View from a bike: adapting a naturalistic driving approach to on-road cyclists

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Introduction: The aim of the project was to adapt the 100-Car Naturalistic Driving Study to develop a new method to investigate the behaviours of on-road cyclists and their interactions with other road users. Cycling is the fourth most popular physical activity in Australia and its popularity is continuing to increase. Given cyclists' physical vulnerability, it is unsurprising that the rise in cycling popularity has been associated with a concomitant rise in the number of serious injuries amongst this road user group. Nationally, in Australia, cyclists account for 17% of all seriously injured road users. Previous research into cyclist/driver collisions has relied on post-event data. Absent from this approach is an understanding of pre-event contributory factors for collisions and near-collisions, and in particular, looking behaviour of cyclists prior to a collision and the behaviour of cyclists and drivers. Additional insights from real world observations are needed to determine the cause of incidents and in turn, to provide guidance on effective cycle safety strategies.

Method: The technique developed was based on the 100-Car Naturalistic Driving Study, the first comprehensive naturalistic driving study that, for the first time, captured important typically unreported minor events and insights into pre-collision behaviours. The method and analysis was adapted to on-road commuter cyclists in Melbourne, Australia. A single compact video camera was mounted to each participant's helmet and footage that was representative of the cyclists' viewpoint was recorded for all trips for a 4-week period. Participant inclusion criteria were: over 18 years of age; travelled the majority of the trip on-road and; able to record 12 hours of riding over a maximum 4-week period. Participants also completed a baseline questionnaire about their cycling and driving experiences, provided a weekly email progress update and completed a semi-structured exit interview. A pilot study was conducted to test the equipment and the method to examine commuter cyclists' riding experiences during regular trips. Pilot study participants were recruited using the snowball technique and while not representative, the purpose was to pilot the helmet camera and refine the method.

Data analysis: Data was analysed in three stages: an initial footage review; identification of collisions and near-collisions and; classification of collisions and near-collisions. In the initial review, the total footage was viewed and low light footage and time spent riding off road were excluded. In the second stage, 100-Car study definitions of collision, near-collision and incident were used to identify events. Finally, events were classified using the 100-Car study data dictionary that was modified for this study. Unlike the driver-centred naturalistic studies, here the emphasis was on understanding cyclist-driver (bike/vehicle) interactions from the cyclists' perspective. In total, 20 variables were adopted from the 100-Car study without change including: event severity, pre-incident behaviour and the road and traffic environment. A further 8 variables were modified, primarily changing the referent from driver to cyclist and adapting to the Australian road environment (left lane drive) and 16 driver-behaviour variables (primarily from internal vehicle cameras) were not captured in this study and were therefore excluded. Additional variables included cyclists' head checks and details of on-road cycling infrastructure. Descriptive statistics were calculated using SPSS 15.0 for Windows.

Results: For the purpose of developing and refining the study methods, 6 participants (3 males, 3 females) participated in the pilot study and 68 hours and 55 minutes of footage was recorded. After the initial review and exclusions, the final footage time for analysis was 46 hours and 16 minutes. All variables were coded from the footage without difficulty. No crashes were recorded, however 36 other events were identified. The majority of events involved male participants (69.4%). Pre-event, most cyclists (91.6%) were travelling straight ahead (i.e., not turning or merging). Most events involved a motor vehicle (77.7%). No bicycle lane was present at over half the event sites (55.5%).

Conclusion: With modification, the naturalistic driving method was successfully adapted to investigate the experiences and behaviours of on-road cyclists. The method provided new data on the looking behaviour of cyclists, head checks and the behaviours of cyclists and driver prior to a near-collision. The adaptation of the 100-Car study definitions provided a framework to classify cyclist/driver events. The main strength of this method is continuous data recording which allows detailed, repeated review and analysis of behaviours over the cyclists' entire trip. The main limitation of the method is the manual review and coding of the footage which is currently a resource-intensive process. A larger study using this method is currently being conducted and is expected to provide insights into the major causal factors involved in collisions and near-collisions between cyclists and drivers. It is anticipated that the analysis will include a detailed review to attempt to determine the cause of the event, road user actions contributing to the event (cyclist and/or driver); location details: cycling infrastructure, traffic lanes and flow, surface condition; driver behaviour: vehicle manoeuvre, driver action, vehicle position; and cyclist head checks.