

Research Report Summary



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A Driving Simulator Evaluation of Cross-Sectional Design Elements and the Resulting Driving Behaviors

This research explores the relationship between the cross-sectional design elements and their impact on selected driver attributes such as speed profiles and lateral positioning. In this experiment a traditional collector-type base roadway of 1.5 miles with a 14 ft travel lane and an 8 ft shoulder was modeled using an advanced driving simulator. The base scenario was subsequently reconfigured with four different cross-sectional designs with various elements within the same physical right-of-way. Specific design elements included narrower lanes, bicycle lanes, a raised center median, and a curvilinear roadway profile. Twenty participants each drove five developed scenarios, which were presented in a counterbalanced fashion to mitigate any potential order effect. Participants' speed and lateral position was recorded throughout each of the drives. Across the virtual scenarios, the same performance measures were analyzed by comparing data at each of five controlled collection points (checkpoints). Experimental results were analyzed using both descriptive and inferential statistical tests.



Figure 1: University of Massachusetts Driving Simulator. The fourth experimental scenario (Sc4) is depicted.

Simulator Scenarios

Existing Roadway: 14' travel lane, 8' shoulder, no median



Sc1: Base Scenario



Sc2: 12' lanes, 6' shoulder



Sc3: 14' lanes, 5' bike lane



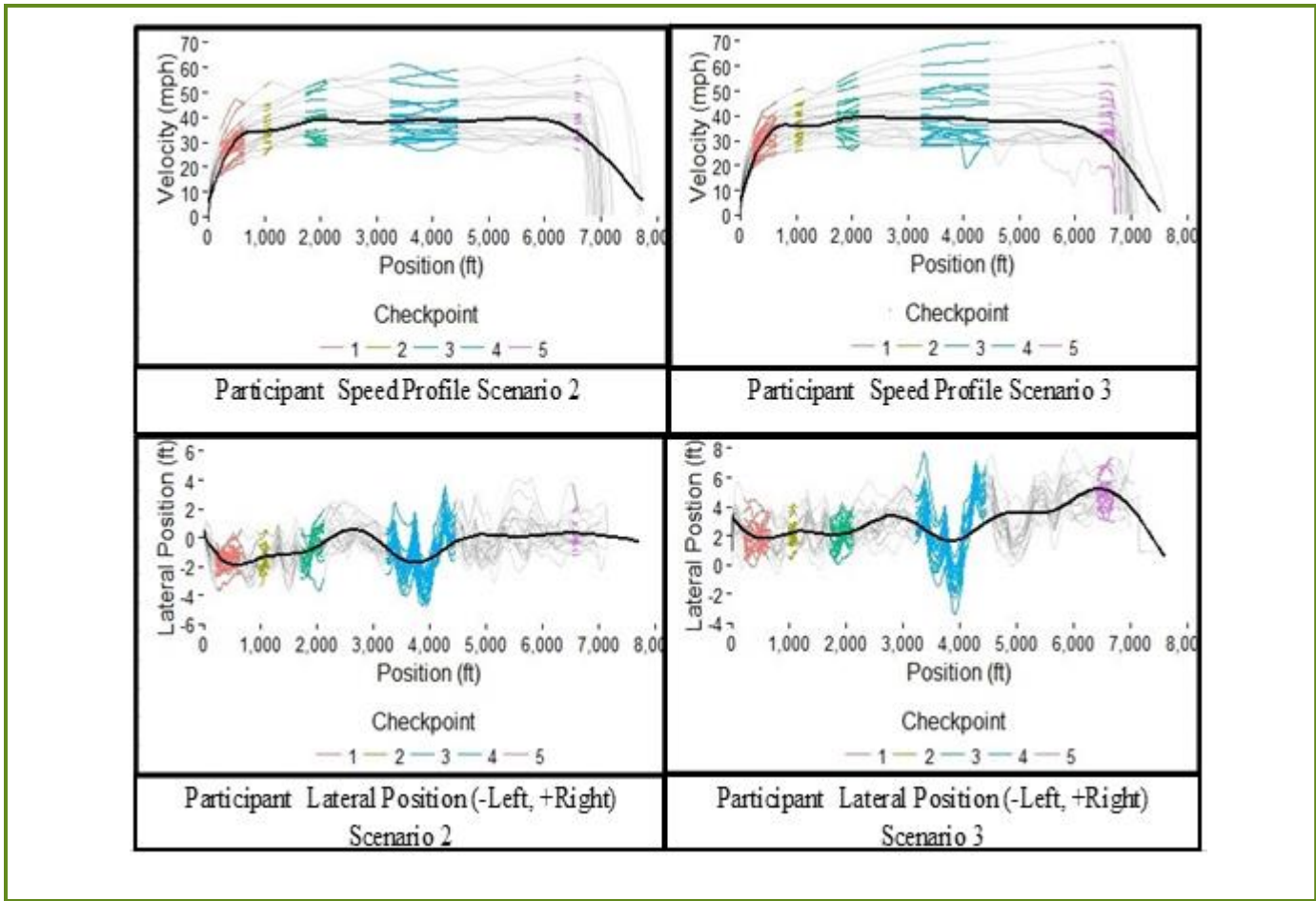
Sc4: 14' lanes, 2' shoulder, 6' raised median



The obtained results show that the participants' mean speed was higher than the posted speed limit in all scenarios except for the curvilinear profile scenario. There was no statistically significant difference in speeds between the base

“Narrower lanes resulted in vehicle lateral positions closer towards the center line.”

(Sc1), narrower lane width (Sc2), bicycle lane (Sc3), and raised median (Sc4) scenarios. In the curved scenario (Sc5), the difference in speeds was statistically significant. The lateral positioning between the scenarios across the checkpoints was significant. Overall, the results suggest that narrower lanes, bicycle lanes, or raised medians have no significant influence on speed reduction. Nevertheless, narrower lanes resulted in vehicle lateral positions closer to the center line.



References

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