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Why do cyclists infringe at red lights? An investigation of Australian cyclists' reasons for red light infringement

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ABSTRACT

This study investigated the behavioural, attitudinal and traffic factors contributing to red light infringement by Australian cyclists using a national online survey. The survey was conducted from February to May 2010. In total, 2061 cyclists completed the survey and 37.3% reported that they had ridden through a signalised intersection during the red light phase. The main predictive characteristics for infringement were: gender with males more likely to offend than females (OR: 1.54, CI: 1.22–1.94); age with older cyclists less likely to infringe compared to younger cyclists 18–29 years (30–49 yrs: OR: 0.71, CI: 0.52–0.96; 50+ yrs: OR: 0.51, CI: 0.35–0.74), and; crash involvement with cyclists more likely to infringe at red lights if they had not previously been involved in a bicycle–vehicle crash while riding (OR: 1.35; CI: 1.10–1.65). The main reasons given for red light infringement were: to turn left (32.0%); because the inductive loop detector did not detect their bike (24.2%); when there was no other road users present (16.6%); at a pedestrian crossing (10.7%); and 'Other' (16.5%). A multinomial logistic regression model was constructed to examine the associations between cyclist characteristics and reasons for infringement. Findings suggest that some cyclists are motivated to infringe by their perception that their behaviour is safe and that infrastructure factors were associated with infringement. Ways to manage this, potentially risky, behaviour including behaviour programmes, more cyclist-inclusive infrastructure and enforcement are discussed.

1. Introduction

Red light infringement is one of the most obvious illegal behaviour of all road users, including on-road cyclists, yet there is little evidence to advance our understanding of why cyclists engage in this, potentially risky, behaviour. In Australia, observational studies reported relatively low infringement rates from 7 to 9 per cent (Daff and Barton, 2005; Johnson et al., 2011) compared with other countries. Internationally, higher rates of cyclist red light infringement rates have been reported. In Brazil, a cross-sectional survey study of male commuter cyclists reported a red light infringement rate of 38.4 per cent ($n = 1511$) (Bacchieri et al., 2010). In China, an observational study of pedal cyclists and electric bike riders reported that over half of all riders had infringed (56%, $n = 451$) (Wu et al., in press).

While driver red light infringement has a definite risk to other road users and is a contributing factor in intersection crashes (Reason et al., 1990; Retting et al., 1999a), cyclist red light infringement leads to few crashes. Analyses of police recorded cyclist crashes due to red light infringement have reported rates of only 1.8 per cent in the UK (Lawson, 1991) and 6–6.5 per cent in Queensland, Australia (Green, 2003; Schramm et al., 2008). In a comprehensive travel study in Brazil, cyclist red light infringement was not significantly associated with crashes ($p = 0.819$) (Bacchieri et al., 2010).

Red light infringement is frequently cited as the cyclist behaviour that most annoys drivers and is perceived as typical cyclist behaviour (Fincham, 2006; Kidder, 2005; O'Brien et al., 2002). Riding through red lights has been identified as part of the Australian media's negative portrayal of cyclists, particularly in the print media (Rissel et al., 2010), despite the low observed number of non-compliant cyclists in Australia and the low association between red light infringement and crashes. The media often report cyclists' frequent red light infringement as evidence of general unlawfulness and suggest increased police enforcement would improve cyclist behaviour (Harrison, 2007; Rennie, 2009).

Little is known about Australian cyclists' reasons for infringement. Observational studies are limited in their capacity to explore

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the underlying mechanism involved in red light infringement, and to date, there have been no epidemiological studies addressing these mechanisms (Wu et al., in press). Cyclist red light infringement due to cyclists' recalcitrance that can be reduced by increased enforcement may be an oversimplification as broader, system factors may also contribute to this behaviour. It is important to understand why cyclists infringe at red lights to guide countermeasure development aimed at compliance.

2. Methods

An online survey was conducted amongst a sample of cyclists and drivers in Australia that investigated their on-road experiences including cyclists' previous red light infringement behaviour and reasons for infringement.

2.1. Participants

Participants aged 18 years or older took part in this study. Participation was voluntary and no incentive was offered. All potential respondents were provided with an explanation of the study and their informed consent was implied in the submission of an anonymous survey response. The Monash University Human Research Ethics Committee approved the study protocols.

The main recruitment method was online through the use of several websites (Monash University webpage and intranet, Amy Gillett Foundation webpage and social network page). In addition, a snowball recruitment strategy was used, the survey link was sent to participants from previous cycling studies at Monash University Accident Research Centre and they were invited to forward the link. The survey was also publicised during a radio interview.

2.2. Online survey

The survey was designed to investigate a range of driver and cyclist behaviours on the road and their reasons for specified behaviours. During the development phase, the survey was piloted with cyclists ($n = 5$) and drivers ($n = 5$) aged 18 years or older to assess question clarity. The survey was delivered online using the SurveyMonkey software. A paper copy was available on request but no requests were received. The survey was conducted from February to May 2010.

2.3. Data analysis

Respondents' status as a cyclist was determined based on the response to the question 'Do you ride a bicycle', with respondents who answered that they rode often or occasionally identified as cyclists. For the current analyses, only respondents identified as cyclists were included.

Two survey questions related to the cyclists' red light infringement behaviour were analysed: (1) When you are riding do you stop at red lights. Response options were 'Never', 'Seldom', 'Sometimes', 'Often' and 'Always' and (2) When would you ride through a red light? Response options were 'I always ride through red lights', 'I never ride through a red light', 'When trying to cross on the amber and it turns red', 'When turning left', 'At a pedestrian crossing', 'When I'm in a hurry' and 'Other' an open-ended option.

Six demographic characteristics variables were extracted: gender, age group, marital status, work status, educational level and income.

Cycling experience questions were also analysed to identify respondent riding characteristics: (1) crash involvement with a vehicle (yes/no), (2) distance ridden, and red light infringement fine when driving in the last two years (yes/no). Previous research into drivers' traffic infringements reported a higher number of self-reported infringements among drivers with a high annual mileage (Reason et al., 1990), (3) distance cyclists typically rode per week in warmer months and colder months (none, <10 km, 11–50 km, 51–100 km, 101–150 km, 200+ km. Dichotomised to: <100 km per week and 100+ km per week). As inclement weather conditions are reportedly a deterrent for Melbourne cyclists (Nankervis, 1999). Responses to red light infringement over the last two years when driving were also analysed.

Respondents were asked about their red light infringement behaviour when driving to explore if infringement behaviour was related to road user type.

Respondents' demographic characteristics and cycling experience/behaviour questions were summarised using descriptive statistics and cross-tabulated by compliance behaviour (yes/no) with independence in the cross tabulations assessed using Chi-square tests (see Table 1). To identify the demographic features significantly associated with infringement, a binary logistic regression model was estimated, with the outcome variable being compliance (yes/no).

Finally, the reasons why cyclists infringed at red lights were analysed using descriptive statistics. A multinomial logistic regression model was then estimated to identify the characteristics of cyclists associated with each reason for infringement. The use of multinomial logistic regression ensured each factor considered in the analysis was controlled for the effects of all other factors in the analysis.

All statistical analyses were conducted using SPSS Version 18. Statistical significance was set at $p < 0.05$.

3. Results

In total, 2061 completed surveys were received from respondents who were identified as cyclists. The majority of these respondents reported that they had not infringed at red lights as a cyclist (62.7%).

3.1. Demographic characteristics

A summary of demographic characteristics, cyclist crash involvement, distance typically ridden per week (warm weather and cold weather months) and their red light infringement as a driver in the last two years by compliance is presented in Table 1.

Four demographic characteristics were significantly associated with infringement: gender, age, marital status and employment status. The majority of cyclists were male (68.6%) and a greater proportion of males reported infringement (39.8%) than females (31.9%). Most respondents were aged 30–49 years (59.1%) however; infringing was greater amongst the younger age group (18–29 years: 43.9%; 30–49 years: 38.5%) than the older cyclists (29.9%). The majority of all respondents were married/in a relationship (70.6%) however; the highest proportion of infringement was among single/never married respondents (42.2%). The majority of respondents worked full time (76.8%) however students reported the highest proportion of infringement (42.3%).

The majority of all respondents had a university degree (50.1%) and an annual household income of over $100,000 (53.2%). There was no significant difference in compliance for these factors.

Of the cyclist behaviour/experience questions, responses to three questions were statistically significant with respect to red light compliance: cyclist crash involvement, distance ridden and driver red light infringement. Over half (57.1%) of cyclists who had been involved in a bicycle–vehicle crash were compliant at red lights and this was statistically significantly higher than cyclists who had not been involved in a bicycle–vehicle crash.