Travel and Commuting Before and After COVID-19

A thesis

submitted in partial fulfilment

of the requirements for the degree

of

Master of Social Sciences in Psychology

at

The University of Waikato

by

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THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

2021

Abstract

Major life events such as COVID-19 have the potential to change how people think about their transport choices. The COVID-19 pandemic has posed a threat to health and created an extended period of disruption in people's lives which could result in long-term changes towards travel attitudes and use of transport services. Research on changes towards travel attitudes and use of domestic travel modes as a result of previous pandemics was very limited with most studies focused on international travel. This study aimed to investigate how COVID-19 has influenced attitudes towards travel and intention to use transport modes in New Zealand and Australia. A survey was created and completed by 787 respondents (New Zealand n = 506, Australia n = 281). The results showed attitudes towards travel were negatively affected, particularly towards air travel and public transport and showed decreases in intentions to use these modes of transport. These changes in attitudes and intentions were more prominent in the Australian sample which reported less positive attitudes and larger decreases in intentions to use domestic transport modes. Further, international air travel attitudes and intentions were similar between the New Zealand and Australian sample. Age, gender, and perceived risk scores were also examined, with some significant but small effects. This information is useful to understand how the demand for transport services might change, particularly as New Zealand and Australia are ahead of many other countries in the pandemic cycle.

Key Words: Pandemic, Travel attitude, Travel intentions, Transport use, Transport system, Public transport, Air travel.

Acknowledgements

Firstly, I would like to acknowledge my supervisor Samuel G. Charlton for his continued support throughout my postgraduate studies. He truly went above and beyond to help me develop my research skills and begin the transition from graduate study into potential career opportunities. I would want to acknowledge the involvement of Ioni Lewis and Sonali Nandavar from the Queensland University of Technology for their valued contribution and feedback on my master's project. Additionally, I would like to thank Jess Leov and Rob Bakker for their assistance and support in my postgraduate studies.

To my friends and family, I want to thank you for creating my support system and encouraging me throughout my time at university. I would like to add a special thank you to Amber-Sky Wilkes, Vaughan Goodhue and Alaria Goodhue for opening their home to me while I finished my final weeks at university. I have made numerous friends during my time at university, and I want to acknowledge Jason Render, James Major, Shaun Foley, and Lea-Renee Iddles.

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1 Introduction

1.1 Background

Our choice of travel mode for commuting is repeated behaviour. For many of us, these behaviours occur every day to get to work or school. People often repeat the same journeys, under the same circumstances, using the same mode of transportation. Thus, travel behaviour is largely a result of habit, as opposed to deliberate decision-making (Verplanken et al., 1994). Travel habits, like other habits, are generally quite resistant to change. Theories of habit suggest that when behaviour occurs repeatedly under the same conditions, the behaviour may become automated, so that the presence of the environmental cues initiate the behaviour with little to no conscious effort (Fujii & Gärling, 2003, 2005). This automaticity can result in behaviours being performed even when they no longer have the most favourable outcome (Walker et al, 2015). For example, a commuter may continue to use a car, even if a new bus lane made travelling faster and more affordable by bus, simply because the well-established habit of car use means that the commuter no longer searches or notices new information related to other options for their commute. Changing behaviours that occur almost automatically is difficult, and often requires changes to the cues that surround the behaviour.

Habits are more susceptible to change when the conditions or environmental cues that surround them are changed, such as when moving to a new house, or changing jobs. Major public emergencies (such as earthquakes and major flooding), while rare, disrupt the conditions that support travel habits occurring automatically. Research on habits suggests when the cues that trigger behaviour are disrupted people revert to deliberate decision making and are more deliberate in relation to their choice of transport (Walker et al., 2015). These disruptions provide a potential opportunity for new behaviours, and for new habits to form. The idea is to leverage

disaster, challenging the usual ‘bouncing back’ mindset to one that is ‘bouncing forward’ towards more desirable outcomes (Brundiers, 2018, 2020).

This idea of leveraging disaster to produce positive social change has been explored previously, such as the 2010-2012 Christchurch earthquakes in New Zealand (Brundiers, 2018). The study involved semi-structured interviews with sustainable change agents in the Christchurch areas. Ideally, plans to leverage disaster start before the disaster occurs and include concepts such as building social networks, preparing for opportunities, and crafting sustainable visions (Brundiers, 2020). The study also provides advice for future attempts towards creating sustainable change when disaster strikes (Brundiers, 2018). While Christchurch was not initially very successful at leveraging disaster, the change agents indicated they continued to see, seize, and sustain opportunities that arose after the initial disaster period (Brundiers, 2018). Further, efforts towards change after a disaster often over focus on short-term objectives. Having a vision of the future can provide a reference point towards change over the long-term, rather than looking back at pre-disaster practices to inform post-disaster initiatives (Brundiers, 2020).

One source of travel disruption is the emergence of infectious disease outbreaks, including epidemics and pandemics. Many countries include travel restrictions to limit human mobility in their contingency planning for infectious diseases (Bajardi et al., 2011). These travel restricted periods serve as a break in commuting habits for most people, as only essential businesses can be open, public transport becomes very limited, and social distancing is enforced. While outcomes of pandemics are largely negative, the current coronavirus disease 2019 (COVID-19) pandemic has been proposed to also offer a unique time to proactively shape transport habits as the environmental cues that support travel behaviours have been disrupted.

The underpinning belief being that through disaster, and the disruption that occurs, an opportunity may exist to create positive change.

Arguably, the road transport system that existed before COVID-19 needs some positive change. This suggestion is based on the observation that road transport is increasingly congested and is distressing our natural environment. Sustainable transport plans have included several ideas to reduce car use, by increasing the use of shared transport options and active transport such as cycling and walking. Efforts to change travel habits towards more sustainable options are essential, especially as the increasing population and the urbanisation of many areas accentuate transport problems, such as infrastructure not evolving at the same pace (Abrahamse et al, 2010).

Previous research on the effects of pandemics and epidemics on travel has largely focused on changes to international travel resulting from disease outbreaks, with fewer studies having researched changes to domestic travel. In addition to the obvious changes resulting from mandated reductions on travel, some segments of the population will experience significant concern and anxiety about domestic travel, both by air and by road. Some important questions to consider include: what are the levels of this concern or anxiety? What is likely to be the long-term impacts of these concerns on the transport system? How can we alleviate these concerns without increasing adverse health outcomes? Finding the answers to these issues is important for everyone, particularly in the face of the current COVID-19 pandemic.

Research into individuals' responses to the 2009 Influenza A virus (H1N1) pandemic explored initial attitudes towards the disease in two countries; Europe and Malaysia (Goodwin et al, 2009). Large regional differences in anxiety and concern were found, with 42% of Malaysians and only 5% of Europeans reporting they were 'very concerned' about catching the flu. Further, 48% of Malaysians reported reduced public transport use, compared to 22% of Europeans. These

differences were also observed in relation to respondents' air travel plans, with 56% of Malaysian, compared to 17% of Europeans, having contemplated either cancelling their air travel plans or delaying their flights.

While there are concerns about virus transmission in relation to COVID-19, this does not provide insight into whether this would result in behavioural change. Another study explored Queensland (Australia) travellers' intentions towards travel during the H1N1 pandemic in 2009 and found that more than half the sample (53.2%) surveyed expressed at least some concern over the virus (Leggat et al., 2010). Yet, a majority (59.3%) of the survey respondents indicated that they would not be willing to postpone their travel plans if they exhibited symptoms consistent with those of H1N1. This finding suggests that at least in the case of the H1N1 pandemic and the sample of respondents surveyed, reported concern about the virus did not necessarily result in intended changes to their use of transport.

While concern does not guarantee behaviour change, research has shown that perceptions of risk (contracting a disease) can increase the likelihood of proactive behaviour aimed at reducing risk, including measures such as receiving vaccinations and travel avoidance (Brewer et al, 2007). Perceived risk in this context is conceptualised as a persons' perception of susceptibility to the disease, and their perceived severity if they were to contract the disease. The higher a persons' perceived risk, the more likely they are to modify their behaviour to reduce their risk. Further, while people might not avoid travel entirely, they may avoid places that are considered risker. Perceived risks related to travel, whether general or to a specific destination are closely related to intentions to modify travel plans or avoid travel entirely (Neuburger & Egger, 2020). People are more likely to avoid places they perceive as high risk and will either postpone travel or find alternatives (Neuburger & Egger, 2020).

Personal and demographic factors have also been shown to influence perceptions of risk. Gender differences in risk perception are well documented; women generally report higher levels of concern about risk than men (Hitchcock, 2001). While gender differences have been reported in relation to perceived risk, some research suggests that men and women may worry about different things. For example, men seem to be more concerned about risks related to industrial accidents and women are generally more concerned about risks related to overexertion injuries and infectious diseases (Gustafson, 1998). This is likely influenced by culture and social roles historically prescribed to men and women. During epidemics and pandemics, women tend to take up more caregiver responsibilities than usual, often at the expense of their health. Additionally, many women have jobs in healthcare that put them at the front line and more at risk of infection (Simba & Ngcobo, 2020).

Age differences in perceptions of risk have also been documented and are often contextual; older adults generally perceive more risk concerning health and ethical domains but less risk in relation to social domains when compared to younger adults (Bonem et al., 2015). Older adults are at higher risk of severe cases of COVID-19, with 89% of recorded deaths in the UK involving COVID-19 between March and May 2020 comprised of those over the age of 65 years (65–74 years: 15%, 75–84 years: 32%, 85+: 42%) (Office of National Statistics, 2020). The increased mortality rate for those over 65 could influence this group's perceptions of risk related to COVID-19, and associated avoidance behaviour concerning travel and transport modes.

Researchers have found evidence to suggest factors such as perceived risk, age, and gender can also influence the extent of travel avoidance within a population. A survey examining the Ebola epidemic in the United States (US) revealed that people were more likely to avoid

domestic travel if they believed they were susceptible to the disease whereas people with high self-efficacy were less likely to avoid travelling domestically (Cahyanto et al., 2016). The study also found younger adults, and females in their sample reported more travel avoidance than males and older adults. Additionally, the results did not indicate a significant relationship between the perceived severity of Ebola and subsequent travel avoidance; this contradicted several reports that suggest people avoid travel (especially to high-risk places) to reduce their risk of contracting the disease (Lau et al., 2009). A potential explanation proposed was that perceived severity may decrease as more information on the disease is discovered.

While New Zealand and Australia have responded well thus far to the challenges of COVID-19 with a lower spread of transmission than other countries, research conducted during previous pandemics has shown that high rates of infection within an area are not required for people to experience stress and anxiety related to a pandemic (Blendon et al., 2004). The impact of pandemics and the corresponding changes in travel behaviour can be examined on the basis of internal and external motives, such as perceived risks and travel restrictions (Wen et al., 2005). The perception of risk can change behaviour beyond that posed by the actual risk. Thus, the perception of risk can be more indicative of actual behavioural change. It is important to understand how people's perceptions of risk are related to the recent emergence of COVID-19 and how these compare to previous pandemics. This information is important for governments and transportation planners to better plan and adapt to changes in demand for transport services.

Compared to other pandemics, the unique challenge of COVID-19 includes its fast-global spread and large numbers of asymptomatic infected people (Hendrickson & Rilett, 2020). What quickly became apparent was that the effect of the COVID-19 pandemic would be long-lasting. COVID-19 has had human and economic costs that far exceed most previous pandemics

(1.5million dead as of this writing, compared to 284,000 for H1N1 and the 1.1 million dead from the 1957-58 Asian Flu pandemic (Viboud et al., 2016)). The long-term effects of COVID-19 will likely impact transport systems and the demand for transport services, including public transport and air travel.

During the initial outbreak as restrictions were being implemented in Australia, research detailed the changes to household travel, work activities and shopping (Beck & Hensher, 2020). Google has produced community mobility reports that provide insight into changes in travel behaviour as a result of COVID-19 concerns and travel restrictions. This information shows movement between locations, categorises the types of trips that are being made and compares this data to pre-COVID-19 travel levels. As shown by the google community reports, people in Australia were spending more time at home and drastically less time at workplaces, places of retail and recreation, and transit locations. In a survey conducted in Australia from the end of March to mid-April, 78% of respondents reported that they had made changes to their everyday travel (Beck & Hensher, 2020). It is difficult to understand what changes will occur long-term to transport use as a result of COVID-19.

One potential positive outcome of the lockdown period as suggested by Harrington and Hadjiconstantinou (2020) was that attitudes becoming more negative towards public transport may motivate people to walk or cycle to work. The findings of their survey showed that 20% of public transport users and 10% of car users had intentions to cycle or walk more as a means of transport after restrictions had been removed. However, the United Kingdom (UK) government discouraged the use of public transport options during the lockdown. There are concerns that this discouragement may result in long-term impacts on the use of public transport as seen in Taiwan following the Severe Acute Respiratory Syndrome (SARS) pandemic (Harrington &

Hadjiconstantinou, 2020). SARS (2002-2004, first identified in 2003) originated in China and spread to Hong Kong, Singapore, Viet Nam and Canada (World Health Organisation, 2003). In Taiwan, public transport use did not return to pre-SARS levels until close to 5 months after the last recorded SARS-related death (Wang, 2014).

There are also concerns that some public transport users would be more inclined to reduce their public transport use in favour of car use when returning to their workplaces (Harrington & Hadjiconstantinou, 2020). Research has shown increased car use has occurred in the US as a result of COVID-19. A survey was administered during April 2020 and had 14,000 respondents answer questions about their private and public use of transport. The results found 17% of respondents indicated they intended to use their vehicle more often because of COVID-19 concerns. Additionally, 20% of respondents who indicated that they were regular users of public transport before the pandemic said they will no longer use public transport services, with a further 28% indicating they intended to reduce their use.

How the COVID-19 will change the world's travel habits is an open question. Certainly, research has shown that the stronger a habit is the more difficult it is to change (Verplanken et al., 1994). A study exploring the impacts of relocating houses on transportation mode choice found participants who reported strong transportation habits were less likely to change their transport mode during the relocation (with such relocation representing a major life event) (Zarabi et al., 2019). The study also found the strength of travel habits was directly related to people's willingness to change their travel, such that strong habits were unlikely to change without an accompanying willingness to change, even after a major life event.

There is also evidence to indicate that the behavioural automaticity underlying travel behaviour does not immediately cease but is more likely to weaken over time as the new travel

habit strengthens (Walker et al., 2015). Such findings imply that time plays a critical component to habit maintenance and change as the original habit tendencies are still present during the disruptive period and can be susceptible to reinstatement. In the case of COVID-19, we do not know whether the changes that occur due to COVID-19 travel restrictions and concerns will result in long-term change to transport use, or if travel behaviour will revert to levels seen before COVID-19 when travel restrictions associated with the pandemic have been removed.

1.2 The current study

The current study investigated people's attitudes and intentions towards everyday shared travel modes prior to COVID-19 concerns, at a time when travel restrictions have been eased to allow for domestic travel, and when restrictions have been removed to allow for international air travel. This survey was initiated while New Zealand and Australia had instituted travel restrictions, a strict nationwide lockdown in the case of New Zealand. The study was rapidly submitted for ethical review in both New Zealand and Australia, and data collection began in each country shortly after ethics was approved. The project was approved by the appropriate University of Waikato Human Ethics Committee in New Zealand on the 12th June 2020 and by the Queensland University of Technology Human research committee in Australia on the 16th of July, 2020.

There were similarities in the way both countries approached the pandemic, such as restrictions on indoor gatherings that occurred at similar time points. Figure 1 presents a timeline outlining some of the important COVID-19 event dates for New Zealand and Australia. Australia first reported cases of COVID-19 on the 25th of January 2020, with New Zealand's first case being reported roughly a month later on the 28th of February. Regarding border closures and limited indoor gatherings, both New Zealand and Australia implemented restrictions in mid-

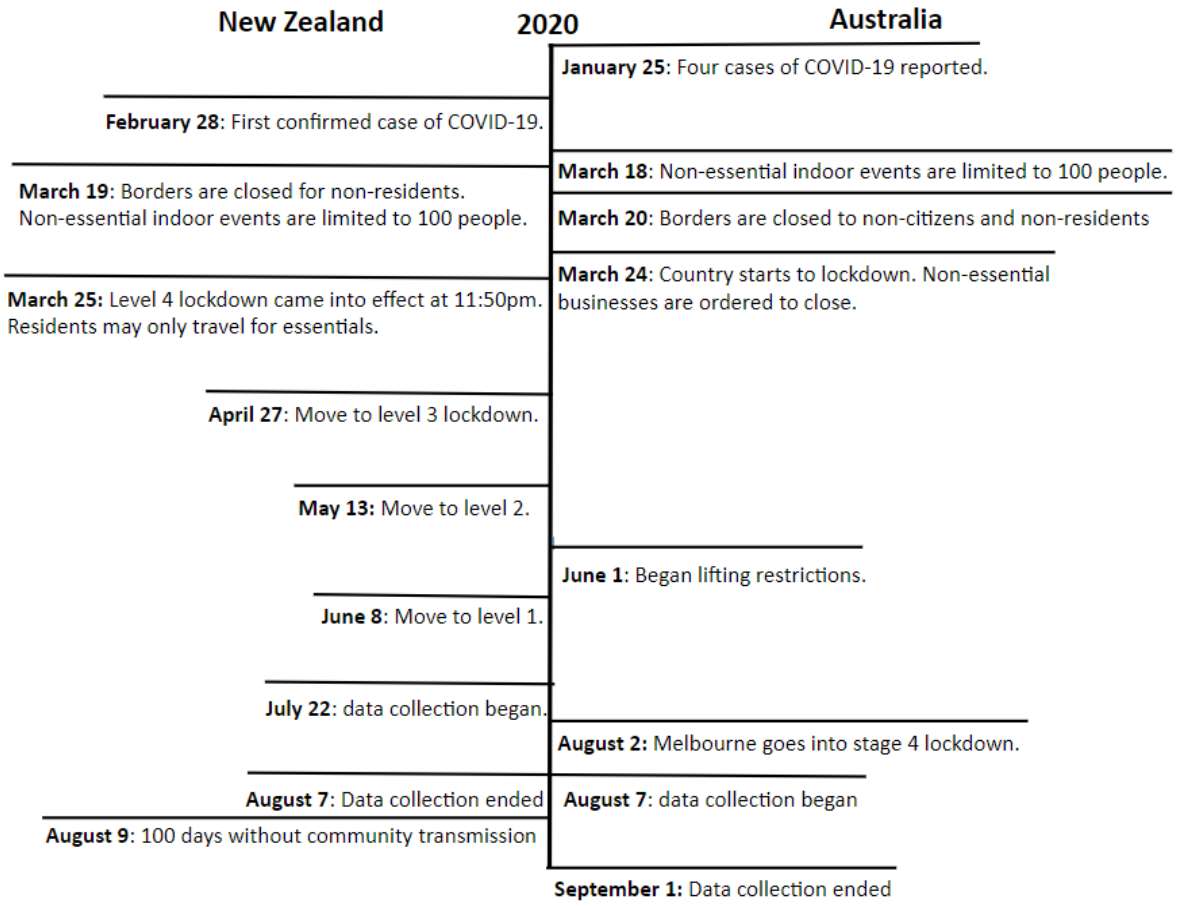
March. Australia started closing non-essential businesses on March 24th, while New Zealand prepared for a nationwide lockdown that went into effect on March 25th. After several weeks, restrictions in both countries began to ease. Data collection in New Zealand began on July 22nd and ended on the 7th of August. Australia had cases reported in Melbourne which resulted in a state-wide lockdown on August 2nd. Data collection in Australia began on August 7th and ended on September 1st, 2020.

The effects of COVID-19 and the public responses that New Zealand and Australia used to manage the initial outbreak of the pandemic were different from the responses taken by the US and UK. This includes the duration of the outbreak and restrictions on their transport systems as well as an earlier conclusion in New Zealand and Australia. This provides an opportunity for an early look at likely outcomes other countries may experience.

The added benefit of having survey data collected in both Australia and New Zealand was that the people are quite similar, yet the experience of lockdown were slightly different for New Zealand and Australia. New Zealand had an early and strict lockdown, declaring a national state of emergency on 25th March 2020. Australia passed through several stages of lockdown beginning at about the same time, with some differences between the states. Australia, with a larger population, and travel between states (as compared to the geographical isolation of New Zealand) had a more complex lockdown regime. Both countries, however, largely eliminated or curtailed the pandemic spread by August (with minor exceptions), much sooner than countries elsewhere in Europe and in the US.

Figure 1.

Timeline of the New Zealand and Australian COVID-19 restrictions and data collection timeframe.



1.3 Research questions

The fundamental question explored was how the COVID-19 pandemic affected travel attitudes and intentions to use transport. We included private and public road transport as well as domestic and international air travel. While we did not have any specific predictions, we were interested in the attitudes of New Zealand and Australian commuters before the implementation

of travel restrictions associated with COVID-19, during its implementation, and after travel restrictions had been lifted.

Additionally, this study was also designed to collect personal and demographic information (age, gender, perceived severity, and perceived susceptibility) to examine if these might influence attitudes and intentions to use transport modes.

2 Method

2.1 Design

A convenience survey (non-stratified) was used to explore attitudes and intentions towards travel before and after COVID-19. In New Zealand, the survey was advertised (see Appendix A) and conducted by staff at the University of Waikato. In Australia, the survey was advertised (see Appendix A) and conducted by the Queensland University of Technology. All respondents who completed the anonymous survey had the option to provide their email address to be included in a prize draw. New Zealand and Australian held separate prize draws with 14 $50 vouchers allocated to each country.

2.2 Participants

To be eligible, respondents were required to hold a New Zealand restricted or a full driver licence, or an Australian provisional or open driver licence, be over 18 years old, and must have been currently residing in either New Zealand or Australia. The mean age of the overall sample was 46.49 years and ranged from 18-85 years.

The New Zealand sample: a total of 506 eligible respondents completed the survey (206 male). The respondents' ages ranged from 18-83 years, with a mean age of 44.71 years. For the ethnicity of the sample, see Table 1.

The Australian sample: a total of 281 eligible respondents completed the survey (118 male). The respondents' ages ranged from 18 to 85 years, with a mean age of 49.70 years. For the ethnicity of the sample, see Table 1.

Table 1

Ethnicity reported in the New Zealand and Australian samples as a percentage

Ethnicities	New Zealand respondents	Australian respondents
New Zealand European	77.1	4.5
Māori	12.7	0.3
Australian	1.8	71.7
Indigenous Australian	0.2	0.6
Other European	8.9	12.4
Pasifika	2	0
Chinese	1.4	2.3
Indian	2	1.6
Other	8.4	6.5

2.3 Materials and measures

The survey questions related to attitudes towards transport modes and intended use of travel modes were specifically created for this study to answer the question of how the COVID-19 pandemic affected attitudes and intentions to use transport. The survey included questions to measure respondents' attitudes towards a range of shared travel modes, including carpooling, public transport, and domestic and international air travel, pre and post-COVID-19 restrictions. Public transport was defined as public buses, trains, and ferries that anyone can use to travel in your local area. Carpooling was defined as travelling in a car with other people that may or may not be related to you. Specifically, the questionnaire asked respondents for ratings of their attitudes towards travel at three specific times; prior to COVID travel restrictions, when travel restrictions have eased, and after travel restrictions had been removed.

When questioning participants about their attitudes and travel use before COVID-19, two phrases were used for consistency. The phrase "prior to COVID-19" asked respondents to

answer as they would have answered just before concerns about COVID-19 arose and restrictions were put in place. The phrase “in the 12-months before COVID-19” asked respondents to answer about the 12-month period before COVID-19 concerns and restrictions and, indeed, before any experience or knowledge of COVID-19.

For the section regarding when restrictions have eased, it was outlined that respondents should report their likely attitudes towards travel at a time when restrictions have eased, and travel is allowed domestically. In this section, respondents were also asked about their intentions to change their use of the travel modes. Because of New Zealand and Australia’s quarantine restrictions on overseas travellers we did not include any questions about respondents’ likely attitudes towards international air travel once restrictions were eased as international air travel was emphatically not an option for most New Zealand and Australia residents. The analysis of attitudes regarding when restrictions had been removed asked respondents to report their likely attitudes once COVID-19 travel restrictions have been removed, and travel is allowed both domestically and internationally. Response options to the questions related to travel attitudes were reported on a Likert scale with five points: extremely positive, somewhat positive, neither positive nor negative, somewhat negative, and extremely negative.

Questions related to intentions to use transport options were similar. Respondents were asked to report their public transport, car, domestic air travel, and international air travel use over the 12-month period before concerns of COVID-19. Respondents were then asked to compare their use before COVID-19 to a time when restrictions have been eased, and their likely use when restrictions have been removed. Responses were recorded on a Likert scale with five options: moderate increase, slight increase, no change, slight decrease, moderate decrease.

The survey also included two measures of interest: perceived severity, and perceived susceptibility. These questions were selected and adapted from Cahyanto and colleagues (2016). The time frame of "right now" was adapted as we were interested in attitudes and intentions when COVID-19 restrictions had been removed, rather than attitudes while restrictions were in place. Additionally, the response options for these questions used a 5-point Likert scale: strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, strongly disagree.

The perceived severity measure included three questions which were used to measure the respondents' perceptions of the severity of the illness if they were to contract the COVID-19 virus. The perceived susceptibility measure included five questions which were used to measure the respondents' perceptions related to their susceptibility to the COVID-19 virus. The full survey contained 93 questions and took estimated to take approximately 20-25 minutes to complete (see Appendix B).

2.4 Procedure

The New Zealand data collection began on the 22nd of July and ended on the 7th of August 2020. The New Zealand portion of the study was advertised online through social media sites, and email invitations were sent to a database of previous participants from the University of Waikato's Transport Research Group. Advertisements promoting the study included a link to the survey which was administered using Qualtrics. New Zealand respondents were provided with an information section that outlined the study aimed to explore attitudes towards travel before and after COVID-19.

The Australian data collection began on 7th August and ended on the 1st of September 2020. Online advertisements on social media sites were also used for the Australian survey. During the ethics review process, the format of the survey administered in Australia was changed

slightly (e.g., the demographic information was moved to the beginning of the survey and psychological distress information was added) to comply with the ethics committee's recommendations. Prior to commencing the survey, the Australia sample viewed a separate information sheet designed for Australian respondents (see Appendix C). All respondents were informed that they were free to withdraw from the study at any time and that by continuing with the survey they were providing informed consent for the information gathered to be analysed and the study's findings to be disseminated.

3 Results

3.1 Research question 1. Attitudes and intentions towards travel modes

The main research question (how has the COVID-19 pandemic affected attitudes and intentions to use transport?) was addressed by asking the respondents to rate their attitudes towards several modes of transport at three stages of the pandemic: attitudes prior to the pandemic, expected attitudes when travel restrictions had been eased, and expected attitudes once restrictions had been removed. In addition to attitudes, we also asked respondents about their likely intentions to use each mode during two stages: when restrictions have been eased, and when restrictions have been removed. The transport modes we asked about included public transport, carpooling, car use, and domestic and international air travel. The ratings for each transport mode are described in the sections that follow.

3.1.1 Public transport

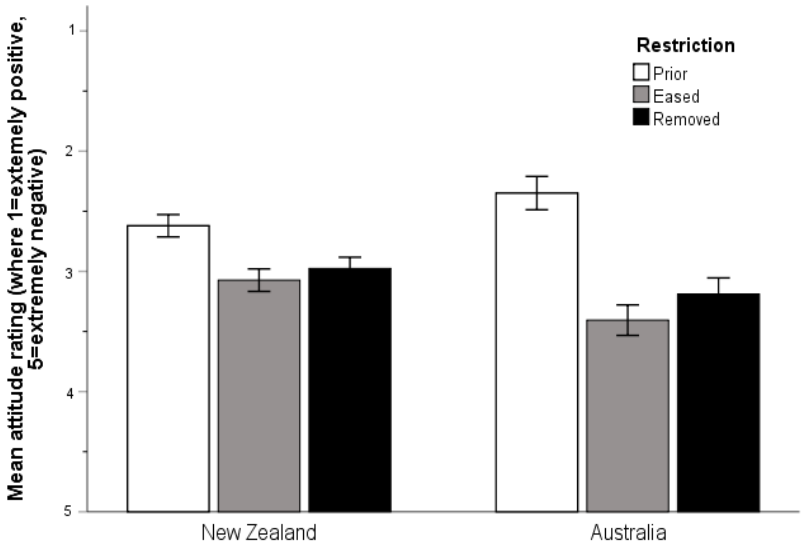
Beginning with public transport, respondents' attitudes towards public transport were compared at the three time contexts, or restriction phases, outlined in this survey; namely, prior to the COVID-19 outbreak, when COVID-19 travel restrictions had eased, and after all restrictions had been removed. The mean ratings for these questions were first assessed separately for each country (see Figure 2).

Attitudes were the most positive prior to COVID-19, becoming less positive at a time when restrictions have been eased and showing some recovery when restrictions have been removed. Respondents from the New Zealand and Australian samples had similar patterns in their attitudes towards public transport. As can be seen in Figure 2, Australian respondents showed slightly more positive attitudes towards public transport than the New Zealand sample prior to COVID-19 (M = 2.62 for New Zealand, M = 2.35 for Australia). Both samples reported

more negative attitudes at a time when restrictions have eased (*M* = 3.07 for New Zealand, *M* = 3.41 for Australia), improving slightly when all travel restrictions have been removed (*M* = 2.98 for New Zealand, *M* = 3.19 for Australia).

Figure 2

Mean attitude ratings towards public transport at each phase of travel restriction, grouped by country. Whiskers indicate 95% confidence intervals.



A 2 (country: New Zealand, Australia) by 3 (restriction phase: prior, eased, removed) ANOVA was used to compare respondents' attitude ratings towards public transport between New Zealand and Australia at each phase of restriction. The results showed a significant main effect of the restriction phase [$F(2,1570) = 241.420$, $p<.001$, $\eta_p^2 = .235$], but no significant overall difference between the countries [$F(1,785) = 1.708$, $p = .192$, $\eta_p^2 = .002$]. There was, however, a significant interaction between country and restriction phase [$F(2,1570) = 38.947$, $p<.001$, $\eta_p^2 = .047$]. Subsequent post-hoc comparisons revealed a difference in the way the two countries responded to the COVID-19 restrictions with a greater increase in negative ratings towards public transport for respondents in the Australian sample at the eased restriction phase

(mean change of -1.057, 95% *CI* = -1.238 to -.875) compared to respondents in the New Zealand sample (mean change of -.453, 95% *CI* = -.564 to - .341), and subsequently a greater increase in positive ratings for when restrictions had been removed (a mean difference of .217 for Australia, 95% *CI* = .103 to .329, and a mean difference of .097 for New Zealand, 95% *CI* = .025 to .169).

To investigate the possibility that frequent users of public transport might have different attitudes to respondents who used public transport only rarely we followed this up with a comparison of these two groups of respondents. Respondents were defined as regular users if they indicated they used public transport at least a few times a month during the 12 months period before COVID-19 concerns (*n* = 71 in New Zealand, *n* = 101 in Australia). These regular users' attitudes were then compared to those who indicated they use public transport infrequently (less than a few times a month) and who were classified as non-regular users in relation to public transport.

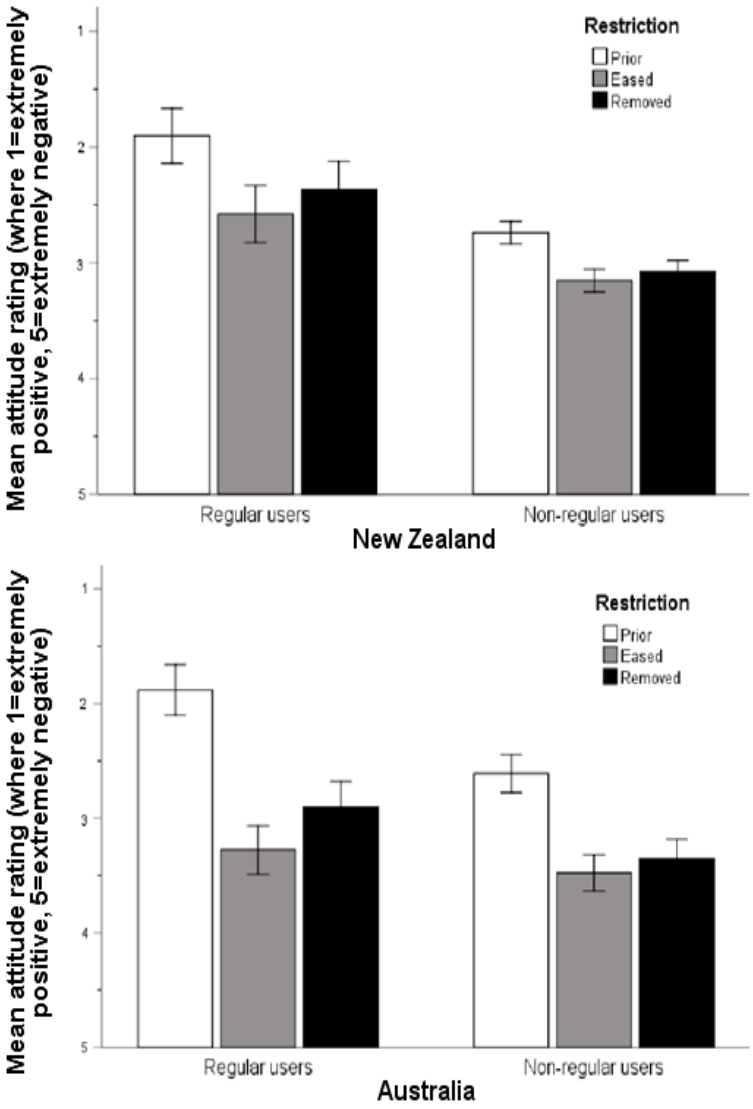
Interestingly, the Australian sample had a higher percentage of regular public transport users (35.9%) than the New Zealand sample (14.0%) which may have contributed to the difference in attitudes observed between the New Zealand and Australian samples' ratings prior to COVID-19. Regular users in the New Zealand (*M* = 1.90) and Australian sample (*M* =1.88) had similar attitudes towards public transport prior to COVID-19 with the ANOVA failing to detect any difference in the attitude ratings of regular public transport users in the two countries [$F(1,170) = .019$, $p = .889$, $\eta_p^2 = .000$]. Non-regular users of public transport in the New Zealand (*M* = 2.74) and Australian sample (*M* = 2.61) had similar attitudes prior to COVID-19, again the ANOVA comparing the attitudes of non-regular users in the two countries was not significant [$F(1,613) = 1.713$, $p = .191$, $\eta_p^2 = .003$]. In sum, the higher proportion of regular users in the Australian sample appears to have contributed to the overall higher rating towards public

transport seen prior to COVID-19. Thus, the Australian sample's more positive attitudes towards public transport may have indeed been influenced by the higher percentage of regular users in Australia.

Next, regular and non-regular users' attitudes were examined at all three stages of restriction for each country (see Figure 3). As can be seen in Figure 3, both countries showed a similar pattern of attitudes with regular public transport users reporting more positive attitudes towards public transport at each phase of restriction than non-regular users. It appeared that regular public transport users in Australia had the largest change in attitudes between the prior and eased phase, a difference of 1.4, as compared to a difference of 0.68 in the ratings from the New Zealand sample. A 2 (country) by 2 (regular, non-regular users) by 3 (restriction phase) ANOVA revealed that the difference in attitude change was significant with a two-way interaction between restriction phase and country; [$F(2,1566) = 26.013$, $p<.001$, $\eta_p^2 =.032$]. Consistent with previous analysis, regular users of public transport were affected more than non-regular users as indicated by a two-way interaction between restriction phase and public transport use [$F(2,1566) = 10.437$, $p<.001$, $\eta_p^2 =.013$]. There were no interactions between public transport users and country [$F(1,783) = 2.34$, $p=.126$, $\eta_p^2 =.003$] or higher-order interaction between restriction, country, and public transport use; [$F(2,1566) = 1.23$, $p =.294$, $\eta_p^2 = .002$].

Figure 3

Mean attitude ratings towards public transport at each phase of restriction, grouped by frequency of use, and separated by country (Top: New Zealand, Bottom: Australia). Whiskers indicate 95% confidence intervals



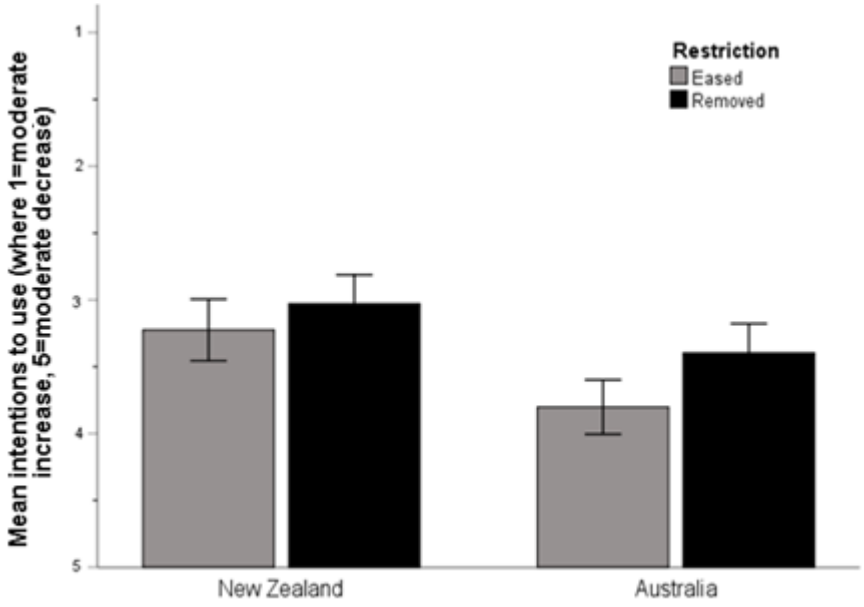
Next, we wanted to know if changes occurred in intentions to use public transport when COVID-19 travel restrictions have been eased, and when travel restrictions have been removed.

We specifically looked at regular users' intentions to change their transport use (to make any changes in intentions easier to see).

Regular users' intentions to use public transport showed decreases in use at the eased restriction phase, followed by some recovery in intentions to use public transport when restriction have been removed. As shown in Figure 4, respondents who regularly used public transport in the New Zealand sample reported less change in their intentions to use public transport between restriction phases, with a greater difference between the phases for the Australian respondents. These observations were reflected in the results of a 2 (country) by 2(restriction phase: eased, removed) ANOVA which revealed a significant difference between restriction phases [$F(1,170) = 21.203$, $p < .001$, $\eta_p^2 = .111$], but no significant interaction between country and restriction phase [$F(1,170) = 2.54$, $p = .113$, $\eta_p^2 = .015$]. There was an overall main effect of country [$F(1,504) = 10.836$, $p = .001$, $\eta_p^2 = .060$] which indicated that country of residence influenced the respondents' intentions to use public transport.

Figure 4

Regular users' intentions to use public transport at the eased and removed restriction phase, grouped by country. Whiskers indicate 95% confidence intervals.

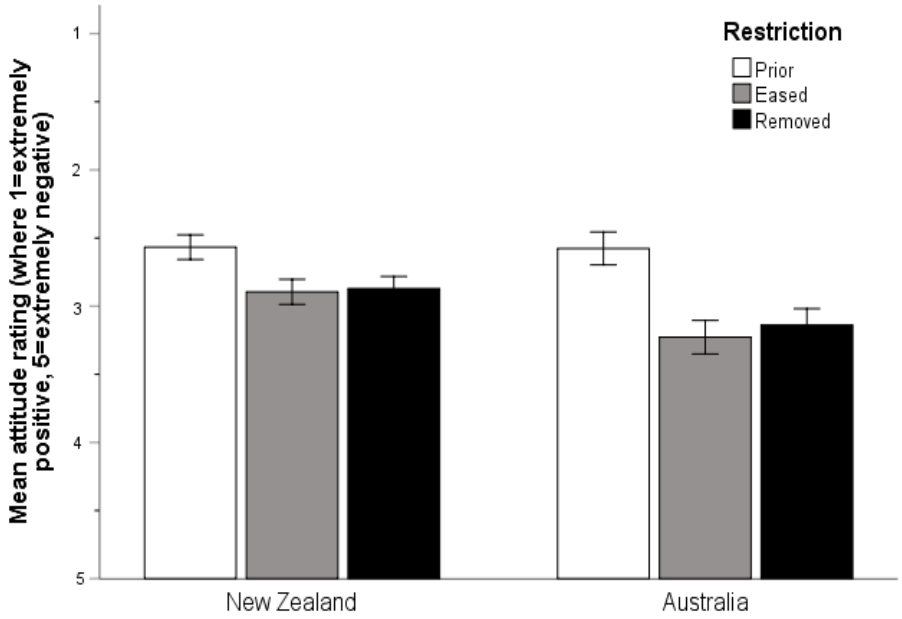


3.1.2 Cars

Another shared transport mode that we examined was attitudes towards carpooling. Respondents were asked to rate their attitudes towards carpooling at each restriction phase. The mean ratings for these questions were grouped by country of residence (see Figure 5).

Figure 5

Mean attitude ratings towards carpooling at each phase of restriction, grouped by country. Whiskers indicate 95% confidence intervals.



Similar to public transport attitudes, respondents in the New Zealand and Australian samples had similar patterns in their attitudes towards carpooling. As shown in Figure 5, both samples reported positive attitudes prior to COVID-19 (M = 2.57 for New Zealand, M = 2.58 for Australia), with attitudes becoming less positive at a time when restriction have eased (M = 2.90 for New Zealand, M = 3.23 for Australia), showing some movement towards recovery at a time when restrictions have been removed (M = 2.87 for New Zealand, M = 3.14 for Australia). A 2 (country) by 3 (restriction phase) ANOVA was used to compare attitude ratings between New Zealand and Australia at each restriction phase. The results indicated that the difference between restriction phases was significant; [$F(2,1570) = 151.746$, $p<.001$, $\eta_p^2 = .162$]. There was also a significant difference between countries [$F(1,785) = 8.728$, $p = .003$, $\eta_p^2 = .011$], and a

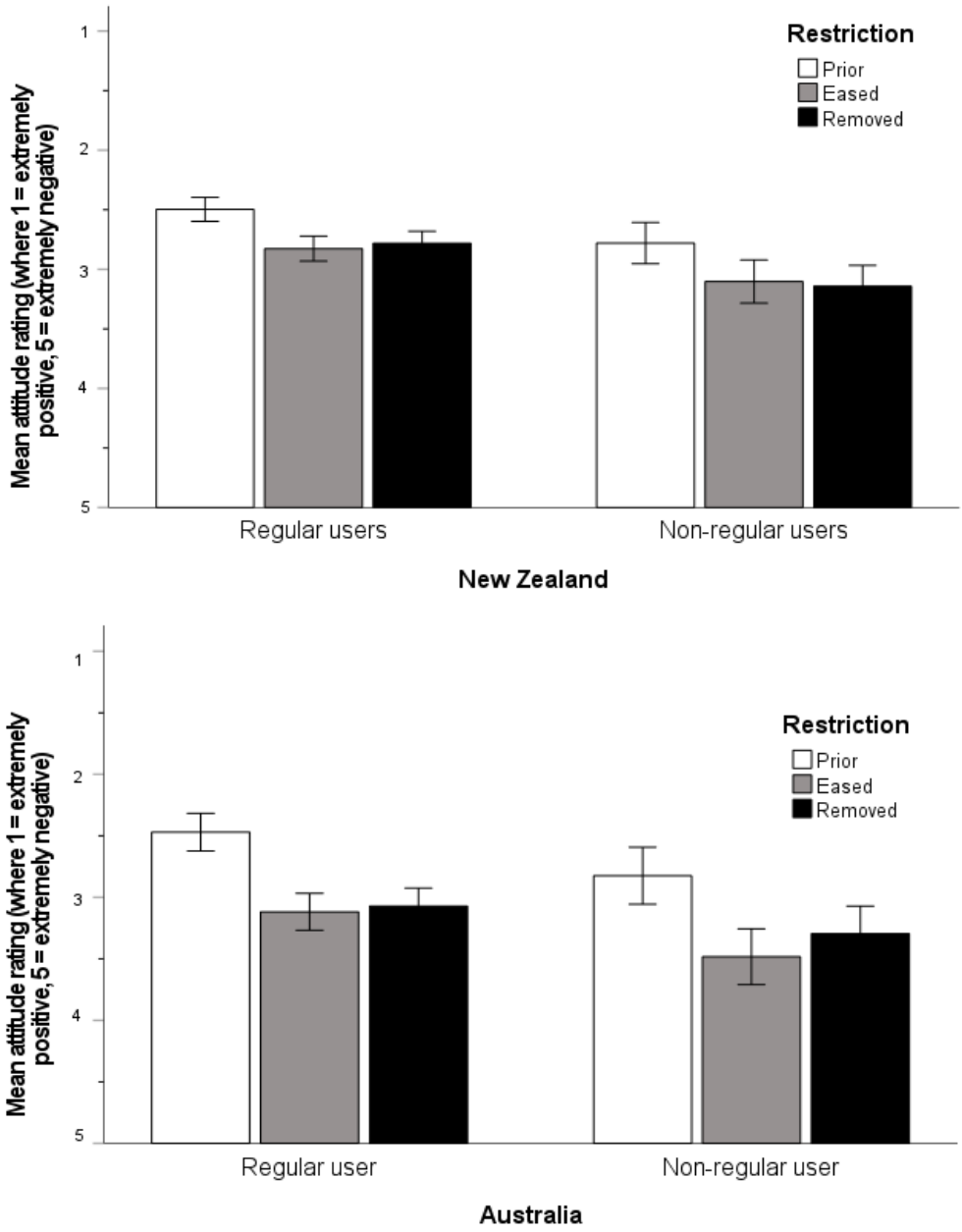
significant interaction between country and restriction phase [$F(1,785) = 15.435$, $p<.001$, $\eta_p^2 = .019$.

As examined with public transport, to investigate the possibility that frequent carpool passengers might have different attitudes to respondents who rarely carpooled, we followed this up with a comparison of these two groups of respondents. The influence of regular prior use on attitudes towards carpooling was analysed using similar methods to those used to analyse the public transport data in that we divided the sample into respondents who regularly were carpool passengers and those who were not. Regular users were defined as those who were passengers at least a few times a month ($n = 379$ for New Zealand, $n = 196$ for Australia), with other respondents defined as non-regular users in relation to carpooling. The New Zealand sample had a higher proportion of regular carpool users (74.9%) than the Australian sample (69.8%).

Regular and non-regular users' attitudes towards carpooling showed a similar pattern between the New Zealand and Australia samples (see Figure 6). A 2(country) by 2(regular, non-regular users) by 3(restriction phase) ANOVA was conducted to compare carpooling attitudes between countries, and frequency of use , over the three restriction phases. Regular carpool users reported more positive ratings towards carpooling than non-regular users at each phase of restriction [$F(1,783) = 16.831$, $p<.001$, $\eta_p^2 = .021$]. There was also a significant main effect of restriction phase [$F(2,1566) = 122.008$, $p<.001$, $\eta_p^2 = .135$].as well as a main effect of country [$F(1,783) = 6.213$, $p = .013$, $\eta_p^2 = .008$]. Additionally, there was a significant interaction between restriction and country [$F(2,1566) = 11.769$, $p<.001$, $\eta_p^2 = .015$]. As shown in Figure 6, this interaction was due to a greater drop in Australian sample's attitudes, compared to the New Zealand sample.

Figure 6.

Mean attitude ratings towards carpooling at each phase of restriction, grouped by frequency of use, and separated by country (Top: New Zealand, Bottom: Australia). Whiskers indicate 95% confidence intervals.



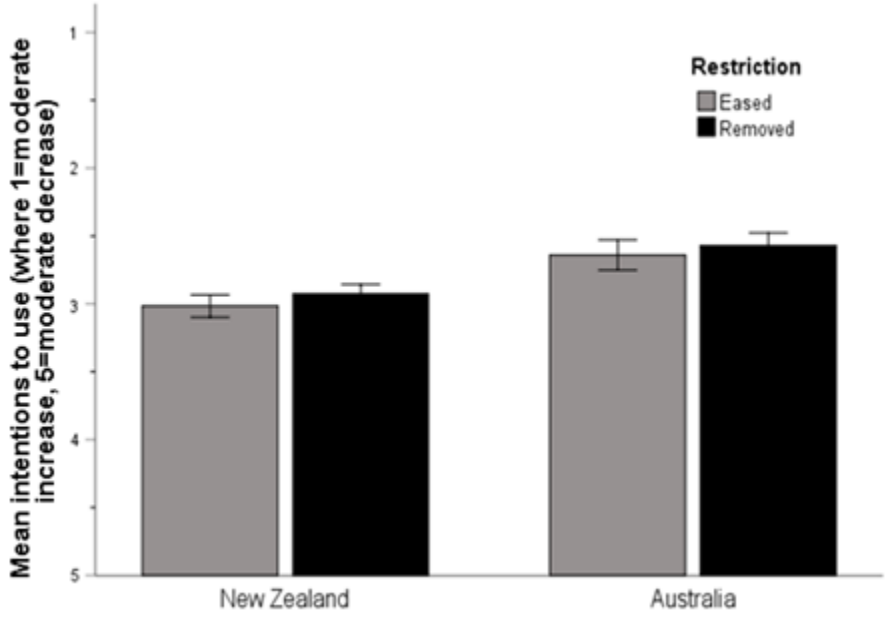
While the survey did not measure carpooling intentions, it did measure intentions towards car use in general. Cars were the most frequently used travel mode: 95% of respondents reported

they used a car at least a few times a month prior to COVID-19 (96.8% for New Zealand, 95.4% or Australia); 82% reporting most of the week or more; and 67% of the sample reporting they use a car almost daily.

Similar to public transport, individuals' intentions to change their car use during the eased and removed restriction phases were examined. Due to the high usage of cars, all respondents were included in the analysis (it was a requirement to have a driver's licence to participate). As shown in Figure 7, changes in intended car use were not large with means for the New Zealand sample being close to no change (Eased: M = 3.02. Removed: M = 2.93). The ratings of the Australian sample were higher than the New Zealand sample at the eased and removed restriction phases (Eased: M = 2.64, Removed: M = 2.57). A 2 (country) by 2 (restriction phase) ANOVA indicated there was a significant main effect of country; [$F(1,785)$ = 41.383, $p<.001$, $\eta_p^2 = .050$]. There was also a significant main effect of restriction phase [$F(1,785) = 6.497$, $p = .011$, $\eta_p^2 = .008$] but no significant interaction between restriction and country [$F(1,785) = .080$, $p = .777$, $\eta_p^2 = .000$].

Figure 7

Mean intentions towards car use for the eased and removed phase of restriction, grouped by country. Whiskers indicate 95% confidence intervals.



3.1.3 Domestic air travel

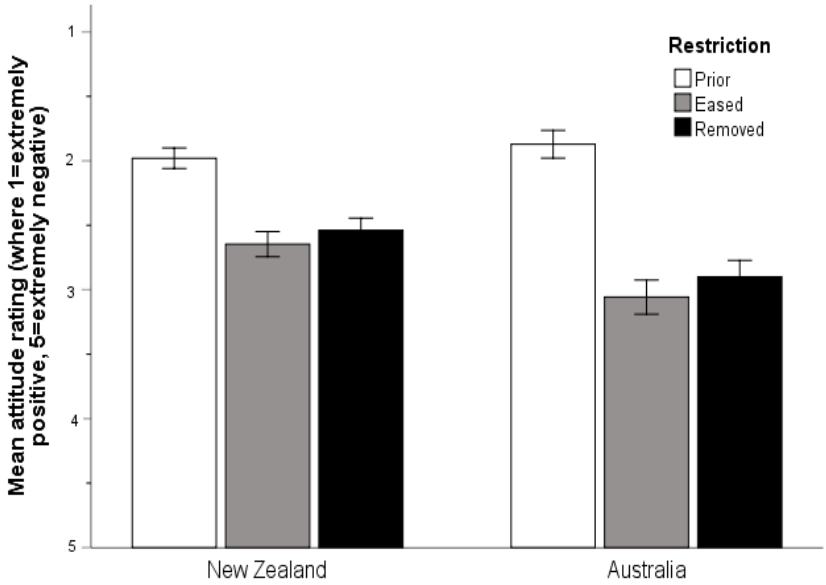
Comparable to other modes of domestic transport, respondents' attitude ratings towards domestic air travel showed a similar pattern (see Figure 8). Both New Zealand and Australian respondents' attitudes were the most positive prior to COVID-19 (M = 1.98 for New Zealand, M = 1.87 for Australia), becoming more negative when restrictions have eased (M = 2.65 for New Zealand, M = 3.06 for Australia), and recovering somewhat at a time when restrictions have been removed (M = 2.54 for New Zealand, M = 2.90 for Australia).

A 2 (country) by 3 (restriction phase) ANOVA was used to compare attitude ratings regarding domestic air travel. The results showed a significant main effect of restriction phase [$F(2,1568) = 364.07$, $p<.001$, $\eta_p^2 = .317$] which indicated that respondents' attitudes towards

domestic air travel were different under the three restriction levels. There was also a significant main difference between countries [$F(1,784) = 11.53$, $p=.001$, $\eta_p^2 = .014$] and a significant interaction between restriction phase and country [$F(1,1568) = 14.807$, $p<.001$, $\eta_p^2 = .037$]. The source of the significant interaction appeared to be a greater recovery of positive attitudes on the part of the Australian respondents.

Figure 8

Mean attitude ratings towards domestic air travel at each phase of restriction, grouped by country. Whiskers indicate 95% confidence intervals.



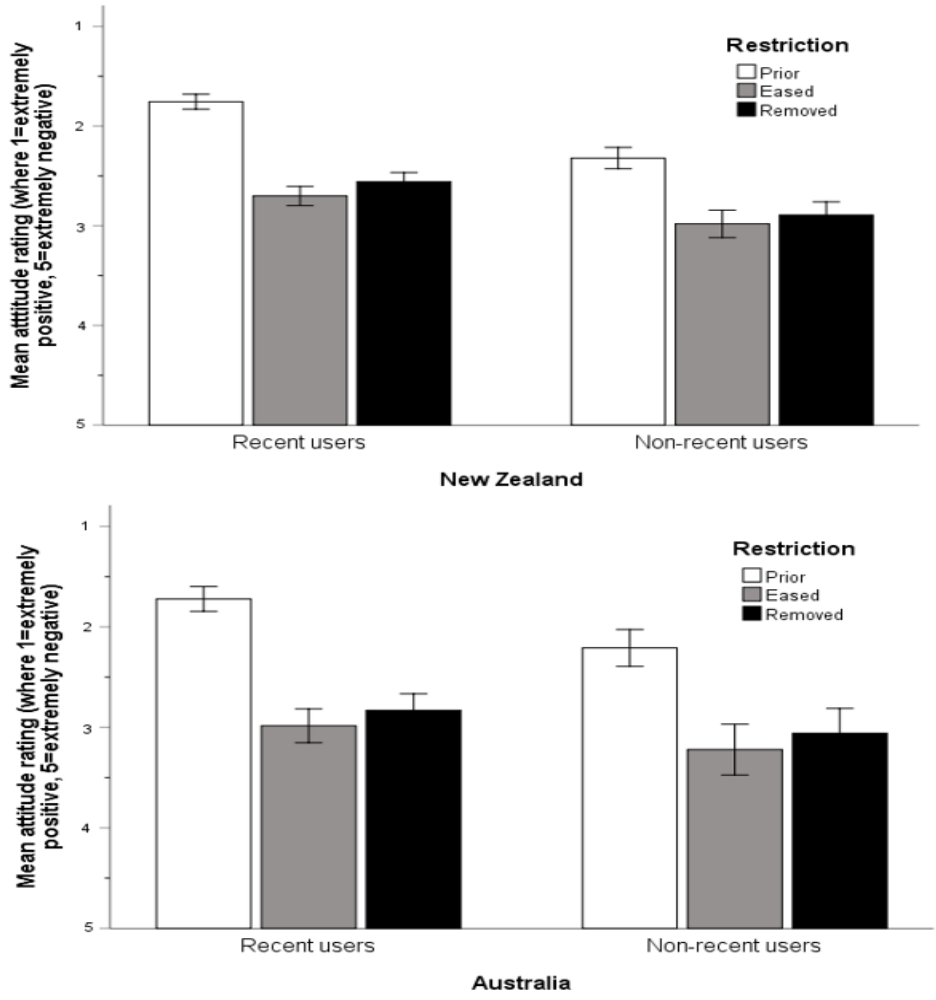
Next, analysis was used to examine if respondents who frequently used domestic air travel reported different attitudes to those who were not frequent users. Since air travel is typically not as frequently used as public transport, we focused on the intentions of recent users of domestic air travel. Recent users were defined as respondents who reported that they used domestic air travel during the 12 month period before COVID-19 (New Zealand $n = 333$, Australia $n = 194$). Both samples had a similar percentage of domestic air travel users (65.8% for

New Zealand, 69.0% for Australia). An ANOVA failed to reveal any significant difference in attitudes between respondents in the two countries when separately comparing the ratings of recent users [$F(1,525) = .552$, $p = .458$, $\eta_p^2 = .001$] and non-recent users [$F(1,258) = 1.352$, $p = .246$, $\eta_p^2 = .005$].

Attitudes towards domestic air travel appeared to be affected more negatively in the Australian sample than the New Zealand sample (see Figure 9). To compare the ratings of domestic air travel across the two countries, a 2 (country) by 2 (recent, non-recent user) by 3 (restriction phase) ANOVA was used. This difference was significant as indicated by a two-way interaction between restriction phase and country; $F(2,1564) = 24.892$, $p < .001$, $\eta_p^2 = .031$. Overall, there was a significant effect of country [$F(1,782) = 9.620$, $p = .002$, $\eta_p^2 = .012$].There was also a significant interaction between restriction phase and domestic air travel use [$F(2,1564) = 6.403$, $p = .002$, $\eta_p^2 = .008$] which suggests that recent users' attitudes were affected more than non-recent users. Further, there was no interaction of users group and country [$F(1,782) = .886$, $p = .347$, $\eta_p^2 = .001$], or higher order interaction of restriction, country, and domestic air travel use; [$F(2,1564) = .179$, $p = .836$, $\eta_p^2 = .000$].

Figure 9

Mean attitude ratings towards domestic air travel at each restriction phase, grouped by frequency of use, and separated by country (Top: New Zealand, Bottom: Australia). Whiskers indicate 95% confidence intervals.

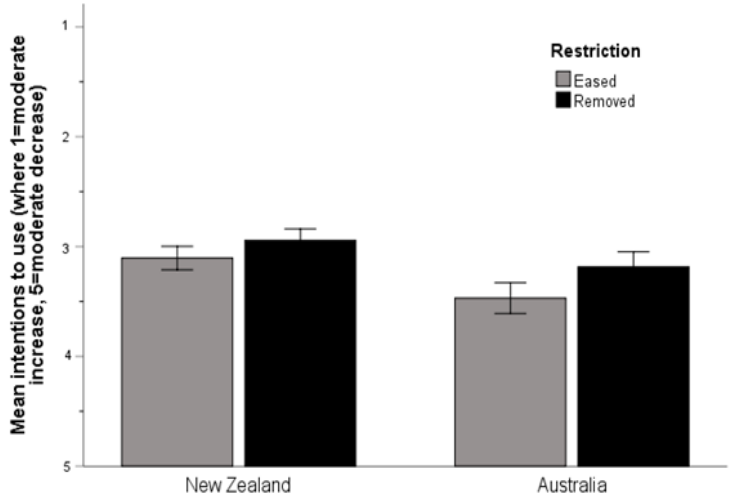


We then looked at intentions to use domestic air travel in a similar manner to that of public transport users, with decreases in intended use reported. Recent users' ratings of their intentions to use domestic air travel are shown in Figure 10. As can be seen, there was an increase (recovery) in intentions to fly domestically once restrictions had been removed. The New Zealand sample reported very little change in use (Eased: M = 3.11 , Removed M = 2.94),

with the Australian sample reporting more change (eased: M = 3.47 , removed M = 3.19). A 2 (country) by 2 (restriction phase) ANOVA indicated a significant difference between restriction phases [$F(1,525) = 42.235$, p =<.001, $\eta_p^2 = .074$], and a significant difference for country [$F(1,525) = 13.679$, p <.001, $\eta_p^2 = .025$], but no interaction between country and restriction phases [$F(1,525) = 3.131$, p =.077, $\eta_p^2 = .006$].

Figure 10

Recent users' intentions to use domestic air travel at the eased and removed restriction phase, grouped by country. Whiskers indicate 95% confidence intervals.

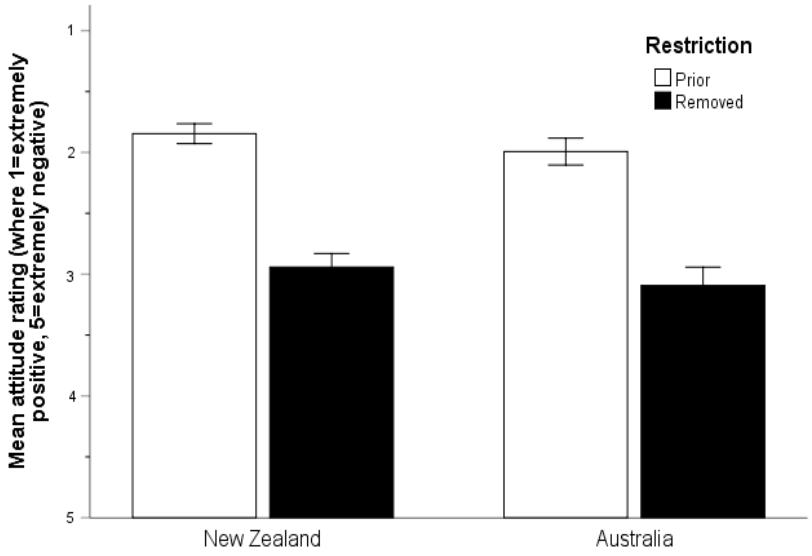


3.1.4 International air travel

Lastly, we looked at attitudes and intentions to use international air travel. Respondents were asked to rate their attitudes towards international air travel prior to COVID-19, and their likely attitudes towards international air travel when all restrictions had been removed. The mean ratings to these questions are shown in Figure 11.

Figure 11

Mean attitude ratings towards international air travel at the prior and removed restriction phase, grouped by country. Whiskers indicate 95% confidence intervals.



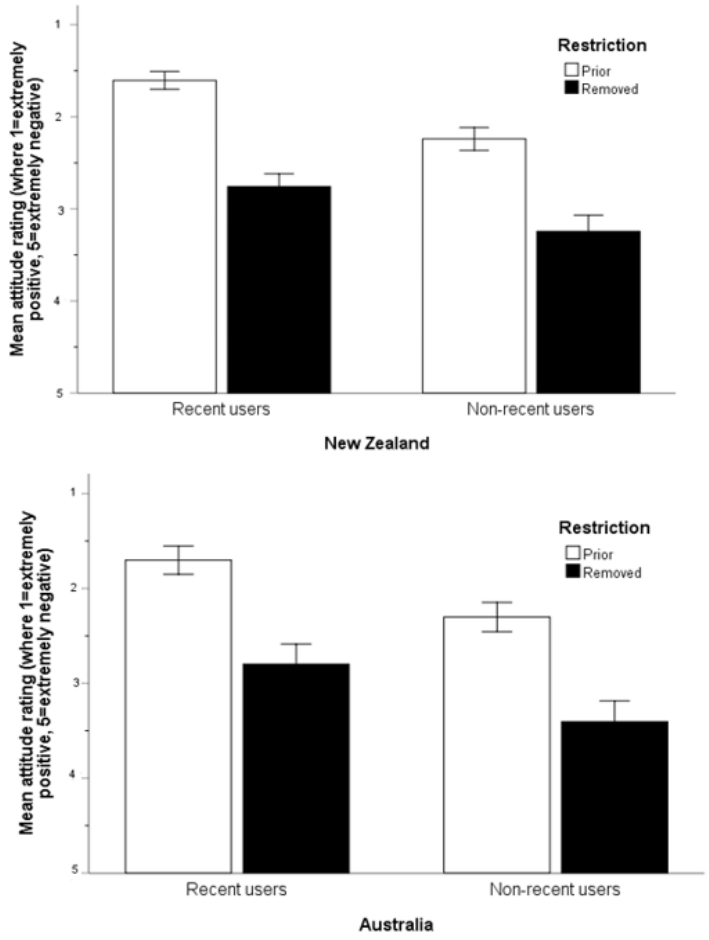
As shown in Figure 11, the New Zealand sample had slightly more positive attitudes towards international air travel than the Australian sample prior to COVID-19 (M = 1.85 for New Zealand, M = 1.99 for Australia) as indicated by a univariate ANOVA [$F(1,784) = 4.401$, $p = .036$, $\eta_p^2 = .006$]. A 2 (country) by 2 (restriction phase: prior, removed) ANOVA indicated that the difference between restriction phases was significant; [$F(1,784) = 518.468$, $p<.001$, $\eta_p^2= .398$]. There was also a slight but significant difference between the countries [$F(1,784) = 4.674$, $p = .031$, $\eta_p^2 = .006$], but no interaction between country and phase [$F(1,784) = .001$, $p = .974$, $\eta_p^2 = .000$].

Further, the New Zealand sample had a higher percentage of recent international air travel users (62.1%) than the Australian sample (51.3%). Similar to domestic travel modes, an analysis was conducted to examine whether respondents' use of international air travel prior to COVID-19 influenced their pattern of ratings. In a similar manner to domestic air travel,

respondents who reported they had travelled internationally in the 12 month period before COVID-19 were defined as recent users, and those who did not as non-recent users in relation to international air travel. The results of this comparison are shown in Figure 12.

Figure 12

Mean attitude ratings towards international air travel at the prior and removed restriction phases, grouped by frequency of use, and separated by country (Top: New Zealand, Bottom: Australia). Whiskers indicate 95% confidence intervals.



There was no appreciable difference between recent international air travel users' attitudes between the New Zealand and Australian samples (M = 2.76 for New Zealand, M = 2.80 for Australia) [$F(1,456) = .098$, $p = .754$, $\eta_p^2 = .000$]. Nor was there any appreciable

difference between countries for the non-recent international travellers (M = 3.24 for New Zealand, M = 3.40 for Australia) [$F(1,326)$ =1.360, p =.244, η_p^2 = .004]. Compared to attitudes reported prior to COVID-19, both recent and non-recent users of international air travel attitudes reported less positive attitudes for the removed restriction phase. Further, recent international air travel users' attitudes remained significantly more positive (M = 2.77) than non-recent users' (M = 3.31); $F(1,784) = 35.064$, $p < .001$, $\eta_p^2 = .043$. Similar to public transport attitudes, the higher proportion of recent users in the New Zealand sample may have contributed to the overall higher ratings towards international air travel seen prior to COVID-19.

Lastly, recent users' intention to use international air travel were examined. Recent users in the New Zealand and Australian samples had similar means intentions to use international air travel when restrictions have been removed (M = 3.31, SD = 1.205 for New Zealand, M = 3.19, SD = 1.281 for Australia), with both countries indicating some decrease in use of international air travel when restrictions have been removed (compared to their prior use). An independent sample t-test of recent international air travel users failed to find a significant difference between the means of the New Zealand and Australian samples; $t(456) = .899$, $p = .369$. The distribution of the New Zealand and Australian samples were also similar (see Table 2). Over 40% of respondents in both samples reported they intended to reduce their use of international air travel, approximately 30% reporting no change, and roughly 26% (New Zealand) to 30% (Australia) of respondents reported intentions to increase their use of international air travel.

Table 2

Recent users' intentions to use international air travel at the removed restriction phase, grouped by country (percentage of respondents).

Response option	New Zealand (n = 314)	Australia (n = 144)
Moderate increase	7.6	11.1
Slight increase	18.2	19.4
No change	30.9	29.2
Slight decrease	22.6	19.4
Moderate decrease	20.7	20.8

3.2 Research question 2. Demographic and personal factors

The second research question examine if personal or demographic factors affected people's attitudes and intentions towards transport modes. This was addressed by examining age, gender, perceived severity, and perceived susceptibility scores reported by respondents in relation to travel attitudes and intentions. The ratings for each factor are described in the sections that follow.

3.2.1 Age

Starting with age, respondents were separated into three age groups: 18-24 years (young), 25-64 years (middle), and < 65 (old). Table 3. includes age groups and the associated mean attitude ratings towards each travel mode at the three restriction phases. Attitudes towards public transport between age groups were not significantly different as determined by a one-way MANOVA; $F(6,1556) = .917$, $p = .481$, $\eta_p^2 = .004$. When examining age groups in relation to carpooling attitudes, younger adults had the most positive attitudes across all restriction phases, followed by middle-aged adults, and older adults: a one-way MANOVA indicated a significant difference: $F(6,1558) = 8.06$, $p < .001$, $\eta_p^2 = .030$. There were no reliable differences found

between age groups' attitudes for domestic [$F(6,1556) = .917$, $p = .481$, $\eta_p^2 = .004$] or international air travel [$F(4,1558) = 1.656$, $p = .158$, $\eta_p^2 = .004$] (although there was a significant pairwise difference between young and older adults' attitudes towards international air travel prior to COVID-19).

Table 3

Mean attitude ratings towards transport modes for each phase of restriction, grouped by age (where 1 = Extremely positive, 5 = Extremely negative).

Restriction phase	Prior		Eased		Removed	
Age	Public transport					
18-24	2.53	(n = 99)	3.22	(n = 99)	3.08	(n = 99)
25-64	2.53	(n = 543)	3.18	(n = 543)	3.02	(n = 543)
>65	2.49	(n = 141)	3.21	(n = 141)	3.13	(n = 141)
	Carpooling					
18-24	2.10**	(n = 99)	2.59**	(n = 99)	2.60*	(n = 99)
25-64	2.57 *	(n = 543)	3.01*	(n = 543)	2.93**	(n = 543)
>65	2.89	(n = 141)	3.32	(n = 141)	3.35	(n = 141)
	Domestic air travel					
18-24	2.00	(n = 99)	2.72	(n = 99)	2.61	(n = 99)
25-64	1.94	(n = 542)	2.76	(n = 542)	2.64	(n = 542)
>65	1.91	(n = 141)	2.94	(n = 141)	2.81	(n = 141)
	International air travel					
18-24	2.03*	(n = 99)			2.99	(n = 99)
25-64	1.92	(n = 542)			3.01	(n = 542)
>65	1.74	(n = 141)			2.93	(n = 141)

* indicates a p value of equal to or less than .05,

** indicates a p value of less than .001.

Next, intentions to use the transport modes at the eased and removed restrictions were examined. Table 4 includes the mean intentions to use transport modes at each restriction phase for the three age groups. There were no differences between age groups in intentions towards car use [$F(4,1560) = 1.348$, $p = .250$, $\eta_p^2 = .003$], or domestic air travel [$F(4,1560) = .506$, $p = .731$, $\eta_p^2 = .001$]. A comparison between the age groups at the removed restriction phase for international air travel failed to show a significant difference [$F(2,780) = .131$, $p = .878$, $\eta_p^2 = .000$] (there was no ratings for the eased restriction phase for comparison). A MANOVA found a significant difference in age groups towards intentions to use public transport [$F(6,1558) = 2.865$, $p = .022$, $\eta_p^2 = .007$].Young adults reported larger decreases in their intended use of public transport than middle-aged and older adults. To investigate if differences in public transport use prior to COVID-19 between age groups accounted for this significant difference in intentions, we looked at the percentage of people in each age group who reported being regular users. Regular users for public transport (a few times a month or more) were largely young adults (young adults: 39.4%, middle-aged: 20.3%, older adults: 16.3%). This difference in intentions to change use of public transport between age groups may have reflected this difference in usage prior to COVID-19.

Table 4.

Mean intentions to use transport modes at the eased and removed phases of restriction, grouped by age (where 1 = Moderate Increase, 5 = Moderate Decrease).

Restriction phase	Eased		Removed	
Age	Public transport			
18-24	3.45*	(*n* = 98)	3.34**	(*n* = 99)
25-64	3.23	(*n* = 543)	3.14	(*n* = 543)
>65	3.23	(*n* = 141)	3.05	(*n* = 141)
	Car			
18-24	2.77	(*n* = 99)	2.67	(*n* = 99)
25-64	2.89	(*n* = 543)	2.83	(*n* = 543)
>65	2.93	(*n* = 141)	2.77	(*n* = 141)
	Domestic air travel			
18-24	3.17	(*n* = 99)	2.97	(*n* = 99)
25-64	3.18	(*n* = 543)	3.01	(*n* = 543)
>65	3.29	(*n* = 141)	3.09	(*n* = 141)
	International air travel			
18-24			3.30	(*n* = 99)
25-64			3.24	(*n* = 543)
>65			3.23	(*n* = 141)

* indicates a p value of equal to or less than .05,

** indicates a p value of less than .001.

3.2.2 Gender

Next, we examined if gender influenced travel attitudes across restriction phases (see Figure 5). There was a significance difference between genders for public transport attitudes as revealed by a one-way MANOVA: $F(3,777) = 4.287$, $p = .005$, $\eta_p^2 = .016$. There were also

significant differences revealed for carpooling: [$F(3,777) = 3.354$, $p = .019$, $\eta_p^2 = .013$]., domestic air travel [$F(3,776) = 4.515$, $p = .004$, $\eta_p^2 = .017$] and international air travel attitudes [$F(2,777) = 6.024$, $p = .003$, $\eta_p^2 = .015$]. Prior to COVID-19, females reported more positive attitudes towards travel modes than males, but during the eased and removed stages females reported less positive attitudes than males.

Table 5

Mean attitude ratings towards travel modes for each phase of restriction, grouped by gender (where 1 = Extremely positive, 5 = Extremely negative).

Restriction phase	Prior		Eased		Removed	
Gender	Public transport					
Male	2.56	($n = 324$)	3.06*	($n = 324$)	2.96*	($n = 324$)
Female	2.51	($n = 457$)	3.28	($n = 457$)	3.11	($n = 457$)
	Carpooling					
Male	2.64	($n = 324$)	2.96	($n = 324$)	2.93	($n = 324$)
Female	2.52	($n = 457$)	3.05	($n = 457$)	2.99	($n = 457$)
	Domestic air travel					
Male	2.02*	($n = 324$)	2.70*	($n = 324$)	2.61	($n = 324$)
Female	1.88	($n = 456$)	2.86	($n = 456$)	2.70	($n = 456$)
	International air travel					
Male	1.98*	($n = 324$)			2.90	($n = 324$)
Female	1.84	($n = 456$)			3.06	($n = 456$)

* indicates a p value of equal to or less than .05,

** indicates a p value of less than .001.

We then examined if gender influenced intentions towards use of transport modes. Table 6 includes the mean intentions to use transport modes at the eased and removed restriction

phases, grouped by gender. There were no significant differences between females' and males' reported intentions to use public transport [$F(2,777) = 1.786$, $p = .168$, $\eta_p^2 = .005$]. There was, however, a slight difference in males' and females' intentions towards car use at the eased and removed restriction phases [$F(2,778) = 3.448$, $p = .031$, $\eta_p^2 = .009$] with males reporting more increase in their intended car use. Further, females reported larger decreases in their intentions to use domestic air travel than males at the eased restriction phase $F(2,778) = 2.593$, $p = .075$, $\eta_p^2 = .007$. When examining international air travel intentions when restrictions have been removed, there was no significant difference between genders [$F(1,779) = 3.136$, $p = .077$, $\eta_p^2 = .004$].

Table 6

Mean intentions to use transport modes at the eased and removed restriction phases, grouped by gender (where 1 =Moderate Increase, 5 = Moderate Decrease).

Restriction phase	Eased		Removed	
Gender	Public transport			
Male	3.19	(n = 324)	3.10	(n = 324)
Female	3.30	(n = 456)	3.18	(n = 456)
	Car			
Male	2.78*	(n = 324)	2.72*	(n = 324)
Female	2.95	(n = 457)	2.85	(n = 457)
	Domestic air travel			
Male	3.11*	(n = 324)	2.95	(n = 324)
Female	3.26	(n = 547)	3.08	(n = 457)
	International air travel			
Male			3.17	(n = 324)
Female			3.31	(n = 457)

* indicates a p value of equal to or less than .05,
** indicates a p value of less than .001.

3.2.3 Perceived severity

Perceived severity scores ranged from 3-15. Respondents who reported scores of 3-8 were grouped as high perceived severity. Scores of 9-15 were grouped as low perceived severity. A high score on this scale would indicate the respondent believes that they would be severely impacted if they were to contract COVID-19, whereas a low score would indicate the respondent believes they would be only mildly impacted by COVID-19 or not impacted at all.

Firstly, we grouped respondents with high and low perceived severity scores and examined the mean attitude ratings towards travel mode at the three restriction phases (see Table 7). Overall, respondents who scored high on perceived severity had more negative attitudes towards travel at the eased and removed restriction phase than respondents who scored lower on perceived severity. A one-way MANOVA revealed a significant difference between perceived severity scores and public transport attitudes [$F(3,783) = .003$, $p < .001$, $\eta_p^2 = .042$]. This was also seen in relation to carpooling attitudes [$F(3,782) = 17.543$, $p < .001$, $\eta_p^2 = .063$]. Further, people who scored high on perceived severity reported significantly less positive attitudes towards air travel: domestic [$F(3,782) = 17.543$, $p < .001$, $\eta_p^2 = .063$] and international [$F(2,783) = 13.355$, $p < .001$, $\eta_p^2 = .033$]. Significant differences were also present between low and high scorers prior to COVID-19 for air travel

Table 7

Mean attitude ratings towards transport modes for each phase of restriction, grouped by perceived severity score (where 1 = Extremely positive, 5 = Extremely negative).

Restriction phase	Prior		Eased		Removed	
Perceived Severity	Public transport					
High	2.47	(n = 421)	3.32**	(n = 421)	3.19**	(n = 421)
Low	2.59	(n = 366)	3.04	(n = 366)	2.89	(n = 366)
	Carpooling					
High	2.57	(n = 421)	3.14**	(n = 421)	3.12**	(n = 421)
Low	2.57	(n = 366)	2.87	(n = 366)	2.79	(n = 366)
	Domestic air travel					
High	2.01*	(n = 420)	3.04**	(n = 420)	2.92**	(n = 420)
Low	1.87	(n = 366)	2.51	(n = 366)	2.38	(n = 366)
	International air travel					
High	1.96*	(n = 420)			3.21**	(n = 420)
Low	1.83	(n = 366)			2.75	(n = 366)

* indicates a p value of equal to or less than .05,

** indicates a p value of less than .001.

Next, we looked at intentions between high and low perceived severity scorer. Similar to transport attitudes, there were also significant differences for intentions to use transport between those who scored high and those that scored low on perceived severity. Table 8. includes the mean intentions to use transport modes, grouped by perceived severity score. Those who reported higher levels of perceived severity, reported significantly larger decreases in their intended use at the eased and removed restrictions for public transport [$F(2,783) = 1.656$, $p<.001$, $\eta_p^2 = .019$] , and air travel [Domestic: $F(2,784) = 15.880$, $p<.001$, $\eta_p^2 = .039$,

International: [$F(1,785) = 13.513$, $p < .001$, $\eta_p^2 = .017$] than those with lower scores. Respondents with higher perceived severity scores were also reported significantly more negative towards air travel prior to COVID-19. Further, there was no significant difference identified between high and low perceived severity scorers in relation to intended car use [$F(2,784) = .778$, $p = .459$, $\eta_p^2 = .002$].

Table 8

Mean intentions to use transport modes at the eased and removed restriction phase, grouped by perceived severity score (where 1 = Moderate Increase, 5 = Moderate Decrease).

Restriction phase	Eased		Removed	
Perceived Severity	Public transport			
High	3.36**	(*n* = 420)	3.22*	(*n* = 421)
Low	3.14	(*n* = 366)	3.07	(*n* = 366)
	Car			
High	2.85	(*n* = 421)	2.77	(*n* = 421)
Low	2.92	(*n* = 366)	2.84	(*n* = 366)
	Domestic air travel			
High	3.36**	(*n* = 421)	3.18**	(*n* = 421)
Low	3.02	(*n* = 366)	2.85	(*n* = 366)
	International air travel			
High			3.39**	(*n* = 421)
Low			3.09	(*n* = 366)

* indicates a p value of equal to or less than .05,

** indicates a p value of less than .001.

To determine whether gender influenced perceived severity a univariate ANOVA was used. There was no significant difference identified between genders in relation to perceived severity scores (M =8.55 for males, M = 8.13 for females); $F(1,779) = 3.544$, $p = .060$, $\eta_p^2 = .005$. The differences in travel attitudes and intentions observed for perceived severity were unlikely to be a result of underlying gender differences.

We also examine if there were differences in perceived severity scores between the three age groups. When analysing perceived severity scores (M = 9.73 for young adults, M = 8.29 for middle-aged adults, M = 7.30 for older adults), there was a significant difference; $F(2,780) = 18.93$, $p<.001$, $\eta_p^2 = .046$. Subsequent post hoc analysis (Bonferroni adjusted) revealed significant differences between all three age groups, with older adults' ratings indicating higher levels of perceived severity than middle-aged ($p<.001$) and younger adults ($p<.001$). Further, middle-aged adults also indicated their perceived severity as higher than that of younger adults ($p = .001$).

Overall, perceived severity was associated with less positive attitudes and more decreases in intentions to use public transport and air travel; older respondents tended to have higher perceived severity scores, but there was no direct relationship between age and attitude and intentions towards travel modes.

3.2.4 Perceived susceptibility

Perceived susceptibility scores could range from 5 to 25. Scores between 5 and 15 were grouped as high perceived susceptibility, and scores 16 to 25 were grouped as low perceived susceptibility. A high score would indicate the respondent believed there is a high chance that they would contract COVID-19, whereas a low score would indicate the respondent believes their risk of contracting COVID-19 is low or non-existent. Starting with attitudes, Table 9.

includes the mean attitude ratings for each travel mode at the three restriction phases and is grouped by perceived susceptibility scores.

Table 9

Mean attitude ratings towards transport modes for each phase of restriction, grouped by perceived susceptibility score (where 1 = Extremely positive, 5 = Extremely negative).

Restriction phase	Prior		Eased		Removed	
Perceived Susceptibility	Public transport					
High	2.48	(n = 362)	3.40**	(n = 362)	3.27**	(n = 362)
Low	2.56	(n = 425)	3.02	(n = 425)	2.86	(n = 425)
	Carpooling					
High	2.57	(n = 362)	3.14*	(n = 362)	3.12**	(n = 362)
Low	2.57	(n = 425)	2.90	(n = 425)	2.79	(n = 425)
	Domestic air travel					
High	2.02*	(n = 361)	3.15**	(n = 361)	3.06**	(n = 361)
Low	1.87	(n = 425)	2.49	(n = 425)	2.34	(n = 425)
	International air travel					
High	1.99*	(n = 361)			3.35**	(n = 361)
Low	1.82	(n = 425)			2.70	(n = 425)

* indicates a p value of equal to or less than .05,

** indicates a p value of less than .001.

People with higher perceived susceptibility scores reported less positive attitudes towards travel at the eased and removed restriction phases than people with lower scores. There was a significant difference between low and high perceived susceptibility scorers in relation to public transport attitudes: [$F(3,783) = .003$, $p<.001$, $\eta_p^2 = .063$]. This was also true for carpooling:

[$F(3,783) = .003$, $p<.001$, $\eta_p^2 = .029$] and air travel (domestic air travel: $F(3,782) = 32.668$, $p<.001$., $\eta_p^2 = .111$, and international air travel: $F(2,783) = 26.683$, $p<.001$, $\eta p2 = .064$).

Next, intentions to use travel modes were examined between respondents with high and low perceived susceptibility scores (see Table 10). Similar to results for perceived severity, respondents who higher perceived susceptibility scores reported larger decreases in their intended use at the eased and removed restrictions for public transport [$F(2,783) = 18.536$, $p<.001$, $\eta_p^2 = .045$], domestic air travel [$F(2,784) = 39.273$, $p<.001$, $\eta_p^2 = .091$], and international air travel [$F(1,785) = 26.029$, $p<.001$, $\eta_p^2 = .032$]. Unlike with perceived severity, there were also significant differences for car use intentions with high scorers reporting more decreases in use than lower scorers: $F(2,784) = 3.482$, $p = .031$, $\eta_p^2 = .009$. Similar to perceived severity, respondents with higher perceived susceptibility scores were also reported significantly more negative towards air travel prior to COVID-19.

To determine whether there was a difference in the perceived severity scores due to gender a univariate ANOVA was used. The differences in mean scores between males and females in relation to perceived susceptibility ($M = 16.18$ for males, $M = 15.82$ for females) was not significantly different; $F(1,779) = 1.929$, $p = .165$, $\eta_p^2 = .002$. We also examined if age influenced perceived susceptibility scores. A univariate ANOVA found no significant differences between age groups and perceived susceptibility score ($M = 15.72$ for young adults, $M = 16.00$ for middle-aged adults, $M = 16.00$ for older adults); $F(2,780) = .271$, $p = .763$, $\eta_p^2 = .001$.

Table 10

Mean intentions to use transport modes at the eased and removed restriction phases, grouped by perceived susceptibility score (where 1 = Moderate Increase, 5 = Moderate Decrease).

Restriction phase	Eased		Removed	
Perceived Susceptibility	Public transport			
High	3.43**	(n = 361)	3.30**	(n = 362)
Low	3.11	(n = 425)	3.02	(n = 425)
	Car			
High	2.79*	(n = 362)	2.73*	(n = 362)
Low	2.96	(n = 425)	2.86	(n = 425)
	Domestic air travel			
High	3.49**	(n = 362)	3.30**	(n = 362)
Low	2.95	(n = 425)	2.80	(n = 425)
	International air travel			
High			3.47**	(n = 362)
Low			3.25	(n = 425)

* indicates a p value of equal to or less than .05,

** indicates a p value of less than .001.

4 Discussion

4.1 General discussion

This study examined how the initial COVID-19 outbreak affected attitudes and intentions to use transport in New Zealand and Australia. Firstly, attitudes towards public transport, carpooling, domestic air travel, and international air travel were all negatively affected by COVID-19. Attitudes were most positive before COVID-19, were less positive during the eased restriction phase, and in some cases showed partial recovery when restrictions were removed.

Research by Waka Kotahi New Zealand Transport Agency (2020) showed declines in concerns about infection and transmission of COVID-19 as restrictions were removed. The removal of restrictions in our study was accompanied by some recovery in travel attitudes. In other words, the changes in attitudes we saw in this survey may have been related to the respondents' more general concerns about COVID-19.

When examining attitudes towards travel, the largest effects were seen in relation to air travel. International air travel attitudes were the most affected followed by attitudes towards domestic air travel. Attitudes towards public transport, while not as negatively affected as attitudes towards air travel, also saw large changes because of COVID-19. The least affected of these major transport modes were attitudes towards carpooling. This may be due to the fact the capacity of passengers in this shared transport mode is lower, and passengers tend to know each other or share a household.

Respondents had more positive attitudes towards the transport modes that they used frequently. In New Zealand, Murray and colleagues (2010) found that direct contact with public transport resulted in less prejudice towards the public transport system. Our finding that regular users had more positive attitudes towards public transport use may provide some further

evidence towards this claim. Further, regular carpool users and recent users of air travel in our study also showed more positive attitudes than those who had not recently used these travel modes; this is consistent with research conducted in Slovenia which found people were less likely to indicate they would avoid travel if they had travelled more prior to COVID-19 (Turnšek et al., 2020). This suggests that frequent use of transport modes positively influences attitudes towards travel. This difference in attitudes between users might have been larger had New Zealand and Australia been more significantly impacted by COVID-19.

New Zealand and Australia reported similar attitudes towards transport modes prior to COVID-19. While there were some slight differences in attitudes between the two countries, some of these may be explained by internal factors such as the proportion of regular users. There were some differences between New Zealanders' and Australians' attitudes towards domestic travel. For example, more Australians used public transport regularly and their attitudes prior to COVID-19 were more positive and decreased to a greater extent than those of New Zealanders.

Secondly, our results showed changes in intentions to use transport modes as a result of COVID-19 concerns. Overall, respondents reported decreases in their intentions to use public transport, domestic air travel, and international air travel compared to their use prior to COVID-19. In the case of domestic air travel, the Australian sample showed a notable decrease in intentions, whereas the New Zealand respondents did not (despite their attitudes becoming less positive).

The largest recovery (between the eased and removed restriction phase) in intentions to use domestic transport modes was for regular users of public transport. There were also small effects seen for domestic air travel which showed some increase in use between the eased and removed restriction phase. Further, car use showed some increase in use between the eased and

removed restriction phases. This increase in car use was likely a result of cars being used as an alternative mode of transport.

Although we were not able to explicitly examine international air travel intentions across restriction phases as we did with domestic modes, approximately 40% of recent international air travel users intended to decrease their use even when restrictions had been removed. This is similar to findings from previous research which reported increased concerns towards international travel as a result of pandemics (Cahyanto et. al., 2016).

Another area that had significant but small effects on intentions to use transport modes was country of residence. Intentions to change use of domestic transport modes were larger for Australians than for New Zealanders. Regular public transport users and recent domestic air travel users in Australia reported more decreases, with a larger corresponding increase in car use than the New Zealand sample.

While respondents in New Zealand and Australia varied somewhat regarding attitudes and intentions to use domestic travel modes, both countries reported similar intentions to use international air travel after restrictions have been removed. Overall, New Zealanders and Australians had similar attitudes and intentions to use international air travel; this suggest that internal factors related to each country's response to COVID-19 may have accounted for the differences seen in domestic travel modes.

Our second research question examined if demographic and personal factors influenced attitudes and intention towards use of transport modes. The most prominent effect was in relation to age and carpooling attitudes with younger adults being more positive towards carpooling at each restriction phase. However, this difference was present at every phase and thus is not a result of the pandemic. While a significant difference was present between older adults and

younger adults in relation to international air travel prior to COVID-19, the effect was small. More importantly, attitudes were similar at the eased and removed phases of restriction between the age groups for all other travel modes; there was no evidence to suggest that COVID-19 affected age groups differently. Overall, it is useful to know that older adults in our sample - despite being more at risk of a severe case of COVID-19 - did not report more negative attitudes towards travel than younger adults.

Other studies on COVID-19 have found similar findings. Graham and colleagues (2020) examined attitudes of older passengers (65+) in the UK by exploring respondents' air travel plans for the following 12 months. Survey responses were collected from June 10th until June 15th; at the time, the country was not under lockdown conditions. They expected to see older adults would show large decreases in their travel plans because of COVID-19 concerns. However, their findings did not suggest a heightened travel aversion from this age group; over 60% of respondents had planned to travel in the following 12 months. Additionally, a study conducted in Bulgaria found older adults (over 51 years) were more inclined to travel overseas post-pandemic than younger adults (Ivanova et al., 2020).

Regarding intentions to use transport modes, the only significant differences were for public transport. Younger adults reported larger decreases in use of public transport than older age groups. However, this result likely reflects the fact that younger adults in our sample used public transport more regularly than middle-aged and older adults.

Moreover, we examined if there was a relationship between gender and travel attitudes and intentions. While there were significant gender differences present in our study, the effect sizes were small. Females' attitudes towards travel modes were more negatively affected than males as a result of COVID-19 concerns. There were also some differences in intentions to use

transport modes. Females reported more reductions in their intentions to use domestic air travel at the eased restriction phase. Males indicated a slight but significantly larger increase in their intended car use than females in our sample at both the eased and removed restriction phase. Despite significant differences in public transport attitudes between genders, there were no significant differences in intentions to change use of public transport between males and females.

Research in other countries during the early stages of COVID-19 outbreak showed that females were more likely to have made changes to their travel behaviour than males (Beck & Hensher, 2020), and males continued to travel more than females (Molloy et al., 2020). However, these studies collected their research only at the start of travel restrictions. These gender differences may not be as pronounced as the pandemic progressed because concerns about the virus decrease (Galasso et al., 2020).

Lastly, we looked at perceived risk scores. As other studies have suggested (Lau et al., 2009; Neuburger & Egger, 2020), respondents with higher levels of perceived severity and perceived susceptibility reported more reduction in their travel attitudes than those who reported lower levels. Similar to gender, these differences were significant but small. Further, our study did not indicate any significant differences between perceived risk scores and gender. Additionally, a small but significant relationship was found between age and perceived severity scores; however, this was not the case for perceived susceptibility scores. This significant relationship between age and perceived severity may reflect the fact that older adults perceive more risk in relation to health concerns (Bonem et al., 2015), or the actual increased risk of older adults in relation to COVID-19 (Office of National Statistics, 2020).

Overall, attitudes generally became more neutral i.e. tended towards the centre of the response scale when COVID-19 restrictions were in place (eased phase). While New Zealand

and Australia showed similar patterns in their attitudes and intentions, the magnitude of the change was smaller for New Zealand respondents. In spite of differences between pandemics, there are some similarities in the way people tend to respond to the risks posed by widespread infectious diseases. Consistent with the findings of this study, other studies on COVID-19 have shown that pandemics tend to increase car use and reduce use of public transport (Abdullah et al., 2020).

Answering our second research question, age and gender did not largely influence people's attitudes or intentions to use travel modes during the COVID-19 pandemic. Where significant differences for age and gender were identified, the effects were small and not practically significant. Further, perceptions of severity and susceptibility had small, but consistent influences on travel attitudes and intentions. Unlike Cahyanto and colleagues' (2016) survey on Ebola with US respondents, (which found no relationship between perceived severity of Ebola and subsequent travel avoidance), the current study indicates a relationship between perceived severity of COVID-19 and decreases in intentions to use public transport and air travel. This finding provides some further support that perceptions of severity may result in a reduction to use of transport modes (travel avoidance) considered risky by respondents.

4.2 Implications

If the intentions reported in this study are representative of actual behaviour at these restriction phases, this could suggest that the Australian transport system may see larger reductions in public transport and domestic air travel use than the New Zealand sample. The recovery in intentions to use public transport when restrictions have been removed suggests that there may be a movement towards levels seen prior to COVID-19. However, some of these

changes could become part of the ‘new normal’ and the effects could extend far longer than concerns for the virus.

Research has shown that public transport use in New Zealand is on the rebound, with public transport ridership increasing closer to levels seen prior to COVID-19 (Waka Kotahi New Zealand Transport Agency, 2020). There are possible explanations for this, such that new riders are using the public transport system, or more likely as seen in our survey data, while attitudes have become less positive towards public transport, riders continue to use the services.

The results of this study suggest that the New Zealand transport system is likely to experience very few and minor long-term changes as a result of the initial COVID-19 outbreak. Australia may see more change in use of public transport than the New Zealand sample as the Australian sample had a larger proportion of regular public transport users and reported larger decreases in use. The Australian sample’s intentions to reduce use of public transport and increase car use should be further explored to understand what implications this might have for Australia’s transport system. It may take some time and additional resources for people to become more comfortable using public transport modes.

Additionally, while Australia’s attitudes and intentions were more negatively impacted by COVID-19 than that of New Zealand, both countries have had only minor outbreaks when compared to countries such as China. Research in China has suggested much larger increases in car use with intentions to increase regular car use to 66%, up from 34% prior to COVID-19 (Dunning & Nurse, 2020). Travel use data will play an important role in monitoring people's use of domestic and international travel.

While intentions reported in this survey suggest many people intended to change their travel behaviour, underlying tendencies may take time to manifest and the quick resolution of the

initial COVID-19 outbreak in New Zealand and Australia might not have lasted long enough to result changes in travel behaviour long-term. Further, a study of eight countries (including New Zealand and Australia) found that concerns about the virus decreased between March and April 2020 (partly reflecting the differences in the actual magnitude of the COVID-19 pandemic) (Galasso et al., 2020). The results of our study found some evidence to suggest recovery between the eased and removed restriction phases. It may also be the case that there will be less change in intentions as concerns related to COVID-19 subside over time (even before travel restrictions are removed).

When we consider if positive changes occurred to the transport sector as a result of the pandemic, we need to consider a range of factors. The transport sector has a range of environmental, economic, and social impacts on the community, and thus, the outcomes of the pandemic are evaluated differently depending on the goals or visions of the group appraising them. If we look at the change in relation to emissions emitted into the environment, there have been changes such as increased car use and decreased public transport use that could be considered negative but decreases in use of air travel could be considered a positive change. These changes could be considered positive for car-orientated companies and fuel corporations who stand to profit from increases in car use, and negative for the tourism industry and countries whose economy rely on international tourists.

Sustainable change agents focus on moving towards sustainable development. With the knowledge that some people intend to change their transport behaviour (i.e. decrease public transport, increase car use), this may result in more deliberate decision making in relation to transport choices. This creates potential to foster movement towards use of more active transport modes. Bicycle sales in New Zealand and Australia increased during and after the lockdown

period (Abaño, 2020). This could be an area to create positive change on the transport system as it indicates intentions to cycle. Brundiers (2020) mentioned it is important to look past the overhyped once in a lifetime window of opportunity and continually look for alternative opportunities for positive change throughout the disaster and recovery efforts. With the knowledge that people want to get more involved with cycling, changes can be made to facilitate this behaviour and remove barriers.

Many changes to the transport system are occurring at an accelerated rate. One example of this in New Zealand is a walking and cycle lane between Wellington and Lower Hutt. This is one of the first projects to be approved as part of the COVID fast-track process. It is a short-term consenting process that aims to boost employment opportunities and economic recovery (The COVID-19 Recovery Act 2020). Similar projects are occurring all over the world: Australia removed parking spaces in Melbourne to create wider walkways and has implemented temporary cycle lanes; and Canada has repurposed some roads into areas for walking and cycling.

Further, a new train system (Te Huia) in New Zealand is set to launch in April 2021 connecting Auckland to Hamilton. Other ideas have been proposed including maximum bus fares that would make travel cheaper for regular public transport users. This may encourage reuptake of public transport and new regular public transport users (Waikato Regional Council, 2020). New Zealand and Australia are some of the first countries to come out of lockdown. The reported changes in attitude and intentions to use transport options could provide an example of what other countries might expect to overcome. Additionally, effective changes to the transport system implemented in New Zealand and Australia would provide useful recommendations that could be adopted by other countries to recover faster and achieve more sustainable development.

In the places where there are still some negative attitudes (public transport, and air travel) there are still people using face masks. Western countries such as New Zealand and Australia have little to no previous experience with face masks. It has been reported that Asian countries are outperforming Western countries in controlling COVID-19. One possible explanation for this was that Asian countries have previous experience with protective measures as a result of the SARS outbreak (Landoni et al., 2020). New Zealand and Australia were not impacted by SARS or Ebola to the extent of widely using facemasks. In New Zealand and Australia, face masks were made mandatory under certain settings including when using public transport and when travelling by air during times (Ministry of Health, 2020; Queensland Government, 2021). This might be a source of negative attitude and remind people of the concern and risk associated with COVID-19.

4.3 Limitations

One limitation of this study was that it assessed respondents' attitudes and their intentions towards various travel modes rather than people's actual use. A second limitation of this study was that both New Zealand and Australia continued to have occasional cases of community transmission reported. While the number of COVID-19 cases has lowered, there is potential for more waves of the virus. We cannot be sure how additional waves might affect respondents' attitudes and intentions towards travel. It is an open question whether the differences between New Zealand and Australia were due to time lags in controlling the virus, or other factors such as New Zealand's geographical isolation, smaller population size, or nationwide lockdown. Additionally, Australia had active cases while data collection was taking place, whereas the New Zealand sample had no cases of community spread during the data collection period.

Another limitation of this study was that the scales used to measure intentions to use transport modes were not exhaustive as they did not have options to indicate more than moderate changes in use. This was mentioned by one of the respondents in the Australian sample: “I didn't moderately change my use of public transport after COVID. I have totally stopped using it …”. If the scale we use to measure intentions included options to report more than moderate changes in use, we may have seen larger intentions to change use of transport modes.

4.4 Future research

This survey did not access attitudes towards active transport modes such as walking or cycling. Studies overseas have suggested that there may be some increases in these modes of travel as a result of concerns regarding COVID-19 (Harrington & Hadjiconstantinou, 2020). Further, as this study only included licenced drivers, it would also be of interest to explore whether attitudes are different for those that are unable to drive themselves. Research may also want to explore attitudes and changes in use of hireable shared transport such as car-sharing schemes, bicycles, and electric scooter hiring.

This study also did not look at the typography of travel and cannot make suggestions regarding changes to the number of trips, combining of trips, or distance travelled. Future research may want to examine if the pattern of travel has changed. Further, it is unclear why some car users increased their use, and what purpose this served. People may be using cars more to attend social events, to go shopping, or to visit local tourist attractions as an alternative to domestic or international air travel. Research may also want to consider how domestic travel for recreational purposes (e.g., holidays) has been influenced.

It would also be useful to understand how additional waves influence the usage of transport modes. It may be the case that public transport increased up to similar usage rates after

the initial wave of COVID-19, but subsequent waves of COVID-19 or the emergence of other viruses might continue this downwards trend in public transport use. If other modes of transport (such as cars or active modes) are used for extended periods, the original habit tendencies may continue to weaken and be less likely to revert. Further, gender and age differences may emerge as a result of this continual threat.

5 Conclusion

New Zealanders' and Australians' attitudes were less positive towards transport modes as a result of COVID-19, particularly in relation to public transport and international air travel. Intentions towards use of travel modes also showed some changes, namely intentions to reduce use of public transport and air travel, with some slight increases in car use. Additionally, the result suggests that Australians were more negatively impacted by COVID-19 than New Zealanders. Australia reported more change in their intentions to use domestic travel modes, but both countries had similar intentions to use international air travel when restrictions have been removed. Personal and demographic characteristics (age, gender, perceived severity, and perceived susceptibility) did not have large effects on attitude or intention ratings. Further research on travel behaviour will be useful in understanding travel during pandemics.

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Appendices

Appendix A. Advertisements for study

New Zealand advertisements:

Australian advertisement:

Headline:

Help us understand your attitudes towards travel before and after COVID-19

Description:

Australian drivers needed for online survey.

Participate in a study conducted by QUT and UOW (University of Waikato) for a chance to win one of fourteen $50 Amazon e-vouchers. If you are 18 years and over, living in Australia and hold an open or provisional driver's licence, you are invited to take part in the study (ethics approval number 2000000481) examining travel and commuting before and after COVID-19.

Appendix B. Travel and commuting before and after COVID-19 survey

[Participants who clicked on the Queensland University of Technology survey link in Australia viewed the participant information for QUT research project (Appendix C)]

Start of Block: Consent

[Participants who clicked on the University of Waikato survey link in New Zealand will view the following text prior to commencing the survey]:

Understanding attitudes towards travel is vital for New Zealand and Australia to provide for citizens' transport needs. This survey aims to explore attitudes towards travel and commuting before and after COVID-19. To take part in this survey (approximately 20-25 minutes) you will need:

- To be currently living in either New Zealand or Australia,
- To hold either a restricted/provisional or full/open drivers' licence.

All finished surveys will go into the draw to win one of 14 Amazon $50 vouchers. Participation is completely voluntary, and you are free to withdraw from the survey at any time. All data collected as part of this study will be anonymized and handled with strict confidentiality. Your participation in this online survey is accepted as an indication of your informed consent to participate in this research project. Findings from this study will be used for research purposes only. This survey has not received financial sponsorship in any way. This research project has been approved by the Human Research Ethics Committee of the Faculty of Arts and Social Sciences. Any questions about the ethical conduct of this research may be sent to the Secretary of the Committee, email alpss-ethics@waikato.ac.nz , postal address, Division of Arts, Law, Psychology and Social Sciences, University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240. If you have any further questions about the study please contact a member of the research team. Prof Samuel Charlton (samuel.charlton@waikato.ac.nz) or Francene Thomas (fmft1@students.waikato.ac.nz) To take part, click the red arrow below.

End of Block: Consent

Start of Block: Everyday travel prior to COVID-19 concerns

Q1 **Please note:** Although you may be answering the same questions a number of times, we are seeking your responses to these questions in relation to each specific travel/commuter scenario. Read each scenario carefully before responding to the questions that follow.

In this survey, where we state 'prior to COVID-19' we would like you to answer as you would have just

before concerns and restrictions were put in place as a result of the COVID-19 virus.

Where we state 'in the 12 months before COVID-19' we would like you to answer in relation to the 12 month period before COVID-19 concerns and restrictions.

Prior to COVID-19, what was your main form of travel for everyday trips? (such as to work, shopping, school, etc.)

- ○ Car (1)
- ○ Motorcycle (2)
- ○ Bus (3)
- ○ Cycling (4)
- ○ Walking (5)
- ○ Train (6)
- ○ Other (please specify) (7) _____

Q2 How long has this mode of travel been your main form of travel?

- ○ Less than one month (1)
- ○ 1-6 months (2)
- ○ 7-11 months (3)
- ○ 1-2years (4)
- ○ 2 years + (5)

Q3 Prior to COVID-19, how comfortable did you find your main form of transport?

- ○ Extremely comfortable (1)
- ○ Somewhat comfortable (2)
- ○ Neither comfortable nor uncomfortable (3)
- ○ Somewhat uncomfortable (4)
- ○ Extremely uncomfortable (5)

End of Block: Everyday travel prior to COVID-19 concerns

Start of Block: Private transport prior to COVID-19

Q4 In the 12 months before COVID-19, how frequently did you drive a car?

- ○ Almost daily (5+ days a week) (1)
- ○ Most of the week (3-4 days a week) (2)
- ○ At least weekly (1-2 days a week) (3)
- ○ A few times a month (4)
- ○ Once a month (5)
- ○ A few times in the 12 months before COVID-19 (6)
- ○ Once in the 12 months before COVID-19 (7)
- ○ I have not driven a car in the 12 months before COVID-19 (8)

Q5 In the 12 months before COVID-19, how frequently were you a passenger in a car?

- Almost daily (5+ days a week) (1)
- Most of the week (3-4 days a week) (2)
- At least weekly (1-2 days a week) (3)
- A few times a month (4)
- Once a month (5)
- A few times in the 12 months before COVID-19 (6)
- Once in the 12 months before COVID-19 (7)
- I was not a passenger in a car in the 12 months before COVID-19 (8)

Q6 Prior to COVID-19, when you drove how often did you take passengers with you? (this includes partners, parents, children, flatmates, friends, etc.)

- Almost always (1)
- Most trips (2)
- Some trips (3)
- Rarely (4)
- Never (5)

Q7 Prior to COVID-19, what was your attitude towards carpooling? (Carpooling refers to travelling in a car with other people that may or may not be related to you)

- ○ Extremely positive (1)
- ○ Somewhat positive (2)
- ○ Neither positive nor negative (3)
- ○ Somewhat negative (4)
- ○ Extremely negative (5)

Q8 Please select the option that best indicates how much the following statement applies to you
"I am a confident driver"

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

End of Block: Private transport prior to COVID-19

Start of Block: Public/air transport prior to COVID-19

Q9 In the 12 months before COVID-19, how often did you use public transport? By public transport, we mean public buses, trains, and ferries that anyone can use to travel in your local area.

- ○ Almost daily (5+ days a week) (1)
- ○ Most of the week (3-4 days a week) (2)
- ○ At least weekly (1-2 days a week) (3)
- ○ A few times a month (4)
- ○ Once a month (5)
- ○ A few times in the 12 months before COVID-19 (6)
- ○ Once in the 12 months before COVID-19 (9)
- ○ I have not used public transport in my local area in the 12 months before COVID-19 (7)
- ○ There is little or no public transport available in my local area (8)

Q10 Prior to COVID-19, how would you rate your attitude towards the use of public transport?

- ○ Extremely positive (1)
- ○ Somewhat positive (2)
- ○ Neither positive nor negative (3)
- ○ Somewhat negative (4)
- ○ Extremely negative (5)

Q11 In the 12 months before COVID-19, how often did you travel by air domestically?

- Almost daily (5+ days a week) (1)
- Most of the week (3-4 days a week) (2)
- At least weekly (1-2 days a week) (3)
- A few times a month (4)
- Once a month (5)
- A few times in the 12 months before COVID-19 (6)
- Once in the 12 months before COVID-19 (7)
- I have not travelled by air domestically in the 12 months before COVID-19 (8)

Q12 Prior to COVID-19, how would you rate your attitude towards domestic air travel?

- Extremely positive (1)
- Somewhat positive (2)
- Neither positive nor negative (3)
- Somewhat negative (4)
- Extremely negative (5)

Q13 In the 12 months before COVID-19, how often did you travel by air internationally?

- ○ Almost daily (5+ days a week) (1)
- ○ Most of the week (3-4 days a week) (2)
- ○ At least weekly (1-2 days a week) (3)
- ○ A few times a month (4)
- ○ Once a month (5)
- ○ A few times in the 12 months before COVID-19 (6)
- ○ Once in the 12 months before COVID-19 (7)
- ○ I have not travelled by air internationally in the 12 months before COVID-19 (8)

Q14 Prior to COVID-19, how would you rate your attitude towards international air travel?

- ○ Extremely positive (1)
- ○ Somewhat positive (2)
- ○ Neither positive nor negative (3)
- ○ Somewhat negative (4)
- ○ Extremely negative (5)

End of Block: Public/air transport prior to COVID-19

Start of Block: Private transport after COVID-19 restrictions have been eased

Q15 **In this section, we would like you to report your attitudes about travel after COVID-19 restrictions have eased, and travel is allowed domestically**

Comparing travel before COVID-19 to a time when travel restrictions have been eased, please indicate if you intend to increase or decrease your use of travelling by car?

- ○ Moderate increase (1)
- ○ Slight increase (2)
- ○ No change (3)
- ○ Slight decrease (4)
- ○ Moderate decrease (5)

Q16 At a time when travel restrictions have been eased, how would you rate your attitude towards carpooling?
(Carpooling refers to travelling in a car with other people that may or may not be related to you)

- ○ Extremely positive (1)
- ○ Somewhat positive (2)
- ○ Neither positive nor negative (3)
- ○ Somewhat negative (4)
- ○ Extremely negative (5)

Q17 At a time when travel restrictions have been eased, how would you rate your attitude towards commuting on public transport?

- ○ Extremely positive (1)
- ○ Somewhat positive (2)
- ○ Neither positive nor negative (3)
- ○ Somewhat negative (4)
- ○ Extremely negative (5)

Q18 Comparing travel before COVID-19 to a time when travel restrictions have been eased, please indicate if you intend to increase or decrease your use of public transport?

- ○ Moderate increase (1)
- ○ Slight increase (2)
- ○ No change (3)
- ○ Slight decrease (4)
- ○ Moderate decrease (5)

Q19 At a time when travel restrictions have been eased, how would you rate your attitude towards **domestic** air travel?

- ○ Extremely positive (1)
- ○ Somewhat positive (2)
- ○ Neither positive nor negative (3)
- ○ Somewhat negative (4)
- ○ Extremely negative (5)

Q20 At a time when travel restrictions have been eased, do you intend to increase or decrease your use of **domestic** air travel as a result of the COVID-19 virus?

- ○ Moderate increase (1)
- ○ Slight increase (2)
- ○ No change (3)
- ○ Slight decrease (4)
- ○ Moderate decrease (5)

End of Block: Private transport after COVID-19 restrictions have been eased

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Start of Block: Transport after restrictions have been removed

Q21 **In this section, we would like you to report your likely attitudes once COVID-19 travel restrictions have been removed, and travel is <u>allowed both domestically and internationally</u> (eg. in 12 months time).**

Comparing travel before COVID-19 to a time when travel restrictions have been removed, please

indicate if you intend to increase or decrease your use of travelling by car?

- ○ Moderate increase (1)
- ○ Slight increase (2)
- ○ No change (3)
- ○ Slight decrease (4)
- ○ Moderate decrease (5)

Q22 At a time when travel restrictions have been removed, how would you rate your attitude towards carpooling?
(Carpooling refers to travelling in a car with other people that may or may not be related to you)

- ○ Extremely positive (1)
- ○ Somewhat positive (2)
- ○ Neither positive nor negative (3)
- ○ Somewhat negative (4)
- ○ Extremely negative (5)

Q23 At a time when travel restrictions have been removed, how would you rate your attitude towards commuting on public transport?

- ○ Extremely positive (1)
- ○ Somewhat positive (2)
- ○ Neither positive nor negative (3)
- ○ Somewhat negative (4)
- ○ Extremely negative (5)

Q24 Comparing travel before COVID-19 to a time when travel restrictions have been removed, please indicate if you intend to increase or decrease your use of public transport?

- ○ Moderate increase (1)
- ○ Slight increase (2)
- ○ No change (3)
- ○ Slight decrease (4)
- ○ Moderate decrease (5)

Q25 At a time when travel restrictions have been removed, how would you rate your attitude towards **domestic** air travel?

- ○ Extremely positive (1)
- ○ Somewhat positive (2)
- ○ Neither positive nor negative (3)
- ○ Somewhat negative (4)
- ○ Extremely negative (5)

Q26 At a time when travel restrictions have been removed, how would you rate your attitude towards **international** air travel?

- ○ Extremely positive (1)
- ○ Somewhat positive (2)
- ○ Neither positive nor negative (3)
- ○ Somewhat negative (4)
- ○ Extremely negative (5)

Q27 At a time when travel restrictions have been removed, do you intend to increase or decrease your use of **domestic air travel** as a result of the COVID-19 virus?

- ○ Moderate increase (1)
- ○ Slight increase (2)
- ○ No change (3)
- ○ Slight decrease (4)
- ○ Moderate decrease (5)

Q28 At a time when travel restrictions have been removed, do you intend to increase or decrease your use of **international air travel** as a result of the COVID-19 virus

- ○ Moderate increase (1)
- ○ Slight increase (2)
- ○ No change (3)
- ○ Slight decrease (4)
- ○ Moderate decrease (5)

End of Block: Transport after restrictions have been removed

Start of Block: Additional questions

Q29 These next questions are related to the use of transport and technology, such as the use of rideshare apps, food delivery services, and contact tracing apps.

Food delivery services include having groceries delivered by supermarkets, online meal prep services, use of Uber eats, and having fast-food/restaurant meals delivered.

Please choose the option that best describes your use of food delivery services in the 12 months

before COVID-19

- ○ Very often (2+ times a week) (1)
- ○ About once a week. (2)
- ○ A few times a month (3)
- ○ Once a month (4)
- ○ A few times in the 12 months before COVID-19 (5)
- ○ Once in the 12 months before COVID-19 (6)
- ○ I have not used food delivery services in the 12 months before COVID-19 (7)

Q30 Please choose the option that best describes how frequently you plan to use food delivery services at a time when restrictions have been eased.

- ○ Very often (2+ times a week) (1)
- ○ About once a week. (2)
- ○ A few times a month (3)
- ○ Once a month (4)
- ○ A few times a year (5)
- ○ Once a year (6)
- ○ I do not plan to use food delivery services when restrictions have eased (7)

Q31 Prior to COVID-19, what was your attitude towards the use of rideshare apps? (eg. Uber/Lyft)

- ○ Extremely positive (1)
- ○ Somewhat positive (2)
- ○ Neither positive nor negative (3)
- ○ Somewhat negative (4)
- ○ Extremely negative (5)
- ○ I am not aware of rideshare apps (6)

Q32 At a time when travel restrictions have been eased, how would you rate your attitude towards the use of rideshare apps? (eg. Uber/Lyft)

- ○ Extremely positive (1)
- ○ Somewhat positive (2)
- ○ Neither positive nor negative (3)
- ○ Somewhat negative (4)
- ○ Extremely negative (5)

Q33 [New Zealand viewed] Contact tracing apps help contact tracers to identify people who may have been exposed to the COVID-19 virus to help stop the spread of the virus. This involved downloading an app on a smart device, such as a smartphone or tablet, and electronically transmits a digital diary of the locations you have visited to the National Close Contact Service. You would be able to receive notifications if you have visited a high-risk location, self-report symptoms if you think you may have

COVID-19, and carry out daily health check-in if you are in self-isolation. Would you consider downloading a contact tracing app?

[Australia viewed] Contact tracing apps help contact tracers to identify people who may have been exposed to the COVID-19 virus to help stop the spread of the virus. This involved downloading the COVIDSafe app on a smart device, such as a smartphone or tablet. The app helps state and territory health officials in Australia to find people who have been in close contact with someone with COVID-19 and who may need to quarantine or get tested. Would you consider downloading a contact tracing app?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)
- ○ I don't have a smartphone/device (4)

Q34 Which of the following organisations would you feel comfortable having access to your contact data?

- ☐ Police (1)
- ☐ Health insurers (2)
- ☐ Government researchers (3)
- ☐ ⊗ I would not feel comfortable sharing my contact data (4)

[The Australian sample received the following information, with questions Q81 and Q82 moved to this section as followed].

Warning: Please be advised that the following section will include questions about your vulnerability, as well as close friends/family members' vulnerability, to COVID-19, which may cause discomfort or distress for some participants. If you experience any discomfort or distress, you can stop the survey at any time, without comment or penalty, by closing the web browser.

Additionally, QUT provides for limited free psychology, family therapy or counselling services for research participants of QUT research projects who may experience discomfort or distress as a result of their participation in the research. Should you wish to access this service please call the Clinic Receptionist on 07 3138 0999 (Monday–Friday only 9am–5pm), QUT Psychology and Counselling Clinic, 44 Musk Avenue, Kelvin Grove, and indicate that you are a research participant. Alternatively, Lifeline provides access to online, phone or face-to-face support, call 13 11 14 for 24 hour telephone crisis support. If you are aged up to 25, you can also call the Kids Helpline on 1800 551 800. Please note, during COVID-19 restrictions the QUT Psychology and Counselling Clinic will offer telehealth only services.

To find more information on COVID-19 and vulnerable individuals, please visit the following website:

https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/what-you-need-to-know-about-coronavirus-covid-19

Q88 Is a close friend or family member considered more vulnerable to the COVID-19 virus? (This includes people that are pregnant, asthmatic, over 70, immunocompromised, or have underlying serious health condition, etc.)

- ○ Yes (1)
- ○ No (2)
- ○ Unsure (3)

Q89 Are you considered more vulnerable to the COVID-19 virus? (ie. pregnant, asthmatic, over 70, immunocompromised, underlying serious health condition, etc.)

- ○ Yes (1)
- ○ No (2)
- ○ Unsure (3)

QUT provides for limited free psychology, family therapy or counselling services for research participants of QUT research projects who may experience discomfort or distress as a result of their participation in the research. Should you wish to access this service please call the Clinic Receptionist on 07 3138 0999 (Monday–Friday only 9am–5pm), QUT Psychology and Counselling Clinic, 44 Musk Avenue, Kelvin Grove, and indicate that you are a research participant. Alternatively, Lifeline provides access to online, phone or face-to-face support, call 13 11 14 for 24 hour telephone crisis support. If you are aged up to 25, you can also call the Kids Helpline on 1800 551 800. Please note, during COVID-19 restrictions the QUT Psychology and Counselling Clinic will offer telehealth only services.

End of Block: Additional questions

Start of Block: Perceived travel risk

Q35 Please select the response that best indicates your agreement with the following statements.
Even when travel restrictions have been removed, I think that the risk of travelling within my country is high

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q36 At a time when travel restrictions have been removed, I would feel very comfortable travelling in my country.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q37 Even when travel restrictions have been removed, domestic travel is just as risky as international travel

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q38 Even when travel restrictions have been removed, domestic air travel should be avoided because of the COVID-19 virus

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q39 Even when travel restrictions have been removed, international air travel should be avoided because of the COVID-19 virus.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q40 Even when travel restrictions have been removed, I would still be concerned about travel by air because of the COVID-19 virus

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q41 When travel restrictions have been removed, I would not be concerned about contracting the COVID-19 virus during travel by air

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q42 Even when travel restrictions have been removed, it is dangerous to travel internationally by air because of the COVID-19 virus.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q43 When travel restrictions have been removed, I expect people around me will refrain from domestic air travel because of the COVID-19 virus.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q44 When travel restrictions have been removed, I expect people around me will refrain from international air travel because of the COVID-19 virus.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q45 The COVID-19 virus is a very frightening disease.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

End of Block: Perceived travel risk

Start of Block: Perceived Severity and susceptibility

[The Australian sample was presented with this following warning and additional information]

Warning: Please be advised that the following section will include questions about your vulnerability to COVID-19, which may cause discomfort or distress for some participants. If you experience any discomfort or distress, you can stop the survey at any time, without comment or penalty, by closing the web browser.

Additionally, QUT provides for limited free psychology, family therapy or counselling services for research participants of QUT research projects who may experience discomfort or distress as a result of their participation in the research. Should you wish to access this service please call the Clinic Receptionist on 07 3138 0999 (Monday–Friday only 9am–5pm), QUT Psychology and Counselling Clinic, 44 Musk Avenue, Kelvin Grove, and indicate that you are a research participant. Alternatively, Lifeline provides access to online, phone or face-to-face support, call 13 11 14 for 24 hour telephone crisis support. If you are aged up to 25, you can also call the Kids Helpline on 1800 551 800. Please note, during COVID-19 restrictions the QUT Psychology and Counselling Clinic will offer telehealth only services.

To find more information on COVID-19 and vulnerable individuals, please visit the following website:

https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/what-you-need-to-know-about-coronavirus-covid-19

Q46
[The New Zealand sample received the following information]: This section includes questions about the seriousness of COVID-19.

Please select the option that best indicates your agreement with the following statements.

I am afraid that I may die if I contract the COVID-19 virus.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q47 If I test positive for the COVID-19 virus, I could pass it to my family and friends who may die.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q48 I am at greater risk of dying if I contract the COVID-19 virus because of my general health.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q49 My chances of being exposed to the COVID-19 virus are high.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q50 It is likely that I will contract the COVID-19 virus if I travel in the next few months

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q51 It is likely that I will be exposed to the COVID-19 virus if I travel in the next few months, but I will not get sick.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q52 It is likely that I will contract the COVID-19 virus if I travel in my country by air in the next few months.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q53 It is likely that I will contract the COVID-19 virus if I travel internationally by air in the next few months.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

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End of Block: Perceived Severity and susceptibility

Start of Block: DASS

X→

[Australian sample viewed the following warning and information]

Warning: Please be advised that the following section will include questions about how you are faring/feeling during the COVID-19 situation, which may cause discomfort or distress for some participants. If you experience any discomfort or distress, you can stop the survey at any time, without comment or penalty, by closing the web browser.

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provides access to online, phone or face-to-face support, call 13 11 14 for 24 hour telephone crisis support. If you are aged up to 25, you can also call the Kids Helpline on 1800 551 800. Please note, during COVID-19 restrictions the QUT Psychology and Counselling Clinic will offer telehealth only services.

To find more information on COVID-19 and vulnerable individuals, please visit the following website:

https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/what-you-need-to-know-about-coronavirus-covid-19

Q54
For the following questions, please read each statement and choose the options that best indicates how much the statement applied to you **over the past week**. There are no right or wrong answers. Do not spend too much time on any statement.

I found it hard to wind down

- ○ Did not apply to me at all (1)
- ○ Applied to me to some degree, or some of the time (2)
- ○ Applied to me to a considerable degree or a good part of the time (3)
- ○ Applied to me very much or most of the time (4)

Q55 I was aware of dryness of my mouth

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q56 I couldn't seem to experience any positive feelings at all

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q57 I experienced breathing difficulty (eg. excessive rapid breathing, breathlessness in the absence of physical exertion)

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q58 I found it difficult to work up the initiative to do things

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q59 I tend to over-react to situations

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q60 I experience trembling (eg, in the hands)

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q61 I feel I was using a lot of nervous energy

- ○ Did not apply to me at all (1)
- ○ Applied to me to some degree, or some of the time (2)
- ○ Applied to me to a considerable degree or a good part of the time (3)
- ○ Applied to me very much or most of the time (4)

Q62 I was worried about situations in which I might panic and make a fool of myself

- ○ Did not apply to me at all (1)
- ○ Applied to me to some degree, or some of the time (2)
- ○ Applied to me to a considerable degree or a good part of the time (3)
- ○ Applied to me very much or most of the time (4)

Q63 I felt I had nothing to look forward to

- ○ Did not apply to me at all (1)
- ○ Applied to me to some degree, or some of the time (2)
- ○ Applied to me to a considerable degree or a good part of the time (3)
- ○ Applied to me very much or most of the time (4)

Q64 I found myself getting agitated

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q65 I found it difficult to relax

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q66 I felt down-hearted and blue

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q67 I was intolerant of anything that kept me from getting on with what I was doing

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q68 I felt I was close to panic

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q69 I was unable to become enthusiastic about anything

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q70 I felt I wasn't worth much as a person

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q71 I felt that I was rather touchy

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q72 I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q73 I felt scared without any good reason

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

Q74 I felt that life was meaningless

- Did not apply to me at all (1)
- Applied to me to some degree, or some of the time (2)
- Applied to me to a considerable degree or a good part of the time (3)
- Applied to me very much or most of the time (4)

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End of Block: DASS

Start of Block: Demographics

Q75
Lastly, we would like to ask you a number of demographic questions.

Please indicate the country you currently reside in

- New Zealand (1)
- Australia (2)

Display This Question:

If Lastly, we would like to ask you a number of demographic questions. Please indicate the country... = Australia

Q76a Which state do you reside in?

- Australian Capital Territory (8)
- New South Wales (3)
- Northern Territory (4)
- Queensland (5)
- South Australia (6)
- Tasmania (7)
- Victoria (2)
- Western Australia (1)

Display This Question:

If Lastly, we would like to ask you a number of demographic questions. Please indicate the country... = New Zealand

Q76b Where in New Zealand?

- ○ North Island (1)
- ○ South Island (2)
- ○ Stewart Island (3)

Q77 Please choose the option that best describes the area in which you live.

- ○ City/Town (1)
- ○ Urban (large city) (2)
- ○ Rural (3)

Q78 Please indicate your gender

- ○ Male (1)
- ○ Female (2)
- ○ Other (please specify) (3) _____

Q79 Please indicate your age in years

_____

Q80 Please indicate your ethnicity. Choose all that you identify with.

- ☐ New Zealand European (1)
- ☐ Māori (2)
- ☐ Australian (3)
- ☐ Indigenous Australian or Torres Strait Islander (4)
- ☐ Other European (5)
- ☐ Pasifika (6)
- ☐ Chinese (7)
- ☐ Indian (8)
- ☐ Other (please specify) (9) _____

Q81 Please indicate the highest level of education you have completed

- ○ No secondary school qualifications (1)
- ○ High school or equivalent (2)
- ○ Tertiary diplomas/certificates (3)
- ○ Bachelor degree (4)
- ○ Master degree (5)
- ○ Doctorate (6)
- ○ Other (please specify) (7) _____

Q82 Please select the option that best describes your main form of employment (prior to COVID-19)

- ○ Employed for wages (1)
- ○ Self-employed (2)
- ○ Out of work and looking for work (3)
- ○ Out of work but not currently looking for work (4)
- ○ A homemaker (5)
- ○ Student (6)
- ○ Retired (7)
- ○ Unable to work (8)
- ○ Other (please specify): (9) _____

Q83 Please indicate your household's annual income

- Less than $50,000 (1)
- $50,000 - $89,999 (2)
- $90,000+ (3)
- Prefer not to say (4)

Q84 How has your household income been affected by the COVID-19 virus outbreak?

- Much better (1)
- Moderately better (2)
- Slightly better (3)
- About the same (4)
- Slightly worse (5)
- Moderately worse (6)
- Much worse (7)

Q85 Please select the option that best fits the makeup of your household.

- ○ Couple with some or all children living at home (1)
- ○ Couple with children that have all left home (2)
- ○ Couple with no children (3)
- ○ Flatting with others (4)
- ○ Living alone (5)
- ○ Single parent with children at home (6)
- ○ Other (please specify) (7) _____

Q86 Please indicate the drivers' licence you currently hold

- ○ Learners (1)
- ○ Restricted/Provisional (2)
- ○ Full/Open (3)
- ○ I do not hold a current driver's licence (4)
- ○ I have never held a driver's licence (5)

Q87 Do you have access to a vehicle?

- ○ Yes (1)
- ○ No (2)
- ○ Other (please specify) (3) _____

[Q88 and Q89 were presented after Q34 for the Australian sample]

Q88 Is a close friend or family member considered more vulnerable to the COVID-19 virus? (This includes people that are pregnant, asthmatic, over 70, immunocompromised, or have underlying serious health condition, etc.)

- ○ Yes (1)
- ○ No (2)
- ○ Unsure (3)

Q89 Are you considered more vulnerable to the COVID-19 virus? (ie. pregnant, asthmatic, over 70, immunocompromised, underlying serious health condition, etc.)

- ○ Yes (1)
- ○ No (2)
- ○ Unsure (3)

Q90 How did you become aware of this survey?

- ○ Facebook (5)
- ○ Email (2)
- ○ Student newsletter (3)
- ○ Other (please specify) (4) _____

Q91 Do you have anything you would like to say about this survey?

_____

Q92 Please provide an email address we can contact if you are the winner of a $50 Amazon voucher.

_____

Q93 Lastly, would you like a copy of the research findings emailed to you?

- ○ Yes (1)
- ○ No (2)

End of Block: Demographics

Appendix C. Participant information sheet for Australian respondents.

PARTICIPATE IN RESEARCH

Information for Prospective Participants

Travel and commuting before and after COVID-19

Research team contacts

Principal Researcher:	A/Prof Ioni Lewis	Associate Professor
	Ms Sonali Nandavar	Research Officer
	Centre for Accident Research and Road Safety- Queensland (CARRS-Q)	
	Faculty of Health, Queensland University of Technology (QUT)	
Associate Researchers:	Ms Francene Thomas	Masters Student
	Prof Samuel Charlton	Professor
	School of Psychology, University of Waikato, New Zealand	

What is the purpose of the research?

The purpose of this research is to investigate attitudes towards travel before and after the COVID-19 pandemic. This research is part of a Masters' research project conducted by Francene Thomas, and her supervisor Prof Samuel Charlton, at the University of Waikato, New Zealand. The QUT research team will also be conducting the same study here in Australia.

Are you looking for people like me?

The research team is inviting participants who are 18 years and over, reside in **Australia or New Zealand** and hold an **open/full or provisional/restricted driver's licence**.

What will you ask me to do?

Your participation will involve completion of an anonymous online survey (approx. 20-25 mins) investigating attitudes towards travel before and after the COVID-19 pandemic.

Are there any risks for me in taking part?

The research team has identified the following possible risks in relation to participating in this study:

- You may have experienced, or know someone who has experienced, negative occurrences while driving (e.g. a crash) and as such, may find this study to be a sensitive issue. Additionally, some individuals may also find this study to be a sensitive issue as it is about a global pandemic and travel before and after a pandemic, and also includes questions from the DASS (Depression Anxiety Stress Scales) asking about how individuals are faring/feeling at this time. If this is you, we ask that you consider whether or not you are comfortable with participating in this study.

It should be noted that your participation is entirely voluntary and information you provide will be treated with strict confidentiality. No identifying information will ever be made public. If you do agree to participate, you can stop the survey at any time, without comment or penalty, by closing the web browser.

Are there any benefits for me in taking part?

It is expected that this project will not benefit you directly. However, it may benefit the wider community by providing a greater understanding of the influence global pandemics have on people's attitudes towards domestic travel, of long term changes that may come as a result of the COVID-19 pandemic, and the extent to which commuting/travel may be associated with potential negative affective states (e.g., depression, anxiety, stress).

Will I be compensated for my time?

To recognise your contribution should you choose to participate, the research team is offering the chance to win **one of 14 Amazon $50 e-vouchers** upon completion of the survey.

I am interested – what should I do next?

If you are interested in participating in this study, please follow this link to the study site:

Alternatively, for details of the next step, please contact:

Ms Sonali Nandavar	s.nandavar@qut.edu.au	3138 8302
A/Prof Ioni Lewis	i.lewis@qut.edu.au	3138 4966

You will be provided with further information to ensure that your decision and consent to participate is fully informed.

Thank You!

QUT Ethics Approval Number: 2000000481