Research Report Summary

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Using Simulation to Assess and Reduce Conflicts between Drivers and Bicyclists

Protected vs. Unprotected Intersection Designs

Separated bicycle lanes are gaining popularity as a means to promote bicycling safety. Despite the documented benefits of separated bike lanes, including fewer crashes along protected segments and increased ridership, there remain concerns about how bicycles and vehicles interact when their paths cross at an intersection. The fear is that following a period of separation, drivers are less likely to anticipate and scan for the presence of bicycles [1-4].

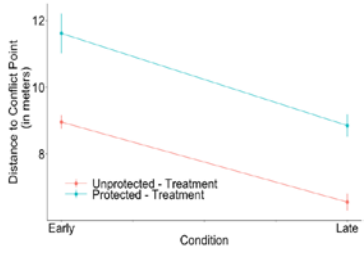

Figure 1. Distance between the rider and the car at the conflict point as a function of condition and car arrival time.

The goal of this study was to systematically test whether protected bike intersections reduce the likelihood of bicycle-vehicle conflicts involving right-hook turns by examining how bicyclists respond to cars making right-hook turns at protected vs. non-protected intersections.

Participants were divided into four groups that differed by the road infrastructure (separated bike lane and protected

Bicycling Infrastructures

Protected Intersection

Unprotected Intersection

Bicycling Simulator

intersections vs. conventional bike lane and unprotected intersections) and the presence (treatment) vs. absence (control) of vehicles making right-hook turns. Turning vehicles were timed to arrive at the conflict point 1 s or 1.5 s before the rider. The results show significant differences in the margin of safety between riders and turning vehicles at the conflict point where their paths cross in protected vs. unprotected intersections.

> *"Protected intersections led to an increased margin of safety at the critical conflict points where vehicles and bicycles mix as compared to conventional, on-road bicycle lanes."*

A variety of factors likely contributed to the differences in how riders approached protected vs. unprotected intersections, including: (1) the geometry of the path caused riders to swerve as they entered protected interactions, and they may have reduced their speed to better negotiate the curved path, and (2) the displacement of the riders' path from the intersection in protected intersections may have given riders a better view of right-turning vehicles, which led them to reduce their speed. Whatever the underlying reason, the increased margin of safety points to potential safety gains with protected intersections relative to on-road bike lanes.

Outcomes

The results show significant differences in the margin of safety between riders and turning vehicles at the conflict point where their paths cross in protected vs. unprotected intersections. When riding on a protected intersection, riders had, on average, about 3 m more space between them and a turning vehicle than did riders in an unprotected intersection. This difference could give riders a greater opportunity to respond to potential collisions.

Impacts

The results demonstrate a positive impact of protected intersections in bicyclist safety. This has the potential to inform decisions about investments in road infrastructure that could lead to reductions in traffic injuries and deaths, as well as an increase in bicycling ridership.

References

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