BRIEF REPORTS

Cycling safety: injury prevention in Oxford cyclists

L McGuire, N Smith

Abstract

Objective—To assess injury prevention measures used by cyclists in Oxford and to detect any differences between wearers and non-wearers of cycling helmets.

Method—A prospective observational survey of a series of cyclists passing a single point on a busy city road in reduced lighting. Two observers jointly recorded four measures of injury prevention: use of front or rear light, high visibility (reflective or fluorescent) clothing, and cycling helmet. The use of the first three interventions was analysed in relation to helmet use/non-use.

Results—A total of 392 cyclists were observed over one hour. Fourteen (3.6%) were observed to use all four studied measures, while 137 (34.9%) used none of them. The frequency of measures observed was: lit front light 190 (48.5%), lit rear light 197 (50.2%), both lights on 163 (41.6%), helmet on 104 (26.5%), and high visibility clothing 39 (9.9%).

Despite the helmet using group's smaller size, it contained a significantly higher proportion of cyclists with lit front light (60.6% v 44.1%), lit rear light (61.5% v 46.2%), and high visibility clothing (27.9% v 3.5%), than the non-helmet group ($p \leq 0.01$). Whereas only 22% of the helmet users had no other observed measures, 47.2% of non-users did so.

Conclusion—Cycling helmet users were significantly more likely to use collision prevention measures in conditions of reduced visibility. Explanations may include higher levels of risk awareness and greater knowledge of safe cycling practices in the smaller, helmet using group. However, current measures by cyclists in a major cycling centre may be insufficient to prevent collisions and consequent serious injury or death.

(Injury Prevention 2000;6:285–287)

Keywords: cycling; protective clothing; cycle lights

John Radcliffe
Hospital, Oxford, UK
L McGuire
N Smith

Correspondence to:
L McGuire, Accident &
Emergency Medicine,
Wycombe General Hospital,
High Wycombe, Bucks
HP11 2TT, UK
(larry@mcguire.freemove.co.uk)

Oxford has been termed the unofficial cycling capital of the UK. Thriving tourism and Britain's oldest university contribute to the motor traffic that regularly congests the city centre. Local planning countermeasures promote already widespread bicycle use, which increases exposure of cyclists to motor traffic, and hence increases potential for injury.

Although most adult cycling accidents do not involve motor vehicles,^{1,2} such high velocity

impacts cause the majority of deaths.^{3,4} Adult cyclists struck by motor vehicles are more likely to be struck at night, less likely to be responsible for the event, and more likely to suffer serious injury or death.^{5,6} Common scenarios are when a vehicle is turning across traffic, striking an oncoming cyclist, or overtaking a cyclist travelling in the same direction.⁷

The first advanced stopline in the UK was introduced in Oxford. These are now widely used road markings, which create a safe zone for cyclists ahead of motor vehicles at traffic lights. Subsequent traffic separation strategies have included cycle lanes on many main roads, and three extensive off-road cycle paths.

A number of publications are issued to educate cyclists about safety in the area, while Thames Valley Police run occasional two week campaigns publicising the legal requirement for functioning rear and front lights after dusk.⁸ In the first week, cyclists failing to comply are stopped and cautioned; in the second week, offending cyclists may be stopped and offered a choice of prosecution or fine. In 1997 during such a campaign, 800 adult cyclists were cautioned in two weeks, while 200 were issued tickets (Thames Valley Police, personal communication). Although no campaign was in practice at the time of this study, a commonly used monitoring point is located 400 m along the road studied.

Strategies to reduce damage and injuries may be developed by studying interactions between factors (human, vehicular, and environmental) in three phases (pre-event, event, and post-event) of accidents.⁹ In the event phase of cyclist collisions, safety helmets reduce the risk of significant head injury and death.³ Pre-event environmental strategies include separation of cyclists from other traffic, while pre-event human factors may be improved with adequate standards of education and testing of proper road use. Cycling lights and high visibility (reflective or fluorescent) clothing are classed as pre-event equipment factors. The use of such equipment, which may reduce risk of collision in conditions of reduced visibility, has not been previously studied in the UK.

Methods

A single observation point was identified on a busy, central two way road serving both university and business areas in the city, with four bus stops within 100 m on each side of the road, and no cycling lane. This would provide a random sample of the whole cycling population of the city. Consecutive cyclists passing only outward from the city centre were

Table 1 Frequency of interventions in helmet users *v* helmet non-users

Measure	Total (n=392)	No (%) helmet users (n=104)	No (%) helmet non-users (n=288)	p Value
Lit front light	190	63 (60.6)	127 (44.1)	≤0.01
Lit rear light	197	64 (61.5)	133 (46.2)	≤0.01
Both lights	163	55 (52.9)	108 (37.5)	≤0.01
High visibility clothing	39	29 (27.9)	10 (3.5)	≤0.01
None observed	137	23 (22)	136 (47.2)	≤0.01
Any observed	255	81 (78)	152 (52.3)	≤0.01
All four interventions	14			

observed to prevent those returning within the study period being recorded twice.

The study was carried out at dusk during the latter part of the evening rush period, from 17:30 (when most motor vehicles had lights on) until 18:30 (when no daylight remained). Street lighting time was at 18:00. Cyclist visibility was therefore reduced throughout the period of study.

Cyclists were observed for three collision prevention measures—high visibility clothing, and active use of front and rear cycle lights—and one injury prevention measure, the use of a cycle helmet. Observations were made simultaneously by two investigators. It was agreed that cases of disagreement would represent insufficiently visible measures, and as such would be recorded as negatives.

The use of the three collision prevention interventions was compared in the helmet wearing and non-helmet wearing groups.

Results

A total of 392 cyclists passed the observation point within the study period. Observations of the four recorded safety measures are shown in table 1.

The most common measure observed was a rear light, with 163 (82.7%) of these also using a lit front lamp. In some cyclists, a lit cycle lamp was the sole intervention: 18 (4.6%) front or 23 (5.9%) rear. High visibility clothing was noted in 39 (9.9%) cyclists; it was seen far more commonly in conjunction with a helmet, and never as a sole safety measure. None of the measures being observed were present in 137 cyclists (34.9%).

During the study, an incidental impression was that cyclists wearing helmets used the other observed safety measures more frequently than those who did not. Comparing the two groups (table 1) confirmed significant differences in the use of all observed safety measures ($p \leq 0.01$), with higher proportions of all measures in the helmet using group.

Discussion

One third of all cyclists observed used none of the four preventative measures while exposed to heavy motor traffic in reduced lighting conditions. Altogether 288 (73.5%) wore no helmet, in keeping with results of previous local studies. Cyclists with helmets were more likely however, to use other safety measures. In contrast, those without helmets were more likely to use none of the other measures.

The presence of four busy bus stops adjacent to our observation point caused frequent stopping and starting of traffic, with consequent regular overtaking. This further exposed cyclists to oncoming vehicles. Consequently, this environment had a number of factors predisposing to cyclist/motor collisions, and might be expected to prompt a high level of use of preventative measures.

The higher frequency of lit front or rear lights, and frequently both, may be related to the legal requirement and police monitoring. Since 1985, reflectors on pedals and rear mudguards have also been legal requirements.⁸ These were therefore excluded from observations of intentional use of reflective bodywear. Other reflective items, such as reflective cycle clips or strips on helmet, were not formally studied. The use, or otherwise, of helmet or clothing was unlikely to have been influenced by weather conditions. During the study, rain occurred only in the last 10 minutes.

Previous UK studies of helmet use have shown similar results. The overall UK rate in 1996 was estimated as 18% of cyclists, while studies in Oxford observed a higher rate of 24%.^{10 11} In Stafford, only 13% of senior high school cyclists wore one regularly.¹² Studies of injured cyclists have recorded helmet use rates of 14% in South Wales¹³ and 11% in Cambridge.¹⁴ In other countries, less than one quarter of Australian teenagers reported regular use three years after introduction of legislation,¹⁵ while 22.9% of cyclists in urban Winnipeg wear one.¹⁶

Discounting direct head injuries, helmet use has been associated with a much lower incidence of severe injury (injury severity score >15) to the whole body.¹⁷ It has been suggested that non-use is a marker of a population of cyclists more likely to be involved in high impact crashes with motor vehicles, perhaps as a result of less safe cycling practices. This study supports the view that use of a cycling helmet is associated with higher use of pre-event phase equipment measures to avoid collision.

Traffic congestion in the UK is an ever increasing problem, with cycling a popular alternative. With increasing calls for control on pollution and inner city traffic levels, it is likely that other cities will find themselves required to support safer routes for cyclists. Oxford may be an atypical environment, because the university could provide a higher than average population of young adult cyclists. Studies of other urban and rural populations would allow validation of these findings on a wider scale.

Implications for prevention

Cycling helmet users in Oxford are significantly more likely to take precautions to increase their visibility in reduced lighting conditions. Cyclists taking measures to prevent injury in event of collision, are more likely to also take measures to appear more visible, and thus avoid such collisions. However, the majority remains at increased risk of high velocity impacts with motor vehicles.

Prevention of such impacts must be as high a priority as prevention of injuries once a

collision has occurred. Effective traffic separation measures are becoming more widespread. The challenge now must be to promote collision prevention practices in cyclists themselves. Lessons may be learned from experience in the introduction and promotion of cycling helmets by approaches including education and legislation. As observed in this study, however, current health promotion tactics are meeting with an inadequate response from the cycling public. Continuing concerted efforts using a combination of strategies remains vital.

- 1 Kiburz D, Jacobs R, Reckling F, *et al*. Bicycle accidents and injuries among adult cyclists. *Am J Sports Med* 1986; **14**:416–19.
- 2 Friede AM, Azzara CV, Gallagher SS, *et al*. The epidemiology of injuries to bicycle riders. *Pediatr Clin North Am* 1985; **32**:141–51.
- 3 Noakes TD. Fatal cycling injuries. *Sports Med* 1995; **20**:348–62.
- 4 Selbst SM, Alexander D, Ruddy R. Bicycle-related injuries. *Am J Dis Child* 1987; **141**:140–4.
- 5 Williams AF. Factors in the initiation of bicycle-motor vehicle collisions. *Am J Dis Child* 1976; **130**:370–7.
- 6 Rowe BH, Rowe AM, Bota GW. Bicyclist and environmental factors associated with fatal bicycle-related trauma in Ontario. *Can Med Assoc J* 1995; **152**:45–53.
- 7 Simpson AHRW, Mineiro J. Prevention of bicycle accidents. *Injury* 1992; **23**:171–3.
- 8 Driving Standards Agency. Rules for cyclists. *The highway code*. The Stationery Office, 1999: 13.
- 9 Haddon W Jr. A logical framework for categorising highway safety phenomena and activity. *J Trauma* 1972; **12**:193–207.
- 10 Bryan-Brown K, Taylor S. *Cycling helmet wearing in 1996*. Transport Research Laboratory report 286. Crowthorne: TRL, 1997.
- 11 Oxford City Council. *Survey of cyclists wearing cycle helmets: cyclists crossing Magdalen Bridge 0800–1800*. Oxford: Oxford Highways and Traffic Division, 1999.
- 12 Wardle S, Iqbal Z. Cycle helmet ownership and wearing; results of a survey in South Staffordshire. *J Public Health Med* 1998; **20**:70–7.
- 13 Harrison MG, Shepherd JP. The circumstances and scope for prevention of maxillofacial injuries in cyclists. *J R Coll Surg Edinb* 1999; **44**:82–6.
- 14 Maimaris C, Summers CL, Browning C, *et al*. Injury patterns in cyclists attending an accident and emergency department: a comparison of helmet wearers and non-wearers. *BMJ* 1994; **308**:1537–40.
- 15 Finch CF. Teenagers' attitudes to bicycle helmets three years after the introduction of mandatory wearing. *Inj Prev* 1996; **2**:126–30.
- 16 Harlos S, Warda L, Buchan N, *et al*. Urban and rural patterns of bicycle helmet use: factors predicting usage. *Inj Prev* 1999; **5**:183–8.
- 17 Spaite DW, Murphy M, Criss EA, *et al*. A prospective analysis of injury severity among helmeted and nonhelmeted bicyclists involved in collisions with motor vehicles. *J Trauma* 1991; **31**:1510–16.

Scooter riders need protective gear

Lightweight scooters, a new fad spreading like wildfire among children of all ages, should not be ridden on the streets or sidewalks and without protective helmets and knee and elbow guards, says Dr Eliahu Richter, an expert at the Bates Institute for Accident Prevention at the Hebrew University-Hadassah School of Public Health and Community Medicine. Richter was commenting on the tragic injury last week of an 11 year old immigrant from Russia who suffered serious brain damage when he went into the street on his new scooter and was run over by a car. The traffic authorities suspect that the driver of the car had not had a license since 1992.

Thousands of the foldable scooters, made of steel or aluminium, are being purchased or given as bonuses each month for magazine subscriptions and used by children as young as 3 years. They move fast and have a brake, but it cannot always be halted easily by younger children. In Europe, they are just as popular among adults, who use them to cover short distances. Richter said that the scooters should not be sold—or given as a bonus—unless it comes with a suitable bicycle helmet. “You don’t have to be hit by a car; it’s enough merely to fall down from any wheeled vehicle, including a bicycle, roller blades, roller skates, skateboard, or scooter”. Even sidewalks can be dangerous, because children could hit pedestrians. Instead, scooters should be ridden on bicycle paths and other spaces strictly separated from vehicle traffic, he said. Unlike two wheeled bicycles and skateboards, the scooters are used by very young children who know nothing about safety rules.

Dr Dan Link, the Road Safety Authority’s official in charge of safety infrastructure and traffic, said the authority is gearing up for a campaign on the dangers of scooters. “The public must cooperate, and we have to reach the parents”, he said. He was not optimistic that a law would be passed soon, or at all, to require scooter riders to wear helmets. “We had a major helmet campaign, selling them at nominal cost, organizing competitions and prizes and posters, but few of the kids actually wear them, and few parents want to get into a confrontation over it with their children”. Link said he did not know whether there is any official standard for the scooters but would investigate (*The Jerusalem Post*, August 2000).

Helmet opponent dies in helmetless motorcycle accident

A motorcycling enthusiast who applauded Florida’s new helmet-free law has died as a result of a motorcycle accident in which she wasn’t wearing a helmet. Dorothy Lynette Rushton, 40, smashed her Harley-Davidson early Saturday morning and was thrown more than 50 feet. She died Monday from injuries she sustained in the crash. Rushton probably would have survived had she been wearing a helmet, said Florida Highway Patrol Cpl John Schultz. He said alcohol was a factor but the lack of a helmet “greatly” contributed to her injuries. Governor Jeb Bush last month signed into law a measure to let motorcyclists age 21 and older ride without helmets if they carry \$10 000 in insurance. It took effect July 1. Friends said motorcycle riding was Rushton’s passion—especially without a helmet. “Lyn wanted to do what she could, even in her death”, close friend Kristi Piscitelli said. “She knew this could happen” (*Tampa Bay Tribune*, August 2000).