Improving Cyclist Safety: Understanding the Relationship between Road Infrastructure and Passing Distance

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Abstract

Cycling-related injury rates are on the rise. As the majority of on-road cycling crashes involve interactions with motor vehicles, there is a need for greater understanding of factors that result in unsafe interactons, particularly unsafe passing events between motor vehicles and cyclists. Through the use of a purpose-built and independently calibrated ultrasonic device, this study aims to quantify passing distance and to assess whether passing distance is affected by specific types of road infrastructure. An on-road observational study is currently underway in Victoria that aims to address these knowledge gaps and improve cyclist safety.

Background

Cycling is an alternative mode of transport to motor vehicles that has numerous health and economic benefits (Oja et al., 2011; Grabow et al., 2012), however cyclists are considered vulnerable road users and injury rates are on the rise (Sikic et al., 2009; Henley & Harrison, 2012).

A large proportion of on-road cycling crashes involve interactions with motor vehicles (Teschke et al., 2012; Boufous et al., 2013; Yilmaz et al., 2013; Beck et al., 2016). Furthermore, nearly one quarter of on-road crashes occur when the cyclist is riding in a marked bicycle lane (Beck et al., 2016), demonstrating that current infrastructure for cyclists is inadequate and does not create a safe cycling environment. Furthermore, a recent review of cycling crashes in Victoria demonstrated that overtaking-related crashes are a major cause of cycling crashes with vehicles (Biegler et al., 2012). As a result, identifying situations in which vehicles pass in close proximity to cyclists is needed to develop a greater understanding of factors that lead to unsafe interactions between cyclists and vehicles.

The primary study aims are:

1. To quantify the distance between passing vehicles and cyclists;
2. To quantify where safe and unsafe passing events occur; and
3. To assess whether passing distance is affected by specific types of road infrastructure (such as marked bicycle lanes, the presence of parked cars next to bicycle lanes and road speed limits).

Methods

An on-road observational study is currently underway in Victoria, an Australian state yet to amend the road rules to legislate a minimum passing distance. Volunteer participants, recruited using a convenience sample, are recording all their cycling trips over a two week period. Participants' bicycles are fitted with a purpose-built and independently calibrated device that incorporates ultrasonic sensors that measure the lateral passing distances of all motor vehicles, a video camera and a GPS datalogger. The device will record the lateral passing distance, video footage, speed, and location. In addition, the device is fitted with a handlebar mounted button that participants' press when they feel a motor vehicle has overtaken them too closely. Video analysis will be conducted to quantify the vehicle type and on-road infrastructure, using the Cycling Aspects of Austroads Guides

(Austroads, 2017). Data analysis will focus on the association between actual passing distances, incidents of perceived unsafe passing and correlated with cyclist type, vehicle type and on-road infrastructure. The focus of the analysis will be on the proportion of vehicle passes that are less than 1.0 m.

Expected outcomes

The proposed project will be the first Australian study to quantify the distance motor vehicles provide when passing cyclists and will provide critical data on which road infrastructure types are most effective in reducing injury risk for cyclists. It is envisaged that the outcomes of this body of work will: 1) inform road design and educational campaigns, 2) reduce injury to cyclists, and 3) increase cycling participation through the reduction of perceived safety concerns that remain as a barrier to increased participation (Winters *et al.*, 2011).

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