforementioned study also reported that the optimal trigger speed was approximately near the 85th percentile speeds i.e. one which had the desired effect of lowering the standard deviation. Another interesting area that can be lifted up in this context concerns studies investigating the environmental impact of speeding (Spellerberg 1998). In general, high speeds and large speed variation have a negative effect on the level of exhaust emissions, the level of traffic noise, fuel consumption and the quality of life for people living or working near the road (Panis et al. 2006, Lumbreras et al. 2008, Cen et al. 2016). However it is still unclear what type of sign should be considered when discussing usage and effectiveness on driver speed. In this paper a comparative study between VAS and SID has been done with an aim of reporting the most suitable signage for relevant usage by investigating the following:

- Effects of VAS and SID when installed on different sites
- Are their effects variable given different times of the day?
- Are their effects comparable in terms of the trigger speed? Does 85th percentile trigger speed of SID reduce the standard deviation of vehicle speed?

The rest of the paper is organised as follows. Section 2 describes the experimental design. Data analysis and results are described in section 3. The paper finally presents concluding remarks.

2. Experimental design

The experimental design in this paper has investigated two key issues namely site selection and sign selection; careless choice of which might lead to inconsistent and biased data. Past studies indicated that site selection should be based on either an area known as speeding area i.e. road segments notorious for speeding and or with a history of accidents where inappropriate speeds were the initial problem (Winnett and Wheeler 2002). In the current study two test sites were selected in Borlänge, Sweden with two different road characteristics; referred to as Mjälga and Djurås sites from this point forward. Mjälga site is restricted to 40km/hr and is one of the local roads (under the authority of the local municipality) in Borlänge. Djurås site is restricted to 60km/hr and is located on a highway segment (E16) between Borlänge and Djurås in central Sweden. It should be noted that choice of relatively small number of sites in the current case is due to the pragmatic limitations involved in installing VAS alongside roads which requires permission from transport authorities and so on. The idea is to be able to verify proof of concept using a small number of sites before large scale experimentation. Note that both areas have known safety problems as a result of which speed limits on the segments have been reduced from 50km/hr to 40km/hr in Mjälga and from 90km/hr to 60km/hr in Djurås. Proper care was taken in