‘Street ergonomics’; designing community routes to optimise usability and public health outcomes

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1. Introduction

The social and financial burden of road traffic injury in New Zealand is high compared with other developed countries (ITF 2014). This injury burden is exacerbated by relatively high levels of chronic disease such as obesity, diabetes and cardiovascular disease (Ministry of Health 2014) – all of which share physical inactivity (including a lack of walking or cycling for transport) as a risk factor. It is proposed that New Zealand’s urban transport infrastructure does not currently provide optimal outcomes for overall economic and societal wellbeing because it disproportionately favours motorised vehicle trips. Meanwhile there is considerable scope to apply ergonomics and human factors principles to street design to improve street usability and safety. This paper outlines two projects that have followed ‘human centred design’ principles to retrofit and evaluate improved suburban streets.

2. Self-explaining roads

A successful ‘Self-Explaining Roads’ (SER) intervention study was carried out in New Zealand (Charlton et al., 2010, Mackie et al., 2012). In this study, a suitable trial and control area were chosen within the suburb of Point England in Auckland City and an SER process was followed to retrofit approximately 11 km of local and collector roads, with the ultimate purpose of creating very legible road categories where their intended function is very clear to all. A design speed of 30 km/h was chosen for local roads, which was given effect via landscaping features to limit forward visibility. Road markings were also removed to create a less formal environment. For local cross-roads, mountable central islands were installed without any signs or markings on the approaches, reflecting the less formal, low speed design of the location. For the collector road category, a higher design speed of 40 km/h was selected with a high standard of road delineation established as a category-defining feature. Centrelines and edge lines were added to the collector roads that lacked them and cycle lanes, pedestrian crossing points and landscaped medians with pedestrian refuges were added (Figure 1).

Pre and post construction measures included traffic speed and counts on the local and collector roads, a perceptions survey and structured video monitoring. Two key effects of the retrofitted roads were much lower traffic speeds on local roads (with a mean very close to the design speed of 30 km/h) and much less variation in speeds on both local and collector roads. Another positive effect was the elimination of speeds over 70km/h on collector roads, which were previously common. The perceptions survey found that there was a closer match between actual and perceived safe speeds post SER construction. Preliminary analyses using 5-year pre and 5-year post construction crash data has shown that crashes numbers have reduced by 40% and crash costs have reduced by 50%, indicating a reduction in crash severity. There was also more pedestrian activity and relatively more unconstrained pedestrian activity on local streets following the street changes.
3. Future Streets

During the SER project it became evident that there are potentially a number of other benefits, in addition to road safety, from more human centred street designs. Public health, environmental impacts and social cohesiveness may also benefit from improved streets if they lead to more pedestrian and cyclist behaviour on neighbourhood streets. While transport systems often have an economic focus based on the efficient movement of motorized vehicles, it may be that at a neighbourhood scale, the greatest overall economic benefits comes from ‘liveable’ neighbourhoods that promote physical activity through active mobility.

Emerging evidence suggests that the safety benefits from SER type street changes are likely to at least be matched by health benefits from activities such as walking and cycling (Macmillan 2013). Other environmental and social outcomes may also benefit from such street changes. In particular, increasing physical activity through even small shifts to more cycling is likely to result in long-term health related savings. The combined safety, health and other benefits make a strong case for investment in more liveable streets in cities and towns and would suggest a significant change in the focus of transport and health policy for government authorities.

With a broader focus, the aims of a new project called Future Streets are to demonstrate a participatory process of designing improved suburban streets; and measure the integrated road safety, health, environmental and social outcomes resulting from implementation. The study design for Future Streets involves a controlled intervention study, with street changes being implemented in one neighbourhood and a matched nearby control neighbourhood that will not immediately receive street changes. Baseline road user speed, count and crash data has been collected, along with a household survey of approximately 2000 residents across both areas.

The design process for Future Streets has followed a participatory design approach, where a number of community engagement and data collection activities were used to firstly gather information and understand the key issues for the area. From this process, key themes were personal safety in parks, speeding traffic, lack of crossings, confusion around vehicle/pedestrian priority at key destinations and dogs. These key issues were the foundation for design principles that were then applied to a network of street changes in the intervention area (Figure 2). The overall goal of the Future Streets designs is to make routes safer and easier to walk and cycle between destinations through high quality and intuitive pedestrian and cycle routes, while reinforcing a clear street hierarchy through SER principles. For the design process the ‘design road user’ was a 12-year old who is travelling around the area independently. Specific design elements include well connected pathways and cycle ways, conversion of ‘short cut’ streets into slow speed streets through planting, intersection treatments removal of centrelines and provision of separated cycle space; partial road closures and high quality pedestrian crossings and connections.
A concept that emerged from the design process was the blurring of streets and off-road paths as multifunctional transport and recreational routes. A central ‘community circuit’ serves as both an important walking and cycling route and a recreation/fitness circuit.

An important element of Future Streets is a process of cultural design. This involves engaging with Mana Whenua (Māori who have demonstrated authority over the land) to work through a process of identifying important references and elements, which can then be reflected in the physical works.

Figure 2. Future Streets area route network in Mangere

The designs are currently being implemented with follow-up measures due for 2016. Longer-term evaluation will also be necessary to fully understand the outcomes that have resulted from the Future Streets improvements.

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References


