



# 'I'd paint rainbows and unicorns on it': Understanding children's school travel behaviours and the impact of a new shared path

Niamh Donnellan<sup>\*</sup>, Victoria Egli, Melody Smith

The School of Nursing, The University of Auckland, New Zealand

## ARTICLE INFO

### Keywords:

Active transport  
Cycling  
Mixed methods  
Child-centred  
Walking

## ABSTRACT

**Introduction:** Evidence shows there is a clear link between active travel to school and children's physical activity levels. Active school travel (AST) in New Zealand has declined while car travel to school has increased. The aim of this research is to understand the factors related to travel mode to school from the perspectives of children, their parents and school representatives, through the evaluation of a shared path in Whangārei, New Zealand.

**Methods:** Children, their parents and school representatives were recruited through four schools located close to a new shared path intervention. Children's mode of travel to school before and after the construction of the new shared path was measured using repeat hands-up surveys. The study was conducted using a child-centred approach. 13 semi-structured focus groups with children (8–12 years old), phone interviews with 35 parents, and face-to-face interviews with four school representatives were conducted. Quantitative data were described descriptively and qualitative data were analysed using inductive and deductive thematic analysis based on the Kids-PoND framework.

**Results:** Three out of four schools surveyed reported small but promising increases in the proportion of AST from pre to post shared path intervention. Triangulation of qualitative data from children, parents and school representatives' revealed a number of factors related to children's mode of travel to school, including: convenience, safety (traffic and 'stranger danger'), fun, health benefits, social environment, weather and environment. All groups also gave a number of suggestions to improve the accessibility, utility and safety of the new shared path.

**Conclusion:** Important insights into why new infrastructure may or may not be successful at enabling AST can be garnered from understanding child, parent and school representatives' perspectives. Our findings have implications for urban and town planners, AST policy makers and public health.

## 1. Introduction

### 1.1. Children's active travel in Aotearoa New Zealand

Active travel (e.g., walking, cycling, or scootering for transport) is a physical activity behavior of particular interest for researchers,

<sup>\*</sup> Corresponding author. School of Nursing, Faculty of Medical and Health Sciences, University of Auckland, Private Bag 92019, Auckland Mail Centre 1142, New Zealand

E-mail address: [n.donnellan@auckland.ac.nz](mailto:n.donnellan@auckland.ac.nz) (N. Donnellan).

<https://doi.org/10.1016/j.jth.2020.100838>

Received 31 October 2019; Received in revised form 16 February 2020; Accepted 22 February 2020

Available online 20 April 2020

2214-1405/© 2020 Elsevier Ltd. All rights reserved.

policymakers and practitioners due to the substantial opportunities for positively impacting human and environmental health (Mandic et al., 2019). Evidence from international systematic reviews (Faulkner et al., 2009; Larouche et al., 2014; Schoeppe et al., 2013) and research in Aotearoa New Zealand (hereafter referred to as NZ) (Oliver et al., 2016) demonstrate a clear link between active travel (predominantly active travel to school) and physical activity in children. Additionally active school travel (AST) has been related to improved cardiovascular fitness (for cycling) (Larouche et al., 2014). As with physical activity, active travel in NZ children has been steadily declining. Between 1990 and 2015, the rates of walking and cycling to school have decreased from 42% to 29% and 12% and 2% respectively, while car travel to school increased from 32% to 57% (Ministry of Transport, 2015). Despite the NZ Physical Activity Report Card (Smith et al., 2018), and recent NZ research (Ikeda et al., 2020; Smith et al., 2020), identifying a number of supports for AST across whānau (family) (e.g., parents valuing being active together), school (e.g., AST programmes and policies), community and environment (e.g., policies, strategies, and infrastructure to increase active travel) and government (e.g., allocated funding to increase physical activity) settings, a number of barriers remain. Indeed the NZ Physical Activity report cards (2014, 2016 and 2018) have shown an ongoing trend of low active travel rates in NZ children (Smith et al., 2019b).

### 1.2. Environments and children's physical activity and active travel

Clear associations between built environments and children's physical activity and active travel behaviours exist. A 2014 systematic review found links between physical activity and availability of facilities, parks and playgrounds, and inconclusive results regarding safety, traffic and weather (Oliveira et al., 2014). Presence of sidewalks (footpaths) and cycle lanes were associated with physical activity, likely to be accumulated through active travel. However, this literature was of a predominantly cross-sectional evidence base, limiting understanding of whether the environment directly causes behaviours. Recently a systematic review limited to study designs where causality could be inferred showed how a number of environmental features impacted children's activity and active travel (Smith et al., 2017). The review reported multi-component park renovations were linked to significant increases in physical activity across all age groups, and multi-component streetscape interventions were associated with higher levels of active travel in children. Importantly, installation of new greenways was associated with significant increases in physical activity and active travel (Smith et al., 2017).

Published NZ research on the environment-activity relationship in children has been predominantly cross-sectional to date. Findings have shown links between children's active travel and street connectivity and destination accessibility (positive) and distance to school (negative), and between physical activity and transport environments that support walking and cycling and have lower traffic speeds (Oliver et al., 2015). Reports from a large sample of parents in Auckland, NZ's largest city, revealed parental desires for safer traffic environments to facilitate their child's independent neighbourhood walking, cycling, and scootering (Smith et al., 2019a). In the same study, children reported enjoying spending time with friends and family and being active; and disliking unsafe traffic environments (Egli et al., 2019).

### 1.3. Evaluation of environmental interventions for active school travel

Numerous environmental interventions to support AST exist worldwide. Yet the impacts of these infrastructural changes on children's school travel modes are rarely evaluated. To some extent, this may be due to the challenges of aligning timing, funding, and priorities across practitioners and researchers (Witten et al., 2018). One noteworthy exception is the Safe Routes to School programme (Boarnet et al., 2005), where extensive evaluation of a range of interventions has been conducted. Results have demonstrated the significant potential impact of providing safe places to walk and cycle on children's active travel modes (McDonald et al., 2013). Additional gaps lie in terms of understanding the impact of interventions from the perspectives of children, their parents, and school representatives. Child-centred research that values the child voice and meaningful participation (Barker and Weller, 2003; Christensen and James, 2008) in evaluating an intervention is also important for AST. Parents are the gatekeepers of their child's activity, and children can be active agents and advocates for their own active travel behaviours. Schools have an in-depth understanding of their wider school community and potential broader issues that may explain why an intervention may or may not have the desired impact (Hawley et al., 2019). Understanding child, parent, and school representative perspectives about new infrastructure can yield important insights into why infrastructure may or may not be successful.

### 1.4. Study aim

It is clear that environmental features can enable or constrain children's ability to travel by active means. Improving safety from traffic is a key strategy to facilitate children's active travel. In this context, separated walkways and cycleways may be especially effective for supporting active travel modes for young children. In Whangārei, NZ, an opportunity arose to evaluate the impact of a new shared path on children's active travel behaviours to school. Through an evaluation of a shared path intervention, the aim of this research is to understand factors related to travel mode to school from the perspectives of children, their parents and school representatives.

## 2. Methods

### 2.1. Study area

Whangārei is the most northerly city in NZ and Whangārei district has an estimated population of 91,230 (Statistics New Zealand, 2018). The district is part of NZ's only subtropical climate zone with warm summers (average high of 24 °C) and mild winters (average high of 16 °C) (Whangārei District Council, 2020). Whangārei City is part of the Urban Cycleways Programme, a national cycling investment in cycleways across 15 urban centres in NZ. The Whangārei arm of the Urban Cycleway Programme has a major focus on encouraging more children to safely cycle to school. With investment from national and local government, two stages of a new shared path, have been constructed along the rail corridor protected from traffic and links the town centre with northern neighbourhoods. The first two stages (2.3 km) of the shared path were opened to the public in early December 2018 and a further three stages are planned to extend the shared path to a total length of 6.5 km.

### 2.2. Study design and participants

This was a repeat cross-sectional study of children's mode of travel to school before and after the construction of new walking and cycling infrastructure, combined with a cross-sectional qualitative examination of child, parent, and school representative perspectives about the infrastructure and its use.

Four schools (three primary and one intermediate) were purposively selected for this study based on their proximity to the new shared path and following consultation with Whangārei District Council, who were interested in children's active travel behaviours from those particular schools. Representatives from the council invited schools to participate in the study in November 2017. ND held face-to-face meetings with the schools in February 2019. Parent information sheets and consent forms, and child information sheets and assent forms were left with school principals for distribution to children. Written informed consent was required from school principals for the school to participate in the study. In each school, all classes for school years 3–8 (approximate ages 8–12 years) were involved in the hands-up survey. For the child focus groups, parent consent for their child to participate and child assent to participate were required. Parent consent was required to participate in the parent telephone interviews. School representative consent was required to participate in the face-to-face interviews. Ethical approval to conduct the research was provided by the University of Auckland Human Participants Ethics Committee (020557, June 21, 2018).

### 2.3. Measures

School travel mode was measured using a hands-up survey for which validity and reliability has been demonstrated in NZ children (de Wit et al., 2012). At the beginning of class each day over five consecutive weekdays teachers asked each child in their class "How did you come to school today?" and to raise their hand if they came to school by family car, friend's car, scooter/skateboard, bike, walking or bus. Children were marked as absent if not at school on the day. Data were collected at two or three time points, depending on the school, always one pre-path and one post-path. The first survey was completed in early December 2017 (pre-path), the second in early September 2018 (pre-path), and the third in late March 2019 (post-path).

Focus groups were held with children at each of the four schools with ND and VE in early April 2019. A semi-structured set of questions were used to guide the focus groups and included a range of questions, including how they usually get to school, what they like and dislike about their route, what they think about walking, cycling or scootering to school in general, what they think about the new shared path, if they had any ideas on how to encourage more children to walk, cycle or scooter to school and what they think of the new path for others in the community.

School representative interviews were conducted face-to-face. Interviews were informed by a semi-structured set of questions and were held with a school representative from each school by ND in early April 2019. School representatives were asked what they thought of the new shared path, if they had an active school policy, if they actively encourage children to walk/cycle to school, if they have done any promotion of the new path with children and parents/caregivers (hereafter parents) and what factors affect parent's decisions to let their child walk, cycle or scooter to school.

Phone interviews with parents were completed in April 2019 by ND and followed a semi-structured set of questions. Parents were asked the following questions: how their child usually travelled to school, what were the main reasons for using that mode of travel, if they knew about the new shared path, what they thought of the new path, what the main factors/barriers that impact whether their child walks, cycles or scooters to school, whether the new shared path affects their decision to let their child walk, cycle or scooter to school, whether the shared path encourages their family to take more trips to other places, and when they were their child's age how they got to school and why has it changed since then.

### 2.4. Data treatment and analysis

#### 2.4.1. Hands-up surveys

Travel modes were grouped as follows: family and friend's car = car; scooter/skateboard, bike and walk = active, bus remained the same and the combination of going by car and walking = mixed mode. Data were examined descriptively and results presented for each school.

### 2.4.2. Focus groups and interviews

Qualitative data were analysed using inductive and deductive thematic analysis, involving six phases: (1) familiarisation with the data, (2) coding, (3) generating initial themes, (4) reviewing themes, (5) defining and naming themes, and (6) writing up. All authors have a shared interest in environments and child health, and activating child voice in this context, with particular regard to respecting and valuing children's ideas and perspectives.

ND and VE ran focus groups with children, ND ran all interviews with parents and school representatives and read all transcripts in their entirety to confirm content and ensure familiarisation with the data. Transcripts were also revisited by ND and VE throughout the data analysis to confirm results and interpretation. ND undertook all qualitative data coding. For child focus group data, the Kids-PoND framework (Kids-Perceptions of Neighbourhood Destinations) (Egli et al., 2019) was used as a guide. The Kids-PoND framework developed by VE and team, offers a way to contextualise and understand children's perceptions and use of neighbourhood destinations. Initially ND and VE analysed two focus groups in partnership to ensure interpretation of codes was consistent with the Kids-PoND framework and to identify new study-specific codes. School representative and parent data were coded by ND and a random 10% subset was checked by VE. Potential themes were identified by ND in consultation with MS and VE. Deductive analyses focused on the key research questions. Inductive analyses were undertaken to generate additional new topics that were identified. Themes were then reviewed by ND and VE, including revisiting the transcripts, reflecting on the study aims; the commonalities and differences observed across children, parents, and school representatives; and the key messages and topics that were identified. Finally, the themes were described and supporting quotes were included to corroborate the key findings (Baxter and Eyles, 1997).

## 3. Results

### 3.1. Socio-demographic characteristics of schools

Descriptive data are provided in Table 1. Three of the four schools are state run (schools B, C and D) and school A is a private Catholic school.

### 3.2. Proportion of travel modes to school

Three hands-up surveys (two pre-path, one post-path) were completed for schools A and D and two surveys (one pre-path and one post-path) were completed for schools B and C (Fig. 1).

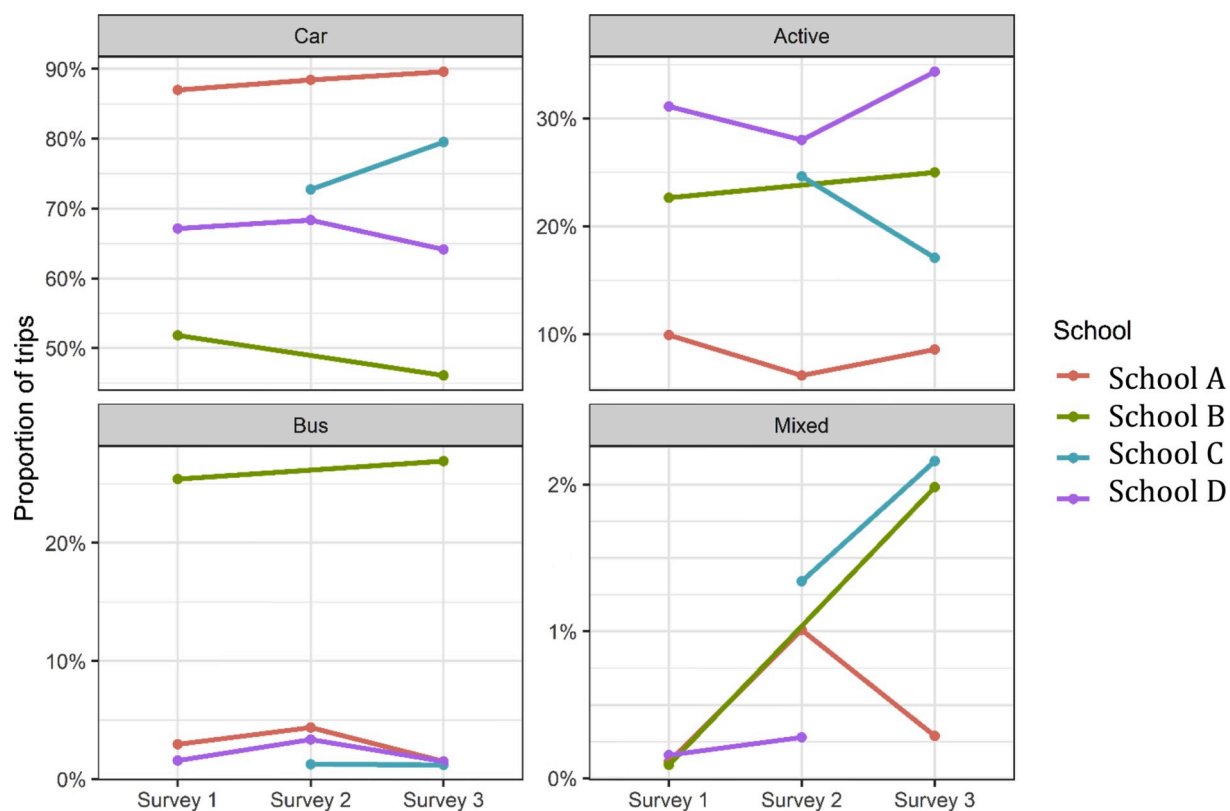
From surveys 2 to 3 (pre to post-path), the proportion of trips taken by car increased 2% at school A, increased 7% at school C and decreased 4% at school D. In school B, the proportion of trips by car decreased 6% from surveys 1 to 3 (pre to post-path). At schools A, B and D, the proportion of active travel to school increased by 3%, 2% and 6% respectively, whereas active travel decreased at school C by 8% pre to post-path intervention. Travel to school by bus decreased at schools A and D (2% and 1%), increased by 2% at school B and remained the same (1%) at school C. Mixed mode travel to school (taking the car and walking) decreased to less than 1% at school A, at schools B and C mixed mode increased 2% and 1%, respectively, and only one child reported using mixed mode school at school D.

**Table 1**

Summary table of school characteristics.

School characteristics	School A Privately run, primary	School B State run, intermediate	School C State run, primary	School D State run, primary
<b>School roll n</b>	510	638	594	242
<b>School decile rank n</b> (area-level socio-economic status)	6 (medium)	4 (medium)	4 (medium)	2 (low)
<b>Sex (%)</b>				
Girl	50	49	53	52
Boy	50	51	47	48
<b>Ethnicity (%)</b>				
European/Pākehā	48	38	42	19
Māori	29	53	42	74
Pacific	3	4	6	7
Asian	16	4	9	1
MELAA	3	1	0	0
Other	1	1	1	0
<b>School year (%)</b>				
Year 3	15	0	17	14
Year 4	19	0	17	17
Year 5	15	0	13	18
Year 6	17	0	19	16
Year 7	3	57	3	2
Year 8	0	43	0	0

Note. MELAA = Middle Eastern/Latin American/African.



**Fig. 1.** Proportion of trips to school by mode of travel, before (survey 1, 2) and after (survey 3) the opening of the shared path. Active mode represents walking, cycling and scootering and mixed mode represents a mix of modes to get to school such as travelling to school by car and walking.

### 3.3. Characteristics of participants

Overall, 59 children from four schools participated in a total of 13 focus groups. Age and sex are detailed in Table 2. Phone interviews with 35 parents and face-to-face interviews were conducted four with school representatives.

#### 3.3.1. School travel mode

Modes of travel reported by children in descending order of frequency were car, walk, scooter, bike and bus. Children also frequently reported multiple modes of travel, including by car and walking, for example 'My mum drops us off at her work and then we walk up the bike track'.

### 3.4. Factors related to children's travel mode to school

In the sub-sections that follow, children, parent and school representative's perceptions of active travel to school and the shared

**Table 2**  
Demographic characteristics of focus group participants.

Demographic characteristics	School A	School B	School C	School D	Total
<b>Age</b>					
12 years		16			16
11 years	1	2			3
10 years	5		5	5	15
9 years	4		8	11	23
8 years				2	2
<b>Sex</b>					
Male	3	7	3	5	18
Female	7	11	10	13	41
<b>Total n</b>	10	18	13	18	59

path are presented. Quotations from participants were not identified by school in order to prevent discrimination and potential stigmatisation based on socio-economic deprivation (Beddoe, 2014).

### 3.4.1. Convenience

Convenience was a key factor related to children's travel mode to school and included ease of dropping/collecting children to/from work, family routine with trip chaining (dropping/collecting multiple children to different schools) and being time poor.

'The reason for me is because I don't live too far away, but then my dad will drop my sister off, my brother off, my big brother, and then he'd drop me and my little brother off, and then sometimes he ends up being late,' (child).

Additionally, the distance children and parents lived, both near and far from their school affected the travel mode to school.

'Because we live far away, we have to go in the car because usually it's too far because mum wants to keep us safe and stuff,' (child).

Even if children lived close to school, some parents believed it was too far to walk on their own because of traffic and having to cross a main highway.

'Walking is usually when I'm free to be able to walk with them. If not, we go by car because [...] just where we live, obviously if I sent them to walk on their own, I'd have to trust them to cross the main state highway and I don't really feel like it's safe enough for them to do that on their own ... It kind of relies on an adult being able to do it with them ... We're really close. When we do walk, it's only like a 20, 30-min walk,' (parent).

Most children from school A, were driven to school and reported living too far from the school, making it difficult for them to walk/cycle. A number of parents that drove their child to school commented on the time it took to get to school, with and without traffic or lights.

'It can take me six minutes door to door flat out driving fast, getting there fast. If the lights are going my way, we're there in six minutes flat,' (parent).

Parents of children who walked to school also commented in terms of time to get to school, ranging from '2 min' to '20 min'. In addition, parents of children who lived within walking distance of the school also dropped their children to school sometimes, irrelevant of time and distance to school.

'Walk most of the time, but sometimes car depending. We're just not far from the school; around the corner,' (parent).

### 3.4.2. Safety

Safety was mentioned by children, parents and school representatives alike. Traffic, personal safety from others, dogs, and personal injury arose frequently in all three groups. Safety from traffic included, crossing the road, fumes from exhausts, traffic volume and speed. When referring to the new shared path the general consensus was that it is 'a lot safer' and 'there's not as many roads to cross, there's only like two, I think, something like that. You don't have to cross as much.' However, even though there are not many road and train crossings along the path some children thought they were safe but others were unsure:

'it's kind of like pretty safe except for the train crossing. But the gate is way more safe because it closes it. Some teenagers jump over the gate if it closes,' (child).

Opinions varied also in relation to the openness of the shared path on route to school and whether it was more or less safe. In general children commented that using the path was safe because of its openness 'I feel like it's really safe [...] It's really open, I guess.' However, some parents viewed the new path as unsafe because it was out of sight from the main road, with few people using it.

'He has used it a couple of times when I've dropped them further up X Street and he's gone down back that way, but then I start worrying about [him] because he's not on a main road if anything happens, no one's going to see what happened if you know what I mean. It's kind of a Catch-22 with both ways that he goes,' (parent).

All three groups (children, parents and school representatives) spoke about personal safety as a key factor related to AST. Children commented that they sometimes felt afraid walking alone on the shared path to school, particularly when their school held school assemblies instructing them to walk with a friend at all times because of 'stranger danger' in the community. It was unclear whether this increased the sense of fear or heightened awareness in children walking/cycling to school.

'because the people at the school, they've told us many times that there's creepy people out there, we could be attacked on the streets, you've got to be careful, walk with more people, don't walk alone. So it's a bit scary sometimes if you're out alone because sometimes Alice doesn't walk up [the shared path] if she has to go somewhere else for a change. Sometimes I'm just like, well now I don't feel that safe walking up there alone,' (child).

Some parents preferred their children to use the main roads instead of the shared path and felt it was safer to be on a main road next to lots of people and traffic.

'I told them to stick to the main roads. Some of the cycleway nobody can see you there. I know there's thugs around that sort of hang out around those areas and they take advantages of little kids, so I just said to them [her children], if you can, stick to the main road where there's lots of people, there's lots of traffic. It's less likely that anything bad will happen to you. I wouldn't mind them using it if they were with an adult,' (parent).

Fear of strangers was also evident among the child and parent participants. Children from one school in particular, described a

number of instances in the previous 18 months where strangers tried to abduct children from their school with lollipops and treats. The story of ‘snatching’ children off the streets caused the effect of some parents driving their child to school for a number of months, when usually their child would walk to school.

‘One thing I don’t like when I’m walking is walking past people that are very, very weird and say, here, come with me, I’ll give you something, and I go like, nope,’ (child).

‘It was last year when people were approaching children, trying to snatch them off the streets in X neighbourhood. I drove my kids to school for a couple of months. It’s just things like that. You hear about things,’ (parent).

Parents also reflected on how times have changed negatively since they were a child and this perception impacts on whether or not they allow their child to walk to school.

‘it’s changed from when we were younger. It’s not safe to walk around. The amount of assaults and what not that you hear, it’s just ... I don’t find it as safe as what it used to be when I was growing up. I remember walking around and it didn’t matter, but now you just can’t trust anyone, really, especially if you don’t know them,’ (parent).

All three groups also commented on the negative presence of older high school teenagers on the shared path on route to/from school. Children mentioned high school kids would intimidate them by calling them names and/or attacking them.

‘[a friend] was riding his bike once and some kid pretended to throw a rugby ball at him ... they think we’re easy targets,’ (child).

‘some call out rude things behind you as you’re just walking, so they’ll just say something inappropriate or weird as you’re walking away,’ (child).

Parents also mentioned instances of older kids stealing younger kid’s bikes on the way to school. School representatives mentioned a number of events and issues with high school kids affecting younger school kids on the shared path, for example, selling drugs, skipping school and ‘pushing’ (kissing).

‘I don’t know how threatened our kids feel because it’s away from everything. If there were more adults using it and people and busier, I think it would be better because people would feel safer, particularly kids,’ (school representative).

#### 3.4.3. Fun

The idea that the shared path was ‘fun’ was a key factor mentioned by children going by active modes to school. The design of the path infrastructure was fun to walk, bike or scooter on. Many children commented it was ‘fun’, ‘nice and smooth’, and described the path as having ‘great concrete’ which made ‘it really easy to rollerblade on’. Some children commented that they liked going to school by car, because they got to play games on their phone, ‘I like going in the car because I get to play on my phone’, or they got to play with their siblings, ‘I like going in cars because I can play with my little brother.’ The fun and enjoyment of the journey to school often overlapped with the themes under the heading the social environment. This is discussed in more detail below.

#### 3.4.4. Health benefits

All three groups noted a number of health benefits to walking, biking or scootering to/from school. Parents who accompanied their child to school also recognised the health benefits for themselves, ‘it helps with her exercising. It helps with my exercise as well.’ Feelings of calmness, relaxation and being in a good mood were key factors mentioned in relation to active travel to school. Children commented on the presence or absence of sound while on their route to/from school. Those who travelled actively enjoyed the quietness of the path, absent of traffic and in nature.

‘There’s no loud noise. It’s just sort of really calm and enjoyable,’ (child).

‘If you walk out there [next to the main road], you can hear the cars go past, but if you’re walking on the path it’s nice and quiet sometimes. And it’s out in nature. It’s just nice. You can enjoy it,’ (child).

#### 3.4.5. Social environment

There were a number of social benefits mentioned by parents and children in relation to commuting to school by active travel, car or bus. Regardless of travel mode, social benefits to children such as spending time with parents, talking with friends and playing with siblings were all key factors mentioned in relation to travel mode to school.

‘I enjoy walking to school because I get to socialise with my friends,’ (child).

‘We talk about what’s happening at school and what’s going on at school,’ (child driven by car to school with their mum).

‘They walk with a group of friends and we know a lot of people around from here to school,’ (parent).

Some children who travelled by car commented on the social environment as annoying at times especially in relation to their parent’s music selection, annoying siblings and dogs misbehaving.

‘My brother always pulls my hair in the car.’

‘When I have to sit next to my brother and he farts.’



'I sit next to my sister and she yells in my ear.'

Parents of children using both active travel and car modes, enjoyed spending time with them and commented it was valuable 'one-on-one' time. A parent that drove their child to school commented 'I like it. It's a good time for us to catch up in the morning. We have a big chat about what the day ahead is.' While a parent that walked with their child to school commented it's good for them and their daughter, 'because she comes from a large family, it's good for her to have that one-on-one time with her mum as well [...] we get to talk about the day and what not.'

#### 3.4.6. Weather and environment

The weather, such as the presence or absence of rain or hot sun was a key factor related to children's travel to school. Generally, children who walked, biked or scooted to school were more or less happy to do so when the weather was fine and dry. However, there were exceptions such as:

'When I'm walking up there in summer and I'm just like dying in the heat and there's just this one tree that I'll walk under for about two minutes just walking as slowly as I can just because it gives off so much shade,' (child).

However, when it rained both parents and children usually went to school by car. For example, one parent commented, 'While the weather's fine, absolutely. When it rains, that's when I will take the children to school in the car.'

Appreciation of, and care for the natural environment was also related to children's travel mode to school. Children reflected that 'walking was good for the environment' and there's 'less pollution' created than going by car to school. Some children also enjoyed walking past trees and flowers on the way to school, one child commented 'I like walking past trees because they look nice. They have flowers that I really like and sometimes I want to pick some flowers and take them to school.'

#### 3.5. Improvements

A number of the improvements suggested by participants related to each of the themes described in detail above. **Convenience:** Parents and children suggested painting a line down the middle of the shared to improve efficiency and blockages by high school kids across the width of the shared path. The middle line could be used to create two one-way systems, separate walkers and cyclists and also speed up getting to/from school. Some children also suggested putting signs at different points along the shared path with distance in kilometres to destinations in town 'which would encourage people to walk through and stuff.' **Safety:** All groups gave many suggestions on ways to improve both actual safety and perception of safety from others along the shared path such as path lighting and increased security cameras. Additionally, parents and school representatives also suggested police or volunteers patrol the path (via walking, biking or on an electric scooter) before and after school hours to increase the perception of safety among children and parents. Other suggestions to improve safety included, warning lights to slow down cars approaching intersections along the path between the road and train tracks and having different school start and end times to the high schools along the shared path, to avoid negative incidences with high school children. **Fun:** Children in particular gave a number of suggestions to make the shared path more fun for their commute to school. Examples included, more interesting paintings and art such as 'swirls, unicorns, stars, rainbows, and spirals', a rock climbing wall, and playgrounds with 'some kids paintings of what they want to be when they grow up' because as one child commented 'the footpath's a little boring when you walk past. You only see schools and that, and you want something more fun.' **Health benefits:** All three groups recommended installing water fountains and benches along the shared path. Having 'more places you can take a break' and 'benches for people to sit and rest if they needed to' (parent) and not having to 'carry around a drink bottle [...] so you can just have a drink' (child) were key recommendations by parents and children. **Weather and environment:** In relation to the weather and walking/biking along the shared path, children in particular suggested 'more shade' from the sun because 'it's a lot nicer riding or walking in shade as it gets really hot,' and also 'some shelter somewhere because there's no shelter and if it starts to rain you can't go anywhere.' All groups recommended installing rubbish bins along the shared path. One child commented on their frustration of not having bins along the path 'I've had rubbish and I've really wanted to put it in a bin but then I can't. There's no bins until you get onto the road.'

#### 4. Discussion

The aim of this research was to advance understanding of the impact of infrastructural improvements on travel modes to school by triangulating perspectives from children, parents and school representatives. Travel modes to school were mixed across the four schools and differed by school type and decile (area-level socio-economic status). For example, nearly 90% of children attending the private (and highest decile) school in this study, were driven to school (increasing 2% from pre to post-path), whereas less than 65% at the lower decile school (D) were driven to school (down from 68% pre-path). This finding is consistent with a recent systematic review on built environment associates of AST in NZ children and youth which found area-level socioeconomic status was negatively associated with mode of travel to school (Ikeda et al., 2018). Increases in the proportion of AST in three out of the four schools surveyed (A, B and D) from pre to post-path intervention while small (3%, 2% and 6%) are promising considering there was only 4 months between pre and post evaluation. Furthermore, previous studies evaluating infrastructural interventions demonstrate that it can take time to see behavioural change (Goodman et al., 2014).

In line with previous research, parental perspectives on convenience of travel to school in terms of time and distance (McDonald and Aalborg, 2009), trip chaining and family routine (Faulkner et al., 2010) were all important factors related to children's AST. Findings from this study highlight the complexity of decision making for parents around AST and their role as 'gatekeepers' (Mah et al.,



2017). Consistent with previous research (Ikeda et al., 2018; Wilson et al., 2018), parents' perceptions of safety from traffic and strangers continued to influence their decision on their child's commute mode to school, irrespective of the new shared path.

Children and school representatives also expressed concerns about safety from traffic and strangers along the route to school. Schools held assemblies regarding safety and warned children to always walk in pairs and some children felt afraid to walk on their own along the new shared path to/from school. An interesting finding from this research is that most children felt the 'openness' of the shared path improved their perception of safety from both traffic and strangers, however some parents still regarded the new shared path as unsafe because it was 'out of sight' from the main road and strangers could still 'take advantage of little kids'. School representatives also commented on the quietness and lack of other people in the community using the shared path during the times children walk and cycle to/from school and that high school teenagers at times negatively impacted younger children walking/cycling to school along the shared path.

Children also commented on the fun aspect of their commute to school. Active travel on the shared path to school was enjoyable because of the smoothness of path for walking, cycling and rollerblading. Children that travelled by car to school enjoyed playing games on their phone or with their siblings. Our findings are consistent with the limited studies that have reported on fun and enjoyment of active travel to school (Fusco et al., 2012; Romero, 2015). Specific neighbourhood attributes with natural elements, recreational amenities and retail spaces are places where children can experience fun and derive much pleasure (Egli et al., 2019; Romero, 2015). Romero argues that neglecting the 'sensory, playful, autonomous and social facets of what children consider' as being fun, 'would be to misrepresent children's walk to school' (Romero, 2015).

Consistent with previous research, (Egli et al., 2019; Hinckson, 2016; Race et al., 2017; Zwerts et al., 2010) all three groups in this study described a number of health and social benefits of commuting to school such as exercising, socialising with friends and spending time with family. Similar to other studies (Fusco et al., 2012; Wilson et al., 2018), parents and children also mentioned that the weather and environment impacted on their decision to walk/bike to school or take the car.

#### 4.1. Study strengths

A strength of this study is the multiple methods approach that included measuring travel to school at multiple time points before and after an infrastructural intervention and the qualitative approach to include three different perspectives (child, parent and school representative) to gain a comprehensive understanding of the factors related to travel mode to school. Another strength was the triangulation of infrastructural and 'soft' recommendations from children, parents and school representatives to improve the accessibility, utility and safety of the new shared path. The suggestion from parents and school representatives of having volunteers or police patrol the shared path during the times children walk or bike to/from school is important to increase the perception of safety. While these recommendations are specific to the study area, many of the ideas (such as providing benches, water fountains, rubbish bins, cameras, painting art, planting flowers, trees) are of practical benefit for other towns in NZ looking to implement built environment interventions to encourage AST. Another strength of the study was the level of engagement from each of the four schools, and the enthusiasm to collaborate with the local council to improve the environment for active travel to school.

#### 4.2. Study limitations

This was a repeat cross-sectional study and as such does not provide an understanding of the longitudinal effects of the shared path on travel behaviours. In addition, hands-up surveys were not completed by all four schools at every stage, however surveys were completed before and after the opening of the shared path for all schools. Address data were not collected and therefore we were unable to determine differences in distance to the intervention (shared path) or if the path was a relevant route for children that walked or biked to school. However, because we collected data on all travel modes to school we were able to include children that came by car and also used the path.

#### 4.3. Implications for future research

The unique triangulation of children, parents and school representative's perspectives is a novel contribution to research on AST. A number of insights and real-world examples of how to make infrastructural interventions more attractive, fun, interesting and accessible were highlighted in this study and have implications for urban and town planners and active school travel policy makers. Future research on AST should aim to include perspectives from multiple stakeholders (children, parents and school representatives) that use infrastructure interventions. In addition, researchers should seek suggestions for improving AST interventions and communicate their findings with local councils.

### 5. Conclusion

This study sought to understand factors related to travel mode to school through a child-centred approach that incorporates children, their parents and school representative's perspectives. Three out of four schools surveyed reported small but promising increases in the proportion of AST from pre to post shared path intervention. Understanding multiple perspectives from children, parents and school representatives' revealed a number of factors related to children's mode of travel to school. This study highlights the importance of fun and the enjoyable aspects of children's commute to school. In addition, children and parents from this study gave practical recommendations to improve the aesthetics, accessibility, utility and safety of the shared path intervention that if acted upon,