Project Summary

Texas Department of Transportation

0-5755: Operational and Safety Impacts for Bicyclists Using Roadways with On-Street Parking

Background

On-street motor vehicle parking raises the level of danger for cyclists sharing roadways with motorists. Cyclists face an increased risk of collision with motorists entering or exiting a parking space, as well as vehicle doors suddenly opened in their path, known as "doorings." Alternatively, on-street parking may encourage cyclists to take alternative routes, inconveniencing their travels or unintentionally steering them onto streets unsuitable for cycling. In order to understand and address this problem, researchers at the Center for Transportation Research observed cyclists using roadways with on-street parking and solicited cyclists' preferences regarding route choice. Through the use of an on-line survey and the help of some paid cyclists, researchers captured the route choices of over 2,000 cyclists in the state of Texas and filmed nearly 1,000 instances of motorists, cyclists, and parked cars sharing roadways in the state. The research augmented data from project 0-5157: Operational and Safety Impacts When Retrofitting Bicycle Lanes.

What the Researchers Did

Half of the research team conducted field work by hiring 29 male and 10 female cyclists of varying experience between the ages of 19 and 64 to ride on six to eight streets with vehicle parking in either Austin, Houston, or San Antonio. The 24 sites spread among the three cities captured more than just the average two-lane street with parallel parking; it also included: angled parking, residential areas, central business districts, multi-lane streets, one-way streets, varying traffic speeds and volumes, and varying parking occupancies from 10% up to 100%. From the video recorded of the cyclists at each site, researchers noted the lateral position of cyclists and motorists as each passed on-street motor vehicle parking both separately and in unison. If a motor vehicle encroached into the adjacent lane when it and a cyclist passed a parked vehicle in unison, this was also noted. Last, researchers studied the lateral positions of motorists and cyclists 40 feet downstream of the last parked car when occupancies were low, noting whether cyclists used the parking area for riding. Data analysis compared results from similar sites as well as linear regression analysis of the entire dataset collected from projects 0-5157 and 0-5755.

The other half of the research team developed an on-line survey of cyclist route preferences, including those related to bicycle facilities with on-street parking. The survey had questions on cyclist demographics, experience, reasons for riding, commute characteristics, frequency of their riding throughout the year, and perceptions of their commute and its bicycle facilities.

The heart of the survey was a series of five questions where the cyclist chose the preferred bike route from a set of three routes with varying characteristics.

Research Performed by:

Center for Transportation Research (CTR), The University of Texas at Austin

Research Supervisor:
Randy Machemehl, CTR

Researchers:
Chandra Bhat, CTR
Naveen Eluru, CTR
Ian Hallett, CTR
Ian Hlavacek, CTR
Ipek Sener, CTR
Kristen Torrance, CTR

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Each of the route choices presented a different bikeway scenario that presented an independent series of questions that were progressive and dynamic. The ability of the on-line survey to direct or lead respondents allowed the research team to develop solid estimates of the trade-offs cyclists make in choosing among multiple route possibilities. The questions answered by all allowed the research team to examine the influence of demographics, experience, and commute characteristics on the route preferences.

What They Found

The field observations of paid cyclists and motorists sharing roadways with on-street motor vehicle parking revealed that:

- Roadway width is a critical variable for efficient operation of bicycles and motor vehicles; standard lane widths and preferred AASHTO bike facility widths should be used.
- Bike lanes of five feet or more and buffers between these lanes and parked cars are the only reliable way to remove cyclists from the "door zone" – the area where an opened car door presents a hazard to cyclists; wide outside lanes are unable to do this, regardless of width.
- Bike lanes appear to reduce swerving into the vacant spaces between parked cars, which may be important on high volume roads where cyclist movements need to be predictable.

The overwhelming number of responses to the on-line survey – over 2,000 – ensured sufficient representation of individuals from backgrounds of differing age, gender, education, cycling experience, and commute distance. Geographic representation was good, with more than half of the responses coming from outside Austin and 16% from outside the Austin, Houston, San Antonio, and Dallas-Ft.Worth metroplexes. Eight percent of survey respondents had been involved in a crash with a parked or parking motor vehicle. The five most important route characteristics, in order of increasing importance, were speed limit, bicycle facility continuity, presence of parking and its attributes, traffic volume, and travel time. More importantly, the survey produced a value for the importance of these characteristics – a critical piece of information that cannot be revealed through traditional survey instruments which simply ask respondents to state or rank preferences. For example, male cyclists on a long commute (more than 6 miles) are willing to increase their travel time by 10.9 minutes if they can avoid any roads with traffic speeds over 35 mph.

What This Means

The knowledge generated by this research will help TxDOT evaluate the suitability of proposed bicycle facilities with on-street motor vehicle parking and, in some cases, suggest alternative routes where the parking causes unsafe operational conditions. In particular, the data from the field observations has been used to update the regression equations underlying the Excel Workbook of the Texas Guide for Planned and Retrofit Bicycle Facilities. This workbook gives various indicators of a roadway's suitability as a bike facility and now predicts if cyclists will be in the "door zone" when on-street parking is present. The insight developed from the on-line survey gives planners, engineers, and bicycle coordinators a tangible estimate of the extent to which a cyclist can be re-routed to avoid problematic roadway conditions. These are two very powerful pieces of information that can be used throughout the state and across the nation.

For More Information:
Research Engineer - Duncan Stewart, TxDOT, 512-465-7403
Project Director - Teri Kaplan, TxDOT, 713-802-5810
Research Supervisor - Randy Machemehl, CTR, 512-232-3107

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Texas Department of Transportation
Research and Technology Implementation Office
P.O. Box 5080
Austin, Texas 78763-5080
512-465-7403