Research Report Summary

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Evaluation of Safety Enhancements in School Zones with Familiar and Unfamiliar Drivers

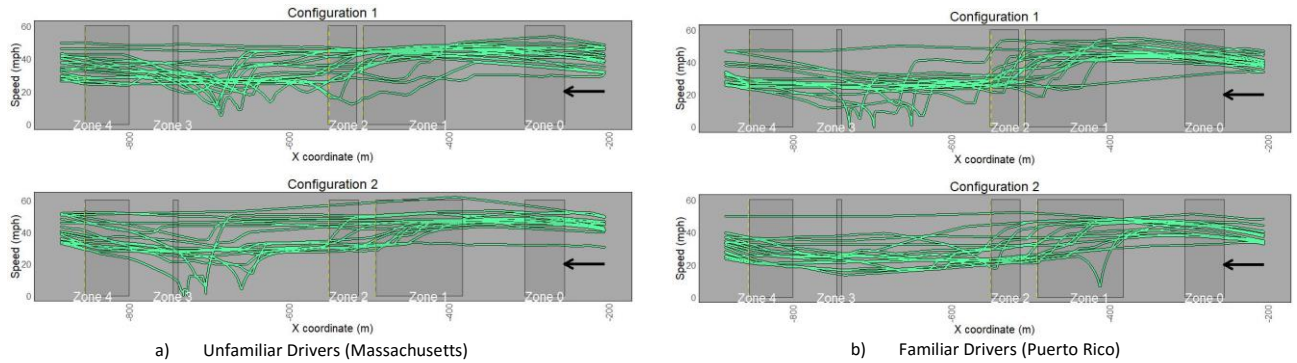
Traffic crashes in school zones are a serious safety concern. According to the NHTSA, there was an average of 128 fatalities per year in school-transportation-related crashes in the United States and Puerto Rico from 2007 to 2016 (1). A recent study conducted in school zones in the western region of Puerto Rico shows that drivers' mean speeds were higher than the posted speed limit in 63% of the evaluated school zones (2).

Driving simulators at the University of Puerto Rico at Mayaguez (UPRM) and the University of Massachusetts at Amherst (UMass) were used to analyze drivers' responses to changes in Traffic Control Devices (TDCs). Familiar and unfamiliar drivers' behavior was compared for a school zone in Puerto Rico with the actual road signage and pavement markings (Configuration 1) and a recommended configuration developed with guidelines from the MUTCD and a preferred enhanced sign selected in an online survey (Configuration 2), as shown in Table 1.

Signage Configuration

Configuration 1	Configuration 2
1. Pavement Markings	
	
2. School Zone Sign	
	
3. Speed Limit Sign	
	
4. End of School Zone	
	

Table 1. Signage Configuration



a) Unfamiliar Drivers (Massachusetts) b) Familiar Drivers (Puerto Rico)

Figure 1. Unfamiliar and Familiar Drivers' Speed Comparison by Configuration

Twelve simulation scenarios were evaluated for each configuration considering three major factors: traffic, presences of pedestrians, and vehicles parked on the shoulder. A total of 72 subjects participated in the collaborative project. Two groups of 36 subjects were recruited from Puerto Rico and Massachusetts.

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In terms of speed behavior, the combined effect of Spanish-text and enhanced TCDs, although following MUTCD colors and size, is not necessarily apparent to unfamiliar drivers. Based on the results of the reaction to the presence of pedestrians, familiar drivers do not show significant speed reductions because they are aware of the environment and are less sensitive to the presence of the pedestrian on the road or shoulder, as shown in Figure 1. In terms of speed compliance, the effectiveness of the enhanced TCDs is higher for the familiar drivers (67% improvement) when compared to unfamiliar drivers (25%). Based on the results of mean reduction in speeds between Zones 0 (segment of the road where the subjects are traveling at free flow speed) and Zone 3 (location in the vicinity of the school driveway where one pedestrian walks on the shoulder in direction toward the oncoming traffic), the enhanced TCDs has a higher speed reduction for unfamiliar drivers, even though the compliance was substantially low (between 0% and 16.67%). For familiar drivers, the mean reduction was smaller, but the compliance was higher (between 33% and 81%). Finally, with the evaluation of the eye tracker data, it is notable that the proposed overhead signage with flashing beacons captures more the attention for unfamiliar and familiar drivers than the signs used in the current configuration.

Outcomes

Overhead speed limit signs with flashing beacons effectively captured the attention for both familiar and unfamiliar drivers in comparison with the roadside regulatory speed limit sign. In terms of speed behavior of familiar drivers, the overall trend was to drive at lower speeds than unfamiliar drivers on both sign configurations. Use of universal symbols of MUTCD should have higher hierarchy as compared to text to be more effective to first time familiar and unfamiliar drivers with emphasis to TCDs located in the National Highway System.

Impacts

Familiarity with the environment plays an essential role on crash risk reduction. This research addresses the effect of an overhead sign with flashing beacons in familiar and unfamiliar drivers' behavior in school zones. The speed limit compliance can be improved up to 30% for familiar drivers and up to 11% for unfamiliar drivers with the implementation of the proposed overhead sign. Providing signage with universal symbols in areas with propensity for unfamiliar drivers, will significantly improve the overall speed compliance, thus enhancing safety and reducing crash potential in school zones.

References

1. National Center for Statistics and Analysis. (2018). School-transportation-related crashes: 2007-2016 data. Washington D.C.: National Highway Traffic Safety Administration.
2. González-Compre, J. (2016). Mejoras en las Medidas para la Seguridad de las Zonas Escolares en el Área Oeste de Puerto Rico. Universidad de Puerto Rico, Recinto Universitario de Mayagüez.

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