OPERATIONAL EVALUATION OF ADVISORY BIKE LANE TREATMENT ON ROAD USER BEHAVIOR IN OTTAWA CANADA

DATA COLLECTION AND METHODOLOGY

Treatment description

The treatment is comprised of the following typical lane configurations: [i] a curb-side eastbound advisory bike lane marked with a dashed white line (1.4 m wide), [ii] a two-way shared central vehicle travel lane (4.0 m wide), [iii] a floating westbound advisory bike lane marked with a dashed white line (1.4 m wide), [iv] a buffer zone marked with solid white lines (0.5 m wide) and, [v] a curb-side parking lane (2.2 m wide). This treatment was initially implemented in the fall of 2016 on Somerset Street East between Chapel Street and Range Road in the downtown of Ottawa, Ontario. Somerset Street East is a residential collector road which features two-way traffic in the eastbound and westbound directions, time limited on-street permissive parking on the north side of the street, sidewalks on both sides of the street, and a speed limit of the 40 km/h.

Video Data Collection and Processing

Video data were collected in two phases where each phase consisted of two different days (weekend approximately 10:00 AM - 2:00 PM and weekday approximately 8:00 AM – 4:00 PM). Phase 1, video data collection (pre-treatment) was collected in May 7th and June 04th, 2016. In this phase the road is completely unmarked. Phase 2, data was collected in July 19th and September 09th, 2017 (one year after the treatment).

The weather on all days of the video data collections was clear. The video data was labeled and converted to an appropriate format that enabled further processing. Video subsequences containing cyclists travelling in both directions while occupying the road were identified. The traffic volumes of the cyclists and the motor vehicles were counted for each direction separately along monitored sections. A total of 1,477 cyclists were counted, (pre-treatment 568 cyclists and post-treatment 909 cyclists).

Observed Performance Parameters

Below is the complete list of different performance parameters that were extracted from the video data collected.

1- When a motor vehicle and a cyclist were visibly adjacent to each other, either in the same direction or in different directions, the lateral distance between the motor vehicle side and the bike tires was measured.

2- When the cyclist was moving with no visible passing motor vehicle, the lateral distance between the cyclist and the south curbside edge was measured, then the lateral distance between the cyclist and the buffer edge line was calculated.

3- Motor vehicle and cyclist speed were measured indirectly by recording the time interval which separates the passages of a motor vehicle and cyclist at two reference locations. The distances between these reference locations was measured in the field.

SUMMARY AND DISCUSSION

This project is the first of two that are being implemented as part of an Advisory Bike Lane Pilot Project; the second of which is being installed in spring 2019. Pre and Post data has and will be collected and analyzed to form a comparable data set from which appropriate conclusions will be able to be determined. Additional data at the Somerset site will be collected in 2019 and included in the next set of evaluations.

This study observes the change in behavior of motor vehicles and cyclists associated with the painting of advisory bike lane. A before and after evaluation was conducted to evaluate the impact of advisory bike lanes. To assess cyclists and motor vehicle behaviors for both conditions, different performance parameters were extracted from the video data collected: [i] lateral distance measurement, and [ii] the rates of vehicle traveler speed.

A total of 1,477 cyclists were observed in both phases. The observations were made within a total period of 4 days: two days in pre-treatment and two days in post-treatment conditions. The treatment is pavement markings in the form of advisory bike lane in urban street in Ottawa, Canada.

Three different lateral distance measurements were calculated for both conditions; [1] the buffer edge line to bicycle, [ii] the curbside edge to bicycle, and [iii] bicycle to moving motor vehicle. Most notably is the decrease in average lateral distance between bike tires and the buffer edge line from 1.11m to 0.85 m. This difference is due to the benefit of pavement markings (advisory bike lane) and to encourage and guide bicycles to ride in the middle of the bike lane. This difference was found to be statistically significant. This is a positive change as more cyclists now ride in the center of the bike lane.

Regardless of the direction of movement, the average lateral distance for both pre and post-treatment were found to be 2.23 m and 2.76 m respectively. After the installation of the advisory bike lane, it was evident that the average lateral distance between cyclist and traveling motor vehicle increased when they were both moving in the same and different directions.

The results effectively show that after the advisory bike lane was installed, the motor vehicle travelling speed decreased. More specifically, the 85^{th} percentile speed was decreased by 5.2% in post-treatment. Although this reduction in motor vehicle speed is small, it can be a significant impact in creating a safer environment for many, including motor vehicle drivers, cyclists and pedestrians. Advisory bike lanes are and effective tool to encourage motor vehicle drivers to reduce their speed, demonstrating that the treatment achieved the initial purpose of this experiment. In addition to the positive impacts of the installation of the advisory bike lanes, the average cyclist speed increased by 7.7%. This increase most likely occurred due to cyclists feeling more comfortable riding within the defined operating spaces.

CONCLUSIONS

This paper examines the change in operational and safety measures for cyclists and motor vehicles associated with the installation of the advisory bike lane on an urban two-way street. The key findings are as follows:

- The advisory bike lanes had a positive impact in encouraging cyclists to ride in the middle of the bike lane, resulting in friction reduction between the cyclists and traveling motor vehicles.
- The average distance between the motor vehicle and the cyclists (passing distance) for all phases' conditions (pre- and post- treatment) were within a safe distance. The results show an increase in passing distance in post- treatment vs. pre- treatment.
- It is evident that the advisory bike lane work well on streets with low volume and low speeds.
- Based on video analysis and treatment results, it is clear that when cyclists are seen to be using one side of the advisory bike lane, the opposing motor vehicle driver tried to distance itself as far away as possible from this cyclist, even when a safe encroachment into the other advisory bike lane on the other side of the road can be made.
- During video analysis, few cases were found where motor vehicle drivers followed cyclists when a safe pass was unable to be made due to incoming opposing motor vehicles, at that same instant.
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The findings of this study indicate positive trends in both cyclist and motor vehicle driver behavior with the presence of advisory bike lanes. Although this method is advantageous, more efforts are still needed to raise public awareness and treatment enhancement to see further reduction in collision risk. More study will be done as part of the next phase at the city's pilot program to evaluate the effectiveness of this treatment.