

Research Report Summary



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Enhancing School Zone Safety: Case Studies in Puerto Rico Using Driving Simulation

Drivers and pedestrians coexist in urban environments that were developed to maximize motorized mobility. In school zones, the interaction of drivers and pedestrians is critical, with additional issues related to the possibility of distracted children crossing streets [1] and drivers speeding in school zones [2].

The driving simulator at the University of Puerto Rico at Mayagüez was used to perform an operational and safety analysis to evaluate the effect on driver behavior of a new combination of road signage and pavement

markings in and around school zones. Exposure, crash history, environment complexity, and stakeholders' interviews for seven schools in the western region of Puerto Rico were considered for the evaluation and selection process of the schools to be studied. Two schools were selected for a more in-depth study: Franklin D. Roosevelt and S.U. Samuel Adams.

A survey across the US and Puerto Rico was conducted to evaluate drivers' knowledge of

Traffic Control Devices



Figure 1: TCDs – S.U. Samuel Adams



Figure 2: TCD – Franklin D. Roosevelt School.

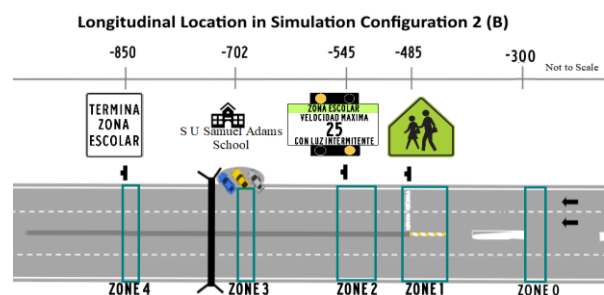
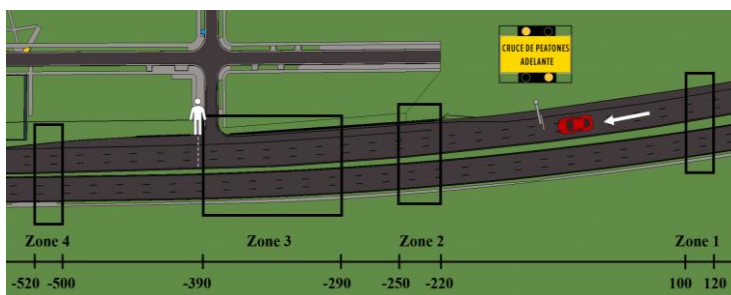


Figure 3. Zones of Interest

school zone areas and how they behaved in them. Additionally, a set of Traffic Control Devices (TCDs) was selected in order to consider their effectiveness in informing drivers of the presence of a school zone and pedestrians, as shown in Figures 1 and 2.

“Overhead signs with flashing beacons are a promising alternative to reduce potential vehicle-pedestrians crashes in and around school zones.”

Scenarios were evaluated considering changes in signage configuration, presence of pedestrians, time of day, vehicles parked in the shoulder, and traffic. A total of 60 subjects participated in the experiments, 36 in the study of the S.U. Samuel Adams and 24 in the study of the Franklin D. Roosevelt. A group of zones of interest was defined along with the roadway scenarios for each school zone, as shown in Figure 3.

Results from the online survey demonstrated that close to half of the drivers lacked an understanding of the fundamental meaning of the School Zone (51%) and School Crosswalk signs (47%). The results of the simulation experiment in S.U. Samuel Adams showed a reduction in mean speed in the proposed TCD configuration for 70.8% of the zones evaluated in the scenarios. The mean position variable is not affected by the proposed TCDs. The presence of the proposed TCD was effective in reducing the change in acceleration in Zone 2 for 25% of the scenarios. Zone 2 is where subject drivers were expected to reduce their speed from 45 mph to 25 mph. The results of the simulation experiment at Franklin D. Roosevelt school showed that the proposed TCD was effective in reducing the mean speed in Zone 3 in 75% of the scenarios. Also, the reaction of the drivers under free-flow conditions to the presence of the crossing pedestrian was primarily to reduce speeds, rather than to perform an evasive maneuver.

Outcomes

Proposed TCDs were effective in achieving a reduction in mean speed in comparison with the existing TCD configuration. The overhead signs with flashing beacons are a contributing factor in making drivers more observant and alert regarding their roadway environment, stimulating drivers to perceive and react effectively to improve their compliance with the speed limits and avoid potential collisions with pedestrians.

Impacts

The proposed pavement marking and overhead signage in school zones in divided major arterials have a positive impact in reducing the acceleration variability and the speed dispersion of drivers. The speed limit compliance can be improved up to 30% with the implementation of these TCDs. Speed uniformity and compliance are associated with lower frequency of crashes, enhancing safety in and around school zones for all road users.

References

1. MacKay, J. M., Steel, A., Wilson, A., Rosenthal, K., & Green, A. (2016). Alarming dangers in school zones. Washington D.C.: Safe Kids Worldwide.
2. Lee, C., Lee, S., Choi, B., & Oh, Y. (2006). Effectiveness of Speed-monitoring displays in speed reduction in school zones. Transportation Research Board, 1973: 27–35. <https://doi.org/https://doi.org/10.3141/2149-01>.