Child pedestrian safety: the role of behavioural science

Environmental strategies must be complemented by behavioural approaches to help children learn to use roads safely

In Australia, pedestrian injury is the leading cause of death among 1–14-year-olds. In 2000, 38 child pedestrians in this age group died and about 1140 (29 per 100 000) were hospitalised, often with lengthy stays, because of injuries sustained when hit by a vehicle. These rates decrease with age and are lowest for 10–14-year-olds.

The most recent comparison with other OECD countries shows that Australia has the 13th lowest pedestrian fatality rate for 0–14-year-olds, with slightly more pedestrian deaths among 0–5-year-olds than the median rate for all OECD nations (1.03 per 100 000 versus 0.89 per 100 000).

The primary predictors of this child pedestrian trauma relate to the interaction between the characteristics of the child and the design and nature of the road environment to which the child is exposed. A Western Australian case-control study of child pedestrians aged 1–14 years identified four key environmental and behavioural factors that independently predicted the likelihood of child pedestrian injury. These comprised the volume of traffic encountered by the child, presence of visual obstructions, availability of footpaths on the child's street of residence, and the child's behaviour.

Predictors also vary according to the age of the child. Whereas 1–2-year-olds are more likely to be hit by a reversing vehicle, the most common cause of pedestrian trauma in 3–9-year-olds is mid-block "dart-out" (entering the road between intersections and not seeing, or misjudging, a gap in traffic). Pedestrians aged under 10 years are particularly vulnerable because of their small physical size and underdeveloped abilities for dealing with traffic situations, both cognitive (attention focus, interpreting traffic signs) and perceptual (locating sounds, judging speed, peripheral vision). Given these limitations, children under the age of 10 do not have the ability to cross roads without adult help.

Ten to 14-year-olds are also vulnerable, but more because of their failure to apply safe pedestrian skills than because of their lack of skills. Further, road trauma in this age group may also be associated with general delinquency and problem behaviour.

Many of these predictors of pedestrian trauma can be prevented or modified and are therefore amenable to intervention. While debate continues about the merits of environmental (passive) versus behavioural (active) intervention strategies to reduce this road trauma, evidence suggests that all are necessary, and no single strategy is sufficient. A multifaceted approach that combines strategies targeting the behaviour of all road users (including education, training and publicity), the road environment and vehicle design have been found to be the most effective.

Strategic approaches involving public health, education, health promotion, urban planning, engineering and motor vehicle design are required.

Consequently, while efforts are needed to make the road environment safer for pedestrians by reducing the speed and volume of traffic to which they are exposed, it is also necessary for pedestrians (particularly children) to learn how to use these road environments safely. Yet, research into behavioural approaches to pedestrian safety has lagged behind environmental research.

Behavioural programs for children need to be developmentally appropriate and include modelling and training by an adult in a social context and road environments relevant to the child. Programs also need to be interactive and involve problem-solving with consistent and prompt feedback from a caring adult, rather than merely following rules. The use of didactic knowledge-only strategies (such as rote learning of rules) is inappropriate, as younger children are not able to generalise this learning to real roads.

Roadside training and, to a lesser extent, realistic simulations appear to improve visual timing and gap selection, to increase the ability to identify safe and dangerous crossing locations, and to enhance learning of appropriate strategies for crossing at parked cars. Such training has produced positive results with children as young as 5 years.

Several new approaches to children's pedestrian safety education are being tested. These include programs targeting younger children and adults who care for children, and use of new technologies. Two Australian reviews recommend targeting 0–5-year-olds, arguing that, with good quality pedestrian safety training, young children could demonstrate a rudimentary conception of danger, which improves with age. Some Australian jurisdictions have developed curricula and materials based on these approaches, such as the Victorian “Starting Out Safely” program.

Engaging parents and helping them recognise their important role in their children's pedestrian safety has the potential to significantly enhance children's safety on and near roads. Parents provide the best role models and one of the only means for children to receive the necessary personalised one-on-one training and to practise crossing real roads.

Technologies that use interactive simulations (eg, visual reality computer) coupled with real road experience and “pretend” road practice (the “pretend” road is set up parallel to a real one) can enable children to practise their skills, receive consistent and instant feedback and repetition, and be introduced with careful control to the complexity of traffic.

While reviews of the impact of behavioural and environmental programs on preventing road trauma in children have demonstrated mixed success, it is apparent that programs need to take a comprehensive preventive approach with modifications to the road environment, enforcement, engineering and education. While much still needs to be done to determine the optimal mix and “dose” of these approaches to reduce child pedestrian trauma, every effort must be made to keep children safe near traffic and roadways that are becoming increasingly busy and complex.

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Early experience confirms that riluzole improves survival and is well tolerated

The recently established Australian Motor Neurone Disease Registry estimates that 1200 Australians are living with motor neurone disease (MND), and 370 new patients are diagnosed each year. Most patients die within 3 years of diagnosis. Aetiological mechanisms implicated in the development of MND have been linked to the glutamatergic neurotransmitter system, with excessive activation of glutamate receptors at the synaptic cleft now believed to trigger destruction of motor neurones. This “excitotoxicity” theory of MND gave rise to the development of new therapeutic approaches and, ultimately, clinical trials involving riluzole. This drug was initially thought to act solely as an inhibitor of glutamate release, although subsequent postulated effects include indirect antagonism of glutamate receptors and inactivation of neuronal voltage-gated sodium ion channels.

Regardless of the precise mode of action, two large trials in the 1990s established the efficacy of riluzole in the treatment of MND. A double-blind, placebo-controlled study undertaken in 135 patients with MND showed a significant prolongation of survival and an improvement in functional outcome measures for those treated with 50 mg of oral riluzole twice daily. A larger, dose-ranging study undertaken in 959 patients confirmed the beneficial effect of riluzole on survival, being in the order of 3–6 months. In the original study, the therapeutic effect of riluzole was more prominent in patients with bulbar-onset MND, while the second study found no significant differences in the responses of bulbar- and limb-onset groups. Subsequent retrospective analyses suggest a survival benefit even longer than 6 months in both patient groups, but these data have been confounded by recent general improvements in the care of MND patients, particularly the use of percutaneous endoscopic gastrostomy for nutritional support and non-invasive ventilation for respiratory insufficiency, in the setting of a multidisciplinary approach to care.

Riluzole remains the only medication to slow the progression of a neurodegenerative disease, leading to an increased survival for patients with MND. In some countries including Australia, riluzole’s manufacturer had difficulty gaining a listing for the medication on pharmaceutical benefits schemes, in part due to issues related to “quality of life”, despite trial data documenting

Pharmaceutical Benefits Scheme (PBS) criteria for riluzole authority (June 2003)

Approved indication
Treatment of motor neurone disease
PBS indication for authority
Initial treatment of motor neurone disease, as diagnosed by a neurologist, in patients aged 75 years or less, with disease duration of 2 years or less and who have at least 60% of predicted forced vital capacity within 2 months prior to commencing riluzole therapy and who:
1) are ambulatory, and
   a) have not undergone tracheostomy, and
   b) have not experienced respiratory failure; OR
2) are not ambulatory, and
   a) have not undergone tracheostomy, and
   b) have not experienced respiratory failure, and
   c) are either able to use upper limbs or able to swallow.

The date of diagnosis and the results of spirometry (in terms of percentage of predicted forced vital capacity) must be supplied with the initial authority application.