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Article

Differences in Active Travel Between Immigrants in an Active and Less Active Mobility Culture

Koen Faber [1,*], Simon Kingham [1], Lindsey Conrow [1], and Dea van Lierop [2]

[1] School of Earth and Environment, University of Canterbury, New Zealand
[2] Department of Human Geography and Spatial Planning, Utrecht University, The Netherlands

* Corresponding author (koen.faber@pg.canterbury.ac.nz)

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Abstract
Despite growing investments in active travel infrastructure in many developed countries, walking and cycling rates often remain low. In addition to changes in the built environment, life experiences, place-specific urban mobility policies, and social and cultural norms with regard to active travel mode use are also found to be important factors for encouraging walking and cycling. Many researchers have examined immigrants' travel behaviour to study the influence of social and cultural norms and place-specific factors on mode choice and travel decisions. However, knowledge of the differences in walking and cycling behaviour between various sub-groups of immigrants remains limited. By means of a multiple linear regression model, this study investigates differences in walking and cycling behaviours between immigrants in a less active travel culture, namely New Zealand, and an active travel culture, the Netherlands. The findings show that immigrants in both contexts walk and cycle more than the wider populations. Analysis results demonstrate that socio-demographic characteristics, car and bicycle access, and trip purpose all have a significant effect on active travel behaviour. Furthermore, on average, Dutch born-and-raised immigrants in New Zealand cycle more days per month than professional immigrants in the Netherlands and tend to use a much wider range of transport modes, particularly sharing services. These findings suggest that past experiences with particular travel modes and socialisation factors likely play a major role in active travel behaviour, thereby stressing the need for more research on the role of cultural and social norms in travel decision-making processes.

Keywords
cycling; immigrants; New Zealand; The Netherlands; travel behaviour; walking

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1. Introduction

Problems related to public health, road safety, traffic congestion, air and noise pollution, and climate change, as well as a growing societal interest in alternatives to motorised transportation, put more emphasis on active travel modes, such as walking and cycling (Barajas, 2020; Brand et al., 2021; Mandic et al., 2017). Despite the many benefits associated with active transportation, walking and cycling are often marginal modes of transport in many developed countries (Koglin & Rye, 2014). This holds particularly true for countries with high rates of car ownership, such as New Zealand (Smith, 2016). In comparison, in well-established active travel cultures, such as the Netherlands, walking and cycling remain common modes of transport despite significant increases in car ownership (Pucher & Buehler, 2008). Consequently, many cities and regions turned to the Netherlands among other Northwestern European countries in order to identify and import the best active travel planning practices to increase walking and cycling among their residents (Barajas, 2020). However, walking and cycling rates remain low compared to these countries (European Commission, 2017), and arguments are

made that besides changes in the built environment, life experiences with walking and cycling, place-specific urban mobility policies, and social and cultural norms with regard to active travel mode use are also important in encouraging walking and cycling (Haustein et al., 2020; Nello-Deakin & Nikolaeva, 2020).

In order to study the influence of social and cultural norms and place-specific factors on travel behaviour, many researchers have examined immigrants' travel behaviour (Haustein et al., 2020; Smart, 2010). Immigrants live in the same travel culture as the wider population, but they have been additionally exposed to other cultural influences. This results in greater flexibility of travel habits and practices, which, in turn, might contribute to mobility changes and adaptation (Beige & Axhausen, 2012). Previous empirical studies reveal great differences between the travel behaviour of immigrants and the wider population, as immigrants in less active travel cultures are more likely to cycle than the wider populations (Smart, 2010), while findings on levels of cycling between immigrants and wider populations in active mobility cultures are less conclusive (Basaran et al., 2021; Haustein et al., 2020). However, current literature generally considers immigrants as a homogenous group characterised by low skills and disadvantaged socio-economic backgrounds (OECD, 2019), thereby neglecting the large heterogeneity that exists among today's immigrant populations. As a result, there is only limited knowledge of the differences in walking and cycling behaviour between various sub-groups of immigrants.

In order to address this research gap, this study explores and compares the walking and cycling habits of immigrants living in a less active travel culture—in this case, New Zealand—and immigrants living in a well-established active travel culture, namely the Netherlands. By means of a multiple linear regression analysis of dichotomous and ordinal variables based on their polychoric correlations, we aim to identify differences in walking and cycling behaviours between Dutch born-and-raised immigrants in New Zealand and immigrants from less active travel cultures now living in the Netherlands and relevant factors. This study focuses specifically on professional immigrants as they are more likely to have modal choice than socio-economically disadvantaged immigrant groups as they can afford a car. In turn, this allows us to compare the active travel behaviour between similar population groups living in varying travel cultures, as their mode choice is not restricted by costs, meaning that they have a range of transport options available to them. Findings from this study provide new insights into the role of socio-demographic characteristics and transport-related factors in immigrants' active travel behaviour living in contrasting mobility cultures. The present study contributes to current literature as it is the first to assess the impact of moving to a contrasting mobility culture on attitudes, preferences, and use of active travel modes among people born and raised in varying mobility cultures. The study results can help policymakers and practitioners set policy priorities that stimulate immigrant populations to use active travel modes and, in the process, develop a more equitable transport system.

2. Theoretical Framework

One of the most influential theories in studying travel behaviour is the theory of planned behaviour (TPB; Ajzen, 1991). The TPB maintains that planned behaviour is influenced by intentions to perform this behaviour, which, in turn, are influenced by the attitudes towards that behaviour, perceived social norms, and perceived behavioural control (PBC). The influence of external factors, such as built and social environment characteristics, is assumed to be entirely mitigated through these constructs, under the condition that every individual is able to perceive these characteristics (Ajzen, 1991). While applying the theoretical principles of the TPB on travel behaviour, empirical evidence shows that actual mode use is significantly influenced by intentions to use a particular mode of transport. In turn, intentions are found to be significantly affected by attitudes towards particular transport modes, social norms with regard to specific transport mode use, and the perceived ease of using a particular mode (Haustein & Jensen, 2018).

Research using the TPB has usually considered attitude (ATT), subjective norm (SN), and PBC as independent predictors of intention (La Barbera & Ajzen, 2020). After examining how these variables are intercorrelated, empirical evidence shows a significant interaction between PBC and attitude in the prediction of intention (Kothe & Mullan, 2015; Yzer & van den Putte, 2014), with a higher PBC over a particular behaviour resulting in a stronger association between intention and actual behaviour. In contrast, empirical findings on the relationship between SN and PBC in the prediction of intention are inconclusive (Castanier et al., 2013; Yzer & van den Putte, 2014), and in many studies, SNs tend to have a relatively weak or nonsignificant effect on the prediction of intention (La Barbera & Ajzen, 2020). Recent findings from La Barbera and Ajzen (2020) demonstrate that PBC moderates the effects of attitude and SN on intention, as a greater PBC tends to strengthen the relative importance of attitude in predicting intention, and, at the same time, tends to weaken the relative importance of SN. These findings may explain the relatively weak or nonsignificant relationship often found between SN and intention, and, thereby, stressing the need to examine both interactions between SN and intention and PBC and intention independently in statistical analyses.

In accordance with the findings of La Barbera and Ajzen (2020), we assume that a large PBC over travel behaviour strengthens the relative importance of attitude in predicting intention and weakens the relative importance of SNs. Empirical evidence shows that car access is often negatively associated with levels of walking and cycling (Heinen et al., 2010), whereas bicycle

availability leads to increased levels of cycling (Fraser & Lock, 2010). These findings suggest a strong association between PBC (i.e., transport mode access) and actual walking and cycling behaviour. As a result, only an insignificant relationship between SN and attitude in predicting intention is expected. SN is, therefore, removed from our conceptual model as a variable. Consequently, we utilise the following conceptual model in this study, highlighting both the direct effects (red) and moderating effects (blue) between various dependent, independent, and control variables and their causality is highlighted (Figure 1).

3. Methodology

3.1. Study Locations

Longstanding and significant investments, temperate climate, relatively flat terrain, and strategies and policies favouring active travel modes have resulted in a well-established active travel culture in the Netherlands, wherein walking and cycling are seen as legitimate modes of transport (Pucher & Buehler, 2008). On the contrary, in New Zealand, cycling is often considered a "childish," "uncool," and "embarrassing" activity and an uncommon commute mode (Frater & Kingham, 2020). Cycling rates in cities in New Zealand are significantly lower compared to other cities in developed countries (Jahanshahi et al., 2022). These differences can partly be attributed to the country's topography as well as socio-demographic factors, such as ethnicity, education, and bicycle user type (Jahanshahi et al., 2022). Furthermore, walking is often perceived as a potentially useful and appropriate mode of transport and a valued social practice among people in New Zealand (Bean et al., 2008). However, walking rates remain low in New Zealand due to perceived dangerous intersections and crossings, poor walking infrastructure and relatively long distances to

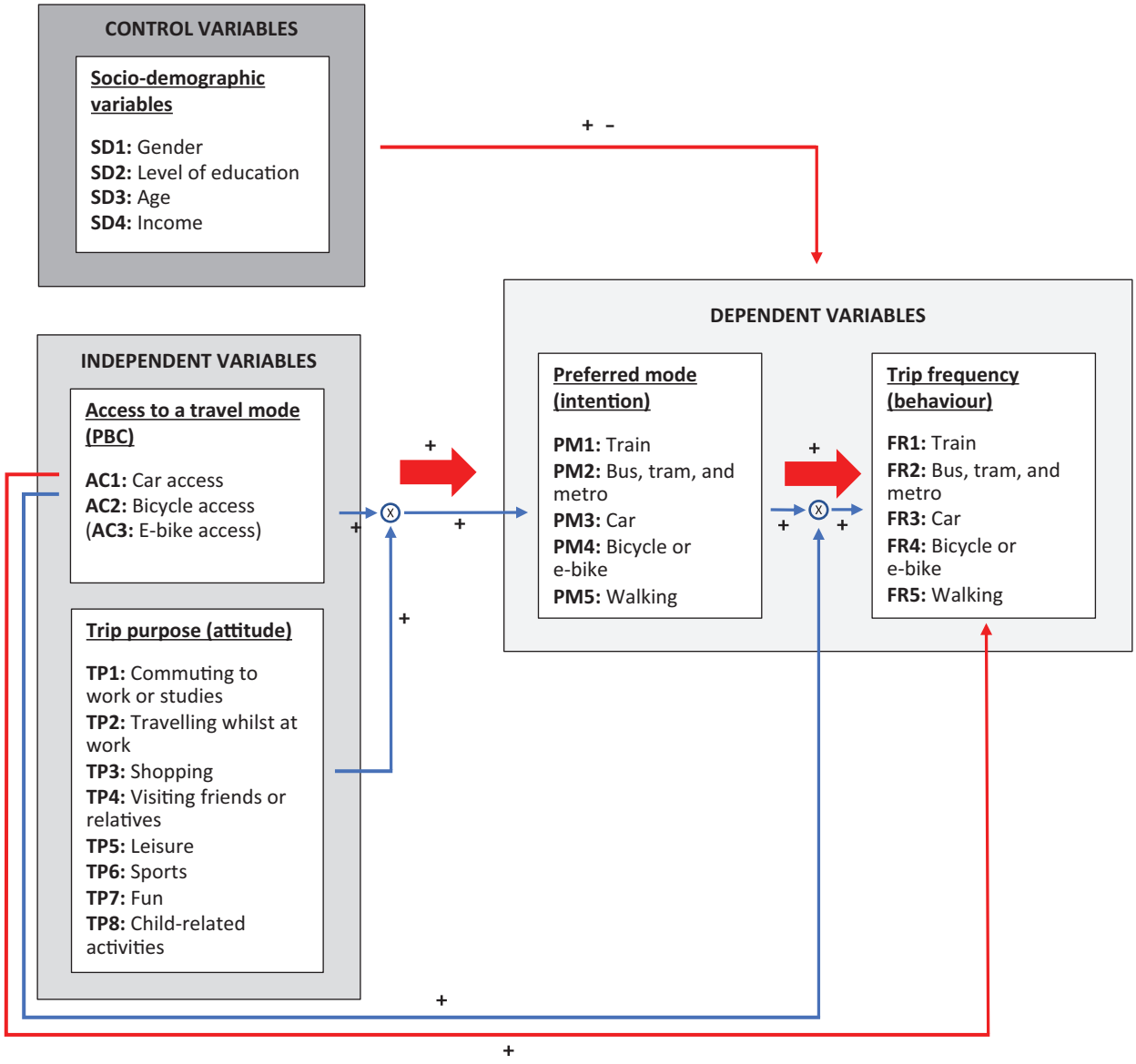

Figure 1. TPB-based conceptual model utilised in this study.

daily activities (Bean et al., 2008; Mandic et al., 2017). In order to compare the walking and cycling behaviour of immigrant populations in both contexts, we conducted a comparative quantitative study among immigrants in the Randstad region, in the Netherlands, and immigrants in New Zealand based on the conceptual model presented in Figure 1.

3.2. Recruitment Strategy

By means of an online stated preference survey, socio-demographic and travel behaviour related data on professional immigrants living in the Netherlands and New Zealand were obtained. Potential participants were recruited via expat and international community groups in the Randstad region and in New Zealand on Facebook. Invitations to participate were distributed through online social media posts, which included information about the purpose of the study, alongside a link to the online survey in Qualtrics. Participants were encouraged to share the link among peers and family in order to include more potential participants. To generate interest, three gift cards, worth 25 EUR/50 NZD, were offered in a prize draw in each respective context.

The survey sought to obtain information about immigrants' personal characteristics, including gender, age, educational attainment, and personal income, as well as current travel practices, including travel mode access, driver's license possession, mode preference, actual mode use, and trip purpose. The questions in the survey are in accordance with the questionnaire used in the 2018 Dutch national travel survey, the Netherlands Mobility Panel (MPN; Hoogendoorn-Lanser et al., 2015), to allow for a comparison of the results. The participants of the 2018 MPN survey are representative of the total Dutch population. In addition, in order to compare the survey data with that of the New Zealand population, a number of questions with regard to employment status, main mode for commuting purposes, and frequency of cycling and using public transport in the last four weeks were included from the 2018 New Zealand Household Travel Survey (New Zealand Ministry of Transport, 2018) and the 2018 New Zealand Census (Statistics New Zealand, 2018). Due to privacy restrictions on data with regard to gross personal income in the MPN, an additional question has been added to compare the samples based on income.

In order to compare both immigrant samples, a similar distribution in socio-demographic characteristics was desirable. Immigrant populations in New Zealand often include highly educated and skilled individuals due to the immigration policies in place. Likewise, we aimed to include a Dutch immigrant population group with similar characteristics by recruiting professional immigrants. Professional immigrants are defined in our study as immigrants who have sufficient financial resources to be able to afford a range of transport options, including a car. Accordingly, due to having multiple transport options available to them, this immigrant population group can be regarded as either "captive by choice" or "choice users" as they choose to be dependent on public or active travel modes while they could own a car or already have a car available to them (van Lierop & El-Geneidy, 2016). Due to the sensitivity often associated with asking for information about levels of income (Riphahn & Serfling, 2005), participants were asked about their current profession to identify participants with a generally above-average paying job that allows them to afford multiple transport options. Only individuals with highly skilled jobs, as distinguished by Salt (1997), were selected for the study, including corporate transferees, professionals in the health or educational sectors, project and consultant specialists, private career development or training movers, academics (researchers and students in higher education), business people and the independently wealthy, technicians, military personnel, clergy and missionaries, entertainers, sportspeople, and artists, and spouses and children of the above professions (Salt, 1997).

3.3. Methods

In order to compare the walking and cycling behaviour of immigrants in the Dutch and New Zealand contexts with each other and with that of the native populations, we used descriptive analysis. Descriptive analysis allows us to identify similarities and differences in travel behaviour between the various samples and was used to determine which population group is more prone to use active travel modes. In order to test for the direct and indirect effects between the variables specified in the conceptual model (Figure 1), a multiple linear regression analysis was performed. This study uses a structural equation modelling approach computed in LISREL 8.80 to estimate the effects between the variables specified in the conceptual model by means of the maximum likelihood method (Jöreskog & Sörbom, 1996). As the variables specified in the conceptual model are measured on either an ordinal or dichotomous scale, two estimation approaches are suited, namely a multi-nominal logit model in combination with an ordinal regression (Bhat, 1997), or by treating all variables as ordinal variables with two or more categories and estimating underlying Pearson's correlation and feeding them into a multiple linear regression model (Olsson, 1979). The latter model is preferred because it additionally accounts for the strength of preferences and the relationships among those preferences, thereby containing a higher informational output. Accordingly, a multiple linear regression analysis of the dichotomous and ordinal variables based on their polychoric correlations was conducted. Polychoric correlations are the Pearson correlations of the standardised normally distributed latent variables underlying the measured ordinal and dichotomous variables (Olsson, 1979).

This method allows us not only to test for the direct effects of independent variables and preferences on

actual travel mode use but also for simultaneous feedback effects of actual travel mode use on mode preferences. It is postulated that the two variables are simultaneously related, independent of common determinants, and are endogenously determined by certain exogenous variables (covariates). As the constructs in our conceptual model are directly measured based on only observed measures, the internal consistency reliability of (in)dependent variables specified in the conceptual model is maintained. Furthermore, correlations of regression errors are estimated in order to control for relations induced by variables not specified in the model. The chosen method does not allow for testing causality, but only statistical correlation between the specified variables.

In order to estimate the models, we first specified the independent variables individually and removed high correlating variables ($R > 0.90$) using a step-wise procedure. This procedure is based on the modification indices indicating significant effects of non-specified parameters provided by the LISREL program and is used to improve the fit of the model. Subsequently, we specified the dependent variables of the conceptual mode using the same approach. In addition, to specifically test the moderation effects between the dependent and independent variables specified in the conceptual model (Figure 1), a simple moderation analysis was performed. As this study makes use of categorical variables, approaches based on assumptions of continuous variables are not applicable (Memon et al., 2019). Therefore, the moderating effects are taken into account as follows; similar to the product–indicator approach, the ordinal values of the independent variables are multiplied by the ordinal values of the moderating variables. Instead of treating the resulting values as continuous, they have alternatively been reclassified on a five-point Likert or the resulting dichotomous scale (i.e., subdividing the continuous resulting values into groups of five or two). This approach allowed us to choose indicators to be included in the model, thereby introducing arbitrariness in the model (Foldnes & Hagtvet, 2014), and, as a result, increasing the fit of the conceptual model on the specified variables. Within the statistical analyses, we explored the best linear model for the data, including a test of the TPB-based theoretical model specified in Figure 1.

3.4. Operationalisation

In order to assess differences in walking and cycling between the two samples, the items specified in the conceptual model (Figure 1) have been operationalised in the context of the TPB. In the context of the TPB, transport mode access relates to PBC, that is, the extent to which it is easy or difficult to access and use a particular transport mode. Furthermore, trip purposes can be encompassed by attitudes towards transport modes and their utilisation for specific purposes. Mode preferences are connected to the intention to use a particular mode of transport and frequencies of use is contained in the actual performance of specific travel behaviour. In accordance with the TPB, PBC and attitude are assumed to be direct determinants in predicting the intention to use particular transport modes, and intention directly affects actual behaviour. In addition, access to a specific transport mode (PBC) has a direct effect on the actual use of a mode (behaviour). Moreover, in order to control for the effects of socio-demographic characteristics on travel mode preference and actual travel mode use, we included them in the set of control variables. Different to the independent variables, we assume that socio-demographic characteristics have a direct effect on both intention and actual behaviour. With regard to the moderating effects, we assume that the higher the PBC over particular behaviour, the stronger the association between intention and actual behaviour. In addition, we assume that a positive attitude towards a particular transport mode and a strong PBC in performing particular behaviour associated with that transport mode has a positive effect on the intention to use a particular transport mode. Furthermore, significant high correlations between e-bike access and access to a car in the New Zealand sample were found, resulting in identification problems in measuring the effects of these variables on other variables specified in the conceptual model. Consequently, the effects of e-bike access on the dependent variables in the model of the New Zealand immigrant sample were not estimated. A list of the variables specified in the conceptual model and how they have been measured can be found in Table 1. The results of the statistical analyses are presented in Tables 4 and 5, in which the estimated results of the theoretical relationships specified in the conceptual model are presented in bold.

4. Results

4.1. Sample Description

Immigrants living in Randstad who participated in the survey are predominately female (76.9%), between 29 and 34 years old (33.1%), and hold at least a master's degree (61.3%), which is not surprising given the target population of this study. In comparison, most respondents from the 2018 MPN survey are female (50.3%), between 29 and 34 years old (21.1%), and hold a bachelor's degree (39.7%). With regards to New Zealand, immigrants in New Zealand are predominately female (76.0%), between 45 and 54 years old (25.3%), and hold a master's degree or higher (40.9%). In contrast, insights from the 2018 census show that the New Zealand population is generally female (50.3%), 65 years or older (20.1%), and have a secondary school qualification (46.9%). The personal characteristics of both immigrant samples and the national population samples in each respective context are given in Table 2. Due to privacy restrictions of information on personal gross income and residential

Table 1. Type of variables specified in the conceptual model.

Variable code	Variable name	Measurement scale	Measurement values
SD1	Gender	Nominal	0 = Male 1 = Female
SD2	Level of education	Ordinal	1 = Left school at 16 or younger 2 = Left school at 17 or 18 3 = Trade/vocational qualification 4 = Bachelor's degree 5 = Master's degree or higher
SD3	Age	Ordinal	1 = 20 years old or younger 2 = 21–28 years old 3 = 29–34 years old 4 = 35–44 years old 5 = 45–54 years old 6 = 55–64 years old 7 = 65 years old or older
SD4	Income	Ordinal	1 = Minimum (<12,500 EUR/<25,000 NZD) 2 = Below the national benchmark income (12,500–<26,200 EUR/ 25,001–50,000 NZD) 3 = National benchmark income (26,200–<38,800 EUR/ 50,001–70,000 NZD), including negative income 4 = Between one to two times the national benchmark income (38,800–<65,000 EUR/70,001–100,000 NZD) 5 = Two times the national benchmark income (65,000–<77,500 EUR/ 100,001–150,000 NZD) 6 = More than two times the national benchmark income (≥77,500 EUR/≥150,001 NZD)
AC	Access to a travel mode	Nominal	0 = Person does not have access to this mode 1 = Person does have access to this mode
TP	Trip purpose	Nominal	Preference intensity for a particular purpose ranging from 0 to 5
PM	Preferred mode	Nominal	0 = Person has a preference to use this mode 1 = Person does not have a preference to use this mode
TP	Trip frequency	Ordinal	0 = Never 1 = Less than once a month 2 = Once a month 3 = 2–3 days per month 4 = 1–3 days per week 5 = 4 or more days per week

location in both National Travel Survey datasets, the samples could not be compared based on these factors.

4.2. Descriptive Analysis

When comparing both immigrant samples with regard to their travel characteristics, the results show that immigrants in the Dutch context walk and use a bicycle or e-bike more days per month on average than other modes of transport, such as private cars and public transportation (Table 3). In contrast, immigrants in New Zealand use on average more frequently sharing mobility services than other transport modes. These findings demonstrate that immigrants in New Zealand use a wider range of transport options per month than immigrants in the Netherlands. When comparing the survey data with that of the national travel surveys in each respective context, insights from the 2018 New Zealand Household Travel Survey revealed that only 3.1% of the respondents cycle almost daily (20 days or more

Table 2. Personal characteristics of the Dutch and New Zealand immigrant samples, and the national travel survey and census samples in each respective context.

	2018 MPN sample (*n* = 8,561)		Dutch immigrant sample (*n* = 160)		2018 New Zealand Census (*n* = 4,669,775)		New Zealand immigrant sample (*n* = 154)	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Highest education achieved by the respondent								
Left school at 18	679	18.7	4	2.5	1,354,044	46.9	7	4.7
Trade/vocational degree	935	25.7	7	4.4	658,938	22.8	20	13.4
Bachelor's degree	1,444	39.7	51	31.9	716,586	24.8	59	39.6
Master's degree or higher	576	15.9	98	61.2	160,047	5.5	63	42.3
Valid cases	3,634	42.4	160	100.0	2,889,615	61.9	149	96.8
Age of respondent (years)								
18–20	855	12.7	3	1.9	182,937	5.1	0	0.0
21–28	559	8.3	46	28.7	532,662	15.0	13	8.5
29–34	1,427	21.1	53	33.1	384,285	9.8	21	13.7
35–44	1,241	18.4	47	29.4	586,743	16.5	38	24.8
45–54	1,418	21.0	8	5.0	630,075	17.7	39	25.5
55–64	1,249	18.5	3	1.9	563,646	15.8	25	16.3
65+	0	0.0	0	0.0	715,167	20.1	17	11.2
Valid cases	6,749	78.8	160	100.0	3,559,515	76.2	153	99.4
Gender								
Male	4,037	47.2	37	23.1	2,319,558	49.7	35	22.9
Female	4,524	52.8	123	76.9	2,380,197	50.3	117	76.5
Non-binary/gender diverse	0	0.0	0	0.0	0	0.0	1	0.6
Valid cases	8,561	100.0	160	100.0	4,669,775	100.0	153	99.4

per month), compared to 15.0% of the New Zealand immigrant sample. Recent insights show that 21% of these trips are made for commuting purposes (Waka Kotahi, 2021). Comparing the data within the Dutch context, 28.2% of the 2018 MPN sample use a bicycle or e-bike 16 days or more per month, while 63.3% of the Dutch immigrant sample cycles with the same frequency. In terms of walking, 45.6% of the 2018 MPN survey respondents walk 16 days or more per month, compared to 65.7% of the immigrants in the Netherlands. Previous research shows that work, school, leisure, and shopping are all positively and significantly associated

Table 3. Results from the descriptive analysis with regard to trip frequency.

	Dutch immigrant sample (*n* = 160)			New Zealand immigrant sample (*n* = 154)		
	$\bar{x}$	*S*	Missing data (%)	$\bar{x}$	*S*	Missing data (%)
Average travel mode used on a monthly basis in days						
Passenger car	4.372	6.315	4.4	0.555	2.391	1.3
Shared car (e.g., Greenwheels)	0.163	0.418	6.3	15.719	4.182	7.8
Car-sharing services (e.g., Uber)	0.554	1.628	5.6	13.644	5.742	7.1
Train	4.802	5.625	0.6	13.448	6.355	3.2
Bus, tram, and metro	5.808	6.130	5.0	12.118	6.273	3.9
Bicycle and e-bike	12.691	6.787	1.3	5.227	6.769	2.6
Shared bicycle or e-bike	0.279	1.442	5.6	16.412	2.965	6.5
Walking	13.959	5.361	2.5	1.039	2.767	1.9
Shared moped (e.g., GoSharing)	0.040	0.235	6.3	17.019	1.014	7.8
Shared scooter (e.g., Bird)	0.092	0.388	5.0	15.448	3.960	6.5

with the preference to cycle among Dutch people (Ton et al., 2019).

4.3. Multiple Linear Regression Analysis

In order to identify the factors that significantly influence the walking and cycling behaviour of immigrants in the Dutch and New Zealand context and test for variations between the two samples, we estimated two separate models based on the conceptual model utilised in this study. The first model estimated the effects of the variables specified in the conceptual model based on the Dutch immigrant sample. The second model performed a similar analysis for the New Zealand immigrant sample, together with e-bike access and relationships between the independent variables and frequency of use in order to obtain an optimal fit of the model. This resulted in the following estimates of the various relations (e.g., standardised beta coefficients) between the variables in the conceptual model (Tables 3 and 4). The goodness of fit index (GFI) and the adjusted goodness of fit index (AGFI) of the model on the Dutch immigrant sample data are both larger than 90% (GFI = 0.976; AGFI = 0.944) and the root mean square error of approximation (RMSEA) is close to zero (RMSEA = 0.001). Furthermore, the optimisation of the conceptual model on the New Zealand immigrant sample results in a GFI and AFGI larger than 90% (GFI = 0.962; AGFI = 0.924) and an RMSEA with a value below 0.05 (RMSEA = 0.045). When checking for moderating effects, we found that these effects are similar to the direct effects of access to transport modes, as indicated by very high correlations (>0.90) between the variables constituting the moderating effects and the variables representing modal access. Therefore, we left out the moderating effects of the model and estimated the direct effects between modal access and other variables only.

4.3.1. Results From the New Zealand Sample

Overall, the findings from the multiple linear regression analysis of the New Zealand immigrant sample reveal that socio-demographic variables do not significantly influence the preference to walk or cycle and actual active travel mode use (Table 4). Taking a closer look at the effects of travel mode access, findings demonstrate that having access to a car is positively associated with the preference to use a car and negatively associated with the preference to cycle. In addition, bicycle access is positively associated with an increased preference to use a bicycle and a decreased preference to use a car or walk. These findings suggest substitutional effects between active travel modes and other modes of transport and with each other. Furthermore, results on trip purposes show that immigrants in New Zealand prefer to cycle for shopping purposes and tend to walk for leisure and sports.

Results from the reciprocal relations between dependent variables specified in the conceptual model show that there are various effects on active travel behaviour. The results reveal the preference to use the bus and/or tram and to walk, as well as regular walking, is related to an increased preference to cycle. Moreover, the preference to use the bus and/or tram is positively associated with the preference to walk. These findings might be due to complementary effects between the use of the bus and/or tram and active travel modes. However, whether these negative and positive effects represent substitution and complementary effects cannot be concluded yet, showing that further research into the nature of the found effects is needed. Interestingly, there is a mutual effect between the preference to walk and the preference to use a car. Finally, the preference to cycle and to use the train is positively associated with levels of walking. Surprisingly, the preference to walk is negatively associated with levels of walking. However, it is not inconceivable that although some participants choose or are forced to walk for certain purposes, they might hold negative attitudes toward the mode.

4.3.2. Results From the Dutch Sample

In our second model, we performed a multiple linear regression analysis of the Dutch immigrant sample consistent with the variables specified in the conceptual model together with e-bike access and relationships between the independent variables and frequency of use in order to obtain an optimal fit of the model. The findings demonstrate that women in particular tend to cycle or use the bus, tram, or metro on a frequent basis and prefer cycling to get around, while older women walk more (Table 5). In general, men tend to walk or use the car more, while older men with relatively lower incomes travel more by car. Taking a closer look at travel mode access, the results show that having access to a car is negatively associated with walking and using public transport modes. In addition, bicycle access is positively associated with levels of cycling and using the train, and negatively associated with walking. Findings on trip purpose show that immigrants in the Dutch context prefer to use a bicycle to shop, though it is negatively associated with commuting. In addition, they tend to walk for commuting, business, and leisure purposes

Moreover, estimations of the effects of the dependent variables on each other demonstrate that the preference to cycle is negatively associated with the preference to use the bus, tram, or metro. Furthermore, levels of cycling are related to increased train use, while it decreases car use. These findings might be explained by substitution and complementary effects between cycling and various public transport modes. But again, these types of effects cannot be derived yet from the results. Surprisingly, in contrast to our expectations, the findings show that there is a significant positive relationship between levels of car use and the preference to walk. These findings suggest that there is an underlying factor that mediates this effect.

Table 4. Estimated direct effects of the (in)dependent variables on each other for the New Zealand immigrant sample (n = 154).

From \ To	PM1: Train preference	PM2: Bus, tram, and metro preference	PM3: Car preference	PM4: Bicycle preference	PM5: Walking preference	FR1: Train frequency	FR2: Bus, tram, and metro frequency	FR3: Car frequency	FR4: Bicycle frequency	FR5: Walking frequency
AC1	—	—	**0.997*** **	−0.282***	—	—	—	—	—	—
AC2	—	−0.676***	—	**0.450*** **	−0.231***	—	—	—	—	—
TP1	—	−0.186***	—	—	—	—	—	—	—	—
TP2	—	−0.431***	−0.493***	—	—	—	—	—	—	—
TP3	—	—	−0.201***	0.355***	—	—	—	—	—	—
TP4	—	—	0.562***	—	—	—	—	—	—	—
TP5	—	0.189**	—	—	0.748***	—	—	—	—	—
TP6	0.157**	—	—	—	0.316***	—	—	—	—	—
SD1	—	−0.451***	—	—	—	—	—	—	—	—
SD2	—	−0.842***	—	—	—	—	—	−0.299***	—	—
SD3	—	—	−0.069**	—	—	—	—	—	—	—
SD4	—	—	−0.326***	—	—	—	—	—	—	—
PM1	—	—	—	—	—	**0.849*** **	—	—	—	0.310***
PM2	0.671***	—	—	0.207***	0.300***	—	**0.960*** **	−0.755***	—	—
PM3	0.247***	0.979***	—	—	0.895***	—	−0.755***	**0.355*** **	—	—
PM4	—	—	—	—	—	—	—	—	—	0.587***
PM5	—	—	0.340***	0.568***	—	—	—	—	0.135**	−0.219***
R^2	0.575	0.512	0.498	0.735	0.217	0.756	0.884	0.441	0.572	0.131

Notes: * Significantly different at $p < 0.10$; ** significantly different at $p < 0.05$; *** significantly different at $p < 0.01$.

Table 5. Estimated direct effects of the (in)dependent variables on each other for the Dutch immigrant sample (n = 160).

From \ To	PM1: Train preference	PM2: Bus, tram, and metro preference	PM3: Car preference	PM4: Bicycle preference	PM5: Walking preference	FR1: Train frequency	FR2: Bus, tram, and metro frequency	FR3: Car frequency	FR4: Bicycle frequency	FR5: Walking frequency
AC1	—	—	**0.910*** **	—	−0.496**	−0.194***	−0.260***	0.393***	—	−0.231***
AC2	—	—	−0.843***	**0.611*** **	—	—	—	−0.219***	0.935***	—
AC3	—	—	—	—	−0.955***	—	−0.288***	—	—	−0.177***
TP1	−0.335***	−0.139***	—	−0.442***	0.476***	—	—	—	—	0.792***
TP2	—	0.624***	0.906***	—	−0.318***	0.147**	0.140**	—	−0.456***	—
TP3	—	—	−0.243***	0.299***	0.606***	—	—	—	—	0.165**
TP4	0.456***	0.250***	0.355***	—	—	—	—	—	—	—
TP5	—	—	—	—	0.428***	—	—	—	—	—
TP6	0.149**	—	—	—	−0.485***	—	—	—	—	—
SD1	—	—	−0.197**	0.438***	0.485***	—	0.244***	−0.220***	0.201**	−0.139**
SD2	—	—	—	—	—	—	−0.254***	—	—	—
SD3	—	—	0.453***	—	0.278**	—	—	0.162*	—	—
SD4	—	—	−0.335***	—	—	—	—	—	—	—
PM1	—	—	—	—	—	—	—	−0.276***	—	—
PM2	—	—	—	—	—	—	—	—	—	—
PM3	—	—	—	—	—	—	—	**0.353*** **	—	—
PM4	—	−0.512***	—	—	—	—	—	—	—	—
PM5	—	—	—	—	—	—	—	0.335*	—	—
FR1	—	—	—	—	—	—	—	—	—	—
FR2	—	—	—	—	—	—	—	—	—	—
FR3	—	—	—	—	—	—	—	—	—	—
FR4	—	—	—	—	—	0.263***	—	−0.368***	—	—
FR5	—	—	—	—	—	—	—	—	—	—
R^2	0.364	0.482	0.905	0.598	0.999	0.074	0.281	0.590	0.757	0.920

Notes: * Significantly different at $p < 0.10$; ** significantly different at $p < 0.05$; *** significantly different at $p < 0.01$.

5. Discussion and Conclusions

By means of a multiple linear regression model, this study investigated similarities and differences in walking and cycling behaviours between immigrants in a less active travel culture, namely New Zealand, and an active travel culture, the Netherlands. In contrast to previous work in this area, this study examines the active travel behaviour of professional immigrants with sufficient financial resources to be able to afford a range of transport options. This is important as it means that if these immigrants use active transport modes, it is through choice and not because they cannot afford more expensive transport modes, specifically the car. Overall, the findings show that immigrants in both contexts walk and cycle more than the wider populations. Similar studies found that immigrants in less active mobility cultures are more likely to travel by bicycle than the wider population (Smart, 2010), while findings on levels of cycling between immigrants and wider populations in active mobility cultures are less conclusive (Basaran et al., 2021; Haustein et al., 2020). When comparing both immigrant samples, the results demonstrate that immigrants in New Zealand cycle more days per month, on average, than immigrants in the Netherlands, and, additionally, use a much wider range of transport purposes, such as shared bicycles and/or e-bikes, car sharing services, and shared mopeds. These findings suggest that the use and combining of sharing services is more prevalent among immigrant populations in less active travel cultures. However, this could also be partly due to locational differences in residence between the immigrant sub-groups at a neighbourhood level (Chatman, 2014; Nello-Deakin & Harms, 2019) and the number of modes available to the respondents due to the policy frameworks in place that allow certain modes on the road (Pucher & Buehler, 2008).

In order to research the influence of socio-demographic variables, transport mode access and purpose on the walking and cycling of both immigrant populations, a multiple linear regression analysis of the dichotomous and ordinal variables based on their polychoric correlations was performed. Based on the theoretical premises of a TPB-based model, the best linear model for both datasets was estimated. In the case of the Dutch context, the findings show that female immigrants often tend to cycle, while male and highly educated female immigrants tend to walk more often. In addition, modal access has a significant effect on the preference to walk or cycle, while having a very limited effect on other transport modes. When focusing on the New Zealand context, the findings show that relatively lower-educated male immigrants tend to prefer to use the bus, tram, and metro, while relatively young, low-educated people with a low income have a preference to use the car and/or regularly drive. With regard to modal access, the findings show that access to transport modes has a significant effect on active travel modes and a limited effect on other modes. Interestingly, findings from both estimated models suggest that immigrants' walking and cycling might possibly both have a complementary and substitutional effect on other transport modes and each other. Together with the correlation analysis findings, these findings suggest that active travel mode preference and use vary significantly and are influenced by other unspecified variables. Findings on trip purpose show that immigrants in New Zealand prefer to cycle for shopping purposes and tend to walk for leisure shows and sports, though immigrants in the Dutch context prefer to use a bicycle to shop and tend to walk for commuting, leisure, and business purposes.

The above findings should, however, be taken into consideration based on the following study limitations. First, in contrast to many transport studies utilising the TPB, measures of travel mode habits were not incorporated in the present study and could, therefore, not be estimated. However, previous research found that travel mode habits have an indirect effect on travel behaviour and are mediated by the variables specified in the conceptual model, together with SN (Forward, 2004). Furthermore, the respondents recruited for this study were not randomly selected and have been included based on convenience sampling. As a result, there might be a high likelihood of possible self-selection among the respondents. In addition, immigrants who significantly changed their walking and cycling behaviour since arriving in the Netherlands might have a greater interest in participating than those who did not. As a result, active travel mode preferences and use may be higher than the mean, meaning that the findings from this study cannot be generalised to larger and/or other immigrant populations within and across contexts. Furthermore, as this study used a stated preference survey, travel mode preference and use might not correspond to actual behaviour, introducing issues regarding the validation of findings. However, previous research shows that stated preference methods have been applied successfully in various transport research areas, including travel behaviour related research (Kroes & Sheldon, 1988). Moreover, due to the small sample size, we could not disaggregate by personal characteristics. Future research using larger sample sizes is needed to gain more insight into differences between various immigrant sub-groups. Finally, due to the sampling method chosen for the New Zealand case study, the New Zealand sample completely consists of Dutch-born immigrants who moved to New Zealand. The selection of these types of respondents allows us to compare immigrants who have lived in both a less active travel culture and an active travel culture in subsequent qualitative research. As a consequence, our findings need to be understood under these conditions. Nevertheless, the findings show that, although a greater share of immigrants in the Netherlands cycle on a daily basis than immigrants in New Zealand, Dutch-born immigrants in New Zealand cycle on average more days per month

(bicycle and e-bike combined) than immigrants in the Netherlands. These differences in bicycle use highlight the importance of education in lifelong cycling, as Dutch children generally receive extensive bicycle training during primary school (Buehler & Pucher, 2021), and, as a result, learn how to independently use a bicycle, are well-informed in the traffic rules as a cyclist, and, in the process, build a certain level of confidence in cycling. In turn, the findings of this study indicate that past experiences with active travel modes and socialisation factors likely play a major role in active travel behaviour. However, differences in travel behaviour between the two immigrant population groups could also be due to transport mode availability. Future research should, therefore, further investigate the influence of transport mode availability, life experiences, and long-term socialisation factors in explaining active travel behaviour by means of qualitative research.

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Conflict of Interests

The authors declare no conflict of interests.

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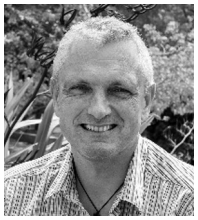
About the Authors

Koen Faber is a PhD candidate at the University of Canterbury in Christchurch, New Zealand. He recently successfully defended his thesis on the relative importance of life experiences, built environment characteristics, and socialisation factors in explaining active travel behaviour. Following the submission of his thesis, he now works as a senior innovation officer at the Ministry of Infrastructure and Water Management in the Netherlands.



Simon Kingham is a professor of geography at the University of Canterbury in Christchurch, New Zealand. He teaches and researches a range of issues related to the impact of the urban environment on wellbeing, with a specific focus on transport. He is also seconded to the Ministry of Transport as their chief science advisor.

Lindsey Conrow is a senior lecturer of geography at the University of Canterbury in Christchurch, New Zealand. Her research focuses on human mobility, accessibility, and urban form.

Dea van Lierop is an assistant professor in Human Geography and Spatial Planning at Utrecht University, the Netherlands. Her research focuses on travel satisfaction, travel behaviour, mobility innovation, and universal accessibility. She is interested in understanding how planners and policymakers can improve the transportation experiences of all transit users, cyclists, and pedestrians, regardless of their age, income, or mobility needs.