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Editorial

Letter from the Editors

The *Journal of Safety Research* is pleased to publish in this special issue the proceedings of several papers presented at the 4th International Conference on Road Safety and Simulation convened at Roma Tre University in Rome, Italy, October 2013. This conference serves as an interdisciplinary forum for the exchange of ideas, methodologies, research, and applications aimed at improving road safety globally.

Conference proceedings provide the opportunity for research in its formative stages to be shared, allowing our readers to gain early insights in the type of work currently being conducted and for the researchers to receive valuable feedback to help inform ongoing activities. This conference in particular offers an array of research topics not often covered by this journal from researchers practicing in over 11 countries. As is common with publishing conference proceedings, the papers published in this issue did not go through the normal *JSR* review process. Each paper included in this issue did meet the Road Safety and Simulation conference review requirements. They reflect varying degrees of scientific rigor, methodological design, and groundbreaking application.

The proceedings published in this special issue of *JSR* draw from the following road safety research sectors represented at the conference: driving simulation, crash causality, naturalistic driving, and new research methods.

It is our hope that the publication of these important proceedings will stimulate vigorous dialogue, rigorous research, and continuing innovative initiatives and applications, leading, ultimately, to fewer traffic fatalities, injuries, and crashes.

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Analysis of driver speeds under night driving conditions using a driving simulator

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ABSTRACT

Problem: Accident statistics demonstrate that there should be a greater focus on nighttime driving to improve our knowledge of driver behavior under poor lighting conditions. However, the current geometric design criteria do not take into account driving at night. Moreover, studies that propose predictive models of operating speed only consider daytime driving conditions. *Method:* This study compares driver speed behavior during daytime and nighttime driving and models operating speeds and speed differentials, identifying significant factors that influence speed behavior under different lighting conditions. The research was carried out using a driving simulator for a section of an existing two-lane rural road composed of 39 tangent–curve configurations. Speed profiles were recorded for 40 drivers under simulated daytime and nighttime driving conditions. *Results:* New predictive speed models, differentiated for daytime and nighttime driving, are proposed that highlight the effects of different geometric predictors under different visibility conditions. Specifically, predictive models for operating speed on curves identified the inverse of the radius and the deflection angle of the curve as predictors under both driving conditions. For speed differentials based on the 85th percentile for maximum speed reduction (85MSR), we found that the inverse of the approaching tangent length and of the curve radius significantly explained the dependent variable in both cases, with a higher dependence of nighttime 85MSR on the curve geometry than on the tangent length. Tangent length had a significant effect on operating speed for independent tangents only for the daytime model, whereas the inverse of the previous radius was confirmed as a predictor for both visibility conditions. *Practical applications:* This research may influence design considerations for nighttime driving by providing evidence of the effects of nighttime conditions on driver speed choices and road safety.

1. Introduction

Studies and accident databases demonstrate that the number of crashes and fatal injuries that occur after dark is disproportionate to the number during daylight, especially since traffic flows are significantly lower at night than during the day. The average number of vehicle kilometers driven at night accounts for less than 20% of the total, but 40–50% of traffic fatalities occur at night. This disproportionality between daytime and nighttime fatalities is greater if we consider the nighttime traffic fatality rates, which are more than four times higher than those during the day (Clarke, Ward, Bartle, & Truman, 2006; Williams, 2003). Accident databases and reports (CARE, 2011; IRTAD, 2013) show that crash severity is at least two times higher during night hours than during the day (Plainis & Murray, 2002). In Italy, the average number of fatal accidents per 100 accidents is 3.4 at night and 1.9 during the day (ACI ISTAT, 2012). In 2012, in the hours between 10 pm and 6 am, conventionally considered to represent nighttime, 25,438 accidents occurred (13.6% of the total) and led to 865 fatalities (23.7% of total deaths) and 41,007 injuries (15.5% of total injuries). Moreover, nighttime road fatality rates are higher in rural driving environments, where accidents, deaths, and injures account for 16.5%, 25.3%, and 17.4% of the respective totals.

A number of factors can negatively affect driving safety at night (Fors & Lundkvist, 2009). Sleepiness, circadian rhythm, low luminance conditions, glare, dark adaptation, road signs and markings, driver age and experience, and visibility are just some of the factors that affect nighttime driving.

Rumar and Marsh (1998) stated that poor road guidance at nighttime, caused by lower or limited visibility, could be one of the main causes of nighttime road crashes. Driver perception and expectations for road alignment could significantly differ between night and day, resulting in differing actions and behavior between daytime and nighttime driving, especially in terms of speeds perceived, desired, and adopted.

In this context, tangent–curve transitions represent the most critical situations, as drivers should be provided with correct and timely information to approach a road curve at a suitable speed. If such information is not appropriate, or even misleading, it can cause a sudden reduction

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