

# Evaluating a shared spaces intervention

## A case study of street users in Auckland, New Zealand

Report to Auckland Council and Auckland Transport

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## Abstract

The environmental qualities of urban spaces have the potential to influence peoples' behaviours, including mode of transport and physical activity patterns, shopper spending habits, and social engagement and behavioural characteristics. Increasingly, urban planners and transport engineers are integrating concepts such as self-explaining roads and shared spaces into environmental design approaches, for improved driver behaviour, pedestrian safety, and health behaviours. Despite this, research focusing on the effects of such interventions is limited, largely due to the substantial expense of implementing built environment infrastructure, and a general disconnect between researchers and regulatory bodies responsible for intervention implementation. Greater focus needs to be on understanding the effects these interventions can have on the general population, to inform future infrastructural initiatives and investment.

This study compares the profiles and perceptions of street users immediately post and sixteen months after a major streetscape upgrade to a shared spaces mode in the the Fort Street precinct (central business district), in Auckland, New Zealand. A convenience sample strategy was employed for data collection and participants completed in-person surveys. Descriptive data treatment and inferential statistical analyses were undertaken to compare user profiles and opinions pre and post streetscape upgrades.

In total, 373 street users in the Fort Street precinct participated in this research. Overall, findings indicate positive perceptions of the Fort Street upgrades and positive impacts on health-related behaviours. Recommendations for further improvements to the area predominantly focused on improving pedestrian safety, including reducing traffic speeds, reducing car usage of the area, and providing better clarity on appropriate driver behaviours.

## Introduction

While roads are more recently a space for vehicle movement, they have historically been a place for people to walk, shop, talk, relax and play (Joyce 2012). Design practices have evolved in alignment with the increasing prominence of motorised vehicles over the last half-century (Shared Space Organisation 2005; Joyce 2012). Roads and the spaces surrounding them are now primarily designed to improve vehicular traffic flow (Shared Space Organisation 2005), with increasing prioritisation of facilitating the efficient movement of motor vehicles (Joyce 2012). These developments have led to separating pedestrians and vehicular traffic (hence curbs, footpaths, traffic signs and road markings). Such planning can undermine pedestrian activities, placing them secondary to the efficient movement of cars.

The notion that roads should be designed solely for vehicles has recently been challenged both in the US and the UK. Researchers argue that streets should be (re)classified in terms of movement and place, with place focussing on prioritising pedestrians and other users over that of the motor vehicle (Shearer 2010). Traditional road safety theory states that drivers are only willing to accept a certain level of task complexity and that standardising the road environment and separating it from pedestrians reduces driver task complexity. Conversely, recent research from the human behaviour field suggests that when task complexity is reduced, drivers compensate by increasing their driving speeds (Joyce 2012). John Adams, a leading theorist on risk compensation has written extensively on the theory of risk compensation. He proposes that if risks are identified in a given system and dealt with, then humans will compensate for this lack of risk by increasingly engaging in risk taking actions somewhere else in this system (Adams 1998; Taylor 2001). According to Adams, humans have an inbuilt level of tolerance for risk and adapt their behaviour according to their perception of risk (Adams 1998). It is hypothesised that separating vehicles and pedestrians results in drivers increasing risk taking behaviours, such as travelling faster and not looking for pedestrians (Joyce 2012). Drivers perceive a greater risk when vehicles and pedestrians are integrated within the street network, road markings are minimised, and shared level surfaces are introduced. This results in reduced speed, increased road user awareness, and therefore safer roads.

Hans Monderman first introduced the concept of shared spaces, and reasoned that risk is one of the founding ideas behind such street designs (Monderman 2008). Shared spaces combine aspects of design and ergonomics to public spaces where automobiles once took priority (Shared Space Organisation 2005). These environments aim to minimise demarcations between pedestrians and vehicles, something that is becoming increasingly influential across many countries (Moody and Melia 2011). Shared spaces are a relatively new approach in the New Zealand urban design context, where the term is generally used to refer to streetscape designs in urban environments which are aimed at minimising the separation between pedestrians and vehicles. This is usually accomplished by removing road markings and introducing a shared level surface (Ministry of Transport New Zealand 2012).

Monderman's designs emphasized human interaction over mechanical traffic devices. By removing conventional regulatory traffic controls, he demonstrated that human interaction and caution would naturally yield a safer, more pleasant environment for motorists, pedestrians and cyclists. This idea is further explained by the risk homeostasis theory, a notion that has been hugely influential in the development of shared spaces and has had a significant impact on their design (Joyce 2012).

When implemented successfully, shared spaces can offer many advantages. One of the fundamental reasons behind the implementation of shared spaces in New Zealand and internationally is the possible effect on improving road safety, an issue of global importance (Bunn, Collier et al. 2003). Worldwide, over 1.2 million people die in traffic accidents every year, with 20-50 million others left injured (World Health Organization 2013). In New Zealand, over 300 people lose their lives in road accidents every year. In addition, during 2011 over 10,000 people suffered serious injuries as a result of incidents on the road (Ministry of Transport New Zealand 2012).

Shared spaces increase the safety of a street by matching a driver's perceived risk of the street to the true risk (Shearer 2010; Dunckley 2012). Both drivers and pedestrians are more expectant of each other; instead of the aggressive stop/start conventional traffic system, a more even flow is achieved. The Laweiplein scheme in the Netherlands, implemented by Hans Monderman in 2000, is estimated to accommodate approximately 22,000 vehicle movements per day and is often cited as a leading example of shared space (Euser 2006). Survey work undertaken before and after the scheme's implantation concluded that there were fewer accidents and less delay for both pedestrians and vehicles (Euser 2006). Another study in the UK where three pre and post studies of a shared space were conducted reported a 43% reduction in pedestrian accidents following the introduction of the shared space street design (Shearer 2010).

Shared space design can also be economically advantageous; reducing traffic volumes through such an area can increase pedestrian activity and subsequently customer spending (Shearer 2010). In addition, removal of the traditional distinction between the footpath and road, can facilitate increased space provision for people, outdoor dining, and other street activities and events (Auckland City Council 2013).

Two studies have used stated preference methods to explore pedestrian attitudes to shared space streets. Kaparias et al. (2010) found pedestrians were most comfortable sharing space in conditions where they were highly visible, i.e. conditions involving low vehicular traffic, high pedestrian traffic, good lighting and provision of pedestrian only facilities. Young men were the most comfortable sharing space, whereas older people and those with disabilities were less confident. In their more recent study, Kaparias et al. (2012) reported similar findings, with the speed and volume of traffic significantly reducing pedestrians' willingness to share space with vehicles. Conversely, the provision of 'safe zones' created by vegetation or street furniture increased the willingness of pedestrians to share space with vehicles.

In the New Zealand context, shared spaces are part of Auckland City's 30-year plan to become the most liveable city. Employing shared spaces can help to deliver a well-connected and accessible Auckland, create people friendly spaces that increase prosperity and opportunity (Shared Space Organisation 2005), and support walking and cycling (Ministry of Transport New Zealand 2005). To date, little is known about implementing shared spaces in the New Zealand context.

At the inception of this research, Auckland Council was implementing shared spaces in selected street segments of the central business district (CBD). These shared space treatments included the removal of kerbs, providing a level surface for vehicles and pedestrians, widened (or no) footpaths to provide more space for people and outdoor dining areas, and the provision of permanent street furniture. These interventions represent 'natural experiments' offering unique opportunities to examine any changes in perceptions and behaviours in response to major streetscape upgrades.

This study is an empirical examination of the relationship between urban design, public health behaviours, and economic implications associated with shared spaces intervention in Fort Street, Auckland CBD. This research has been designed to address knowledge gaps and add to the growing body of urban regeneration research by measuring street user perceptions and behaviours immediately post and sixteen months after a major shared spaces intervention.

## Methods

### Intervention

The Fort Street shared spaces upgrade was implemented by Auckland Council between 2010 and 2013 in three stages (Figure 1). Stage 1 (Fort Street West) included upgrades to Fort Street between Queen and Commerce streets, Fort Lane, Jean Batten Place and Shortland Street (southern footpath only) between Queen Street and O'Connell Streets, in Auckland's central business district. Infrastructural work for Stage 1 was completed in September 2011. Detailed information about the full scope of works for the Fort Street area and supplementary evaluation methods can be found in Carmine et al. (2012). This research was designed as a follow-up study of street user perceptions in the Fort Street West area (Stage 1) from immediately post streetscape upgrades (October-November 2011) and sixteen months after the shared spaces upgrades were completed (January-February 2013). Ethical approval to conduct the study was provided by the Auckland University of Technology Ethics Committee (reference 11/216, 8 September 2011).

**Figure 1.** Stages of shared spaces streetscape upgrades in the Fort Street area



Source: Carmine et al. (2012)

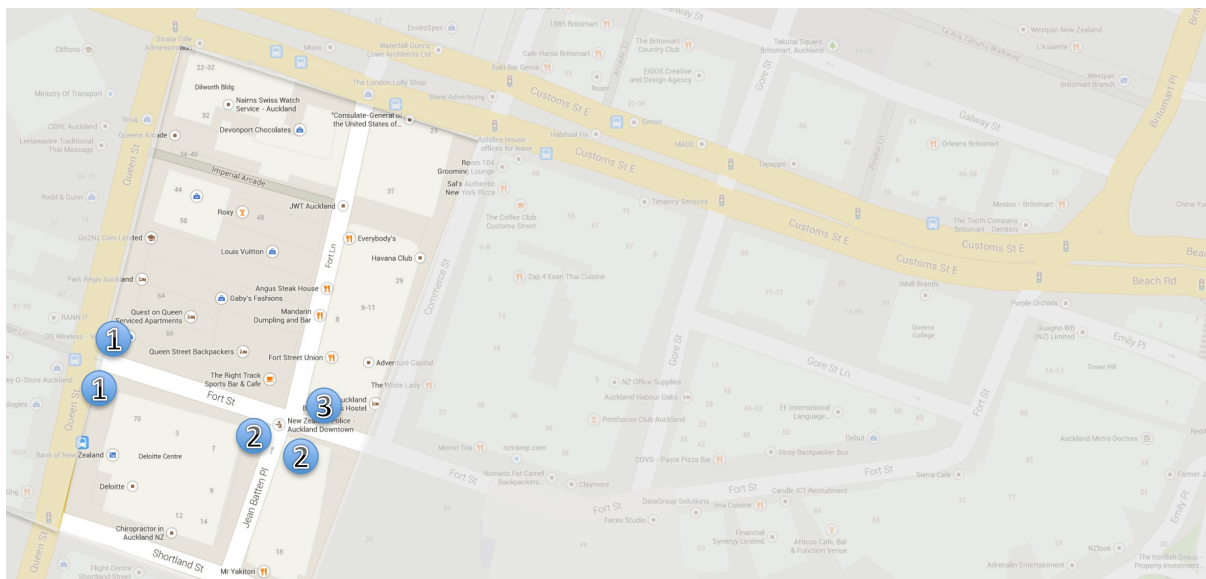
## Measures and participant recruitment

A study-specific questionnaire was developed by adapting the Central Copenhagen Pedestrian Survey used by Gehl et al (1999). The questionnaire was pilot tested prior to distribution to ensure comprehension, question clarity, and appropriateness of response categories.

Travel modes to the area, purpose of visit, area-specific spending patterns, activities engaged in the area, perceptions (including access for those with disabilities), and demographics were assessed using a 17 item paper-based questionnaire. The questionnaire was administered to street users travelling through the Fort Street West area using face-to-face interview methods.

A convenience sample strategy was employed for data collection. Data were collected from people seated in the Fort Street West area between 10.00 a.m and 2.00 p.m. These time periods were used to avoid peak commuter pedestrian times (8.00 a.m. to 8.30 a.m. and 5.00 p.m. to 5.30 p.m.). Every fifth adult was selected to participate in the questionnaire. The questionnaire was carried out at five sites distributed within the study area (Figure 2). Apart from the age restriction (< 20 years of age), exclusion criteria applied for individuals with minimal command of the English language, or who were unwilling to complete the questionnaire.

**Figure 2.** Data collection points for the street user survey



Key: 1=corner of Queen Street and Fort Street; 2=corner of Fort Street and Jean Batten Place; 3 = corner of Fort Lane and Fort Street

## Data analysis

Descriptive data were calculated for baseline and follow-up measures. Independent samples t-tests, Pearsons chi-squared, and Fisher's exact tests were utilised to identify whether changes between baseline and follow-up were of statistical significance. All analyses were undertaken in Stata/SE 12.0 for Windows (StataCorp LP, TX, USA).



## Results

### Participants

In total 373 people participated in the street user surveys. There was a significant difference between baseline and follow-up by ethnicity (Fisher's exact = 0.007), age (Pearson's chi-squared = 0.001), and whether participants were tourists to the area (Pearson's chi-squared = 0.026).

	Baseline		Follow-up		Total	
	N	(%)	N	(%)	N	(%)
Sex						
Male	139	(55.2)	57	(47.1)	196	(52.6)
Female	113	(44.8)	64	(52.9)	177	(47.5)
Ethnicity*						
New Zealand European	164	(65.6)	64	(52.9)	228	(61.5)
Māori	7	(2.8)	10	(8.3)	17	(4.6)
Pacific Island	7	(2.8)	12	(9.9)	19	(5.1)
Chinese	8	(3.2)	3	(2.5)	11	(3.0)
Indian	7	(2.8)	2	(1.7)	9	(2.4)
Other	57	(22.8)	30	(24.8)	87	(23.5)
Age (years)*						
16-25	52	(21.0)	46	(38.3)	98	(26.6)
26-35	70	(28.2)	38	(31.7)	108	(29.4)
36-45	57	(23.0)	16	(13.3)	73	(19.8)
46+	69	(27.8)	20	(16.7)	89	(24.2)
Disability						
Yes	5	(2.0)	0	(0)	5	(1.4)
No	244	(98.0)	121	(100)	365	(98.6)
Tourist to the area*						
Yes	35	(13.9)	28	(23.1)	63	(16.9)
No	217	(86.1)	93	(76.9)	310	(83.1)

N = number of participants

\*significant difference between baseline and follow-up,  $p < 0.03$

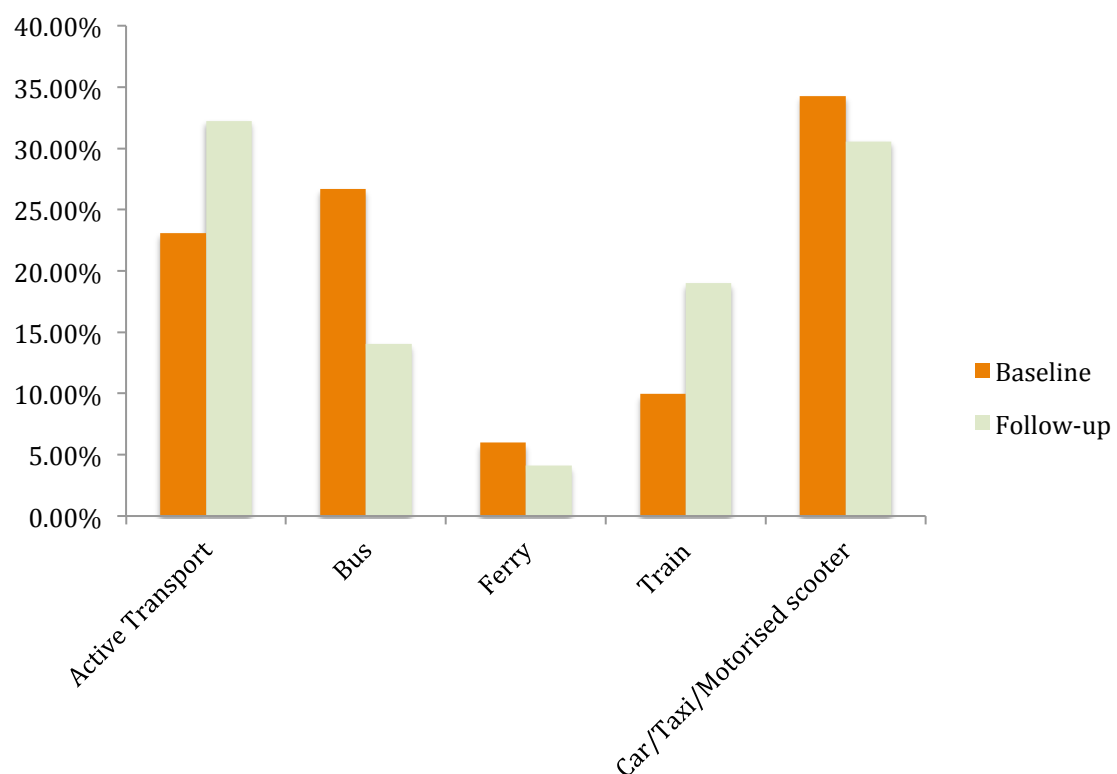
### Physical activity (health) outcomes

Three questions assessed the potential changes in travel and health behaviours between baseline and follow-up measures. Firstly, mode of transport to the area was measured, including active transport modes (i.e., walking or cycling to the area). Secondly, purpose of visit to the city centre was assessed, including a response option for 'exercise'. Finally, activities undertaken in the Fort Street area were reported by participants, which included responses to assess physical activities such as walking and exercise.

### Active transportation

At the broadest level, a non-significant shift was observed between the two time points for active modes, public transport use, and motorised transport modes, with an increase in active transportation to the area, and a decrease in public transport modes. When examining transport modes in more detail; although public transport use decreased overall, a significant shift was observed within public transport modes (Fisher's exact  $p < 0.001$ ), with an increase in respondents travelling to the area by train, and a decrease in bus and ferry use (Figure 3).

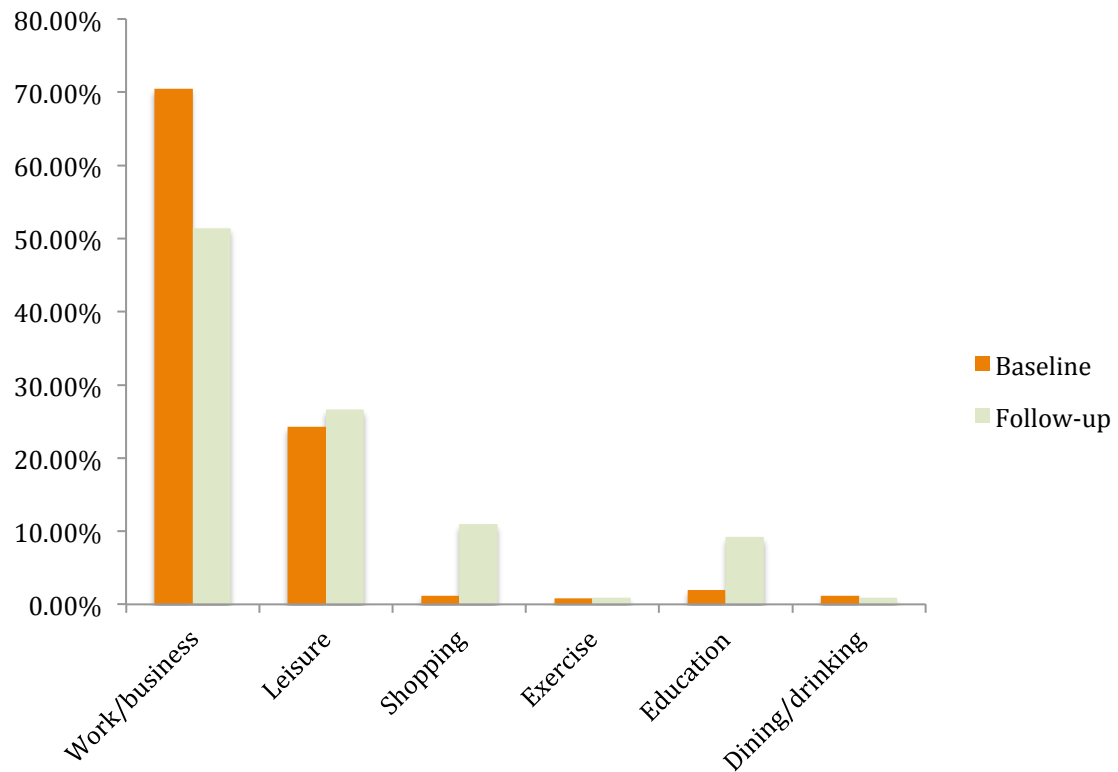
**Figure 3.** Proportion of respondents travelling to the area by active, public and motorised transport modes



### Purpose of visit to the city centre

When asked about the primary purpose of their visit to the Auckland city centre, respondents at baseline predominantly reported being in the area for work or business purposes at both time points. However, there was a significant shift downwards in the proportion of people in the area for work purposes, and a significant increase for those in the area for shopping or education reasons (Fisher's exact  $p < 0.001$ ).

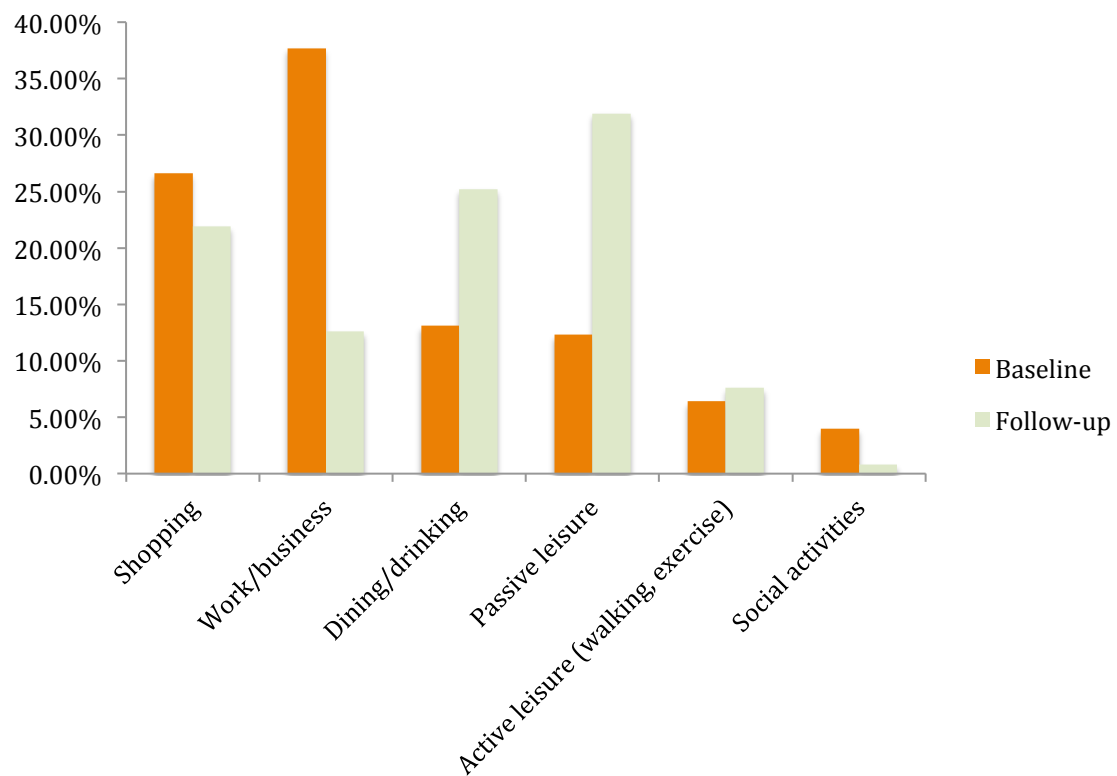
**Figure 4.** Respondents' primary reason for visiting the Auckland city centre



### Activities undertaken in the Fort Street area

When considering the Fort Street area, a significant change in reported activities undertaken in the area on the day of data collection was found (Fisher's exact  $p < 0.001$ ). Increases in the proportion of people who had visited a café, restaurant, or bar; and the proportion of people who had or were undertaking passive leisure activities (e.g., sitting and reading) were observed (Figure 5). Conversely, a significant drop in the proportion of people who reported having undertaken work or business related activities on the day was found.

**Figure 5.** Activities undertaken by respondents on day of data collection

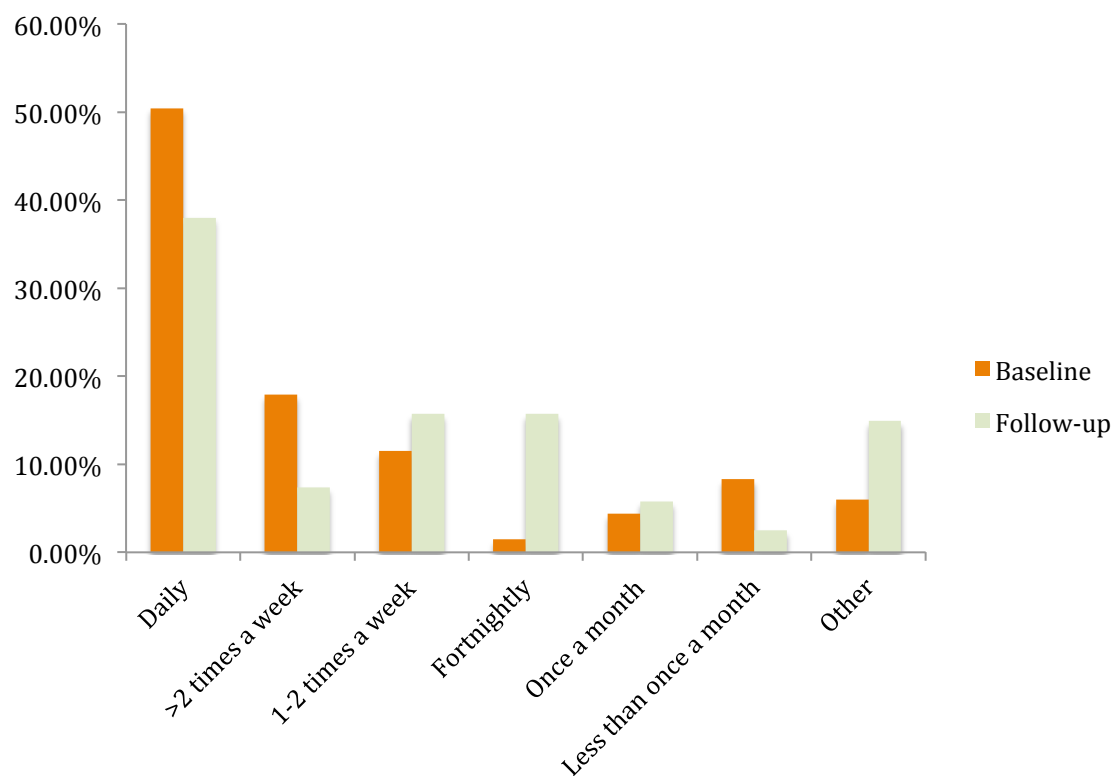


## Economic outcomes and usage

Participants were asked approximately how much they had spent or intended to spend in the Fort Street area that day, whether they intended to make purchases from more than one shop/retailer in the area, and how often they visited the area in the past month.

A significant decrease in the estimated spend was found between baseline and follow-up, from a mean of \$25.87 to \$14.75 ( $p = 0.021$ ). When asked if they intended to spend money in more than one shop or retailer, a non-significant upwards trend was found, whereby 30% of respondents reported yes at baseline, and 43% stated yes at follow-up. Significant changes in visitation to the area over the previous month were observed from baseline to follow-up (Figure 6; Fisher's exact  $p < 0.001$ ). In part, this was due to the increased number of tourists to the area, who reported "other" due to residing outside the Auckland region in the previous month. In addition, a drop in regular (more than twice a week) visitation was observed, with an increase in respondents reporting having visited the area between one to four times per fortnight.

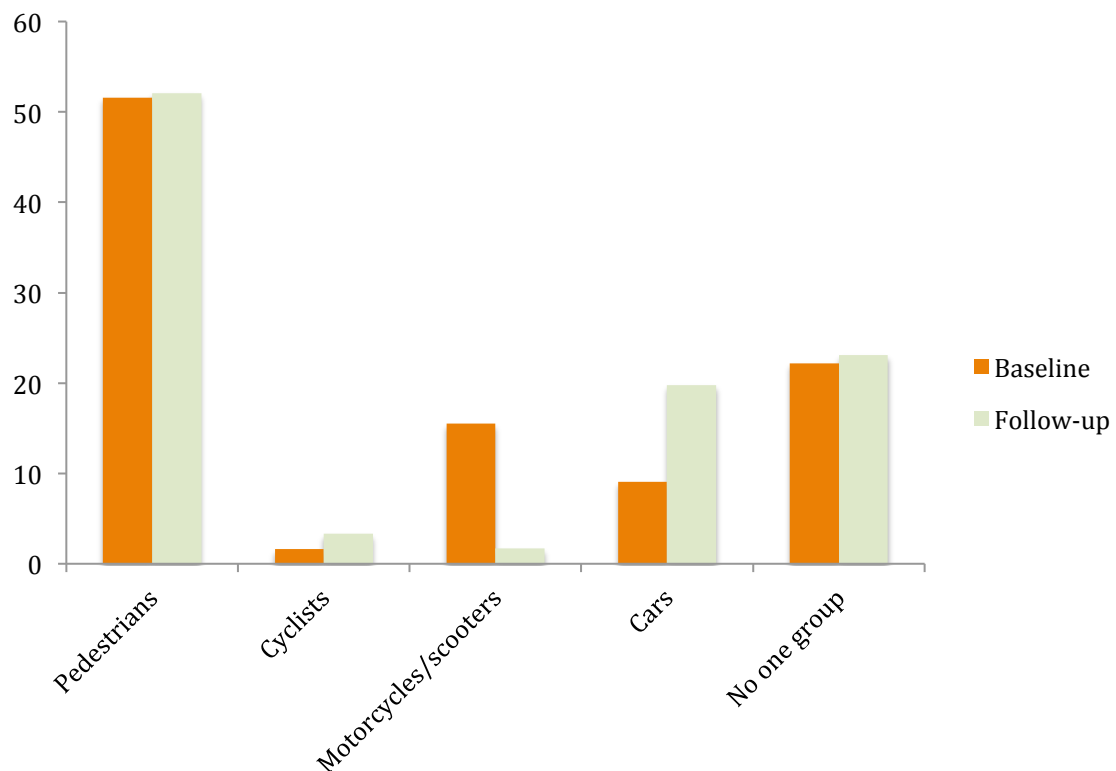
**Figure 6.** Visitation to the Fort Street area in the previous month



## Safety and universal accessibility

At both time points, more than half of all respondents perceived that pedestrians had right of way in the Fort Street area. Perceptions regarding pedestrians, cyclists, and no group in general remained relatively stable, while a significant shift from motorcycles and scooters to cars was observed (Fisher's exact  $p < 0.001$ ; Figure 7).

**Figure 7.** Perceived mode of transport that has the right of way in the Fort Street area



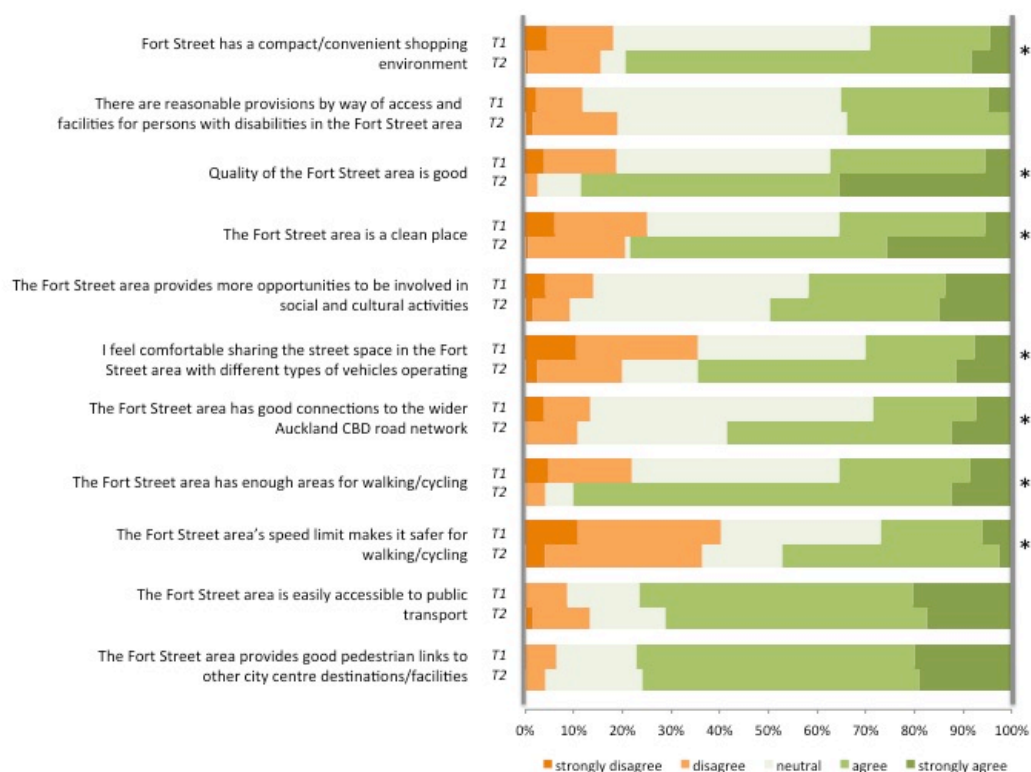
As may be observed in Table 1, five respondents reported considering themselves as having impaired mobility at baseline, and none reported experiencing impaired mobility at follow-up. At baseline, only those who reported having impaired mobilities were asked how much the shared spaces upgrade impacted their mobility or ease of navigation through the area. Of those, only one (with a fractured hip) responded to this item, reporting that their mobility/ease was greatly improved. At follow-up, all respondents were asked this question. Of these 121 participants, 3% reported that the changes made mobility somewhat difficult, 34% reported no change, and 63% reported that their mobility/ease was improved or greatly improved. These results provide some indication of ease of transitioning through the area, albeit this does not reflect the perceptions of people with impaired mobility.

## Perceptions of the Fort Street area

### Street user perceptions

Participants were provided with a series of statements about the Fort Street area, and asked to record their responses using a 5-point Likert scale (strongly disagree to strongly agree). Responses were aggregated to (1) strongly disagree or disagree and (2) agree and strongly agree to determine whether statistically significant changes in positive and negative perceptions about the area occurred between baseline and follow-up measures. Figure 8 provides detail for statements that were positive about the Fort Street area, while Figure 9 provides detail for statements that were negative about the Fort Street area. Green shading indicates respondents' positive perceptions of the area, while orange indicates negative perceptions about the area. A number of significant shifts in perceptions were observed, with all but one (regarding prevalence of car traffic; Figure 9) of these significant changes being positive towards the Fort Street shared spaces area.

**Figure 8.** Participants' responses to positive statements about the Fort Street area at baseline and follow-up



Note: T1 = time 1 (baseline), T2 = time 2 (follow-up)

\*Significant difference between positive and negative perceptions between baseline and follow-up

**Figure 9.** Participants' responses to negative statements about the Fort Street area at baseline and follow-up



Note: T1 = time 1 (baseline), T2 = time 2 (follow-up)

\*Significant difference between baseline and follow-up

### Street user recommendatons

Survey respondents were asked the following open-ended question: “What changes would you recommend (if any) to the Fort Street area redevelopment?”. Of the 373 survey respondents, 204 (55%) provided one or more recommendations in response to this item. Recommendations for both time points have been combined and aggregated into common themes arising, as detailed in Table 2.

**Table 2.** Participant recommendations for changing the Fort Street area

Recommendation	%
Make the area pedestrianised/restrict to service vehicles only	15.2
Improve/add more signage and road markings	13.2
Reduce traffic speeds, lower speed limit, use speed bumps and other traffic calming measures	12.8
More public amenities – shade from rain and sun, seats, toilets, water features, rubbish bins, ashtrays	12.2
Add greenery, planting, etc.	8.0
Remove the strip clubs from the area	6.4
Provide tourist information – maps, shop information, public transport timetables	5.6
Extend the shared spaces infrastructure to other areas	5.6
Remove rubbish/general incivilities	5.2
Reduce/divert cars from area (as opposed to complete pedestrianisation)	3.6



A common concern amongst respondents was the conflict between cars and pedestrians. This concern featured regularly in responses regarding recommendations for reducing/removing car use, improving signage, and reducing traffic speeds. A related and common concern was also the lack of clarity regarding who has right of way. This is reflected somewhat in Figure 7, whereby almost half of the respondents thought that non-pedestrians have right of way.

Example comments that reflect these concerns are provided below:

*"Make it safer for pedestrians. I have had so many near misses with cars, They tend to not slow down at all or consider pedestrians. I am genuinely concerned that it is only a matter of time until an accident happens."*

*"Perhaps have an amber flashing light to warn drivers that pedestrians ahead and/or have a limited speed zone applied as some vehicles seem to travel far too fast. Seen a vehicle turn right into Fort Street from Queen Street. Waiting for someone to be hit."*

*"Make it clear that pedestrians have right of way... I am fed up with being run over by cars going too fast down there."*

*"Enforce slower car speeds... speed bumps/divets etc. Cars still think they own this space."*

*"Pedestrians/motorists appear to be unsure as to who has the right of way. Turning right from Fort Street into Queen Street is difficult because pedestrians think they have the right of way and consequently are reluctant to give way to vehicles."*

## Discussion and conclusion

Environmental interventions have the potential for significant and sustained impact on outcomes for those exposed to the area. Shared spaces have been in existence for decades in some form or another. However only recently have they begun to attract widespread attention due to their potential in targeting the sustainability agenda, global epidemic of obesity, and improving the aesthetics of urban design. This research provides the first long-term evidence of impacts on health behaviours, spending patterns, and user perceptions following a major streetscape upgrade to a shared spaces mode in Auckland, New Zealand.

Although non-significant, results showed the shared spaces approach has the potential to improve health-related behaviours via trends towards improved prevalence of active transport modes and reduced car use, and increased use of the space for exercise purposes.

While significant decreases in estimated spend were observed between baseline and follow-up, and visitation frequency reduced over time, respondents did report an increase in likelihood of shopping in more than one location in the area. Substantial and significant positive changes in user perceptions of the area occurred over time; it is plausible that ongoing improved perceptions will lead to improved usage and ultimately increased expenditure in the long term. Recommendations for improving the area largely focused on improving pedestrian safety, with numerous concerns about driver speeds were noted.

It is worth noting that this longitudinal research measured information from two independent samples at baseline and follow-up, for which some demographic information was significantly different (increased prevalence of tourists, younger respondents, and those identifying themselves as being of Māori or Pacific Island ethnicity in the second wave). These demographic changes may reflect changing demand for the amenities and destinations available in this area. In most instances those who travelled into the city for 'other' reasons were in Auckland on holiday. It is also noteworthy that the timing of the baseline survey coincided with the Rugby World Cup, hosted in Auckland, Wellington, and Christchurch, New Zealand, between September-October 2011. Despite this, a significant increase in respondents who reported they were tourists to the area was observed from baseline (14%) to follow-up (23%). This may reflect increasing tourist demand for the Fort Street area amenities and destinations, and could also reflect long term positive effects of the Rugby World Cup and other large-scale events on tourism. A delimitation of this research was the collection of data outside commuting hours. Subsequently, there is the possibility that perceptions and behaviours of workers in the area may have been under-represented. Taking these issues into account, interpretation of some of the longitudinal results remains challenging, as demographic factors may have confounded the changes somewhat.

## Recommendations for further research

While most feedback was generally positive about the shared spaces upgrade, there was still concern raised around the recklessness of motor vehicles drivers in the area. It appears that many 'near-misses' may be occurring that are not measured via traditional data collection modes such as road crash statistics. It is possible that ongoing exposure to the shared spaces environments around Auckland City over time and subsequent improved understanding of appropriate road user behaviours in these settings may mitigate this somewhat.

It is also worth noting the paucity of representation of individuals with disabilities in this research. The lack of users identifying themselves as experiencing a disability may be a reflection of the area being challenging for these individuals to navigate through, however whether this is the case cannot be determined from the current research. Ensuring universal design (and thus accessibility and usability for people with varied abilities) is an important consideration in planning successful, liveable, and world class healthy cities for all.

Further longitudinal research, research to gauge the incidence of 'near miss' events, research that targets individuals with disabilities, and intervention research to mitigate the conflict between cars and pedestrians would be worthwhile.

## Conclusion

Findings from this research indicate significant improvements in user perceptions of the Fort Street West shared spaces work over time. While there is more work and research to do in this field, it is without question that the changes made have had a positive impact on the people that use this area. Whether it is those who use the area on a daily basis or those who are there for the first time, road users and pedestrians are optimistic about the changes and for what lies ahead with the completion of the remaining Fort Street area.

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