Bicycle infrastructure at intersections:
An evaluation of driver behavior using a driving simulator

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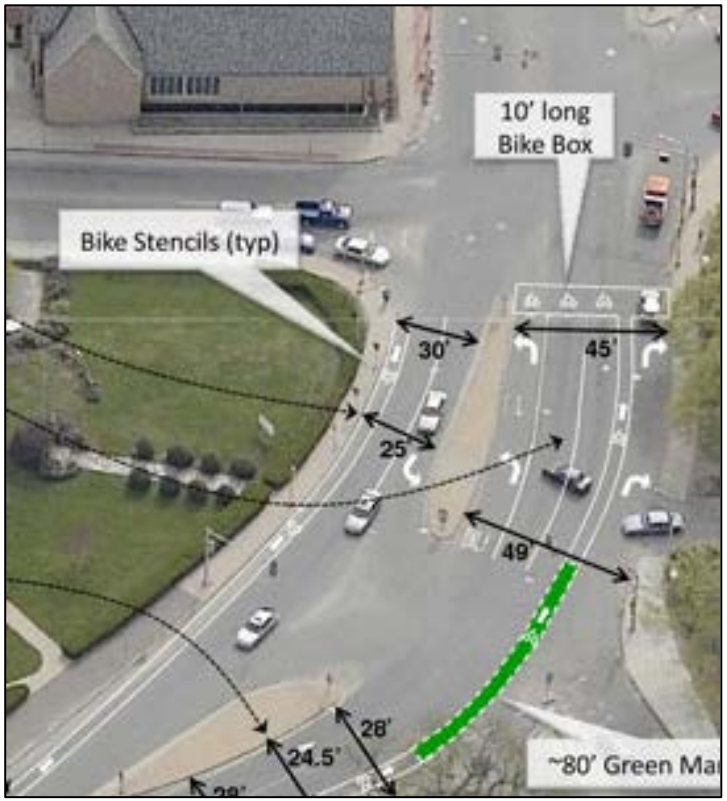
http://streetsmarts.bostonbiker.org/

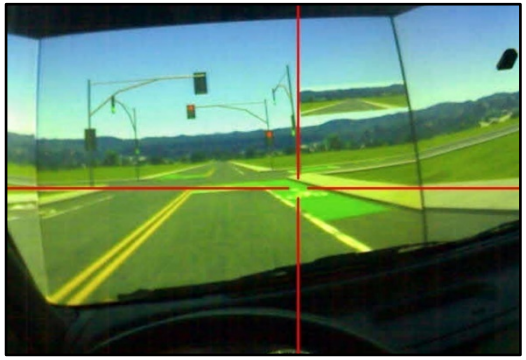


http://nelsonnygaard.com/

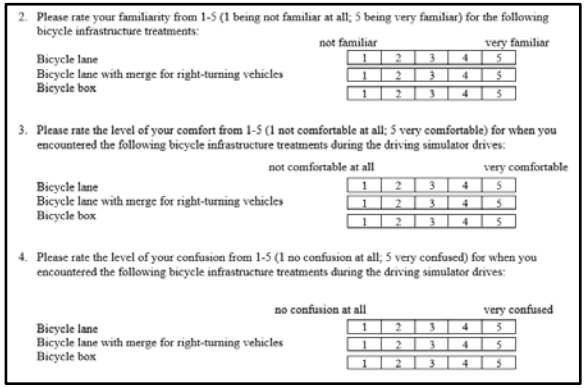
Apparatus

Driving Simulator

Eye Tracker



Questionnaire



2. Please rate your familiarity from 1-5 (1 being not familiar at all; 5 being very familiar) for the following bicycle infrastructure treatments:

	not familiar				very familiar
Bicycle lane	1	2	3	4	5
Bicycle lane with merge for right-turning vehicles	1	2	3	4	5
Bicycle box	1	2	3	4	5

3. Please rate the level of your comfort from 1-5 (1 not comfortable at all; 5 very comfortable) for when you encountered the following bicycle infrastructure treatments during the driving simulator drives:

	not comfortable at all				very comfortable
Bicycle lane	1	2	3	4	5
Bicycle lane with merge for right-turning vehicles	1	2	3	4	5
Bicycle box	1	2	3	4	5

4. Please rate the level of your confusion from 1-5 (1 no confusion at all; 5 very confused) for when you encountered the following bicycle infrastructure treatments during the driving simulator drives:

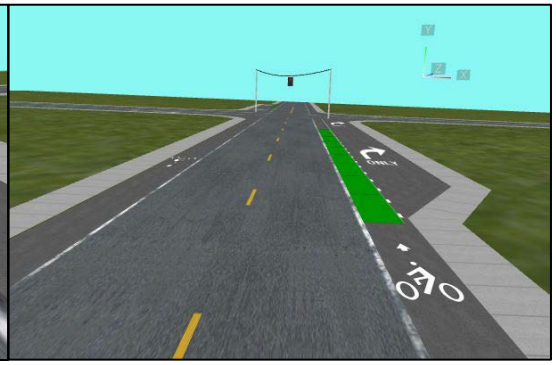
	no confusion at all				very confused
Bicycle lane	1	2	3	4	5
Bicycle lane with merge for right-turning vehicles	1	2	3	4	5
Bicycle box	1	2	3	4	5

Driving Simulator ⟷ Questionnaire

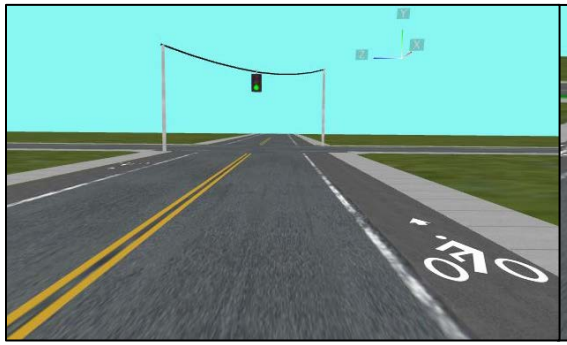
Scenario Design

"Sharrow"

Merge Lane



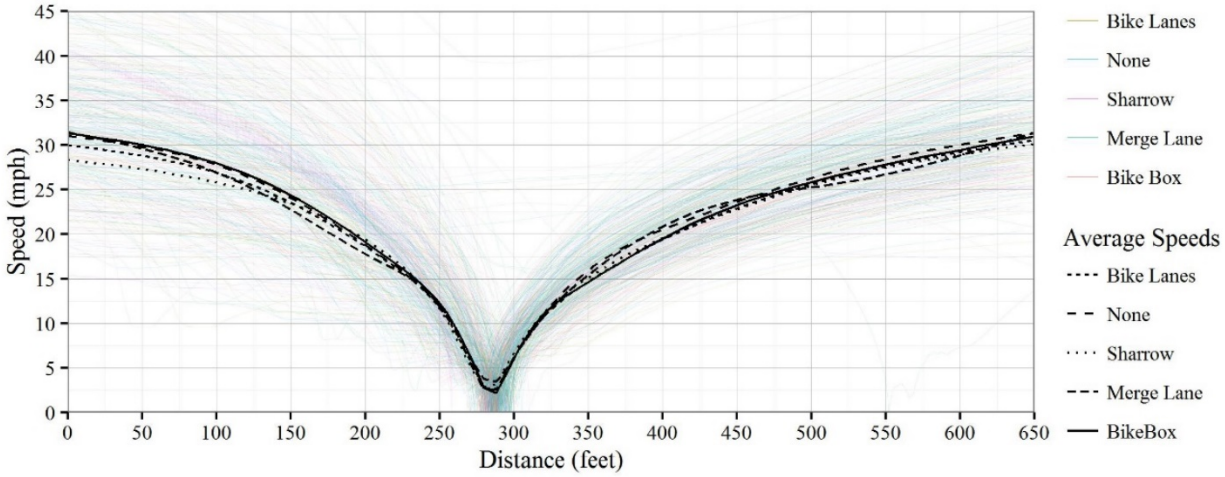
Bike Lane



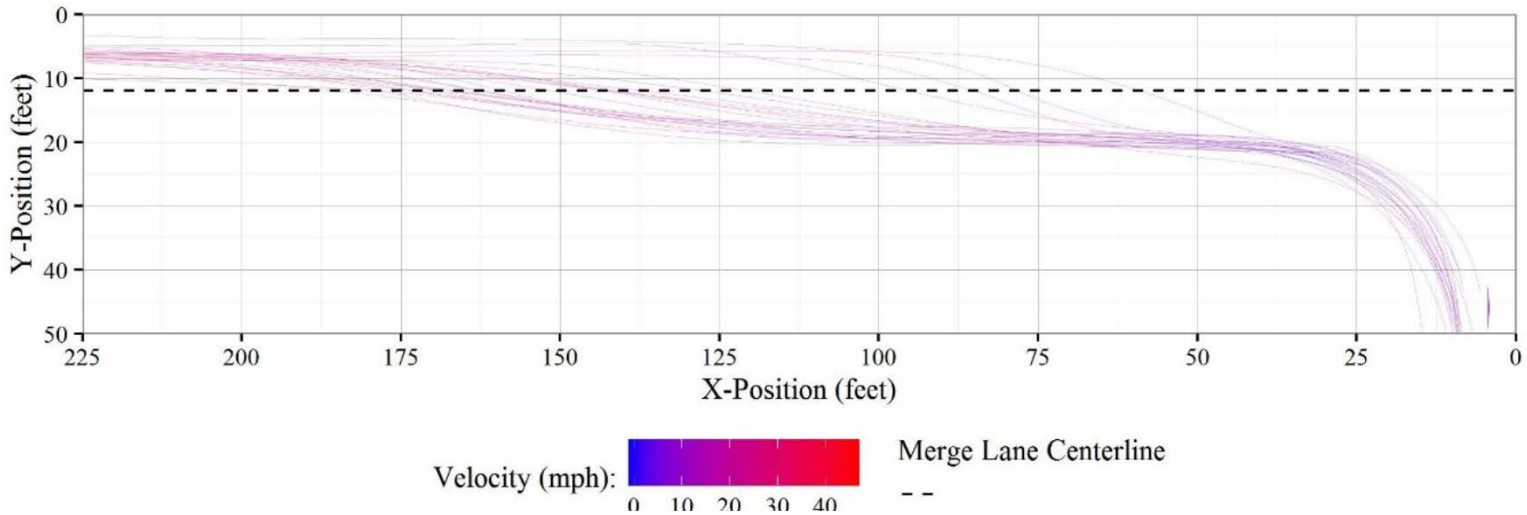
Bike Box

- 16 intersections, one for each treatment and turning movement (Left, Right, Through)
- Half of participants drove a reversed scenario
- Signals in final simulation were MUTCD compliant
- Vehicle and bicycle traffic was light and in opposite direction to not cause queuing

Results: Sharrows & Merge lanes

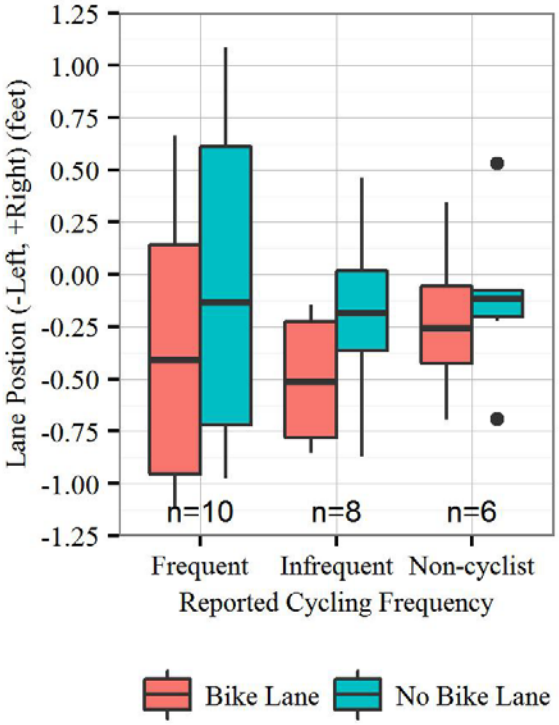


- Sharrows and merge lanes yielded no significance
- Likely due to sharrows and merge lanes depending upon bicycle interaction

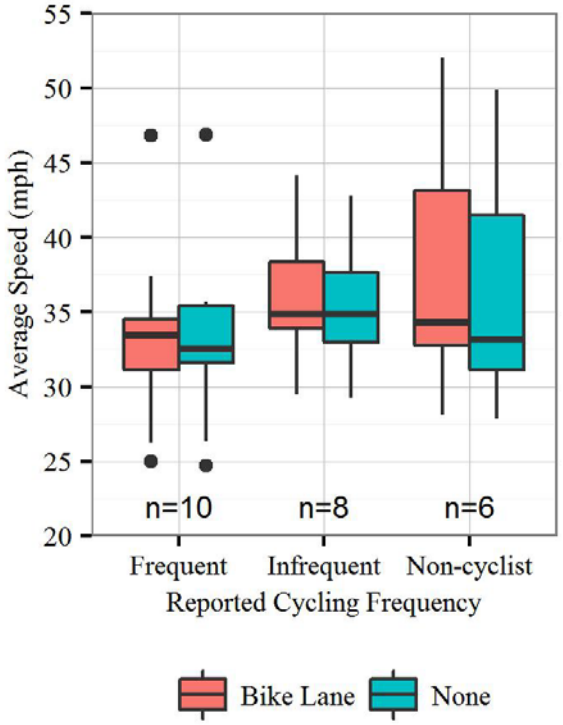


Results: Bike Lanes

Lane positioning



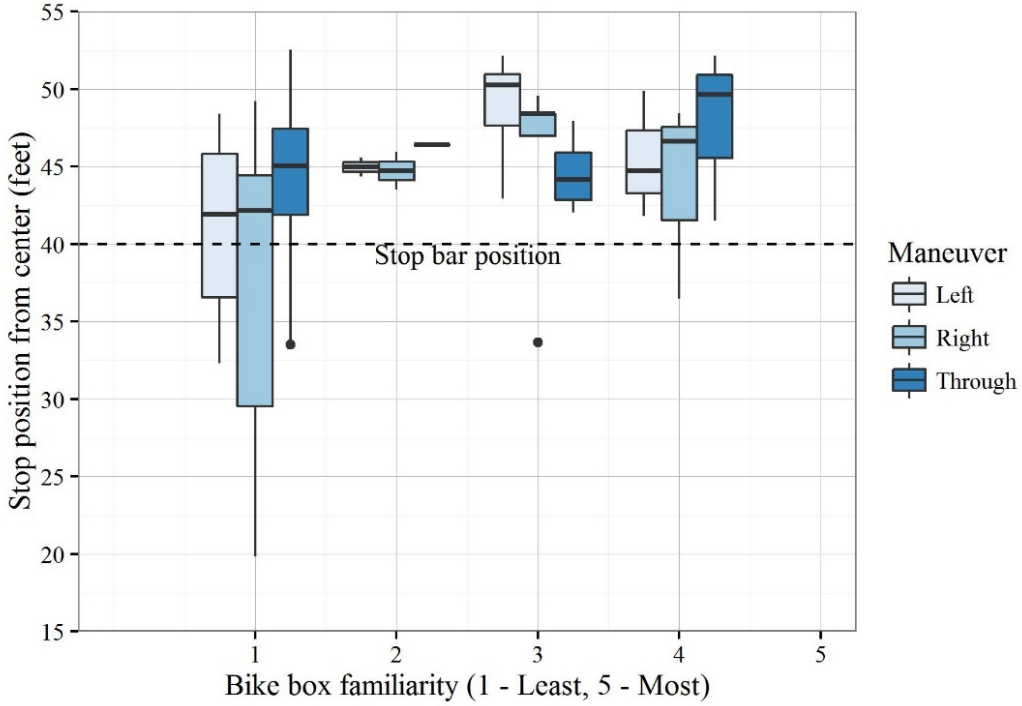
Average speed



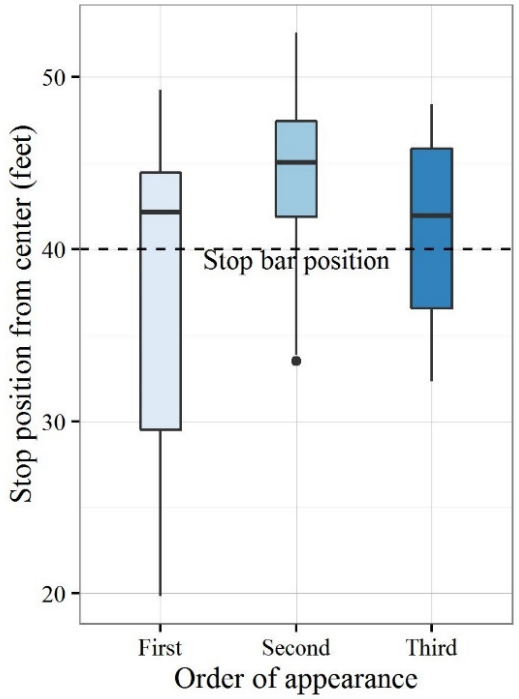
- Cyclists tended to drive slower and position the vehicle more variably within the drive lane

Results: Bike Boxes

All drivers stop position

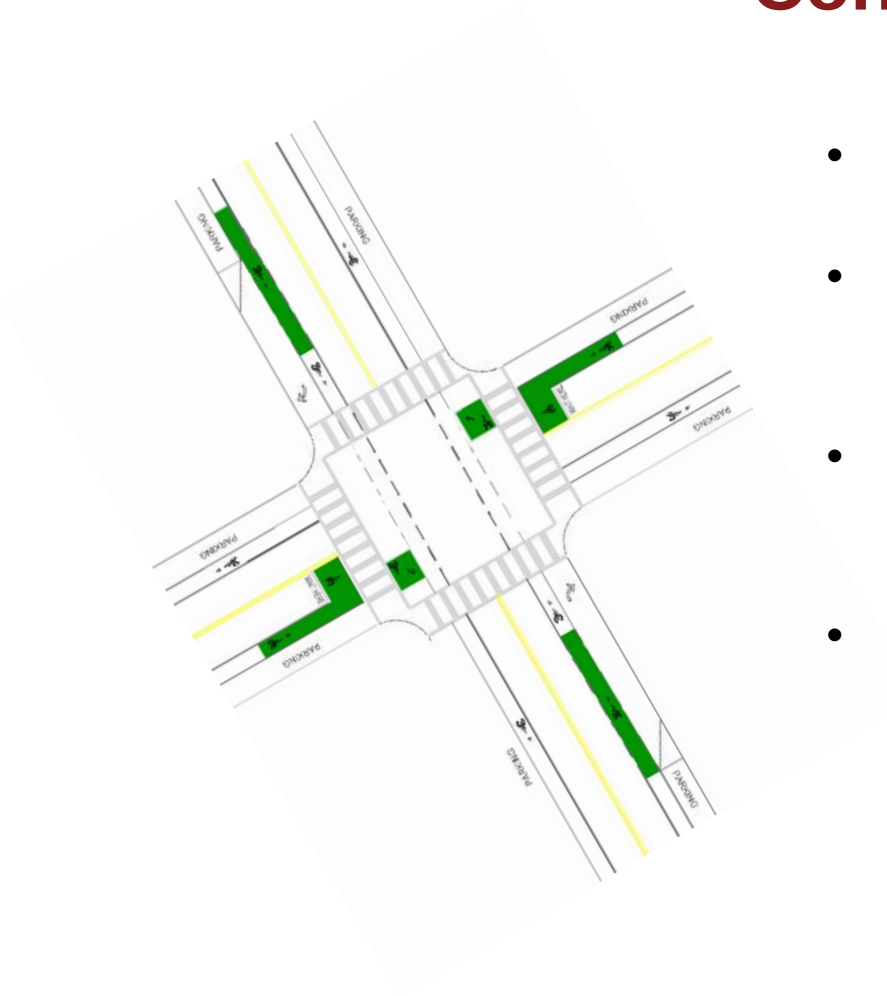


“Unfamiliar” stop positions



- Drivers that were familiar with bike boxes appropriately stopped behind stop bar
- Of “unfamiliar” drivers, performance improved after the first appearance of bike box

Conclusions



- Cyclists drive differently than non-cyclists
- Drivers familiar with infrastructure can improve their performance
- This supports the importance of integrating education with infrastructure.
- Future effort is to add additional subjects to improve statistical strength