

Attracting the next 10% of cyclists with the right infrastructure

Glen Koorey², Simon Kingham^{1*} and Katherine Taylor¹

¹Dept of Geography, University of Canterbury, Christchurch, New Zealand

²Dept of Civil and Natural Resources Engineering, University of Canterbury, Christchurch, New Zealand

*corresponding author - simon.kingham@canterbury.ac.nz

Abstract

Although considered a cycling centre in New Zealand, Christchurch still has relatively low cycle use but huge potential for utilitarian cycling due to its favourable geography. There is continuing, but relatively small, investment in infrastructure for cyclists, yet evidence seems to suggest little if any growth in cycle numbers. Therefore, on behalf of NZ Transport Agency, research at the University of Canterbury has assessed the barriers to cycle use, with a specific focus on the infrastructure needed to attract people who do not cycle regularly for utility trip purposes.

The nature of the consultation process for local cycling projects means that only current cyclists tend to comment on issues relating to cycle infrastructure. Yet it is not current but 'future' cyclists whose views need to be sought to achieve a breakthrough and get more people cycling.

The research surveyed workplaces, recreational cyclists and community groups to identify potential (but not current) regular utility cyclists. Focus groups were then held with them to discuss the motivations and barriers for cycling. In addition, a series of plans and pictures of various types of cycling infrastructure (mid-block and intersections) were shown. Participants rated each type of infrastructure and discussed them, particularly on how safe and attractive they perceived each one.

It is important to provide a type of infrastructure that will appeal to current utility cyclists but, perhaps more importantly, also attract the 'next 10%' of people to regularly cycle for utilitarian reasons. The findings suggest that potential cyclists in Christchurch will be attracted to regular cycling through a network of infrastructure that provides some level of separation from other users rather than shared space. The most preferred network would be a fully segregated network of cycleways situated between parking and pedestrians, with specific intersection cycle facilities like hook turns and signalised crossings.

Introduction

New Zealand has followed the trend of many western nations with increasing motor vehicle use and decreasing use of sustainable transport modes such as public transport, walking and the bicycle (See Table 1). The focus on achieving modal change has arisen due to increasing global concern about the sustainability of our urban centres and the impacts of transport (Pucher and Dijkstra, 2003; Skinner and Rosen, 2007; Tolley, 2003). This research therefore, undertaken by the University of Canterbury on behalf of NZ Transport Agency, aimed to investigate how to encourage more people to cycle for transport in Christchurch.

Table 1 Commuter mode share on Census Day 1986-2006

Census Year	Drove in a Motor Vehicle	Public Transport	Bicycle	Walking or Jogging
1986	61.4%	9.8%	5.7%	10.3%
1991	69.2%	5.1%	5.4%	8.4%
1996	73.9%	4.8%	4.0%	7.3%
2001	76.5%	5.2%	3.1%	7.1%
2006	77.0%	5.2%	2.5%	7.0%

A key question is how existing and potential cyclists perceive the environment in which they have to cycle. This is particularly important given that, for the most part, cyclists in New Zealand currently have to share space on streets either with motorists or pedestrians. Therefore the research looked at a variety of options for how cyclists could be provided for on the street network.

Background

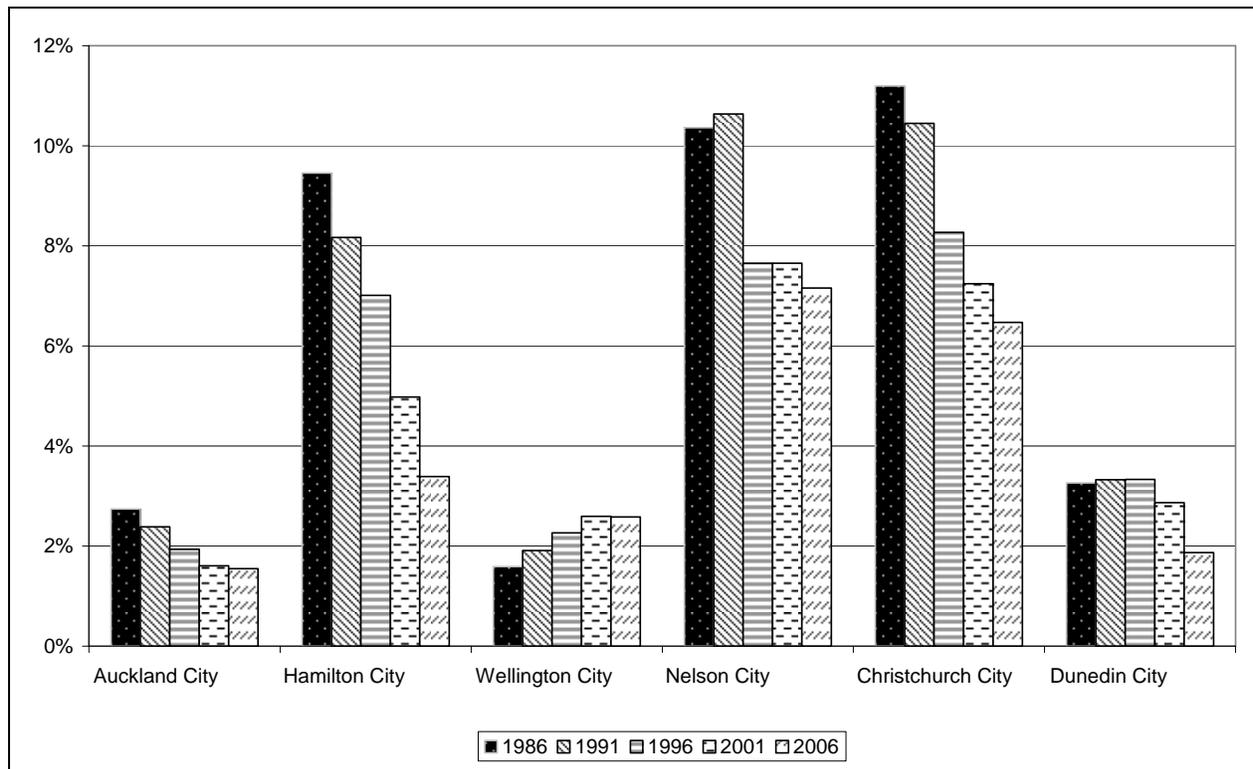
The impacts on transport and benefits of cycling are well known, including environmental, social, health and economic gains to the individual and society from increasing bicycle transport and reducing the dominance of the private motor vehicle (Docherty, 2003; Jensen et al., 2000; Morris, 2004; Ploeger, 2003). Therefore, this research looked at how to increase utilitarian cycling, i.e. cycling for day-to-day transport, not for recreational purposes (Skinner and Rosen, 2007). Research objectives were:

- to identify the characteristics of people who currently cycle, both for utility and recreation;
- to determine who may potentially be interested in utilitarian cycling; and
- to investigate the motivations and barriers for utilitarian cycling as perceived by potential cyclists.

Potential for cycling was seen to exist amongst people who do not currently cycle (or cycle infrequently) for transport but are interested in cycling (or cycling more) for commuter or other trips. While latent demand is apparent, it is still difficult to encourage these people to cycle. This study aimed to address this issue through consulting with a wide range of people to identify potential cyclists and then undertake qualitative research into their motivations and barriers for cycling.

Christchurch was the location for the study as it is recognised as having high rates of cycling (for New Zealand), however, it has had decreasing cycling rates over time. Currently, the only city to maintain higher commuter rates of cycling is Nelson (see Figure 1). The environment in Christchurch is conducive to cycling with a predominantly flat terrain, wide transport corridors providing plenty of space for cycling and a climate with few temperature extremes and low rainfall. The reasons that utilitarian cycling is declining in Christchurch are therefore likely to be related to variables that can be influenced, such as driver behaviour and the physical transport environment.

Figure 1 Proportion of workers cycling to work on census day in major NZ cities 1986-2006



The latent demand for cycling is assumed to exist because of:

- the number of urban journeys completed in a reasonable distance for cycling (two to eight kilometres) (Davies et al., 1996; O'Fallon and Sullivan, 2005),
- the increasing number of bicycles owned by the population (British Medical Association, 1992; Davies et al., 1996; Lawson, 2002; McClintock, 2002; Tolley, 1997) and
- studies that have shown there are people who are interested in cycling but deterred by barriers (de Dios Ortúzar, 2000; Lawson, 2002; Opinions Market Research Ltd, 2005; Sullivan and O'Fallon, 2006). These people include workers, as the commute is a significant part of urban congestion.

Typically in New Zealand, cycling is provided for through on-road cycle lanes or paths often shared with pedestrians and in many locations cycling is not provided for at all. This provision means that people cycling are either sharing the road space with motor vehicles (Figure 2 and Figure 3) or with pedestrians (Figure 4), although technically there may be some separation implied by the layout.

Considering that the current transport environment encourages sharing of road space between two or more modes, this research aimed to investigate what is the preferred environment for people interested in cycling. A variety of options were therefore presented ranging from integrated with motor traffic, fully separated, and integrated with pedestrians.

Figure 2 A wide local street in Christchurch, New Zealand



Figure 3 Cycle lane next to parking with solid white line in Palmerston North, New Zealand



Figure 4 Shared path alongside Heathcote River, Christchurch, New Zealand



Methods

Generally, research into encouraging cycling considers people who currently cycle, particularly when investigating cyclists' perceptions of cycle facilities and the impact cycleways have on their experience of the journey (Durdin and Ferigo, 2007; Hughes, 2007). Commuter cyclists and non-commuter cyclists, however, perceive the motivations and barriers differently (Stinson and Bhat, 2003). Consequently, this research aimed to investigate the issues for people interested in cycling but who do not currently cycle regularly.

Both quantitative and qualitative methods were used to achieve the research objectives. Firstly, New Zealand census data was analysed to understand the current trends in commuter transport and to identify the characteristics of current cyclists. Secondly, questionnaires were undertaken at the University of Canterbury and with recreational cyclists. The recreational questionnaires were distributed online and face-to-face at known recreational sites around Christchurch. Finally, focus groups were held with participants identified as people interested in cycling, who were drawn from the questionnaires based on their responses to specific questions and their willingness to participate in focus groups. Alternatively, focus group participants were found through advertisements asking people who met certain criteria to register their interest. Indicators used to identify people interested in cycling included their usual mode of transport to work, alternative modes of transport, reasons for using their usual mode of transport, the distance between their residence and workplace and their willingness to consider cycling for work.

The purpose of the focus groups was to investigate the motivations and barriers for cycling, and to complement the results found in the questionnaires and census data about the characteristics of people who currently cycle and the issues cyclists face. Safety was a major theme that arose in the literature and consequently a significant part of the focus groups centred on a discussion of safety and cycle infrastructure.

Findings

Commuter transport in New Zealand is dominated by the motor vehicle, with 77% of employed people driving to work on census day 2006, while 7% walked, 5% took public transport and 3% cycled (Statistics New Zealand, 2008). The area with the second highest commuter mode share for cycling on Census Day 2006 was Christchurch with 6% of commuters cycling to work. Broader data from the New Zealand Travel Survey data shows that 1.3% of trip legs across New Zealand and 3% of trip legs in Canterbury are

undertaken by bicycle (Ministry of Transport, 2008). While the motor vehicle still dominated as the commuter mode of transport for the questionnaires, both university staff and students and recreational cyclists were found to be less dependent on motorised transport. The University of Canterbury Travel Survey 2008 had 39% of people drive, 24% walk and a further 19% cycle as their usual mode of transport to university. Cycle mode share for commuting was even higher among recreational cyclists with almost 40% cycling to work.

Potential for cycling

In Christchurch there is definite potential for encouraging people to cycle to work. At the University of Canterbury 75% of people have access to, or own, a bicycle. Approximately 50% of drivers, passengers or public transport users consider that they live a reasonable distance to cycle. Amongst recreational cyclists, a higher proportion of people perceived they lived a reasonable distance with 73% of current drivers and all current passengers and public transport users indicating they lived a reasonable distance to cycle. There is still evidence of people who are not interested in cycling, however, with 35-40% of motor vehicle passengers or drivers from the University questionnaire stating that nothing would encourage them to cycle. Among recreational cyclists who drove to work, over 80% of respondents stated that nothing would encourage them to cycle to work, suggesting that recreational cyclists either currently cycle when it is feasible or are not interested in cycling to work.

Barriers for cycling

Questionnaire respondents were asked what factors would encourage them to cycle and the most commonly reported were: more courteous vehicle drivers, improved cycle lanes to work, and less traffic on the roads. Showering and changing facilities were also important, more so for recreational cyclists than the University population. Similar barriers arose in the focus groups as important: safety, particularly traffic behaviour and the perceived safety of cycle lanes, as well as showering and changing facilities were most commonly mentioned. For the majority of participants safety was of more importance than workplace showering and changing facilities. Enjoyment of the journey came through the comments that participants made, especially that people would cycle when the route was attractive but also when it was safe so that cyclists did not have to be constantly on their guard for motorists' behaviour.

Other issues that arose included:

- bicycle parking at work, which was not an issue for most workplaces;
- workplace motor vehicles, usually available but respondents working off-site sometimes had problems;
- luggage capacity of the bicycle, which was also an issue at shops as it was difficult to carry purchases and to secure items on the bicycle;
- safety equipment such as reflective vests and lights; these were generally accepted as a necessary purchase by most people;
- clothing, which linked to the more significant issue of having showering and changing facilities at work;
- helmets were considered a necessity due to the transport environment but uncomfortable;
- time and organisation, particularly getting organised to cycle to work as well as getting into the habit of cycling;
- trip chaining, most people were not interested in cycling to other locations on the way to or from work;
- night-time cycling, generally the issues was personal safety or occasionally visibility;
- confidence on a bicycle, especially how to use cycle infrastructure appropriately; and
- transporting children, which related back to safety and organisation.

Cycling infrastructure

Participants in the focus groups were shown a PowerPoint presentation with a variety of different types of cycle infrastructure for mid-block street sections, signalised intersections (both through-movements and right-hand turns) and roundabouts. These examples (presented in random order) drew on existing New Zealand and international cycle infrastructure and ranged from no specific provision through a variety of on-road and off-road treatments. Brief discussion was also raised with the participants in regard to traffic calming and local area traffic management as a means of providing a cycle-friendly environment without cycle facilities; however the lack of experience of such environments meant that there was little enthusiasm displayed for them. In general, participants preferred to have some level of separation from traffic but to be kept within view of drivers. While sharing with pedestrians was also disliked, it was preferred to sharing space with motor vehicle drivers.

From the discussions it can be concluded that the preferred type of facility for mid-block street sections were kerbed cycle lanes adjacent to the traffic lane, as they were seen as keeping the cyclist in the view of vehicles, or alternatively a path between parking and the footpath. For signalised intersections where cyclists were performing a straight ahead manoeuvre, the favoured infrastructure was on-road cycle lanes and for right-hand turn manoeuvres the most preferred were hook-turns (where cyclists stay on the kerbside and cross in two phases). "Head-start" traffic signals for right-turning cyclists were also liked by participants, but there were concerns about delaying the general traffic with this type of facility and people cycling being given priority over motorised traffic, hence the hook-turn was preferred as a compromise.

Roundabouts continued to be extremely difficult with most participants agreeing they would prefer signalised intersections. Although the research attempted to focus participants' attention on options at low-speed single lane roundabouts, clearly their responses were influenced by many of the higher-speed multi-lane roundabouts prevalent in New Zealand. Underpasses were considered extremely safe in the physical sense, but there were concerns for social safety particularly after dark. There seemed to be little agreement on another type of infrastructure, but cycle lanes or paths at roundabouts had both benefits and difficulties.

An interesting observation from the focus group discussions was the lack of understanding of how to use some of the treatment options presented, even when they were already reasonably prevalent around Christchurch. Participants were not always clear when they should use certain facilities, where they should position themselves, and what their rights were in respect to other road/path users (or whether those other users knew what to do). Some participants noted that the facilities generally did not have sufficient explanatory material (e.g. advance signs) and there was virtually no public education on using these facilities. These concerns were also related to the wide variety of cycling facilities used throughout the country and even across Christchurch. Participants pointed out that if there was more consistency of cycling infrastructure then all road users would be more likely to understand how to use various facilities and consequently inexperienced people would have more confidence when cycling.

Participants were also asked to rate each of the cycle facilities on a four-point qualitative scale regarding how often they would cycle if the facility shown was the standard along their utility cycle routes and their other personal barriers had been eliminated. The results are shown in the following figures (Figure 5 to Figure 8) and they display a common trend of people preferring facilities that provide separation, which was difficult to determine from the qualitative comments alone. For mid-block, the most preferred type of facility is a cycleway behind parking with separation (see Figure 5). When performing a straight ahead manoeuvre at intersections, the cycle path going with cycle or pedestrian signals is preferred (Figure 6) with head start signals or a hook-turn preferred when completing a right hand manoeuvre (Figure 7). Finally, for roundabouts, underpasses are the most preferred option (Figure 8).

Figure 5 Results from the focus group infrastructure questionnaire for mid-block streets (n=48)

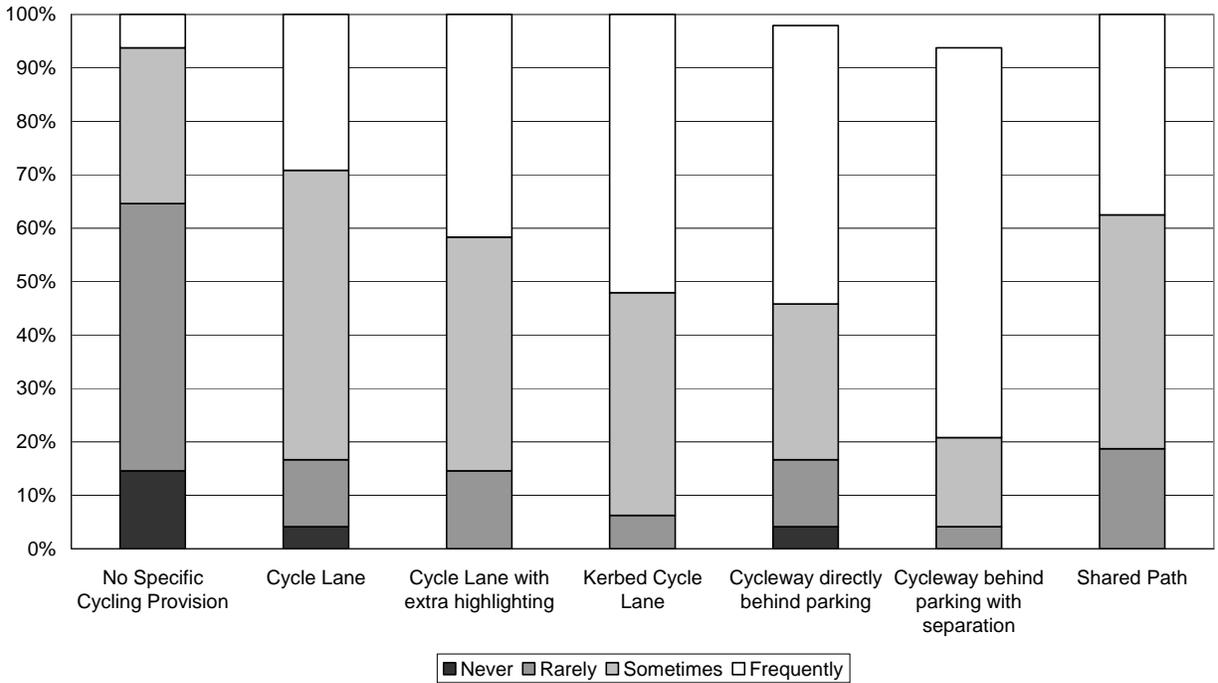


Figure 6 Results from the focus group infrastructure questionnaire for signalised intersections (straight-through movement) (n=48)

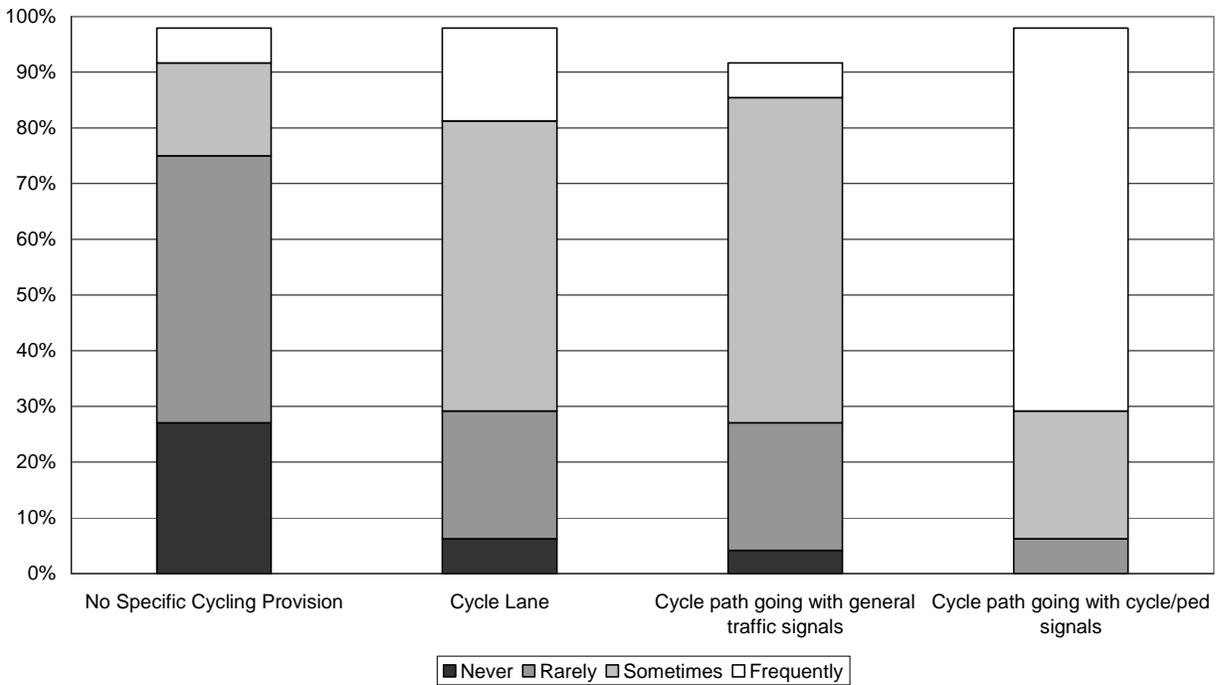


Figure 7 Results from the focus group infrastructure questionnaire for right hand turns at signalised intersections (n=48)

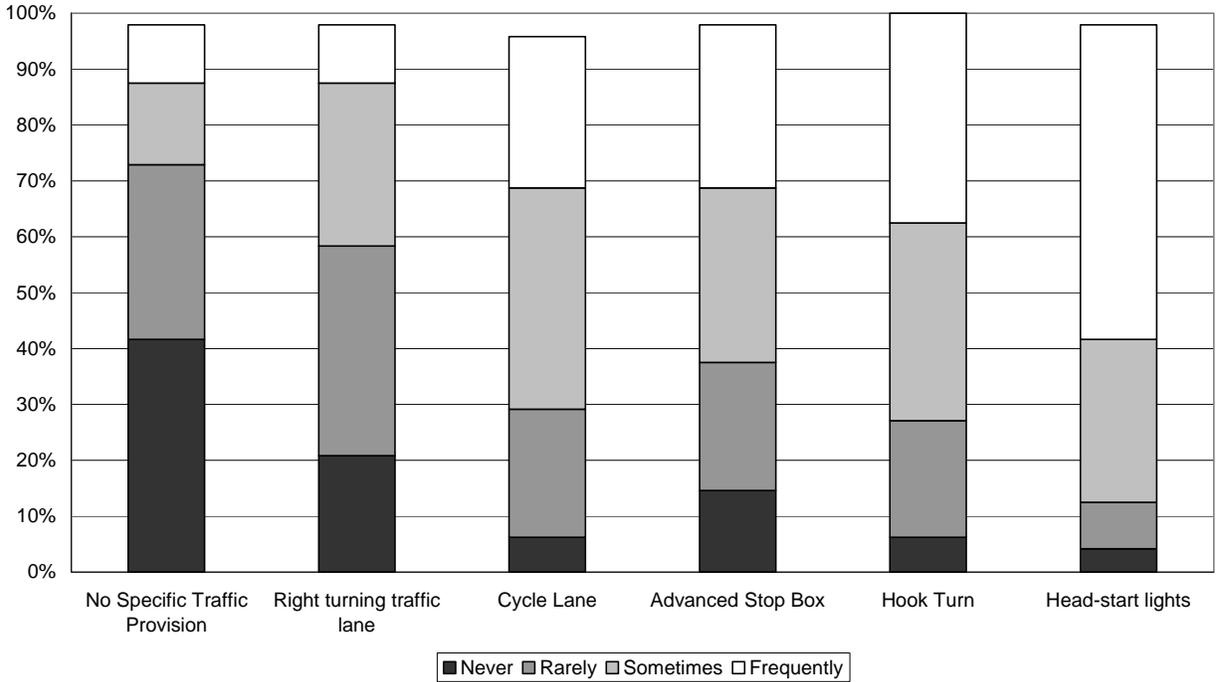
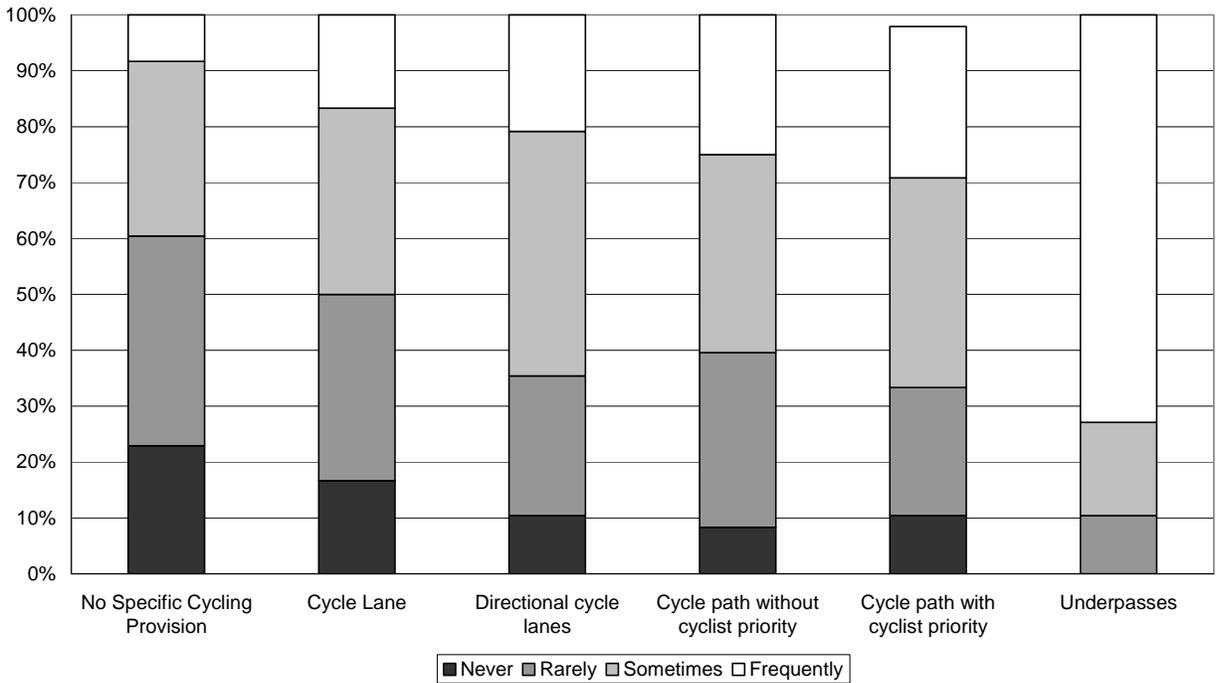


Figure 8 Results from the focus group infrastructure questionnaire for roundabouts (n=48)



(Note: some plots add up to less than 100% due to non-responses)

Conclusion and recommendations for encouraging cycling

The research found that overall, people interested in cycling have several motivations encouraging them to investigate utilitarian cycling and have usually overcome obvious barriers such as distance between their place of residence and their workplace. There are then three major barriers identified that they face before starting to cycle: safety, showering/changing facilities at the workplace, and enjoyment. This research found these three barriers should be the primary focus of policies to encourage cycling. There are also many minor barriers for potential cyclists. Finally, there is the possibility of future issues and impacts that will arise if more people commence cycling for transport.

Potential cyclists in Christchurch will be attracted to cycling through a network of infrastructure that provides some level of separation from other users rather than through shared space. The most preferred network would be a fully segregated network of cycleways situated between parking and pedestrians, connected to other off-road paths through parks and between streets. An example of this type of facility recently constructed in Christchurch is shown in Figure 9. If it is not feasible to provide this network, people interested in cycling would prefer cycle lanes with differentiation from the traffic lane (e.g. by kerbing) or paths shared with pedestrians. At signalised intersections, potential cyclists are happy to rejoin the street, so long as suitable facilities are provided such as cycle lanes, hook-turns, and head-start signals. Roundabouts continue to be perceived as problematic for would-be cyclists.

This research asks people with little or no experience cycling what is their preferred facility based on pictures and diagrams rather than actual experience. Consequently, different preferences could be found amongst people who do not cycle regularly but at least have more experience of cycling in the road environment. While the focus groups aimed to present sufficient information about each potential treatment, it is still possible that some users would identify issues they hadn't thought of, should they cycle them in real life. It is clear also that much better road user education (e.g. signage/markings and public campaigns) is necessary to successfully introduce in New Zealand a variety of the international cycle facilities presented in this research so that more people take up cycling.

Figure 9 Recently constructed segregated cycling infrastructure in Christchurch, New Zealand



References

- BRITISH MEDICAL ASSOCIATION (1992) *Cycling Towards Health & Safety*, Oxford, Oxford University Press.
- DAVIES, D., MCCLINTOCK, H., CLEARY, J. & MACLEAN, G. (1996) Guidelines for Cycle Friendly Infrastructure. DAVIES, D. London, The Institution of Highways and Transportation.
- DE DIOS ORTÚZAR, J. I., A; VALEZE, C (2000) Estimating demand for a cycle-way network. *Transportation Research*, Part A, 353-373.
- DOCHERTY, I. (2003) Policy, Politics, and Sustainable Transport : the Nature of Labour's Dilemma. IN DOCHERTY, I. & SHAW, J. (Eds.) *A new deal for transport? : the UK's struggle with the sustainable transport agenda*. Malden, MA ; Oxford, Blackwell.3-29
- DURDIN, P. & FERIGO, M. (2007) Christchurch City Council Cyclist Survey Project. *New Zealand Cycling Conference 2007*. Napier, NZ.
- HUGHES, T. (2007) Value for Money; Level of Service tools for assessing the cycling environment. *New Zealand Cycling Conference 2007*. Napier, NZ.
- JENSEN, S. U., ANDERSON, T., HANSEN, W., KJAERGAARD, E., KRAG, T., LARSEN, J. E., LUND, B. L. C. & THOST, P. (2000) Collection of Cycle Concepts. Copenhagen, Denmark, Road Directorate.
- LAWSON, S. D. (2002) Cycling Motorists 10 years on: still mobile, but failing to thrive? *tec*. Britain.
- MCCLINTOCK, H. (2002) The development of UK cycling policy. IN MCCLINTOCK, H. (Ed.) *Planning for cycling : Principles, practice, and solutions for urban planners*. Boca Raton [FLa.] Cambridge England, CRC Press ; Woodhead Pub.17-35
- MINISTRY OF TRANSPORT (2008) *Cycling for transport: ongoing New Zealand Household Travel Survey 2003-2007*, Wellington <http://www.transport.govt.nz/latest-results-1/> [Accessed: January 2009]
- MORRIS, H. (2004) Commute Rates on Urban Trails: Indicators from the 2000 Census. *Transportation Research Record*, 1878, 116-121.
- O'FALLON, C. & SULLIVAN, C. (2005) Trip Chaining: understanding how New Zealanders link their travel. *Transfund New Zealand Research Report No. 268*. Wellington.
- OPINIONS MARKET RESEARCH LTD (2005) Cycle Monitor 2005. LTD, O. M. R. Christchurch, Christchurch City Council.
- PLOEGER, J. (2003) Infrastructure planning for cycling. IN TOLLEY, R. S. (Ed.) *Sustainable Transport*. Woodhead Publishing Ltd.267-281
- PUCHER, J. & DIJKSTRA, L. (2003) Promoting Safe Walking and Cycling to Improve Public Health: Lessons from the Netherlands and Germany. *American Journal of Public Health*, 93, 1509-1516.
- SKINNER, D. & ROSEN, P. (2007) Hell is other Cyclists : Rethinking Transport and Identity. IN HORTON, D., ROSEN, P. & COX, P. (Eds.) *Cycling and Society*. Aldershot, England, Ashgate Publishing Ltd.83-96
- STATISTICS NEW ZEALAND (2008) *Census Data*, <http://www.stats.govt.nz/census/census-outputs/default.htm> [Accessed: July 2008]
- STINSON, M. A. & BHAT, C. K. (2003) Commuter bicyclist route choice: Analysis using a stated preference survey. *Transportation Research Record*, 1828, 107-115.
- SULLIVAN, C. & O'FALLON, C. (2006) Increasing cycling and walking : an analysis of readiness to change. *Land Transport New Zealand Research Report 294*. Wellington.
- TOLLEY, R. S. (1997) Obstacles to walking and cycling. IN TOLLEY, R. S. (Ed.) *The greening of urban transport: planning for walking and cycling in western cities*. Second ed. Chinchester; New York, Wiley.3-20
- TOLLEY, R. S. (2003) *Sustainable transport : planning for walking and cycling in urban environments*, Boca Raton, FLCambridge, CRC Press ;Woodhead.