Shared paths – the issues

Victoria walks

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“They [cyclists] go ‘whoosh’ as they go past, and often the paths aren’t very wide, so this notion that you have to share has to come with more thought. If there’s not enough room it’s not a good match. If it’s got to be shared it’s got to be wider. Or separation between them.”

Quote from focus groups with Victorian seniors (Garrard 2013)

Thank You

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Shared Paths – the issues.
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Outline

This paper considers issues around shared walking and cycling paths. It reviews the literature relating to:

- The safety of shared paths, including collision risk, the speed of cyclists and potential impact on pedestrians
- User perception of shared paths
- The circumstances where walking and cycling paths should be segregated or separated
- International and local design guidance around shared paths
- The practice of converting footpaths to shared paths
- Legal liability issues raised by shared paths.

The focus is on broader questions of when shared or separated paths are the appropriate infrastructure choice, rather than details of shared path design.

A number of recommendations are made to Victorian agencies, for future planning and management related to shared paths.

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Executive summary

Cycling ridership is growing very quickly and shared paths are the most common form of off-road cycling facility in Australia. Some shared paths are carrying very high numbers of cyclists and for some local government areas shared paths are their busiest cycling routes. Nonetheless, volumes of cyclists vary dramatically between paths, even in the same area.

Victoria Walks has significant reservations regarding the provision of shared paths. Generally, slow moving recreational cyclists may be able to share paths with walkers. However walkers may not mix well with commuter or sports cyclists in particular, who typically travel at higher speed.

To develop this paper, Victoria Walks prepared a literature review based primarily on Australian information. Consultation was then undertaken with select stakeholders, subject experts, VicRoads and councils. The Municipal Association of Victoria (MAV) facilitated initial consultation and a total of eighteen councils provided comment.

There is very little reliable data that would allow the risk of crashes on shared paths to be compared to pedestrian risk in other transport contexts. The limited evidence available suggests that shared paths may be more hazardous for cyclists than some other environments, such as on-road cycle lanes. However the safety issues for walkers on shared paths do not appear to have been assessed by quality research – a significant gap given that shared paths are common infrastructure. While cycling speed on shared paths varies significantly between locations and users, average cycling speed typically ranges between 20 and 30 km/h – generally above the 20 km/h envisaged by Austroads for shared paths.

Where observational studies have been compared with surveys and/or focus groups of users, the observational studies usually find minimal levels of conflict, but the user experience is quite different. For example in one Sydney survey 8% of pedestrians reported being knocked over by a cyclist and 33% reported being frightened by a cyclist travelling too fast.

Many people are unaware or unclear about the requirement for cyclists to give way to pedestrians on shared paths. Shared paths are often described as 'bike paths,' even by local authorities.

Both walkers and cyclists prefer segregated or separated paths, when user numbers are high.

People who are elderly or vision impaired are particularly vulnerable and uncomfortable sharing with cyclists. For older seniors, walking and footpaths are critical to their personal mobility and their capacity to lead active, independent lives. For those aged 75 and over, walking makes up 77% of their total physical activity. And as seniors get older, their walking is increasingly about everyday life needs such as shopping and personal business.

In a survey of 1,128 Victorians aged 60 or over, better cyclist behaviour on shared paths and reduced cycling speed on shared paths were the top two responses for action that would make walking feel safer.

In a survey of 607 Victorians with vision impairment, 8% had been involved in a collision and 20% were in a near collision as a pedestrian over the previous 5 years – 24% of these incidents were with bicycles.

We conclude that many seniors and visually impaired people are likely to avoid walking on some shared paths because of their concerns about cyclist speed and collision risk. This may be extended to walkers generally when faced with shared paths that have high volumes of commuter cyclists.

Despite these issues, shared paths have been constructed and in some cases utilised by cyclists to the point where they have become key routes for bicycle transport. This goes well beyond the primarily recreational role that seems to have been originally anticipated.

In stakeholder consultation many councils agreed that separation of walkers and cyclists was preferable where there were high numbers of users. However councils were conscious of the cost of separated facilities and several suggested that in many cases separated facilities may not be practical, due to limited space or fixed limitations such as rocks or trees.

One theme of the stakeholder consultation was that behavior change is key to overcoming conflict issues on shared paths. However users take their cues from the infrastructure provided, as well as cultural and other influences. Cycling speeds on shared paths suggest those cues are inconsistent with a vision of shared paths as low speed recreational (but not sport cycling) environments. Consistent with broader 'safe system' approaches to road safety, we should not rely exclusively on managing behaviour, especially when our capacity to manage cycling behaviour on shared paths is weak, compared to vehicles on the road. While managing behavior is important, appropriate provision of infrastructure should be the starting point.

Austroads guidelines recommend shared paths should be used only where user numbers and cycling speeds are low. There is a conflict between these guidelines and VicRoads *Cycle Notes 21,* which does not definitively recommend separated facilities unless cyclist volumes are extremely high – greater than 600 per hour. This guidance is based on level of service to cyclists, not pedestrians. *Cycle Notes 21* needs to be revised to recognise that separated or well segregated paths better cater for high numbers of users.

Subject to further research, we propose a standard threshold for separation of 50 cyclists or 100 pedestrians per hour in the commuter peak. The number of 50 cyclists generally aligns with the Austroads, Norwegian and Dutch guidance. The number of pedestrians is higher, but the recent work in Australia has established that cyclists can comfortably accommodate up to 100-110 pedestrians per hour.

It is important to note that at higher volumes, separate paths will generally provide higher capacity than a shared path of the same total width, so separation is warranted by operational efficiency alone.

The practical implications of our threshold are expected to be that significant cycle commuting routes in inner areas of major cities should be identified for separation/segregation or that options to safely provide for cycling in a street context (on or off road) will be more strongly pursued. However most existing shared paths across Victoria would be deemed acceptable.

It is clear that shared paths will continue to be a significant form of infrastructure provision for cyclists and walkers. Therefore, efforts need to be made to establish a broadly accepted culture of sharing by shared path users, consistent with applicable road rules. It must be similarly accepted that shared paths should be low speed. Shared paths were envisaged as low speed environments, but it is not clear that this has been effectively communicated to cyclists. It should be recognised, however, that controlling cyclist speed is likely to be difficult in practice. Bicycles are not registered, speed limits are not enforceable and physical measures to control cycling speed may present a hazard to cyclists, so have generally not been attempted. This paper recommends trialling of physical measures, but there is currently no proven method of managing cyclist speed on shared paths.

Generally, existing footpaths should not be converted to shared paths and new suburbs should not be designed with shared paths rather than footpaths. Road managers should understand that by converting footpaths to shared paths, they may be 'designing out' the most vulnerable road users – older walkers and those with a disability.

Key recommendations of this paper include:

- VicRoads should revise *Cycle Notes 21* (perhaps as a 'walking and cycling note' or a 'shared path note') to be consistent with Austroads guidelines and more strongly encourage separated facilities.
- Road management agencies should lower vehicle speed limits on non-arterial roads or where there are high numbers of cyclists or pedestrians, to provide good conditions for transport cycling, as recommended by UK guidance.
- Road management agencies should adopt a hierarchy of cycling provision as set out in UK guidance. Conversion of existing footpaths to shared paths or construction of a shared path in place of a footpath along a street should be a 'last resort' option for cycling provision. Conversion of footpaths into shared paths should particularly avoid activity centres; routes on the Principal Pedestrian Network; or other areas where high numbers of seniors can be expected, including retirement villages and aged care facilities.
- The Victorian Government should fund a program of education and signage to promote a positive culture of sharing space. This program should include emphasis that cyclists are required to give way to pedestrians on shared paths and may have to slow down to do so.
- Shared paths should be designed, managed and promoted with 20 km/h or less envisaged as the desired cycling speed.
- VicRoads should commission trials of options to limit cyclist speed on shared paths, including path design to reduce speed.
- The Victorian Government should establish a fund for upgrading shared paths or creating segregated/separated facilities.
- Clause 56.06 of the Victoria Planning Provisions should be amended to require separated cycling paths rather than shared paths on connector and arterial roads in growth areas.

Introduction

> "The interaction between pedestrians and cyclists is increasingly causing safety concerns... Some of these concerns are real and others are perceived, but nevertheless important in terms of people's willingness to walk"

(Austroads 2006).

Walking is the most popular form of leisure related physical activity in the Victorian population. Walking is especially important for older people, who are otherwise least likely to meet recommended levels of physical activity (Garrard 2013). In Victoria, about 12.2% of transport trips are walked, while around 1.7% are cycled (Department of Transport 2009).

Shared paths are the most common form of off-road cycling facility in Australia (Queensland DTMR 2014).

Victoria Walks has significant reservations regarding the provision of shared paths. Generally, slow moving recreational cyclists may be able to give way to, and share paths with, walkers on low volume paths. However walkers may not mix well with commuter or sports cyclists (who typically travel at speed).

> "The potential for conflict on shared paths is exacerbated by the differences in type, abilities and movements of users. Users mingle readily at low speeds but where higher density flows are experienced, the risk of collisions rises"

(Grzebieta et al 2011).

Shared paths seem to be a lower cost option for infrastructure providers, but that does not mean they are always the best option. Shared paths and cycle use of footpaths is the most common mode of providing off-road cycle facilities in Australia, but European guidelines stress the importance of separating the two wherever possible (Austroads 2006).

Austroads (2006) note:

> "The issue of conflict on paths is by no means a new one, although it may be becoming more serious as the number of people walking or cycling increases after a prolonged period of decline in many places, combined with a high level of reliance on shared facilities.
>
> "In order to minimise conflict, holistic solutions are needed where conditions are improved for cyclists and/or pedestrians but not for one at the expense of the other." (emphasis in original)

What is separation vs segregation?

Terminology around shared, segregated and separated paths can be confusing. We use the following definitions:

- Shared paths are paths shared by both walkers and cyclists. They may or may not have a central dividing line to guide direction of travel.
- Segregated paths have a designated area for walkers and a dedicated area for cyclists. Effectively they are separate but adjoining paths. The walking and cycling paths can be differentiated by material (eg concrete path next to an asphalt path), or by paint or colour on the same material (eg concrete path with bike lanes coloured green and walking path left uncoloured).
- Separated paths are physically separated paths for walkers and cyclists.

Literature on this subject commonly discusses separation of walkers and cyclists without specifying whether that means segregated or separated paths, or both. We follow this model and when discussing separation we generally group both separated and segregated paths under the broad term of 'separated,' unless discussing the specific differences between separated and segregated paths.

Children are allowed to ride bikes on footpaths and in Queensland, ACT, Tasmania and the Northern Territory adults are also allowed to ride on the footpath. However this paper focuses primarily on designated shared paths as applicable in Victoria, which does not allow adult cycling on the footpath, unless accompanying a child under 12 or with a medical certificate (as is also the case in NSW, while SA and WA are currently under review).

Existing path usage and performance

Some shared paths are carrying high numbers of commuter cyclists and for some local government areas shared paths are their busiest routes. At the extreme, the Main Yarra Trail/Capital City Trail adjacent to Gardiners Creek Bridge records 811 riders per hour in the peak and the Gardiners Creek Trail in the City of Boroondara records 587 riders per hour. This makes them the second and third highest Super Tuesday count points (Bicycle Network 2014). Nonetheless, volumes vary dramatically between paths, even in the same area. City of Yarra counts, for example, record around 300 cyclists per hour at some points, while in some other shared path locations volumes are less than 20 cyclists per hour (City of Yarra 2014).

While volumes vary immensely between shared paths, cycling ridership generally is growing very quickly. Bicycle Network's 2014 Super Tuesday count recorded a 9.5% increase on 2013 levels for Victoria (Bicycle Network 2014).

A study in Melbourne (SKM 2008) investigated the design of six well-utilised shared paths against local and international standards. It found:

> "Four of the six observed paths failed to meet the desired width requirement of any of the international guidelines, including current Australian (Austroads) guidelines. None of the paths met all of the international guideline width requirements."

> "Some shared paths, such as the Main Yarra Trail, were designed primarily for recreational use but are increasingly used by commuters. The result is that during peak periods cyclist volumes can approach 500 cyclists per hour on the busiest parts of the trail."

Planning for off-road paths should anticipate future growth including an increase in commuter cycling. Almost three-quarters of recreational paths on the Metropolitan Trail Network, originally intended for leisure and low levels of transport use, now have high levels of transport use (State of Victoria 2012).

Cycling speed on shared paths

Evidence suggests that cyclists on shared paths with significant levels of commuter cycling typically travel between 19 and 30 km/h, or higher where conditions allow.

A Brisbane study of four shared paths, counting a total of 198,000 movements, found average cycling speeds of 20.2, 22.8, 26.6 and 34.5 km/h (Rees 2011). The 85th percentile speeds were 25.6, 29.5, 31.3 and 39.2 km/h. On the path with the highest speeds (where cyclists had come off a slope), 6% of cyclists were recorded travelling between 40 and 50 km/h, but it was very unusual for cyclists on other paths to reach that speed.

	Toowong Footbridge		Goodwill Bridge		Normanby Bikeway		Mowbray Park	
Speed km/h	Count	Percent	Count	Percent	Count	Percent	Count	Percent
10 – 20	212	0.6	54410	48.3	9876	29.0	1545	6.8
20 – 30	3271	9.6	50331	44.7	21135	62.0	15923	69.7
30 – 40	28467	83.8	3205	2.8	2630	7.7	5153	22.5
40 - 50	1928	5.7	5	0.0	6	0.0	6	0.0
50 - 60	0	0	2	0.0	2	0.0	0	0

Table 1 – speeds on shared paths in Brisbane (Rees 2011)

Counts at 13 points on shared paths in the City of Yarra found average speeds of 12.9, 16.3, 17.8, 19.2, 19.5, 20.7, 22.2, 22.7, 22.7, 23.1, 23.7, 24.1 and 25.3 km/h (median 22.2 km/h). 85th percentile speeds were 14.8, 18.7, 20.4, 22.4, 22.5, 24.6, 25.8, 26.2, 26.6, 27.8, 27.8, 28.0 km/h (City of Yarra 2014).

A study in Hobart looked at a sample of 44 cyclists on an urban shared path and found average speeds of 20-25 km/h (CDM Research 2012).

One study assessed the speed of cyclists on different types of infrastructure in the Sydney region, using volunteer cyclists fitted with GPS devices (Grzebieta et al 2011). This found little variation in speed between different riding environments. Average speeds for different infrastructure were: footpath (21 km/h); bicycle lane (23 km/h); cycleway in a park (19 km/h); roads with a speed limit of 50 to 70 km/h (26 km/h); and roads less than or equal to 50 km/h (21 km/h).

It should be noted that these figures describe average speeds (and 85th percentile where available). Speeds vary significantly between individual cyclists, between paths and between different points on paths. Observational studies also suggest some cyclists slow down when encountering other path users (Taverner Research 2009), although there seems to be a perception by some walkers that they do not slow down as much as they should (Heart Foundation 2012; Garrard 2013).

Media reports on the Strava cycling app suggest that some cyclists may travel at significantly higher speeds than average users, potentially up to 65km/h (The Age, 2015). Bicycle Network noted that enjoyment of shared paths "… is being threatened by a small group of show-offs that are taking extreme risks just so they have bragging rights by having their name up on Strava."

Potential to control cycling speed

Controlling cyclist speed on shared paths is challenging for a number of reasons:

- The very high speeds which disproportionately present the greatest risk are often by riders who are difficult to effectively reach through marketing or education (this is similar to other areas of road safety, such as recidivist speeding, drunk drivers or young adult males).
- Physical measures which seek to control speed can present a hazard to cyclists and may, in some instances, lead to more crashes than they eliminate through reduced speeds.

- There is no legal basis on which speed limits on shared paths can be enforced in Australia.
- Physical measures may present an undue hindrance to the vast majority of path users (pedestrians and most cyclists) who are travelling at an appropriate speed. Hindering walking and cycling would be contrary to local and state government policy to encourage these modes." (CDM Research 2012).

Despite these challenges, controlling speed on some shared paths or parts of shared paths may be necessary to improve safety and amenity, particularly for walkers.

Potential speed control measures do not appear to have been subject to any before-after evaluation, so it is not possible to say definitively what works and what does not (Munro 2013). A range of possible options for managing cycling speed on shared paths are explored by CDM Research (2012) and summarised in the following table.

Option	Advantages	Disadvantages
Physical interventions		
Signage	Low cost	Unlikely to be effective Visual clutter Additional obstacle (if installed on new poles)
Pavement markings	Low cost More in line of sight to riders than signs (riders tend to be looking downward)	Unknown effectiveness Visual clutter
Tactile coloured surfaces	Low cost Minimal to no hazard to path users Does not affect path user amenity	Unknown effectiveness
Vertical deflections	Potential to be effective at reducing speed	Potential hazard to riders Trip hazard to pedestrians Cost
Chicanes	Most effective at reducing rider speeds	May not have much effect on speed >20m downstream of the chicane Potential hazard May distract riders from task of observing traffic Deters riders and pedestrians, particularly riders with trailers
Marketing & Communications		
Behaviour change campaign	Relatively low cost May form part of a wider community engagement activity Highly visible (to those who participate) – 'feel good' factor	Unknown effectiveness May be least effective on those presenting the greatest risk
Regulation, Legislative & Enforcement		
Speed limits	Low cost Consistent with user understanding of the road environment	Legally unenforceable Difficulty of establishing a limit which is acceptable to pedestrians and cyclists

Table 2 – options for managing cyclist speed on shared paths (CDM Research 2012)

Shared path injury risk

Walkers often perceive a risk of collision with cyclists on shared paths (see subsequent section on user perceptions). That perception is important in itself, because it clearly influences the sense of comfort and enjoyment people have in using the path (CDM Research 2012) and may deter people from walking on shared paths or from walking at all, if a convenient alternative is not available. Nonetheless, reliable quantifiable information about safety risks is very limited.

This section briefly looks at the general risk of pedestrian-cyclist collisions, before considering the risks specific to shared paths.

General cyclist-pedestrian crashes and injury

Available literature indicates that cycling is not a significant cause of pedestrian fatalities (see for example Grzebieta et al 2011).

There is nonetheless a potential for injury, especially for pedestrians, in collisions between cyclists and walkers. The difference in kinetic energy between a pedestrian and a cyclist is similar to the difference between a cyclist and a car travelling at 50 km/h (CDM Research 2012; Grzebieta et al 2011). For this reason the pedestrian is more likely to be injured in a collision with a cyclist than the cyclist. A Queensland study of 204 reported collisions found 79 pedestrians were hospitalised compared with 19 cyclists (Rees 2011).

Collisions between cyclists and pedestrians are under-reported (Rees 2011; Aultman-Hall and LaMondia 2005; Taverner Research 2009). As a result, the only reliable data about this type of collision seems to be hospitalisation data, providing a picture of the proportion of crashes that cause significant injury. Estimates of the proportion of pedestrian injuries resulting from collisions with cyclists vary from 2.1% (Boufous et al 2010) to 3.1% for Victoria (Oxley and Hern 2014); and 7.6% for NSW (Grzebieta et al 2011). The relatively low proportion of pedestrian hospitalisations is consistent with generally low levels of exposure to cyclists – in Victoria only 1.7% of transport trips are made by bicycle (Department of Transport 2009).

Cyclist-pedestrian crashes may impact disproportionately on children and seniors. There were 2,802 pedestrian hospitalisations in Victoria arising from traffic crashes between 2004 and 2008, and 2.1% were due to collisions with cyclists. A third of those hospitalised were over 60 and another 25% were less than 18 years old (Boufous et al 2010). This is consistent with other road safety contexts – seniors are generally more vulnerable to injury in most environments, including vehicle traffic accidents.

Pedestrians who are blind or have low vision appear to be at particular risk of collision with a cyclist. Unlike a motor vehicle, a bicycle does not emit sufficient noise to alert the pedestrian of the bicycle's approach and for those individuals who rely on residual vision, bicycles are also more difficult to see (Burtt 2014).

In a survey of 607 Victorians with vision impairment, 8% had been involved in a collision and 20% were in a near collision as a pedestrian over the previous 5 years. A quarter (24.1%) of these collisions or near collisions were with bicycles. Survey respondents reported lower levels of confidence in interaction with cyclists than any other situation that was studied (Oxley et al 2012).

It should be stressed that the studies above report on interaction between cyclists and pedestrians generally. The limited information considering risk on shared paths specifically is discussed below.

Injury risks on shared paths

There does not appear to be any reliable Australian data on the proportion of cyclist-pedestrian crashes or injuries that occur on shared paths.

Consideration of the detailed crash location of pedestrian hospitalisations in Victoria between 2010 and 2013 suggests the rate of serious injuries on a 'cycleway' is very low, at 0.1% of pedestrian hospitalisations (Oxley and Hern 2014). However dedicated cycleways are unusual and there is no categorisation for shared paths in this dataset, so it is likely that a significant proportion of injuries on shared paths are being categorised in other ways, such as 'sidewalk' (3.9%), 'sports and athletics areas' (1.7%), other (2.2%) or unspecified (11.2%).

A Queensland study (Rees 2011) considered data from the Queensland Police Service for all crashes that were reported in Queensland for the period 1992 to 2009. This recorded 204 crashes between cyclists and pedestrians, with 61% on the road, 28% occurring on footpaths and 11% on 'bikeways.' Once again however it is not clear whether 'bikeways' equates to shared paths, or whether crashes in one type of location are more likely to be reported than others. It should also be noted that adult cycling on footpaths is permitted in Queensland, so the proportion of collisions across locations may be quite different in other jurisdictions.

A survey of 2,532 adult cyclists in Queensland found:

> " Of all the self-reported pedestrian-cyclist crashes, the largest number occurred on bike paths (including shared paths), representing 18% of bike path crashes and 68% of pedestrian-cyclist crashes."

(Haworth, Schramm and Debnath 2014)

It should be noted that the profile of the respondents to this survey may have affected the results – 73% were male and 47% were 'fitness riders', with an average age of 42.6 years (Haworth and Schramm 2011).

A study of cycling injury in the ACT considered 202 crashes in transport environments resulting in presentation to hospital emergency departments, with only 17% of crashes reported to Police (De Rome et al 2014). Notably, more than a third (36%) of crashes occurred on shared paths. The study found:

> "Though over half of those injured on shared paths were in single bicycle-only crashes, almost one quarter involved other cyclists and 20 percent involved a pedestrian. Crashes on shared paths and in traffic were also more likely to result in serious injury and to require admission to hospital than those on cycle lanes or footpaths."

The finding that injuries were more serious on shared paths is consistent with Canadian research that found bicycle crashes on footpaths and shared paths had the highest odds of ambulance transport and hospital admission (Cripton et al 2015).

The ACT study included counts of cyclists in different environments and used these to approximate exposure rates, finding that crash risk on shared paths was high. It estimated that the crash involvement risk per 1000 cyclists using shared paths was 11.8, compared to 5.8 for on-road cycle lanes.

As noted by the authors:

> "Perhaps the most important finding is the relatively high crash involvement rate on shared paths compared to cycle lanes. These findings are consistent with other studies that have concluded that separated cycle-only facilities such as on-road cycle lanes have a positive safety effect (Moritz 1998; Reynolds et al. 2009), whereas shared facilities such as footpaths (side-walks) and shared paths (multiuse trails) have been found to pose higher injury risk than riding in traffic (Aultman-Hall and Hall 1998; Aultman-Hall and LaMondia 2005; Moritz 1998; Reynolds et al. 2009).
>
> The findings for shared paths raise questions that need to be resolved urgently as public policy increasingly promotes their usage (Austroads 2010)."
>
> "Though the injury risk of collisions with motor vehicles is undeniable, these findings indicate that undue focus on motor vehicles may lead cyclists to underestimate other sources of injury risk, particularly other cyclists."
>
> (De Rome et al 2014).

The study concluded:

> "There is substantial evidence of the incompatibility of cyclists and motor vehicles but little to justify shifting the risk to shared paths where similar incompatibility exists between pedestrians and cyclists (Aultman-Hall and LaMondia 2005; Chong et al. 2010; Lusk et al. 2011; Reynolds et al. 2009)."
>
> "The results provide evidence of the relative safety of on-road cycle lanes compared to riding in traffic or on shared paths or footpaths. The crash rates and cycling speeds reported on shared paths indicate an urgent need for review to determine appropriate criteria and speeds for classifying paths as suitable for shared or segregated usage."

One United States study considered the risk of injury, in terms of collisions and falls by all users on shared paths, in comparison to distance travelled. Using this metric it found high rates of both collisions and falls, compared to crash rates for cars on roads, although the differences in the types of events mean that a direct comparison is not possible.

> "The collision and fall events reported by the participants are occurring relatively frequently. They are not extraordinarily rare. The relatively high frequency of safety events on the shared-use paths in this study merits consideration. This study indicates that these frequent collisions and falls often result in some injury. There is a need for safety countermeasures...The overall incident rates are the highest on the path with the largest traffic volume and largest number of intersections and the lowest on the path with the fewest intersections and the lowest percentage of skaters and bicyclists."
>
> (Aultman-Hall and LaMondia 2005)

Shared path injury risk (cont.)

This study also reminds us that any holistic assessment of safety should consider falls as well as collisions.

> "A total of 63% of the events reported were falls. More injuries resulted from falls than collisions (20 injuries from falls versus 15 injuries from collisions). This illustrates the need to focus on the path circumstances that lead to falls as well as those that lead to collisions."

(Aultman-Hall and LaMondia 2005)

This holistic analysis provides quite a different picture of risk than other studies, with the most common incident involving a cyclist alone. The level of falls reported in this study appears consistent with the proportion of falls causing injury in public space generally (ITF 2011). Our review did not identify any other research on the rate of falls on shared paths.

In summary, very little can be definitively said about injury risk on shared paths, although there is evidence to suggest they may be more hazardous for cyclists than some other environments, such as on-road cycle lanes. Surveys of users suggest that some injuries occur (Robinson 2011; Haworth and Schramm 2011; Heart Foundation 2012), but there does not seem to be any strong evidence to suggest that shared paths have a higher or lower injury rate for walkers than other travel environments. There does not appear to be a significant risk of fatal injury, although collisions and falls affecting the frail elderly could have serious implications over time. This literature review did not identify any research on risk of pedestrian falls relating to interaction with cyclists.

As Munro (2013) notes:

> "Very little is known about the objective level of risk of conflict between riders and pedestrians, nor have any countermeasures been subject to any rigorous evaluation. As such, the relative merits of various measures are subject to conjecture."

Observation of shared paths

Shared paths can be studied by observing interaction between walkers and cyclists. Most observational studies find low levels of conflict between users, although this does not necessarily reflect the user experience, as discussed further below.

A large observational study of shared paths involved a total of 672 observation hours at 10 shared path locations in NSW between 12 July and 2 August 2009 (Taverner Research 2009). The study found risks of physical conflict were very low – "only 5 actual conflict incidences between pedestrians and bicyclists were observed over the course of the study."

The study found:

> "In situations where pedestrians and bicyclists were in the observation zone at the same time, 91% of pedestrians and 66% of bicyclists were not required to take action to avoid each other. The most common avoidance manoeuvre was for bicyclists to change their line of travel (76% of bicyclists who avoided pedestrians) and to slow down (30% of bicyclists who avoided pedestrians).
>
> "Of the 528 pedestrians that made a move to avoid a bicyclist, 73% moved to the edge of the path, 18% actually moved off the path and 9% changed to walking single file."

Victoria Walks notes that the results suggest that pedestrians are much more likely to feel the need to take avoidance action on paths where there are comparatively high numbers of cyclists. Of the ten paths studied, only one had more cyclists than pedestrians. On that path, 23% of walkers encountered a cyclist in the observation zone and 13.6%, more than half of those who met a cyclist, took evasive action (moving to the edge or off the path, or walking single file. This was 2.8 to 45 times the level of avoidance action by pedestrians on other paths. We conclude there may be a risk that shared paths where cyclists outnumber pedestrians come to be seen as de facto cycle paths, and the onus on cyclists to give way to pedestrians starts to reverse in practice. Further research on this potential would be valuable.

Walking children aged 0-12 were more likely to take avoidance action (11%) than adults aged 31-49 (7%). This difference was even more pronounced for older walkers, with 11% of 50-69 year olds and 18% of those aged 70+ taking avoidance behavior. As noted by the authors:

> "Pedestrians over age 70 were also more likely than other age groups to move to avoid bicyclists, suggesting that this age group perceived a higher level of danger than younger pedestrians."

A study in Sydney observed 407 cyclist/pedestrian passing events on three relatively wide, busy shared paths. It found:

> "Cyclists frequently pass on the left of pedestrians, often too close and without slowing. Use of mobile telephones and mp3 players is common, particularly amongst pedestrians, and appears to contribute to potential crashes. Incidents were fairly common, and most likely to emerge when one or both users strayed from the rules of thumb to keep to the left, and to overtake on the right. Survey responses suggested that there are issues with perceptions of space ownership." (Hatfield and Prabhakharan 2013)

A study commissioned by VicRoads involved video observations of six shared paths around Melbourne (SKM 2008). They concluded:

> "The possibility of conflict situations on paths is complex and depends on many variables including the number and size of groups of users, presence of dogs, the speed of users and the degree to which the flow is tidal.
>
> "The number of conflicts we observed was low – 22 conflicts out of 1126 encounters (2%). Conflicts were difficult to observe because they are rare and we only observed short sections of path for 90 minutes during a quiet time of year (mid-winter). Conflicts can include subtle signs, like cyclists slowing, which are difficult to observe from the video. It would help to understand how often pedestrians and cyclists *feel* unsafe in various conflict situations. A user perceptions study could provide this information, which would be a useful complement to this study."

This hints at the limitations of observational studies and provides important recognition that the user experience of conflict and interaction is both valid and important.

Where observational studies have been compared with surveys and/or focus groups of users, the observational studies usually find low levels of conflict, but the user experience is very different (Countryside Agency 2003). An Australian report provides this example:

> "…serious pedestrian-cyclist accidents on shared paths are rare. There were six reported bicycle-pedestrian collisions in 2008 in the City of Sydney. Observational surveys commissioned for this report show that pedestrians and cyclists generally mingle peaceably. During 9 hours of observation, including morning peak hour on Pyrmont Bridge, no instances of conflict were noted.

Observation of shared paths (cont.)

However that is not the whole story. Although the real risk of physical injury on shared paths is low, the apprehension of danger may be relatively high, and many people have had experiences that confirm those fears. In research along the Glebe foreshore for instance, 8% of pedestrians reported having been knocked over by a cyclist and 33% reported being frightened by a cyclist travelling too fast. Every cyclist in focus groups commissioned for this report reported witnessing or being involved in near misses with pedestrians and a majority of cyclists had come off their bikes at some time in order to avoid a collision with a pedestrian." (Robinson 2011)

Note the claim that pedestrian-cyclist collisions on shared paths are rare is based on:

- Reported collisions, which are known to be under-reported; and
- Observation of a path for 9 hours. Conflict is an unusual event in human interaction – if a suburban intersection is watched for 9 hours conflict is unlikely to be observed.

Some researchers do not acknowledge these limitations – rather they say users misunderstand the risks.

Some authorities seem to have reached a conclusion that conflict between users on shared paths is perceived rather than real, based on observational studies that did not detect high levels of conflict (Department for Transport 2012). One Australian observational study found "incidents were fairly common" (Hatfield and Prabhakharan 2013). There would seem to be a level of subjective interpretation of observation, and user experience is very different to reported observation. It is questionable whether observational studies should be relied on so heavily as a basis for policy.

Injury and fear of injury are both important – fear of injury can impact on walking behaviour, enjoyment, and amenity. User perceptions of shared paths, including risks, are discussed further in the next section.

User experience of shared paths

A major study of shared paths in the UK (Countryside Agency 2003) concluded that conflict on shared paths was rare, based on observations of shared paths. Users, however, perceived a greater degree of conflict:

> "Focus group discussions found walkers felt overwhelmingly that shared use involves compromise. The chief constraint to sharing routes was the perceived danger of accidents with, and abuse from, fast 'macho' cyclists. Few cyclists seem to have the same level of animosity towards walkers. Cyclists claim that walkers often seem to obstruct them for no apparent reason. Equally, most cyclists claim that they have had more 'near-misses' with other cyclists than they have had with walkers."

A Sydney study found

> "The main behaviours that cause the apprehension of danger are:

- On the part of cyclists: riding at high speed, overtaking too close, and failure to signal before overtaking.
- On the part of pedestrians: blocking the path, unpredictable movements, and crossing the path without looking." (Robinson 2011)

Cyclist perceptions

In research funded by VicRoads (CDM Research 2012a), 502 rider interviews were completed across 14 sites in inner Melbourne between May and July 2012 during the AM peak period (7 – 9 AM).

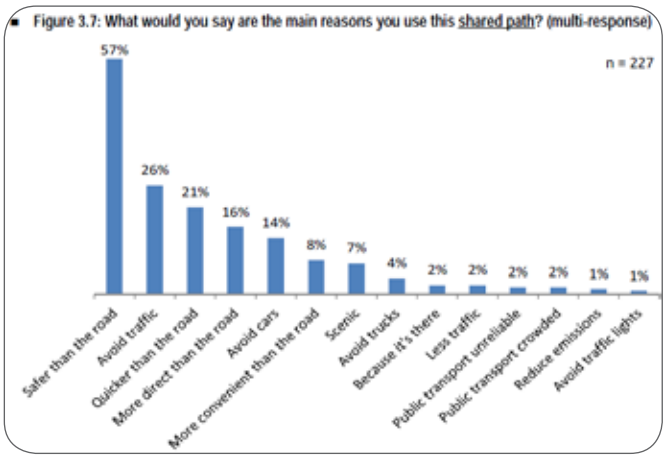


Figure 1: Main reasons for cyclists using shared paths (CDM Research 2012a)

The study found that "there is a strong preference to ride on shared paths in preference to roads, equivalent to around 4 minutes of travel time for confident riders and 17 minutes for cautious riders."

The 227 cyclists interviewed on shared paths were asked about their reasons for travelling on them and the results are illustrated in Figure 1.

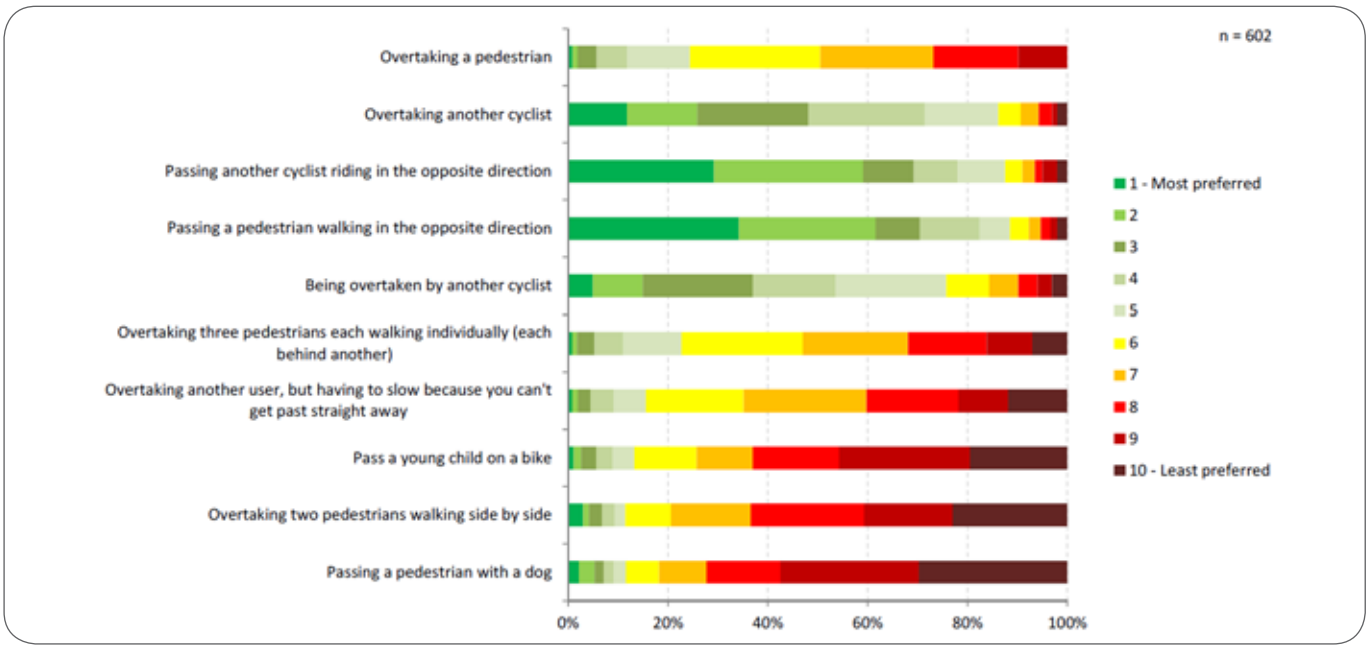


Figure 2: Cyclist ranking of typical interactions on a shared path (CDM Research 2012a)

User experience of shared paths (cont.)

The research for VicRoads also involved an online survey of 602 respondents. Key results are set out in Figures 2 and 3. It is notable from Figure 2 that cyclists see no difficulties in interacting with individual pedestrians, but dislike overtaking two pedestrians or a pedestrian with a dog.

Figure 3 illustrates that cyclists are generally more positive than negative about shared paths, but the surrounding environment can have a significant influence on that. It also illustrates that cyclists strongly prefer segregated paths to shared paths, with 66% saying they 'really like' riding on segregated paths compared to 3% to 8% for shared paths, depending on the context.

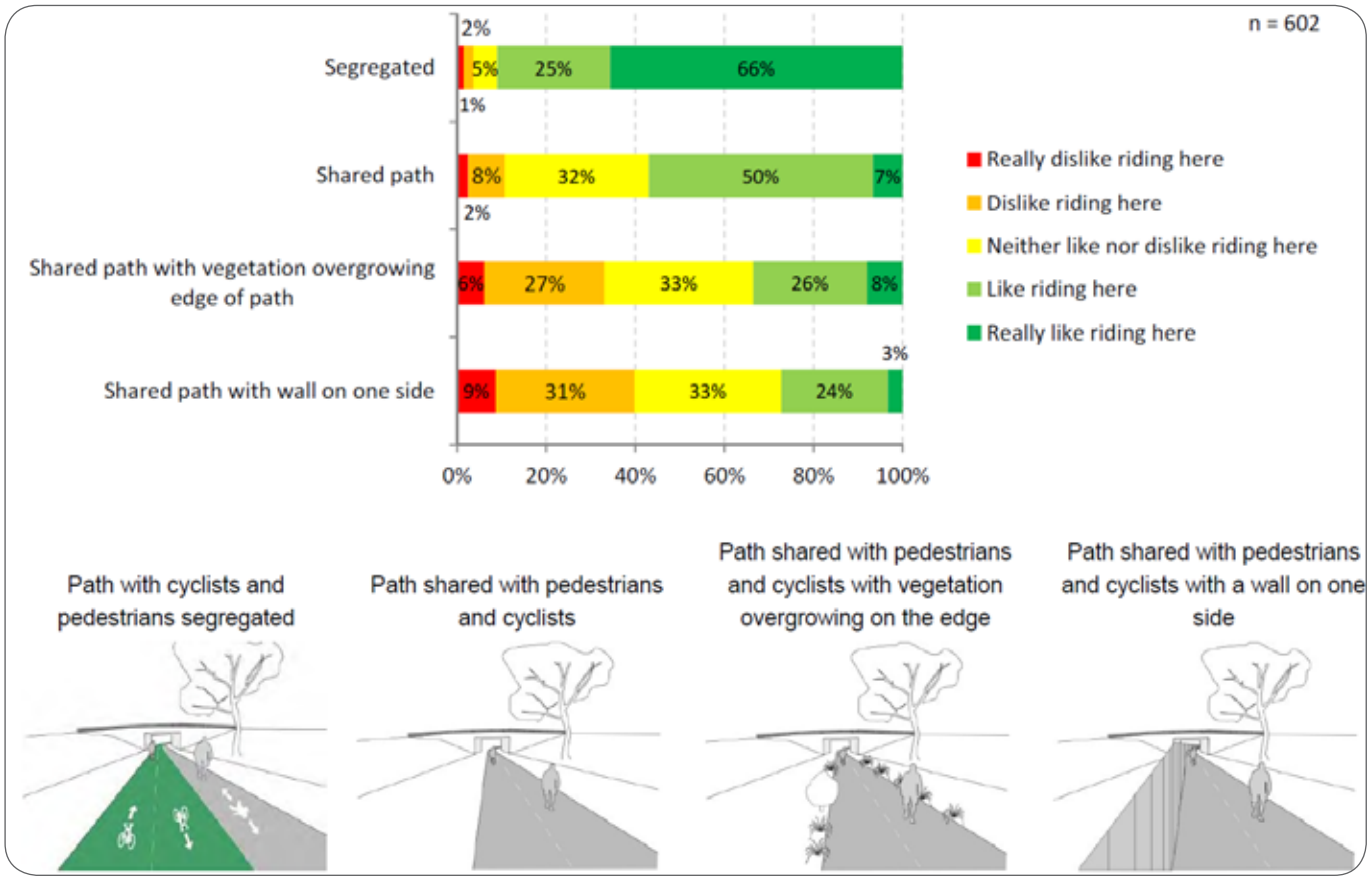


Figure 3: Cyclist path type preferences (CDM Research 2012a)

Walker perception and experience of shared paths

A survey of 236 regular shared path users in Canberra (Heart Foundation 2012) appeared to be directed primarily to walkers. Respondents were asked "Have you ever been involved in an incident with a cyclist where you were injured, unsafe or in danger?" 37.4% said they had. Of those, 14% said they'd been injured, 10% said the cyclist was injured and 2% said a fellow walker was injured. Another 37 respondents (15.7% of total sample) said they'd been involved in a 'near miss' or 'close call.'

The study also found:

> "44.5 per cent of the surveyed people saw the cause of incidents where caused by bicyclist, followed by walkers behaviour around 30.9 per cent and path quality 24.6 per cent.
>
> The perceived main reasons for the current bicycle behaviour issues were for example unreasonable high speed, right of access and failure of warning.
>
> The perceived main reasons for current walkers behaviour issues were for example inattentive and erratic behaviour, blocking the path, unleashed dogs, inability to hear warning, or blind corners on paths."

Moonee Valley City Council conducted a walking survey in October 2010, completed by 138 people. People were asked about their experience with eleven different aspects of walking. 'Safety on paths shared with cyclists for walkers' had the second lowest level of satisfaction for all aspects of walking in the municipality.

The report noted:

> "The community rated separation between pedestrians and cyclists as important and in need of improvement. Moonee Ponds Creek and Maribyrnong River trails were identified as key routes that required improvement."

It seems that the requirement for cyclists to give way to pedestrians on shared paths is comparatively poorly understood. Initial findings from the VicRoads Cycling Road Rules Survey indicate that this is one of three rules that many people "are unaware of or unclear about," compared to other rules (Minister for Roads 2014). Related to this, in the experience of Victoria Walks shared paths are often described as 'bike paths,' even by local authorities. Shared paths seem to be perceived more as cycling infrastructure than walking infrastructure. A study of cyclist injuries in the ACT found:

> "Many of the cyclists who crashed on shared paths referred to them as bike paths, which may reflect longstanding usage." (De Rome et al 2014).

There are significant risks in describing shared paths as bike paths, because it is likely to further confuse the fact that walkers are legitimate users of the path and cyclists are legally required to give way to them.

Older walkers and shared paths

It is widely recognised that shared paths are not comfortable walking environments for many seniors and people who are disabled (Department for Transport 2012, Queensland DTMR 2014).

A study of seniors and walking (Garrard 2013) included a survey of 1,128 Victorians aged 60 or over. "Bicycle riders on shared walking and cycling paths" was rated a moderate or major constraint to walking by 39% of respondents.

When asked what measures would impact their feelings of safety when walking generally, the top two responses were:

1. "Better cyclist behaviour on shared paths
2. Reduce cycling speed on shared paths."

These factors were rated more important than any action to improve car driver behaviour. There was no option in the survey to identify separated walking and cycling paths as a desired action.

The study also included eight focus group discussions with a total of 32 senior Victorians. Speed, unexpected appearance (such as overtaking from behind) and unpredictable behaviour of bicycle riders on shared paths was a significant concern:

> *"They [cyclists] go 'whoosh' as they go past, and often the paths aren't very wide, so this notion that you have to share has to come with more thought. If there's not enough room it's not a good match. If it's got to be shared it's got to be wider. Or separation between them."*

User experience of shared paths (cont.)

"I live inner city and walking inner city is quite dangerous because of the bikes – not necessarily local residents, but commuters. On the shared paths, they travel too fast, and on crowded paths it's quite dangerous."

"Cyclists on shared paths that go like a bat out of hell."

"Cyclists are really bad...and I ride a bike myself, but they scare me [on the Koonung trail at the weekend]. They do not ring their bell, and I don't like the lycra people coming past. It's by law they should have a bell. Bicycle Victoria says "Obey the road rules", but they don't. So the Police need to start fining people."

"It [cyclists on sections of Yarra Trail] puts me off walking there, but it doesn't stop me walking."

Quotes from focus groups with Victorian seniors (Garrard 2013)

Concern by older walkers regarding sharing paths with cyclists is likely to be related also to a reduced physical capacity to avoid collisions and increased frailty with age.

Older pedestrians are more likely to have impaired vision and people with vision impairment are at risk in interactions with cyclists (discussed above under 'general cyclist-pedestrian crashes and injury).

Perception of safety is likely to be a key determinant of pedestrian amenity. UK guidance notes:

"Disabled people and older people can be particularly affected by shared use routes."

"…perception of reduced safety is an important issue for consideration, because it has a bearing on user comfort, especially for older people and disabled people." (Department for Transport 2012)

An implication of this evidence is that many seniors and visually impaired people are likely to avoid walking on busy shared paths because of their concerns about cyclist speed and collision risk. This may be extended to walkers generally when faced with shared paths that have high volumes of commuting cyclists.

Some argue that walkers who don't like sharing paths with cyclists can simply walk on footpaths instead. Aside from the fact this overlooks the absence of footpaths in some areas, seniors, children and those with limited mobility should not be deterred from walking or using open space and recreation areas by inadequate or inappropriate infrastructure. Walking is by far and away the most significant form of exercise for seniors and many prefer to walk in park, beach or similar semi-natural environments (Garrard 2013). Curtailing recreational walking would have significant negative implications for public health.

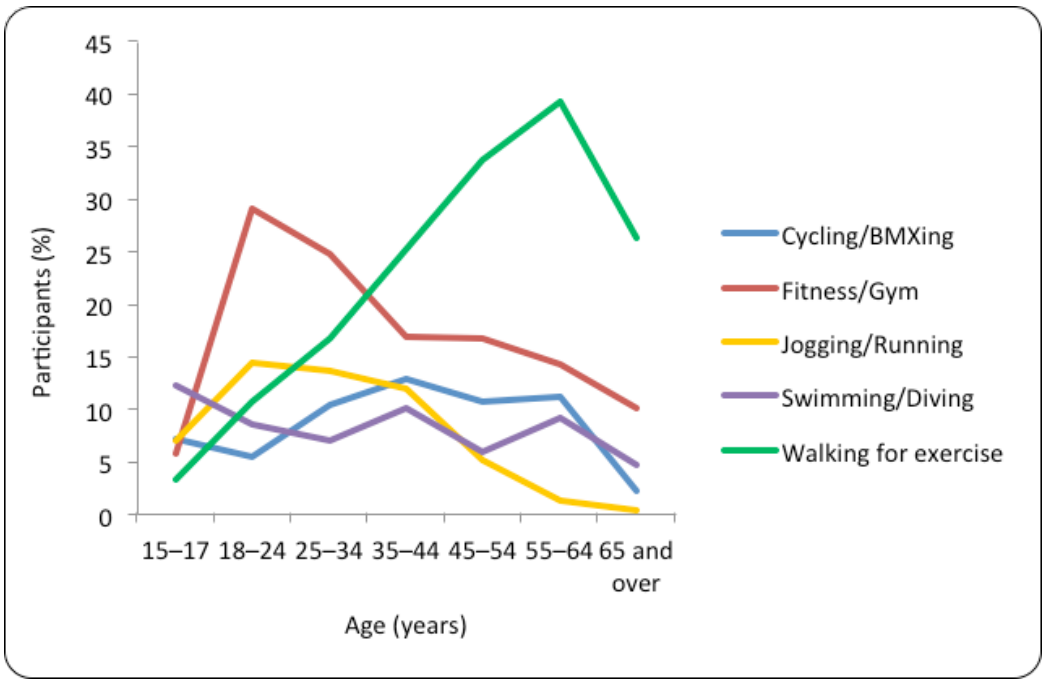


Figure 4: Participation in the top five forms of sport and physical recreation, Victoria (Garrard 2013)

Segregation and separation

Separating cyclists from pedestrians recognises the speed differential between cyclists and pedestrians; acknowledges that each user group prefer to be separate from one another; provides a more pleasant walking environment, especially for seniors and those with limited mobility; and can reduce the frequency of delay that cyclists experience along a path.

Some of the key issues are summarised by Tolley (2008):

> "Understanding for whom and for what purpose a cycle route is proposed is an important part of deciding whether or not to offer cyclists the option of using an off-roadway facility.
>
> For example, on trails with a low density of users, sufficient space and unanimity of use (i.e. leisure), such as rural rail trails etc, sharing space is sensible and functional. Similarly, shared use may be appropriate in zones around a school, where the only users are expected to be children (on foot or bicycle) and parents, all going slowly. However, if these school routes are part of a bigger network, which might attract fast cycling commuters, shared use is not desirable – and indeed may actually reduce levels of children walking and cycling to school, through increased perceived levels of danger."
>
> "World best practice emphasises that bicycles belong on the road, or on segregated facilities provided specifically for them. If cycling facilities segregated from cars are to be provided, this should be at the expense of space for cars, not people on foot. Forcing walkers and cyclists to share a path should only be contemplated as a last resort, when no other solution is possible."

Queensland guidance (Queensland DTMR 2014) notes:

> "Separation improves the safety and sharing difficulties between the different user groups by providing clearly defined operating space designed to cater to their particular operating characteristics. Separation also allows cyclists to maintain more comfortable speeds, reduces the potential for conflict between cyclists and pedestrians and improves the level of service for pedestrians, especially elderly pedestrians or those with a disability.
>
> If there is sufficient space for a 4.0m shared path, then a 1.5m footpath and a 2.5m bicycle path may be a better outcome."

For paths that are segregated between users (cyclists and pedestrians) the capacity of users that can be accommodated is increased in comparison to a shared path of the same width, in most circumstances (SKM 2010).

From a cycling perspective, SKM (2008) note:

> "Shared paths work well in situations of low volume pedestrian and cyclist volume where there is sufficient width provided for cyclists to overtake the slower moving pedestrians. At higher volumes the likelihood of a user being injured increases as cyclists are forced to weave between pedestrians or move off of the path in order to pass another user. This is particularly true in circumstances where pedestrians tend to walk in groups or with dogs."

To cater for vision impaired pedestrians, segregated paths should have a physical barrier or interceptor between them to prevent pedestrians with vision impairment inadvertently moving into the cycle path. Barriers would need to be carefully designed, however, to avoid creating a fall hazard for cyclists and pedestrians.

Where space allows, a separated path is generally preferable to a segregated path, because segregated paths present some challenges in terms of user behaviour and require careful design in response (Department for Transport 2012). SKM (2008) note:

> "Separated paths provided cyclists and pedestrians with their own space and are the most effective at ensuring each user type keeps to the designated side of the path. As users can no longer just 'cross the line', each part of the path has to be sufficiently wide to ensure that in most situations users will not have to leave the path. Separated paths are standard practice in nations with strong cycling cultures such as the Netherlands."

In the City of Melbourne, Princes Bridge is an example where high user numbers make a segregated path problematic. To their credit, the City of Melbourne have reduced the vehicle traffic capacity of the bridge in order to provide a dedicated on-road cycle lane and separate footpath on the western side of the bridge.

International guidelines

Austroads (2006) notes:

> "Shared paths and cycle use of footpaths is the most common mode of providing cycle facilities in Australia, but European (including UK and Ireland) guidelines stress the importance of separating the two wherever possible."

A literature review of international shared path guidelines (SKM 2008) noted:

> "The way in which guidelines are specified, and have been derived, differ very significantly between regions. Some simply provide a recommended width, while others take into account the volume and type of users in determining whether the path needs to be segregated and recommending an appropriate width. In countries with the most rigorous standards, namely the Netherlands and Norway, the recommended widths are higher than those currently recommended by Austroads Part 14 (Bicycles). Furthermore, there is a strong preference for separating pedestrians and cyclists onto physically separated paths."
>
> "In Europe the guidelines tend to be based on empirical evidence garnered over a large number of years of relatively high bicycle usage."

This is explored in more detail in SKM 2010:

> "In the case of the Norwegian guidance… the required width varies depending on the number of pedestrians and cyclists. For very low volume paths (with cyclist volumes under 50 per hour and pedestrians under 50 per hour) a shared 3.0 m path is recommended. For any higher volumes segregation is recommended.
>
> Segregation if either cyclist or pedestrian volumes exceed 50 user/hour is consistent with the Dutch CROW guideline, where it is recommended that segregation be used if there are more than 25 pedestrians per hour per metre of pavement width and bicycle volumes are low. This reflects Dutch practice of segregating motor vehicles, cyclists and pedestrians wherever possible. While there are rural shared use paths in the Netherlands in built-up areas almost all cycling facilities are dedicated for cycling alone."

UK guidance

In the UK the term 'shared use paths' is used to refer to both shared and segregated paths.

The UK guidance includes a decision making framework which starts with the question "would it be feasible and desirable to improve conditions for cyclists in the carriageway?" If the answer to that question is yes, the response is "Shared use is not appropriate. Design on-carriageway improvements."

A UK Department for Transport Local Transport Note (LTN) recommends a hierarchy of provision for cycling infrastructure as set out below (Department for Transport 2008):

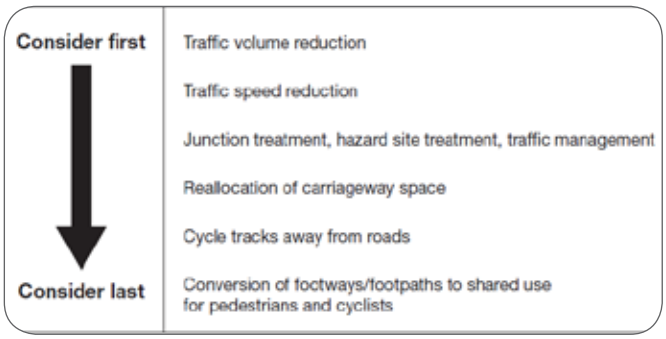


Figure 5: UK preferred hierarchy of provision for cyclists (Department for Transport 2008)

"This LTN focuses on routes within built-up areas, where the predominant function of the route is for utility transport, and where use by pedestrians and/or cyclists is likely to be frequent. As such, it expresses a general preference for on-carriageway provision for cyclists over shared use."

Advice on design of shared paths is set out in Local Transport Note 1/12, *Shared Use Routes for Pedestrians and Cyclists* (Department for Transport 2012). This guidance no longer definitively recommends separated paths over shared, on the basis of observational studies that have found low levels of observed conflict between cyclists and walkers. However the UK tendency to discuss both shared and segregated paths as 'shared use' clouds this issue.

The UK guidance also notes:

> "The design of shared use routes requires careful consideration and is best carried out by someone experienced in planning and designing for pedestrians and cyclists. A poorly designed facility can make conditions worse for both user groups." (Department for Transport 2012)

Australian Guidelines

Austroads

Australian guidance is led by Austroads. The primary guidance is the *Guide to Road Design Part 6A: Pedestrian and Cyclist Paths* (Austroads 2009). This sets out the role of shared paths:

"A shared use path may be appropriate where:

- demand exists for both a pedestrian path and a bicycle path but where the intensity of use is not expected to be sufficiently great to provide separate facilities

  an existing low-use footpath can be modified to provide for cyclists by satisfying legal requirements and as necessary upgrading the surface, width and kerb ramps

  there is an existing road nearby which caters well for faster cyclists (e.g. has on-road bicycle lanes), to limit the extent of user conflict on the shared path.

Shared paths can be used for a variety of purposes including recreation, local access and providing links between higher speed on-road paths or bicycle paths."

The Guide also notes:

> "A significant issue associated with shared use paths is the variety of users who display various characteristics that can lead to conflict between them."

The decision making framework for determining what type of path to build is summarised in Figure 6.

Points to note are that shared paths are recommended when pedestrian and cyclist volumes are low (each less than 10 per hour), or when either the pedestrian or the cyclist volume is low and cyclist speeds are below 20 km/h.

As noted above, average cycling speed on shared paths typically range between 20 and 30 km/h – well above the cycling speeds envisaged by Austroads for shared paths. Shared paths on main cycling routes typically also have more users than anticipated in this guidance.

The apparent tension between the vision of shared paths as low speed, low use infrastructure and the reality of high use and high speed was noted in a study of cyclist injury in the ACT (De Rome et al 2014).

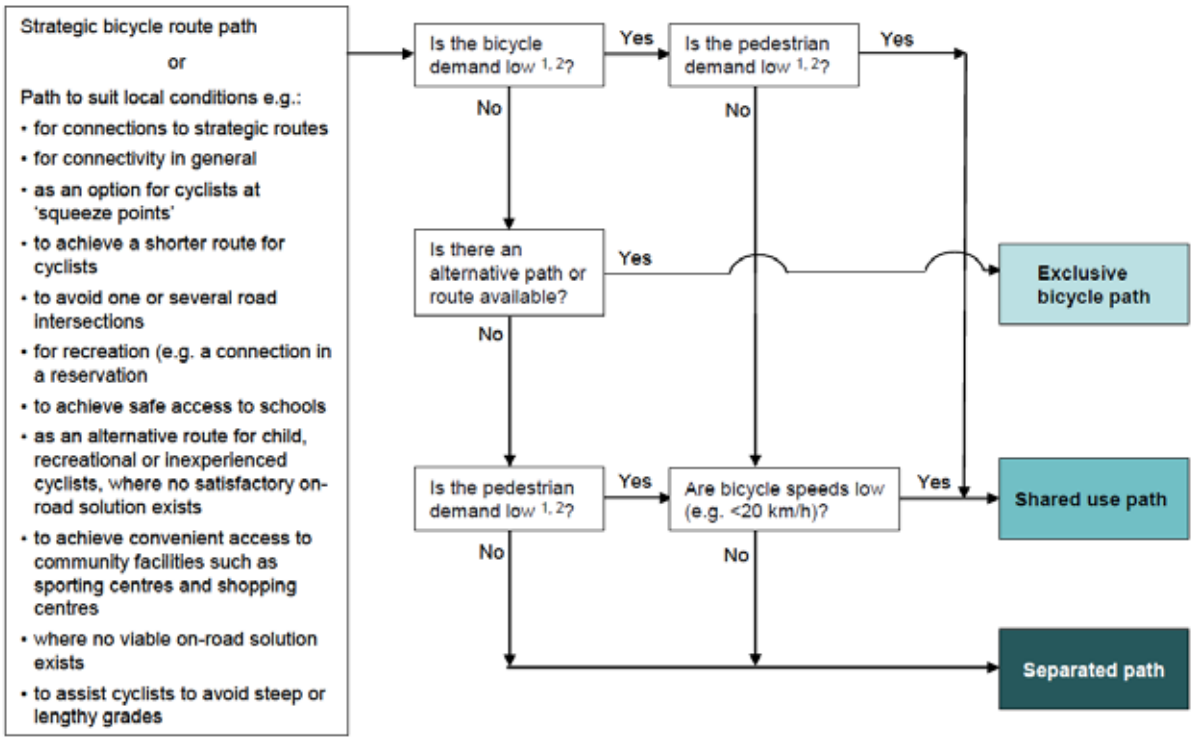
The Austroads vision for cycling specific infrastructure is very different to that for shared paths. In the general 'Path Design Criteria for Bicycles', Austroads (2014) notes:

> "It is important to recognise that under appropriate conditions many fit cyclists can maintain relatively high speeds. Speeds in excess of 35 km/h can be maintained on the flat whilst speeds of over 50 km/h can be attained on moderate gradients."

> "It is recommended that paths be designed for a speed of at least 30 km/h wherever possible and desirable given the purpose of the path, and in other cases for the anticipated operating speeds. However, it should be recognised that it may be necessary to adopt higher or lower design speeds in specific circumstances."

The combined implication of these guidelines seems to be that shared paths should not be utilised for routes designed for significant numbers of cyclists. The guidelines indicate that shared paths should be designed for speeds less than 20 km/h, but paths for cyclists should allow a speed of at least 30 km/h. Victoria Walks conclude that shared paths should not be envisaged as primary cycling routes.

Austroads provides limited guidance on shared path width, compared to the Queensland and VicRoads guidance discussed in following sections. The key table is set out in Figure 7. Austroads also provides considerable guidance on detailed shared path design.



1 The level of demand can be assessed generally on the basis of the peak periods of a typical day as follows:
a. Low demand: Infrequent use of path (say less than 10 users per hour)
b. High demand: Regular use in both directions of travel (say more than 50 users per hour).
2 These path volumes are suggested in order to limit the incidence of conflict between users, and are significantly lower than the capacity of the principal path types.

Figure 6: Austroads guidance on choosing path type (Austroads 2009 and 2014)

	Path width (m)		
	Local access path	Commuter path	Recreational path
Desirable minimum width	2.5	3.0	3.5
Minimum width – typical maximum	2.5(1)–3.0(2)	2.5(1)–4.0(2)	3.0(1)–4.0(2)

1 A lesser width should only to be adopted where cyclist volumes and operational speeds will remain low.
2 A greater width may be required where the numbers of cyclists and pedestrians are very high or there is a high probability of conflict between users (e.g. people walking dogs, roller bladers and skaters etc.).

Figure 7: Austroads guidance on shared path width (Austroads 2014)

Queensland guidelines

Queensland guidance on shared paths is set out in a technical note currently under development (Queensland DTMR 2014), with a draft available on the Department of Transport and Main Roads website.

The method of determining appropriate path infrastructure is set out in the following diagram.

This guidance is based on research (SKM 2010), where it was assumed that 12 delayed passings per hour represents the upper limit of cyclists' tolerance for being delayed. This is equal to 6 delayed passings for a 30 minute trip or 1 delayed passing every 5 minutes. A delayed passing typically involves interaction of at least three users, such as a cyclist slowing to pass a walker because there is another walker coming from the opposite direction. Delayed passings are therefore likely to be unusual events except on busy paths.

The Queensland guidance is based on a measure of level of service to cyclists. Pedestrian amenity was not considered (Munro 2014). Where usage exceeds about 100 pedestrians (for any cyclist volume), or 1000 cyclists (for any pedestrian volume), separate/segregated facilities are recommended.

The Queensland guidelines do not appear to be consistent with the Austroads guidance set out above. Shared paths are anticipated for much higher numbers of users than is anticipated in Austroads.

Other Queensland guidance (Queensland Transport 2006) notes:

- "it is important that auditing of path use is monitored over the life of the path to assist those managing the path (e.g. to be aware of increases in use that may affect its efficient, conflict-free operation)."
- "…if experienced cyclists are expected (e.g. on a commuter route), then separate paths are preferred. It may be better to create an on-road bike lane or wide kerbside lane to carry more confident cyclists.
- "Physical separation is necessary when combined volumes of bicycle and pedestrian traffic exceed 300 per hour."

It is not known whether this guidance will be superseded by the technical note under development.

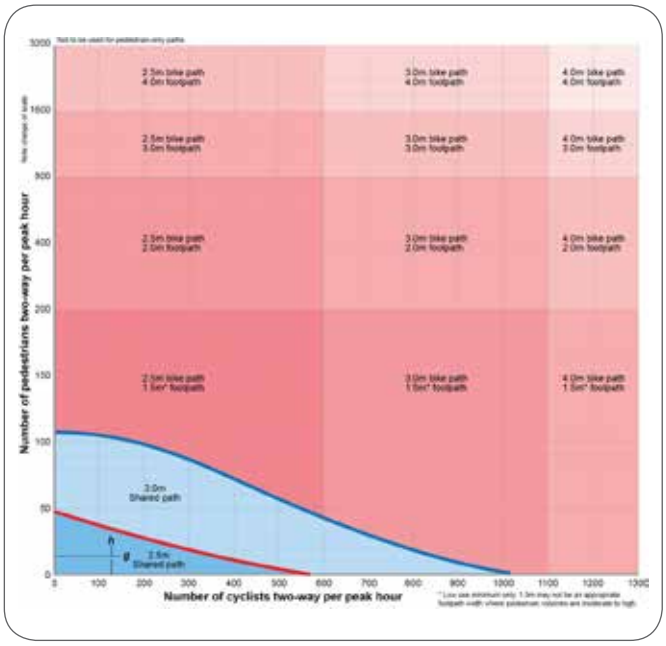


Figure 8: Path capacity and recommended widths for recreational paths, directional split 50/50 (Queensland DTMR 2014)

Victorian guidelines

Victorian guidance on shared paths is set out in VicRoads *Cycle Notes 21*. This guidance is conceptually similar to the Queensland guidance and has the same limitations, in that it is based on level of service to cyclists, with little consideration of service for walkers.

The VicRoads guidance has significant additional limitations:

1. *Cycle Notes 21* does not definitively recommend separate facilities for cyclists and walkers unless numbers of cyclists are extremely high – over 600 per hour – irrespective of the volume of walkers.
2. *Cycle Notes 21* envisages speeds on shared paths in excess of 25 km/h.

Both of these aspects conflict with the applicable Austroads guidance.

The absence of a clear recommendation to separate facilities at high volumes is very significant, because shared paths will typically be cheaper to construct than segregated or separated facilities. Therefore asset managers will opt to build shared paths unless they are clearly directed to do otherwise by official guidelines.

The problems with *Cycle Notes 21* are significant. As a matter of priority, it needs to be revised to better consider the needs of walkers (and cyclists) and recognise that separated or well segregated paths better cater for high numbers of users.

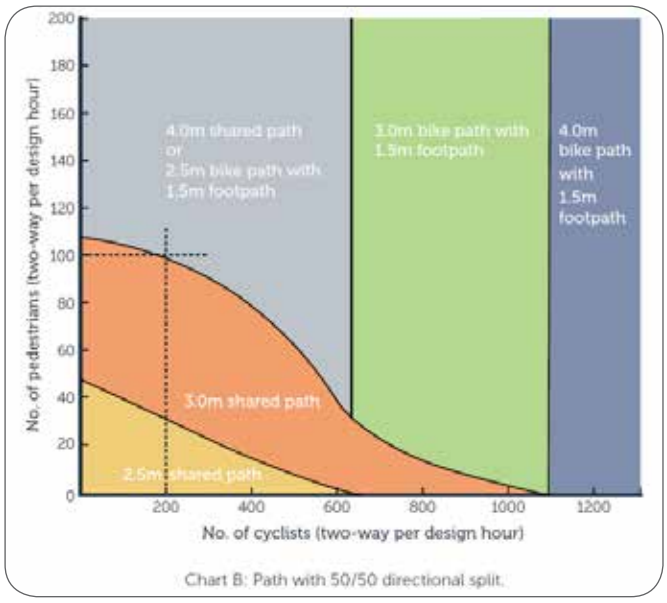


Figure 9: Cycle Notes 21, Victorian guidance on off-road paths for walkers and cyclists (VicRoads 2013)

VicRoads also provide *Shared Path Audit Guidelines*, which describe how to undertake a safety audit of a shared path. These guidelines are focused on the risk to cyclists, more than pedestrians, for reasons explained in the document:

> "Many safety concerns on shared paths relate to cyclists due to the higher speed that cyclists travel. As a result, most obstacles and hazards post a greater risk to cyclists than they do to pedestrians, often resulting in more severe injuries to cyclists."

While it is important to consider obstacles and their risk to cyclists, and fall risks for both cyclists and pedestrians, this focus does seem to mean that the risk of collision is overlooked. For example, the section on path width discusses the issues around paths that are too narrow for the volume of users, but there is virtually no mention of a resulting collision risk. The risk rating of a shared path that is too narrow is summarised as:

> "Low to medium (1-8)
> An incident may occur, but the chance of injury is minimal unless cyclist hits a hazard or obstacle."

Also notable is the reliance on appropriate cyclist behaviour to mitigate risk when "the horizontal and/or vertical alignment of a path restricts sight distance and causes cyclists to travel too fast, to cross onto the wrong side of the path or creates conflict with other path users." The example situations used in the guidance are illustrated in Figure 10.

Figure 10: Situations described in Victorian guidance as 'low to medium' risk, on the assumption that cyclists will slow down (VicRoads 2012)

The guidance suggests that the risk of these situations are "low to medium" because "in most cases cyclists will slow down and take greater care when presented with cases of poor sight distances, particularly if they are familiar with the location." No evidence is provided for that assertion and it is debatable whether cyclists will slow down as much as they should.

The *Shared Path Audit Guidelines* should be reviewed to better consider collision risk and reduce the reliance on good cycling behaviour to overcome infrastructure limitations.

Conversion of footpaths to shared paths

Authorities may be tempted to convert existing footpaths into shared paths, as a way of catering to cyclists. There is some discussion of this in Austroads (2009) section 3.4, but it is not widely discussed in the literature, perhaps because it is a poor option compared to others.

UK guidance notes:

> "Shared use routes created through the conversion of footways or footpaths can be controversial. There are many such examples that have been implemented inappropriately and/or poorly designed, particularly in urban areas. It is essential for designers to understand that shared use is not the 'easy fix' it might appear to be." (Department for Transport 2012).

Dr Jan Garrard's 2013 seniors walking study and subsequent report *Senior Victorians and walking: obstacles and opportunities* demonstrates that walking is critical for senior Victorians to live healthy, independent lives. For those aged 75 and over, walking makes up 77% of their total physical activity. And as seniors get older, their walking is increasingly about everyday life needs such as shopping and personal business (see Figure 11).

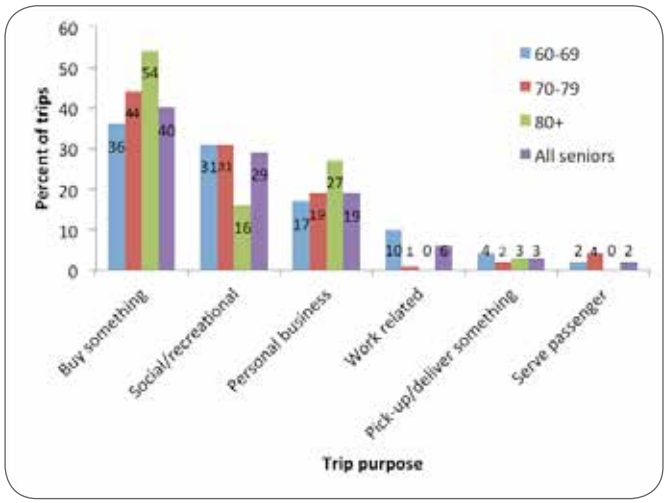


Figure 11: Walking trip purpose by age, based on Victorian Integrated Survey of Travel and Activity data (Garrard 2013)

For older seniors, therefore, walking and footpaths are critical to their personal mobility and their capacity to continue to lead active, independent lives.

From a pedestrian perspective, it is important that existing footpaths are not converted into shared paths and new paths along roads are not constructed as shared paths, because:

- Footpaths are for feet – they are for walking but also for talking, stopping, playing, living and learning. They are the foundation of our public and community space. Cycling on footpaths brings pressures to 'keep left' and 'keep moving', turning footpaths into thoroughfares rather than public space.
- Walkers, particularly more vulnerable walkers such as seniors, children, and those with a vision impairment or other disability, may be at increased collision risk. Irrespective of the 'real' crash risk, it is clear that cyclists on the footpath are a concern to these groups and increased cycling on the footpath can be expected to deter them from walking.

Road managers should understand that by converting footpaths to shared paths, they may be 'designing out' vulnerable road users.

As noted by Living Streets in the UK:

> "…poorly designed shared or adjacent use on footways, often implemented in a token effort to increase the local lengths of cycling 'provision', are welcomed by neither cyclist organisations nor pedestrians and must become a thing of the past." (Living Streets 2009)

Conversion of footpaths into shared paths raises issues of cycling safety, particularly where the path regularly crosses driveways. International research suggests cycling on footpaths is significantly more dangerous for cyclists than cycling on the road (Reynolds 2009).

Road management agencies should seek to avoid converting footpaths to shared paths. This should be seen as a 'last resort' option for providing for cyclists. Agencies should apply the hierarchy of cycling provision used in the UK (see Figure 5). Where shared paths are used in a street context, road managers need to ensure there is a dedicated footpath on the other side of the road; and that the path meets applicable shared path design standards.

Conversion of footpaths should particularly avoid activity centres; routes on the Principal Pedestrian Network; or areas where high numbers of seniors can be expected including around retirement villages and aged care facilities.

Growth areas

In Victoria, street design for growth areas or other major development sites involving residential subdivision is dictated by clause 56.06 of the Planning Scheme, in particular clause 56.06-8, Standard C21 (Victoria Planning Provisions 2010). This specifies:

- For connector streets (level 2) expected to carry 3,000-7,000 vehicles per day (vpd), designers have the option of a 1.5m footpath on both sides of the road and 1.7m on-road bicycle lanes; or 2.5m wide shared paths on both sides of the road.
- For arterial roads expected to carry more than 7,000 vpd, 3m wide shared paths on both sides of the road or alternative as required by the relevant road authority. VicRoads has tended to require both on-road cycle lanes and a 3m shared path (Holland 2011).

This clause also makes general statements about providing for walkers and cyclists through footpaths, shared paths and cycle paths, without further specification as to which option should be used where.

Element six of the Precinct Structure Planning Guidelines include the following relevant standard:

> "9. Marked bicycle lanes are provided on all collector streets. On all arterial roads, provide a shared bicycle/footpath (segregated where possible) and on road bicycle lanes wherever possible. (Growth Areas Authority 2009)

Consideration of cycling infrastructure requirements in the growth areas of Cardinia found that separated paths for cyclists were preferable to shared paths or on-road cycle lanes. With reference to the Officer Precinct Structure Plan, it was concluded that constructing separated paths rather than on-road cycle lanes – the optimal solution for both walkers and cyclists – would also save the developer $330 per linear metre (Holland 2011). This reflects the cheaper construction costs of off-road paths, which do not need to be able to support the weight of heavy vehicles, compared to on-road lanes. Separated paths may still be more expensive than shared or segregated paths.

Some precinct structure plans are now anticipating separated paths and Figure 12, an excerpt from the recent Westbrook Precinct Structure Plan (PSP), illustrates how they can be accommodated in a 25.5 m wide road reserve for a connector street. There does not appear to be a consistent approach however, either between plans or within this plan – the cross section for the arterial road in the Westbrook PSP shows a shared path and on-road cycling paths rather than a separated cycling path.

With this background, Bicycle Network advocates for separated off-road bicycle only paths on connector streets and arterial roads (Bicycle Network 2013). In the remainder of the street network, on-road cycling on local roads designed for low vehicle speeds (maximum 40 km/h) is proposed.

Unfortunately this best practice provision for both cycling and walking appears to conflict with clause 56.06-8 of the Planning Scheme as it currently stands. Comments from Wyndham City Council as part of this process specifically suggested that the Victoria Planning Provisions be revised accordingly.

In greenfield areas there should be no need to compromise and there is an opportunity to provide optimal design for all transport modes. Separated paths rather than shared paths should be provided on connector streets and arterial roads in metropolitan growth areas. A different approach may be acceptable in regional cities and towns, because significant levels of through cycling (cyclists passing through one suburb from another) are unlikely. Areas with higher numbers of older walkers and approaches to secondary schools (where higher cycling volumes are likely) may still warrant separated paths.

There appears to be little specific guidance around use of shared paths in open space planning. The Precinct Structure Planning Guidelines include the following relevant standard:

> "13. Dedicated off-street shared pedestrian and cycle paths are established through open space areas. Where relatively high levels of pedestrians and cyclists are expected, segregated paths exist." (Growth Areas Authority 2009)

Bicycle Network caution against the risks of providing a shared path through open space that is more convenient than designated commuter cycling routes:

> "This may lead to transport bike riding along the shared path at speeds not appropriate for sharing with other path users (walkers, dogs on leads, groups, etc.) and adjacent land uses. Pedestrians and vulnerable path users may be intimidated and avoid using the path." (Bicycle Network 2013)

Open space managers need to be aware that shared paths do not necessarily provide a quality walking environment, particularly for the elderly, vision impaired and possibly children. They should ensure that key open space areas provide dedicated walking paths. Unless alternate walking paths are available, shared paths through open space should perhaps follow indirect routes that discourage commuter use – in a growth areas context, commuting cyclists should be catered for by separated cycle paths in the street network.

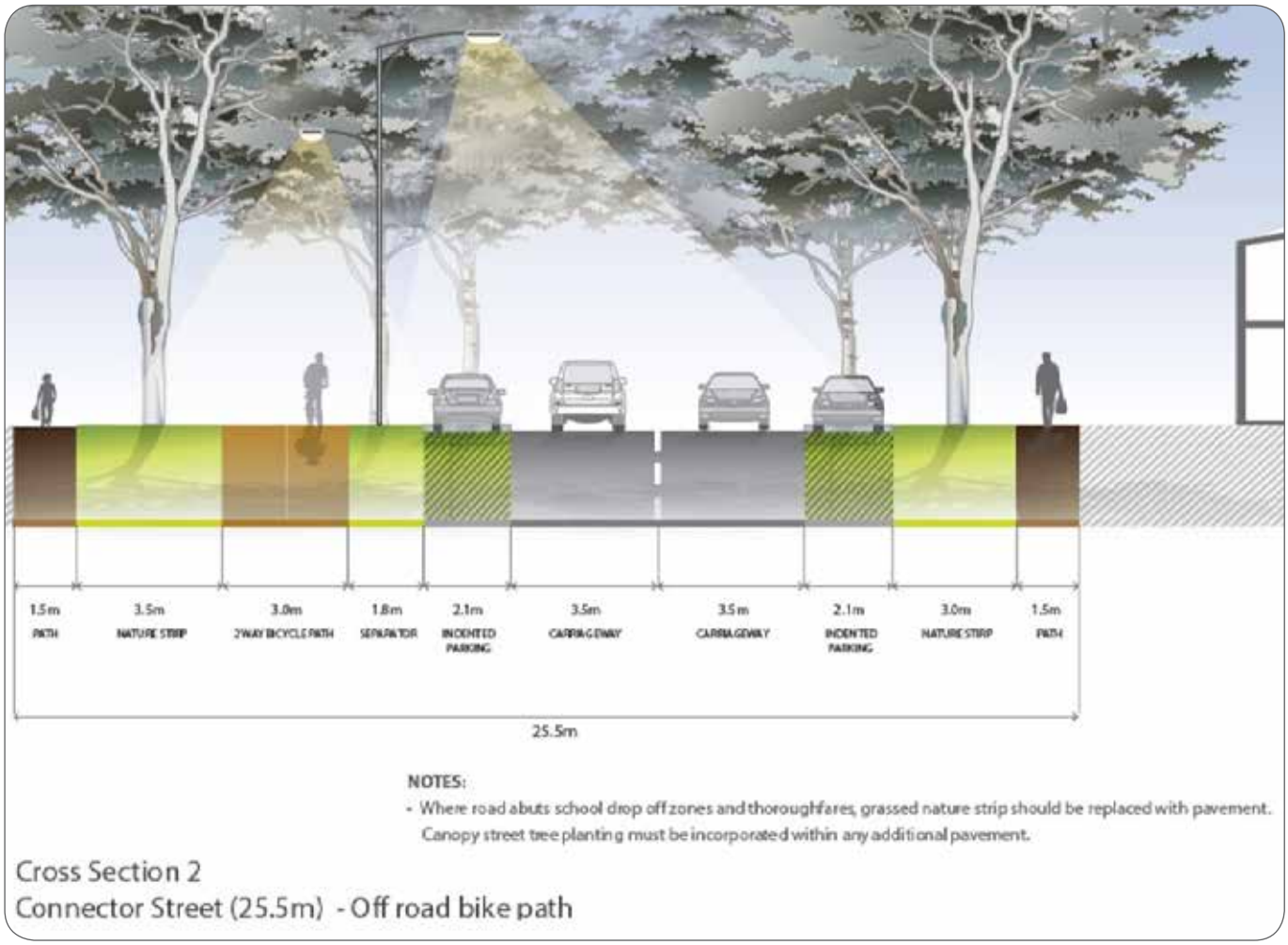


Figure 12: growth areas connector street cross section incorporating separated bike path and footpaths (MPA 2014)

Liability and legal issues

Shared paths raise issues of liability. There are no speed limits for cyclists, no registration plate to identify them and no third party insurance requirements (Pedestrian Council of Australia 2013).

A study of cycling injuries in the ACT concluded:

> "The legal status of these paths in relation to traffic regulation requires clarification to ensure that they are under appropriate jurisdiction for traffic management, enforcement, and crash reporting requirements." (De Rome et al 2014)

In Monty v Bayside City Council & Ors the County Court of Victoria considered a case where a cyclist sought damages in response to injuries suffered when he hit the bluestone edging of the bike path on Beach Road and fell onto the steel post of a road safety barrier. The Court awarded a total of $230,000 damages against Bayside City Council for negligence in its construction of the path.

In a NSW legal opinion for the Pedestrian Council of Australia, Slater & Gordon (2008) noted:

> "The issue raised is of some importance as pedestrians would not have recourse to compensation for their injuries against bicyclists under compulsory third party personal injury insurance under the Motor Accidents Compensation Act (NSW) 1999 as bicycles are not motor vehicles for the purposes of that legislation.
>
> …
>
> "The civil proceedings commenced by Maria Guliano in the Supreme Court of NSW were settled for a substantial amount of money with the result that the Court did not have to determine whether any breach of duty of care arose in the circumstances. This civil claim nevertheless identified a number of deficiencies in the existing design guidelines and regulation of Shared Bicycle Paths and that roads authorities may be liable in negligence to pedestrians injured by Bicyclists on Shared Bicycle Paths even though the existing requirements are satisfied.
>
> I am therefore of the opinion that local government road authorities may be found to be in breach of duty of care for failing to impose safe speed limits for bicyclists on Shared Bicycle Paths although any such finding of breach of duty of care must necessarily depend upon the particular facts of the case before the Court. Allegations of breach of duty of care based upon the design or configuration of Shared Bicycle Paths may also be successful even though those paths apparently conform to existing design guidelines in circumstances where they offend general transport engineering principles..."

VicRoads guidelines appear to conflict with Austroads guidelines and Queensland guidance is different again. The legal opinion suggests that even if guidelines were consistent, provision of infrastructure in accordance with them would not necessarily safeguard shared path providers from liability. These liability issues would seem to warrant further legal research. In our consultation, some councils supported the need for further research, although one said that they understood the liability issues and no research was required.

Stakeholder consultation and issues

Stakeholder consultation on the first draft of this paper was undertaken in September 2014.

Cameron Munro of CDM Research and Malcolm Daff of Malcolm Daff Consulting provided expert comment on the paper. Initial discussion was undertaken with members of VicRoads Head Office staff.

Victoria Walks approached two major cycling organisations for comment, but for varying reasons neither provided formal feedback. One experienced professional cycling advocate provided comment in an individual capacity, rather than as a corporate position, and key elements of those comments are set out below:

- "The main issue is inappropriate behaviour on paths and roads. This includes excessive speeds where one path or road users is travelling too fast to enable them to stop and give way, if needed, to another.
- All path (and road) users should not feel threatened by others and should be considerate of other. This includes people on bikes slowing down around people walking. In practice this means travelling at such a speed and manner to be able to stop and give way to other path users, including pedestrians, if needed. It also means dog walkers keeping control of their animals and people keeping to the left of paths and letting other by.
- When speeds or volumes warrant it then separation is preferable. But separation is not always possible, especially in existing streets, due to space or other constraints. In these situations people must adapt their speed and behaviour to the conditions. Which usually means slow down and share with others.
- For new or redesigned streets then segregated paths should be required along busier roads such as collector and arterial roads. Busier routes such as southbank and the northbank trail need upgrading and/or alternate/better routes provided to deal with their popularity.
- Slow speeds on local roads (40km/h or less) are critical for both people walking or riding. Speeds below 30km/h should be the standard for local streets elsewhere and allow people to walk and ride in comfort and a sense or safety."

The comments suggested "the crash, injury and incident rates cited don't point to a significant problem with shared path usage." However this was prior to inclusion of the ACT study suggesting shared paths were a risk to cyclists (De Rome et al 2014).

Importantly, the bicycle advocate comments indicated support for all of the recommendations in this paper, but with some qualifications in relation to recommendation 10.

They suggested that "the design speed should be 25-30km/h to allow a measure of safety with sight lines and other potential obstructions... People should ride at max 20-25km/h but tolerances for higher speeds are in the design of the path." This recommendation was subsequently refined.

The comments also expressed some reservations on trialling of options to control cycling speed – "This is often taken to mean bollards, barriers and speed humps which are often a hazard for bike riders. Better to target the behaviour and user (usually at a particular place and time) than introduce blanket measures."

In relation to shared versus segregated paths, the Bicycle Network website says:

> "…if there is a mix of users (people walking and cycling at varying speeds) travelling in opposite directions, then once path users numbers (all users) rise above about 150-200 per hour at any time of the day then one should consider separate paths for cycling and walking."

Council consultation

The Municipal Association of Victoria (MAV) facilitated initial consultation by providing the draft issues paper to all Victorian councils.

A total of eighteen councils provided comment – two regional, two peri-urban, and a range of metropolitan councils. Due to short timeframes, the comments represented the views of individual or a select group of officers rather than a formally endorsed council position. Some councils provided individual comment from more than one officer.

The feedback indicated that shared paths were a fairly common infrastructure choice. For example Frankston City Council is planning over 60km of shared use paths. Some growth area councils noted that shared paths were a planning scheme requirement in new subdivisions.

Many councils agreed that separation of walkers and cyclists was preferable where there were high numbers of users. However councils were conscious of the cost of separated facilities. It was a common view that in circumstances with low user volumes, the benefits of separation would not justify the costs. For example one council stated:

> "Where paths are mainly recreational and movements are generally slower there seems little wrong with the concept of sharing."

Outer metropolitan and regional councils generally indicated that volumes of pedestrians and cyclists did not justify separated facilities in their areas, although only one

provided quantification of those volumes. Frankston City Council said their 'Super Sunday' counts found an average of 45 users per hour (including walkers and cyclists) at their seven survey sites. Surf Coast Shire offered a different perspective, indicating that they seek to provide on-road facilities for commuter and training cyclists rather than shared paths.

Several councils raised the point that separated facilities may not be practical due to limited space or fixed limitations such as rocks or trees. One council suggested separated facilities may not be desirable because they take up more open space and another raised the visual impact on road environs or open space areas.

One council questioned the level of safety benefit, suggesting that people may not use segregated paths correctly and that the conflict generated in this situation may be more aggressive. That council also raised the lack of clarity around the terms 'separation' and 'segregation.'

There was little comment on cycling speed on shared paths. One council suggested that while cycling speeds on shared paths might be reasonably high, actual impact speeds may be lower than 20km/h if cyclists slow due to limited visibility, or brake in an attempt to avoid a collision.

A number of councils highlighted the differences between learner, recreational, commuter and training/sports cyclists. Some indicated they attempted to provide infrastructure tailored to the anticipated users. One council suggested that problem cyclist behaviour was attributable only to a small proportion of cyclists.

Three councils specifically agreed that important commuting routes should generally have dedicated bicycle infrastructure. Some others took a different view – opinions were divided to the extent that in one case individual officers from the same council expressed very different perspectives. Three councils emphasised the potential for on-road cycling facilities as an alternative to shared paths or a way of moving commuter cyclists off the shared path network.

One council specifically agreed that shared paths should not be installed where there are significant numbers of elderly or pedestrians with vision impairment. Generally however councils did not express a view on those groups specifically.

There were mixed views on conversion of footpaths to shared paths or construction of shared paths rather than footpaths in road environments. Two councils agreed that generally conventional footpaths should not be converted to shared paths. A number of others suggested this might be appropriate in limited circumstances, but they would need to meet shared path design standards. Middle and outer suburban councils in particular saw value in converting some footpaths to shared paths in order to provide an off-road cycling network. Some councils said they seek to provide a shared path on one side of collector roads in new areas, with a footpath on the other.

Some of the comments suggested a desire to retain flexibility in infrastructure choices and against strictly applied guidelines. One council summarised:

> "If the provision of safe cycling infrastructure was made, either cost prohibitive, or separation was mandatory under the various guidelines and road space was not available, it may result in local government placing the provision of cycling in the "too hard basket" to the detriment of cyclists."

A number of councils argued for or supported education for shared path users. Some suggested that further research was required to understand pedestrian-cyclist interaction or conflict.

Some of the councils provided specific comment on the recommendations in the initial draft of this paper. One of the more controversial recommendations was the specific suggestion to install chicanes to control speed at problem locations on shared paths. One council argued for advisory speed limits as an alternative. Some councils disagreed with the general recommendations against converting existing footpaths to shared paths and against using shared paths in place of traditional footpath networks. They argued that it may be appropriate for shared paths to take the place of conventional footpaths in some circumstances.

One council opposed most of the recommendations, generally arguing that they would be too restrictive of council infrastructure choices. One council suggested the recommendations should be more specific in identifying the agencies responsible for them.

Four councils indicated that they generally supported the paper and/or its recommendations. Two councils were generally critical of the draft paper and the presentation of material. They raised a range of specific issues with the detail of the paper. Along with one other council, they raised issues regarding the data on shared path safety and cyclist-pedestrian collision risk.

To the extent possible we have amended the paper, including recommendations, to reflect the council comments.

Conclusions

There is very little reliable data that would allow injury risk on shared paths to be compared to other transport contexts. Observational studies find low levels of conflict, but user surveys indicate a perception of conflict and a level of collision and injury.

The limited evidence available suggests that shared paths may be more hazardous for cyclists than some other environments, such as on-road cycle lanes. However, the safety issues for walkers on shared paths do not appear to have been assessed by quality research – a significant gap given that shared paths are common infrastructure.

One concern, as summarised by a study of cycling injury in ACT, is:

> "As the usage of shared paths increases, it is likely that the burden of injury will shift from bicyclists to pedestrians, particularly older pedestrians (Sikic et al. 2009)." (De Rome et al 2014)

What we do know is that average cycling speed on shared paths with significant levels of commuter cycling typically ranges between 20 and 30 km/h, and potentially higher where conditions facilitate it, such as a downhill slope. These speeds are consistently above the cycling speeds envisaged by Austroads for shared paths (20 km/h or less).

Both walkers and cyclists prefer segregated or separated paths, when user numbers are high. It is also clear that people who are elderly or vision impaired, many of whom are dependent on walking to get around, are particularly vulnerable and uncomfortable sharing with cyclists.

Despite these issues, shared paths have been constructed and in some cases utilised by cyclists to the point where they have become key routes for bicycle transport. This goes well beyond the primarily recreational role that seems to have been originally anticipated, and the role envisaged by Austroads guidelines.

One theme of the stakeholder consultation was that behavior change is key to overcoming conflict issues on shared paths. However users take their cues from the infrastructure provided, as well as cultural and other influences. Cycling speeds on shared paths suggest those cues are inconsistent with a vision of shared paths as low speed recreational (but not sport) environments. In road safety there is increasing acceptance that motorists should be able to intuitively assess the appropriate speed based on the road environment (not the posted speed limit). A similar approach should perhaps be applied to shared paths.

Consistent with broader 'safe system' approaches to road safety, we should not rely heavily on managing behaviour, especially when our capacity to manage cycling behaviour on shared paths is very weak, compared to managing vehicles on the road. While managing behavior is important, appropriate provision of infrastructure should be the starting point.

There is a need to reconsider the appropriate role of shared paths, within the suite of infrastructure options available for walking and cycling. *Cycle Notes 21* needs to be revised to better consider the needs of walkers (and cyclists) and recognise that separated or well segregated paths better cater for high numbers of users. This would provide a better understanding of the implications of infrastructure choices and facilitate both cycling and walking, without one compromising the other.

Shared paths should not be installed where there are higher numbers of elderly or pedestrians with vision impairment, large numbers of walkers generally, or significant numbers of commuter cyclists. In those situations separated paths better provide for walkers and cyclists, or safe cycling routes in the road environment should be provided.

Generally, existing footpaths should not be converted to shared or separated paths. Road managers should understand that by converting footpaths to shared paths, they may be 'designing out' the most vulnerable road users.

While this paper concludes that there should be more separation of pedestrians and cyclists and less reliance on shared paths, it is clear that shared paths will continue to be a significant form of infrastructure provision for cyclists and walkers. Therefore, efforts need to be made to establish a broadly accepted culture of sharing by shared path users. Guidelines for Sharing Roads and Paths have recently been developed by a broad group of organisations (including Victoria Walks), led by the Amy Gillett Foundation (Amy Gillett 2014). These guidelines can provide a basis for education.

While walking and to a lesser extent cycling infrastructure is typically seen as a local government issue, the Victorian Government should fund the necessary upgrading of shared path facilities. Councils are under significant funding pressure and paths that are over capacity are typically serving cycling commuters, who are likely to travel through more than one municipality. Councils that find themselves at the crossroads of major cycling routes should not be held accountable for the costs of maintaining and upgrading that infrastructure to suitable standards.

Appropriate threshold for separated paths

One of the key questions that emerges from this review is, in what circumstances should official guidance recommend separated paths rather than shared paths?

Conclusions (cont.)

From a pedestrian perspective, the key factor in determining the comfort of a shared path is likely to be the number of cyclists and the speed they travel. Our review did not identify any research that has explored walkers' tolerance for numbers of cyclists, in the way that cyclists' preferences have been explored to create the Queensland and Victorian guidance (eg SKM 2010; CDM Research 2012a). Ideally research of that nature would be undertaken to determine the threshold volume where separation should be recommended.

To assist in determining what an appropriate threshold might be, based on current information, we have compiled the following table of existing guidance.

Guidance	Threshold for separation of paths	Notes
Austroads 2009	10-50 cyclists and 10-50 peds per hour	Also recommends separation where cycling speeds exceed 20 km/h
Norway	50 cyclists and 50 peds per hour	As described by SKM 2010
Netherlands	25 peds per hour per metre of pavement width and bicycle volumes 'low.'	As described by SKM 2010
Bicycle Network	150-200 total users per hour	
Queensland DTMR 2014	Varies. 200 cyclists if 100 peds	
VicRoads Cycle Notes 21	Varies. 200 cyclists if 100 peds.	Separation not clearly preferenced – separation or wider shared path provided as options

The Queensland and VicRoads guidance is of limited assistance because they consider only cycling amenity, not pedestrian amenity. The other guidance is likely to provide a better direction for future recommendations, particularly around the appropriate volume of cyclists.

We propose a standard threshold of 50 cyclists <u>or</u> 100 pedestrians per hour in the commuter peak. The number of 50 cyclists generally aligns with the Austroads, Norwegian and Dutch guidance and seems a reasonable estimation of the volume of cyclists that could be comfortably tolerated by walkers. The number of pedestrians is higher, but the recent work in Australia, reflected in the Queensland and VicRoads guidance, has established that cyclists can comfortably accommodate around 100-110 pedestrians per hour. The combined 150 total users per hour is within Bicycle Network's suggested range of 150-200 users.

The threshold is in some ways consistent with the Queensland guidance, which recommends separate facilities for a path with 110 walkers and 50 cyclists per hour.

It is important to recall that at higher volumes, separate paths will generally provide higher capacity than a shared path of the same total width (Queensland DTMR 2014; SKM 2010). Separation is therefore warranted by operational efficiency alone, other factors being equal.

The application in the commuter peak recognises that commuting cyclists are likely to travel faster than recreational cyclists, so the number of commuting cyclists is likely to determine pedestrian amenity. In the event that there are higher numbers of users at other times, such as weekend riders or school peak times, cyclists are likely to be travelling at a slower speed than commuters, on average.

The practical implications of this threshold are expected to be that significant cycle commuting routes in inner areas of major cities would be identified for separation/segregation, where space allows. This would include the busiest paths such as Gardiners Creek Trail and Capital City Trail in inner Melbourne. More marginal examples would be paths such as the Koonung Creek Trail in the Whitehorse City Council

area, with 87 cyclists per hour and Dandenong Creek Trail in Maroondah, with 76 per hour (Bicycle Network 2014).

Most existing shared paths would be deemed acceptable, using our threshold, including the busiest commuter routes in some municipalities, such as the Federation Trail in Wyndham (29 cyclists per hour) and the Diamond Creek Trail in Nillumbik (Bicycle Network 2014). The busiest shared path Super Tuesday count for Frankston, for example, is 24 cyclists per hour (Bicycle Network 2013a).

This (or similar) standard threshold should be accompanied by clear direction on circumstances where it may be appropriate to vary. These should include:

- Where pedestrian volumes exceed 100 per hour, but cyclists remain below 50 per hour, a shared path may be appropriate. Similarly a shared path above the threshold may be acceptable where the volume of walkers is much higher than the number of cyclists. In both scenarios a separated path would be preferable for both cyclists and pedestrians, but if constraints apply a wider shared path may operate acceptably.
- Shared paths may be appropriate where there are more than 50 cyclists in the commuter peak if a large proportion are school students.
- Shared paths should not replace footpaths in and around activity centres, retirement villages, or aged care facilities.
- Shared paths should not replace footpaths on a Principal Pedestrian Network.
- Shared paths should not be planned as primary elements of a principal, regional or strategic bicycle network. These routes should be designed for cycling at 25-40 km/h (Bicycle Network 2013; Austroads 2014), which is not an appropriate speed for sharing with pedestrians.
- Where average cycling speed exceeds 20 km/h, separated facilities or speed control may be required, even if the volume of cyclists is less than 50 in the peak hour.

Where the threshold of 50 cyclists per hour is exceeded but circumstances prevent provision of segregated paths, stronger measures to control user behaviour, including cyclist speed, should be applied.

If it is accepted that shared paths are appropriate in many locations, due to the cost and practical complications of separation, it must be similarly accepted that shared paths should be low speed environments. Shared path managers should aim for 20 km/h as the 85th percentile cycling speed, based on Austroads guidance. Shared paths were envisaged as low speed environments, but it is questionable whether that was ever effectively communicated to cyclists, let alone attempted as a managed outcome.

On existing shared paths with higher volumes of cyclists, cycling speed should be measured. If average speeds exceed 20km/h, path managers should either take steps to control cycling speed or provide a separated path. In planning new paths, if the objective is to provide a cycling route that allows cyclists to travel at more than 20km/h, separated paths should be provided.

Notwithstanding the above, it should be recognised that controlling cyclist speed is likely to be difficult in practice, particularly for some cyclist types. To sports cyclists, for example, speed is fundamental to their reasons for cycling (Upton 2012).

While these proposals are put forward with the intent of ensuring that walkers are reasonably well provided for, one size does not fit all. Irrespective of efforts to control speed or other behaviour, infrastructure managers should understand that by providing shared paths, they may be 'designing out' the most vulnerable walkers.

Recommendations

1. VicRoads should commission research on:
   a. walker perceptions of shared paths, including levels of tolerance for volumes and speed of cyclists, to assist in revising *Cycle Notes 21*
   b. user behavior and experience of shared paths where/when cyclists outnumber walkers
   c. user experience of collision, falls and injury on shared paths, including falls caused by near misses, incorporating survey of shared path users
   d. user perceptions of appropriate shared path etiquette, such as ringing of bells.
2. VicRoads should revise *Cycle Notes 21* (perhaps as a 'walking and cycling note' or a 'shared path note') to be consistent with Austroads guidelines and more strongly encourage separated facilities. Subject to the results of further research, guidelines should recommend segregated or separated facilities where numbers of pedestrians exceed 100 or cyclists exceed 50 per hour in the commuter peak, with qualifications as discussed in this paper.
3. VicRoads should review the *Shared Path Audit Guidelines* to better consider collision risk and reduce the reliance on good cycling behaviour to overcome infrastructure limitations.
4. Responsible agencies should ensure any new shared path meets official design standards, wherever possible.
5. Road management agencies should lower vehicle speed limits on non-arterial roads or where there are high numbers of cyclists or pedestrians, to provide good conditions for transport cycling, as recommended by UK guidance.
6. Road management agencies should adopt a hierarchy of cycling provision as set out in UK guidance (Department for Transport 2008). Conversion of existing footpaths to shared paths or construction of a shared path in place of a footpath along a street should be a 'last resort' option and avoided where possible. Conversion of footpaths should particularly avoid activity centres; routes on the Principal Pedestrian Network; or areas where high numbers of seniors can be expected including activity centres, retirement villages and aged care facilities.
7. Councils and other agencies responsible for shared paths should undertake periodic monitoring to identify locations where existing shared paths do not meet design standards for current volumes of cyclists and/or walkers and plan to upgrade the infrastructure accordingly.
8. The Victorian Government should fund a program of education and signage to promote a positive culture of sharing space. This program should include emphasis that cyclists are required to give way to pedestrians on shared paths and may have to slow down to do so. This may be implemented through direct communications on shared paths (eg pavement stencils) rather than a mass media campaign. VicRoads or the Department of Transport, Planning and Local Infrastructure should develop a proposal for this fund.
9. VicRoads should commission trials of options to limit cyclist speed on shared paths, such as those identified in Table 2 (sourced from CDM Research 2012). Priorities for speed control would be locations where the width of the path is inadequate for current volumes or sight lines are restricted.
10. Shared paths should be designed, managed and promoted with 20 km/h or less envisaged as the desired cycling speed.
11. The Department of Economic Development, Jobs, Transport and Local Resources or Municipal Association of Victoria should undertake research on the legal liability issues relating to shared paths.
12. The Department of Health should amend hospital admission forms so that they more accurately capture the circumstances and location of pedestrian-cyclist collisions causing injury.
13. The Victorian Government should establish a fund for upgrading shared paths or creating segregated/separated facilities. VicRoads or the Department of Economic Development, Jobs, Transport and Local Resources should develop a proposal for this fund.
14. Clause 56.06 of the Victoria Planning Provisions should be amended to require separated cycling paths rather than shared paths on connector and arterial roads.
15. Open space managers in growth areas should ensure that key open space areas provide dedicated walking paths.
16. Planning for off-road paths should anticipate future growth, including an increase in commuter cycling.

Note that these recommendations are focused on issues related to shared paths. They do not represent a complete set of recommendations for facilitating either walking or cycling. For a broader analysis of measures to successfully promote walking and cycling refer to Krisek, Forsyth and Baum (2009).

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Victoria Walks: Level 7, 225 Bourke Street, Melbourne VIC 3000
P: 03 9662 3975 **E:** info@victoriawalks.org.au **W:** www.victoriawalks.org.au