Contributed articles

A dim view of pedestrian safety: Raising awareness of the needs of vision-impaired pedestrians

by Caroline Maplesden, Orientation and Mobility Instructor, Vision Australia, Geelong, Victoria

Introduction

This article will explain the travel skills used by vision-impaired pedestrians. It is based on my personal experience working and walking alongside people who are blind or have low vision. My objective is to raise the awareness of other professionals, whose work roles or personal interests provide the opportunity to act on suggestions to improve the safety of all pedestrians, particularly those with a disability.

If you were to wake up blind tomorrow from a car accident or have an eye disease severe enough to reduce personal safety, you would be offered assistance from an Orientation and Mobility Instructor like myself, to maintain independent travel. My own training included months of blindfold and low vision simulator travel using a white cane. Trainers of Seeing Eye dogs complete a separate cadetship, and we are usually employed by not-for-profit agencies. Knowing I can remove my blindfold is an important difference between my experiences and those of my students. Instructors work with adults who need to shop, reach their community and commute to work, with children who need skills to attend school, and elderly people who need to remain active and independent.

Variations in disability and outcomes

Blindness, and what may be accomplished using other senses or residual vision, is not well understood by the general public. The type and progression of an eye disease determines what vision remains. For example, glaucoma results in a tunnel view where hazards to the side are missed; vision is worse at night. Cataracts reduce contrast, more so in glare. A stroke may eliminate exactly half of the visual field, left or right. Macular degeneration causes distortion, obscures central hazards and affects colour vision.

A visual acuity reduced to less than 6/60 in the better eye after correction, or a field of view restricted to 10 degrees or less, qualifies as legal blindness. A licence to drive a car generally requires 6/12 in the better eye and 110 degrees of horizontal field. An Australian survey in 2009 estimated 575,000 people over age 40 have a vision loss, defined as less than 6/12 acuity in both eyes [1]. At least 90% of legally blind people have some remaining vision. Whether their vision will avoid a particular hazard or locate an available clue will depend on lighting, contrast, speed and proximity, amongst other factors. Similarly to other pedestrians, they may also have a hearing, physical or cognitive disability which will impact on their training and outcomes.

Their decision to walk (or use a wheelchair) within the public road network must be acknowledged as more than a choice – it is a necessity. If a person cannot hold a driver's licence or ride a bicycle safely, walking is their only option to avoid dependence for the rest of their life. In my experience, the people I teach will continue to travel independently if they do not continually have bad experiences.

Mobility aids for independent travel

A white cane is the internationally recognised symbol of vision impairment. There are three common types. A short white cane may be displayed for identification, for example when residual vision is generally adequate for close hazards but not to judge the approach of traffic. Support canes can be white to satisfy both needs. Correct use of a long white cane will check the ground surface ahead for each footfall and provide one stride's warning of obstacles or drop-offs. White canes can be folded up out of view and used occasionally. People who choose not to use a white cane usually say they do not want pity or to show their vulnerability. There are only minor references in information for learner drivers about the meaning of a white cane. A driver can wrongly assume eye contact with a pedestrian who has a vision loss. Road safety programs that support the public education provided by blindness organisations would be welcome.

Seeing Eye dogs are on duty when in harness, and are depended on for safety. If you pat one without permission you risk snarls from the owner. Legislation permits them

entry to all public venues, including restaurants and taxis. Contrary to popular myth, Seeing Eye dogs do not interpret traffic lights. Aside from being colour blind they wait for the 'pack leader', who must be the owner, to give instructions about when to turn, what to lead towards and when to cross the road. A Seeing Eye dog should only 'intelligently disobey' if there is a necessity for mutual safety.

Your offer of assistance to a vision-impaired person, if they appear to need it, may be very welcome. Offer your elbow and stay half a pace ahead. Stop at any edges until they are also level with the edge, before you step up or down. They will feel the rise or drop of your elbow, then follow. Give directions left or right from their perspective and use specific words – 'over there' is nowhere.

Senses and the environment

Mobility lessons optimise residual vision and other sensory information. Looking upwards or to the side may provide better vision to people with reduced central acuity. The expression 'facial vision' usually refers to hearing the reflection of sound waves by a close object. Mental imagery of their surroundings is a conceptual skill, developed to high levels by some people. Maintaining a constant position of sunlight, or the sun's warmth on exposed skin, can reduce veering. Facing towards the sun and listening to a 'talking watch' provides the north compass direction (halfway between the sun and the hour) for orientation. A watch can also be tactile. I-pads can photograph the bus timetable then enlarge the print. Applications of technology are continually created and shared, including GPS.

People with a vision loss generally say that white vehicles, and those with lots of glinting chrome on sunny days, are easier to see than dark cars and grey or metallic colours that blend into an asphalt horizon. Such information may influence decisions about purchases of fleet vehicles or of your own car. Daytime use of headlights also helps detection.

Hearing

Changes in engine or gear noises can suggest a vehicle is slowing to make a turn. Traffic surge noise must be in both directions to eliminate the possibility the noise relates to a green arrow for an advanced turn. Perpendicular or parallel noise assists orientation. Listening for idling vehicle engines at an intersection (the motor vehicle stop line) assists the vision-impaired pedestrian when beginning or completing a road crossing. Providing 'head start boxes' or 'advanced stop lines for cyclists' [2] may move the useful noise clue further away.

Anyone who stands with closed eyes at a roundabout, remembering that drivers look towards the right for other traffic and do not have to give way when turning, will appreciate the courage it takes to step out. Eye contact with the driver or detecting indicator lights may not be possible. Pedestrian facilities within a reasonable distance of busy roundabouts should be planned.

The quiet motor of an electric bicycle or hybrid/electric car are an increasing hazard for vision-impaired pedestrians. Detecting quiet vehicles in driveways or parking lots is especially difficult. Halfway refuges do reduce the complexity of judging both directions of approaching traffic but do not provide assurances of when it is safe to cross.

The source of a ticking audio-tactile device must be louder than ambient noises. The faster louder ticking informs when a crossing can be commenced, but silence during the last metres of a long crossing is not helpful. A device that provides only audible ticking is less helpful than one providing both audio and a vibrating pulse. Tactile pulses are felt with the fingertips to confirm which signal for which corner is active and are especially useful for people with severe or unequal hearing loss.

Feeling underfoot

Tactile Ground Surface Indicators (TGSI) are discerned underfoot, by cane tip or their contrasting colour. Ivory on white concrete is not best practice. A grid of hazard bumps indicates the ground surface will be changing; a ramp, stairs or train platform edge may be imminent. Hazard bumps should be placed exactly opposite the next patch of bumps to walk towards, and a user's feet should not be pointed towards the centre of an intersection. Directional indicators (parallel bars) must commence at the building line and be wide enough for pedestrians not to miss them between strides. TGSI which are installed at correct depths should not be a tripping hazard.

Gradient and camber underfoot can be interpreted. Sideways can warn that a driveway has been veered into; downwards can indicate the approach to a pram ramp. A wide strip of a soft recycled tyre product (possibly the same as is used on a footpath to slow skateboards) can be easily detected underfoot and could be tried as a tactile clue for vision-impaired pedestrians.

Hazards

White canes do not protect above waist height (an exception is overseas electronic models). When a sign is installed too low, or branches not trimmed back, or roof-rack loads protrude over a pedestrian crossing, there is potential for injury. Where paths are 'not available', white cane skills might track the edge of a vehicle lane or grass verge. You could inspect your local streets to appreciate the difficulties caused by breaks in continuous access along a route.

Even a small lip, for instance at the bottom of a pram ramp, provides an anchoring point for a cane tip. A dead flat entry does not provide any indication of where to pause and check for vehicles. When Hans Monderman [3] put forward his pioneering idea to remove all curbs and signs to create flat, shared road spaces called 'naked streets' – where drivers and pedestrians would exchange eye contact and nods to communicate, he could not have had the abilities of a vision-impaired pedestrian in mind. The lower accident rates attributed to these projects may have depended on avoidance by people who could not communicate that way.

The modern project shown at Figure 1 is the vehicle and pedestrian entrance to a city's central train station. The silver discs are in lieu of a curb edge, silver TGSI laid in grey paving blocks have low contrast and the traffic light pedestrian crossing is not defined by painted lines. Random colours of pavers were used for 'aesthetics' throughout the precinct.

Figure 1. The shared zone pedestrian and vehicle entrance to a train station.

Slip lanes

The Australian Road Rules require drivers to give way to pedestrians at a slip lane. To display a white cane and step onto one requires an act of faith. To reach the pedestrian call button provided on an island might first require running the gauntlet of a slip lane that has no pedestrian lights. An uncontrolled slip lane can block, or seriously endanger, vision-impaired pedestrians negotiating the road system.

Footpath clutter

Alfresco dining has changed streetscapes everywhere. Councils and shires responded with footpath trading policies, or similar regulations, requiring traders to comply with permit conditions. Trading zones that abut curb zones enable the pedestrian zone to commence at the property or building line. A clear building line is important for people with vision impairment to remain oriented on paths, locate shop entrances and avoid obstacles such as sandwich boards.

Enforcement of permit conditions by by-laws officers is also important. Complying traders are disadvantaged when other traders ignore restrictions that give priority to pedestrian safety over profit. Permits can require that gaps be provided to reach and leave parked cars, that TGSI can't be covered and bus zones can't be used, umbrella points must be above head height, a dog leash must not be a trip wire, legs and weights for portable fences must not protrude and perspex or glass walls require decals at both wheelchair and face level. By-laws officers are generally not involved with moving motor vehicle offences but do issue penalty notices to drivers who obstruct paths.

Bicycles

When a white cane locates a stationary object, such as a towbar at shin height, the user has one stride to stop. If it locates a moving hazard or cyclist there is very little time to react. A requirement for bicycles to have a kickstand and park at the curb zone would reduce the number of bicycles parked randomly, often against the building line, despite the provision of racks. Chaining a bicycle to staircase handrails or traffic light poles could be considered as dangerous. On roads, bicycles are quieter, smaller and more difficult to detect than cars. It would be helpful if cyclists were to ring their bell when approaching a pedestrian who is displaying a white cane and listening for road traffic.

National cycling strategies rightly encourage cycling. However, as the number of bicycles increases, an issue that needs attention is the legal situation of a pedestrian-cyclist crash that causes injury. That cyclists' injuries are less severe off-road than on-road [4] is positive for them, but the increased potential for injuries to pedestrians has not been adequately addressed.

In Victoria, all drivers pay compulsory third party insurance to the Transport Accident Commission (TAC). The TAC manages compensation and is bound by the Transport Accident Act 1986. Only incidents involving the use of a motor vehicle (or tram or train) are covered. A bicycle is not a motor vehicle, but in some situations is covered by the TAC, for example through an amendment in 2000

which encouraged commuting [5]. Currently, unless a motor vehicle is involved in a pedestrian-cyclist collision, the TAC does not cover the pedestrian. All losses and costs beyond Medicare for personal injury from a cyclist and pedestrian conflict could be out of personal pockets. The injury becomes a civil matter with the other party and can involve claims against the municipal council [6].

The incidence of vision impairment and other disabilities is higher in the older age group [1] yet the new National Disability Insurance Scheme will not apply to people over age 65 years. An amendment to the Transport Accident Act 1986 to include incidents involving only pedestrians and bicycles is required.

Engineering resources

In the past, there was an Austroads Guide to Traffic Engineering Practice devoted to the needs of elderly or disabled pedestrians, called Part 13. A similar document about cyclists' requirements of infrastructure was Part 14. Both parts were replaced in 2009 with Part 6A Pedestrian and cyclist paths [7]. The safety checklist for pedestrian audits disappeared. Many of the pedestrian topics are now dispersed amongst Parts 1 to 12. However, most of the cyclist information of Part 14 survives as Part 6A, including its bicycle safety audit checklist, as a single resource for path requirements.

A supplement for Part 6A was published in September 2010 [8] still containing the original 1971 American urban modelling data for pedestrians. References to the capacity of stairs and travelators seem barely relevant to provision of pedestrian and cyclist paths. An engineering guide that would provide relevant information about the requirements for safe pedestrian infrastructure, in a single resource for engineers and planners, would return balance to the resources available. Pedestrian safety on shared paths will remain difficult to achieve unless literature is equitable.

Twenty one 'Cycle notes' provide information on the design of bicycle facilities – for example the widths for shared paths [9]. Unfortunately, the extreme situation of a two metre width was provided. That provides clearances of 30 cm between a cyclist and a pedestrian on shared paths. Average walking speed is five km/h yet standard shared path surfaces are recommended to accommodate cyclists' speeds up to 30 km/h [4, 7]. Clearances and speed differences on shared paths require review for mutual safety.

Advocacy

Organisations like The Heart Foundation and Victoria Walks are funded primarily to address health and fitness issues. There is no organisation for pedestrians to equal the positive road safety achievements of the Amy Gillett Foundation in terms of resources, partnerships or publicity. Valid issues raised by the Pedestrian Council of Australia attract media attention [6] but not necessarily a government response.

Suggestions that footpath cycling by all ages may not adversely affect pedestrians were based on 2002 data which indicated that 'the incidence of cycling is not expected to change' [4]. The Pedal Study conducted in the ACT (2011) [10] noted that cycling increased by 36% in the period 2000-2008. An attempt to permit cycling on all footpaths was defeated in Victoria, in large part due to the advocacy of Vision Australia, but that is not obvious now. Gradually changing the word 'footpath' to an off-road, shared, separated or transport path has circumvented the spirit and intent of then Minister Geoff Craig. When a local footpath used by a pedestrian with a disability is 'upgraded' to a shared path – and promoted as a cyclist network route – the safety of the pedestrian has been diminished.

Cyclist advocacy for a share of the road or footpath emphasises it is a legitimate form of transport. However, cycling clearly does not have more legitimacy than walking. Where pressures exerted by motorised traffic create conflict between cyclists and pedestrians, 'solutions must **not** improve the conditions for one at the expense of the other' [4].

Road safety programs

Safety programs with messages about children, intoxication and reversing in driveways – all good and necessary – are not addressing the generic loss of safe footpaths for pedestrians to walk on. The successful cyclist safety slogan *A metre matters* could be used to emphasise that 'a metre matters to pedestrians too'.

Subtle transfer of Road Rule concepts to pedestrian areas

On-road behaviour is managed by requiring drivers and riders to obey prescribed signage and rules set out explicitly in national or state legislation. Driver knowledge and ability is tested. A licence can be lost by accumulated demerit points. Road users are prohibited from travelling in the wrong space for more expedient travel.

The abilities of a pedestrian may be inadequate to obtain a driver's licence or ride a bicycle safely. Advisory (black) signage can be mistaken as regulatory (red). Signage of any type can be unseen or misinterpreted and similarly for symbols or paintwork. There is a recommendation that Road Rules re-introduce a requirement that pedestrians keep left on shared paths 'to match and support the many

sensible codes of conduct already in widespread use, and the effective practice of centre-line marking with "keep left" and similar stencils' [4]. Such advisory line markings and signage can create assumptions of 'territory' among users, which can expose vision-impaired pedestrians to greater risk if they should stray onto the wrong side. Figure 2 demonstrates why keeping left of a painted line may not be possible.

Figure 2. Advisory painted lines can divide a path into widths not adequate for both users on each side. Sides can also be misinterpreted as 'territory'.

The reason why the pedestrian shown in Figure 2 is not a driver or rider is clear, but this is not always so obvious. Symbols and 'advisory centre lines' for both users on each side (shown more fully across the street) have divided the path into widths not adequate for both users on each side. There is an important difference between walking along the left side of a path when possible and keeping to the left of a painted line. An expectation for all pedestrians to walk on a path, with the same level of concentration and vigilance required to walk on a road, is not reasonable. Guidelines that include stop lines and 'give way' signage in pedestrian areas should be reviewed for appropriateness.

Statistics

The under-reporting of pedestrian-cyclist conflict incidents was noted in a Monash University Accident Research Centre (MUARC) report back in 1989 [11], but hospital admissions continue to be the source of injury statistics today. The same study noted that pedestrian amenity needed to be addressed. The Pedal Study found that none of the pedestrian crashes in its study were reported to police [10]. A recent study of road trauma found that the likelihood of death when presenting as trauma patients during the study period (2002-2008) was five times higher for pedestrians than for pedal cyclists. The authors recommended further research into factors contributing to pedestrian injury, including road design and pedestrian crossings [12]. More information is also needed on pedestrian-cyclist collisions.

The assumption that a pedestrian is a fit and healthy person with satisfactory vision and hearing, one who will be paying attention and does not have a physical disability, will misrepresent a significant proportion of the population [13]. Aspects of the road environment which restrict mobility and life choices for pedestrians require more attention. Vision Australia is currently gathering data on the experiences of their clients.

Summary

Raising awareness of the needs of vision-impaired pedestrians is vital to safeguard their ability to move around the complex and changing road environment and to maintain their independence and quality of life. The safety of pedestrians has not received adequate consideration, for example, in measures to increase the capacity for cycling. Solutions to minimise conflict are required that do not improve the conditions for one road (or shared path) user at the expense of another. Measures suggested in this article to improve the safety of pedestrians, particularly those with a vision impairment or other disability, will positively affect the general population and promote 'active transport' for all.

References

1. Clear focus - The economic impact of vision loss in Australia in 2009. An overview of the report prepared for Vision 2020 Australia by Access Economics Pty. Ltd. http://www.vision2020australia.org.au accessed 27 June 2012.
2. VicRoads. Head Start - Storage areas at intersections. Cycle Notes No 5, 2000.
3. Obituary: Hans Monderman. www.guardian.co.uk. news/2008/feb/02/obituaries accessed 27 June 2012.
4. Austroads. Pedestrian-cyclist conflict minimisation on shared paths and footpaths. Sydney: 2006.
5. Transport Accident Act 1986 No 111 of 1986 Part 1 – Preliminary S.3(1A)(c) inserted by No. 84/2000 s.4(1) http://www.tac.gov.au/upload/taa1986 p 29 accessed 13 July 2012.
6. Media release Wednesday 3 December 2008, Pedestrian Council of Australia. www.walk.com.au/ pedestriancouncil/ accessed 27 June, 2012.
7. Austroads Guide to traffic engineering practice Part 6A Pedestrian and cyclist paths, October 2009.
8. VicRoads. Supplement to the Austroads Guide to Road Design Part 6A – Pedestrian and cyclist paths, Rev.1.1 – Sept 2010.
9. VicRoads. Widths of off-road shared use paths. Cycle Notes No 21, June 2010.

10. De Rome L, Boufous S, Senserrick T, Richardson D, Ivers R. The Pedal Study: Factors associated with bicycle crashes and injury severity in the ACT. The George Institute for Global Health, University of Sydney Medical School, Australian National University, Final report July 2011.

11. Drummond A. Pedestrian casualties resulting from collisions with cyclists on footpaths. Monash University Accident Research Centre, October 1989 Report No. 8.

12. Frydenberg EM, Curtis K, Chong S, Poulos R, Grzebieta RH, Steel TR, Nau T. Road trauma, patterns of injury and mortality in an Australian trauma centre. Journal of ACRS, Volume 23 No 1, 2012.

13. Bakovic Z. Vulnerable road users: Characteristics of pedestrians. Journal of the ACRS 2012, Volume 23, No 1, 2012.