



Perceptions of trip making and wellbeing

Hanne Tiikkaja^{a,*}, Steve O'Hern^{a,b}, Riku Viri^a

^a Transport Research Centre Verne, Tampere University, P.O. Box 600, FI-33014 Tampere University, Finland

^b Accident Research Centre, Monash University, Victoria 3800, Australia

ARTICLE INFO

Keywords:
Wellbeing
Travel
Barriers in travel

ABSTRACT

Travel and mobility have an impact on creating and maintaining wellbeing. This paper focuses on barriers recognised in wellbeing-related travel by addressing two research questions: 1) Who agree that their wellbeing would increase if they could make more trips? and 2) What are the transport-related barriers identified in making trips important to wellbeing? The analyses are based on a survey conducted in Tampere, Finland in autumn 2020. 484 responses were collected from adults aged 18 and older. The results indicate that having a car and having access to use a car play an important role in wellbeing-related travel. Having a driving licence did not have a similar effect suggesting that driving licence ownership may be more voluntary compared to car ownership or access to car. Many barriers, such as cost of travel, travel time and location of destinations, were identified by those who agree that their wellbeing would increase if they were able to make more trips compared to those who disagreed with the statement. This implies that those who think that their wellbeing could increase with more travel encounter many barriers in travel. It is noted that the survey was planned before the COVID-19 pandemic. During data collection the COVID-19 situation was stable and public transport frequencies were normal. Notwithstanding, given the COVID-19 pandemic, the results may overemphasize importance of car in making trips on wellbeing. Nevertheless, mobility choices and wellbeing are increasingly important and complex issues due to COVID-19.

Introduction

Travel and mobility have an impact on creating and maintaining wellbeing. Increasing travel options allows people to participate in more activities that are important in achieving goals in peoples' lives, thus increasing life satisfaction (Waygood et al. 2019). Conversely, limiting travel options can have a negative impact on wellbeing, for example by increasing social exclusion (Delbosc & Currie 2011; Lucas 2012). The effects of travel on long-term wellbeing are mainly indirect through activity participation (De Vos et al. 2020). The more trips one can make, the more activities related to wellbeing one can participate in. The relationship between wellbeing and travel is noted in many studies including Chatterjee et al. (2020), Delbosc (2012), De Vos et al. (2013), Ettema et al. (2010), Ettema et al. (2011), Bergstad et al. (2011) and Mokhtarian (2019).

This paper seeks to understand who would perceive that their wellbeing would increase if they were able to make more trips and what are the barriers recognised in wellbeing-related travel. The research questions are: 1) Who agree that their wellbeing would increase if they could

make more trips? (RQ1) and 2) What are the transport-related barriers identified in making trips important to wellbeing? (RQ2) The analyses are based on a survey conducted in Tampere, Finland in autumn 2020.

The ultimate social policy goal in transport should be improved wellbeing, and not only improved mobility or accessibility. Mobility or accessibility should not be promoted just for the sake of it, but policies should be tied to wellbeing outcomes Delbosc (2012). According to Bergstad et al. (2011), satisfaction with travel plays an important role in subjective wellbeing and when implementing policy measures, such as to reduce car use, measures of satisfaction with travel and subjective wellbeing are important to employ (Bergstad et al. 2011). This research provides knowledge as to who perceive that their wellbeing would increase if they could make more trips and if increasing mobility is seen to increase wellbeing. The encountered barriers recognised in this study will help to understand what needs to be changed in the transport system to build a more sustainable travel environment that provides greater possibilities for wellbeing-related travel.

At the moment, the COVID-19 epidemic can also affect the encountered barriers in travel. For example, according to Jenelius and

* Corresponding author.

E-mail addresses: hanne.tiikkaja@tuni.fi (H. Tiikkaja), steve.ohern@tuni.fi (S. O'Hern), riku.viri@tuni.fi (R. Viri).

<https://doi.org/10.1016/j.trip.2021.100464>

Received 28 April 2021; Received in revised form 3 September 2021; Accepted 7 September 2021

Available online 24 September 2021

2590-1982/© 2021 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Cebecauer (2020), the decline in public transport ridership during COVID-19 may be due to both restrictions set by authorities and travellers' own choices. Tiikkaja and Viri (2021) studied the effects of COVID-19 epidemic on public transport in Tampere, Finland. During spring 2020, public transport frequencies were decreased, however at the same time there was a significant reduction in public transport ridership. This resulted in fill rates that were lower than in normal situation in most parts of the city (Tiikkaja & Viri 2021). This survey was planned before the COVID-19 epidemic, and during the data collection period for this research, public transport frequencies were normal and the situation with COVID-19 stable. Nevertheless, mobility choices and wellbeing are increasingly important and complex issues due to COVID.

This paper is organized as follows. First, we provide background for the research. Second, we present the material and methods used in the analyses. Then we present the results and finish the paper with discussion and conclusions on the findings.

Background

How is wellbeing defined in travel-related research?

In research, subjective wellbeing (SWB) goes by different names, such as wellbeing, life satisfaction and happiness. However, all the terms are subjectively determined by individuals and measured at the level of the individual (Delbosc 2012). SWB is often used to refer to satisfaction with life in general (Bergstad et al. 2011; Van den Berg et al. 2019). According to Singleton (2019, p. 249), "subjective well-being (SWB) is a conceptualization of well-being interpreted through the lens of an individual's perceptions and experiences." According to Friman et al. (2017a), SWB in current research is measured as an evaluation of satisfaction with life and as emotional wellbeing, which refers to experienced positive and negative moods and emotions. To measure wellbeing in transport-related research, different approaches have been used. Some specific measures have been developed to measure travel-related wellbeing, for example Ettema et al. (2011) developed a measure for subjective wellbeing called the Satisfaction with Travel Scale (STS) (Van den Berg et al. 2019). The developed STS measure includes both affective and cognitive components related to daily travel (Ettema et al. 2011). According to Van den Berg et al. (2019), some research has also been done focusing on satisfaction with life in general and how that possibly relates to travel (e.g. Chatman et al. 2019).

Many travel-related studies measure wellbeing in relation to travel satisfaction. However, according to Van den Berg et al. (2019), the way wellbeing is operationalised differs (for STS see e.g. de Kruijff et al. 2019; Singleton 2019; Ye & Titheridge 2019, for other measures see e.g. Chen et al. 2019; Handy & Thigpen 2019; Waygood et al. 2019). Singleton (2019) lists some of the measures used to measure SWB, such as the Swedish Core Affect Scale (SCAS) (Västfjäll et al. 2002), and the Flourishing Scale (Diener et al. 2010). Also, Bergstad et al. (2011) and Friman et al. (2017b) list a number of measures for SWB. Friman et al. (2017a) and Bergstad et al. (2011) used multiple measures, such as STS, SCAS and SWLS (Satisfaction With Life Scale) in their study. In this paper, wellbeing itself is not measured, rather participants were asked to evaluate travel-related issues in relation to their subjective view of wellbeing. Wellbeing was only used as a subjective measure.

Relationship between travel and wellbeing

Five ways as to how travel affects wellbeing have been recognised: through experiences during travel, access to activities, activities during travel, trips where travel is the activity, and potential travel (De Vos et al. 2013). Delbosc (2012) identified that there is evidence that transport can have a measurable impact on wellbeing, with support from Canada, Europe and Australia. However, the size of the effect is often found to be small. When subjective measures for transport disadvantage are used, more consistent evidence for the effects of transport on

wellbeing were found. If objective measures, such as number of trips, are used, effects are more likely to be absent or inconsistent (Delbosc 2012). Compared to other influences, travel only has a small impact on how people feel, and only accounts for a small part of the variance in daily mood (Morris & Guerra 2015).

According to Friman et al. (2017a), effects associated with out-of-home activities influences both emotional wellbeing and life satisfaction, which has been found in many countries, including Sweden (Bergstad et al. 2011), USA (Archer et al. 2013) and Canada (Spinney et al. 2009). If one is not able to travel, it can have a negative effect on life satisfaction (Friman et al. 2017a; Lucas 2012). Morris and Guerra (2015) and Mokhtarian and Salomon (2001) both suggest that travel is more than just derived demand. Travel itself is found to be valuable, including both utilitarian and recreational travel (Morris and Guerra 2015). Since travel imposes costs on the individual, e.g. money, time, danger of physical harm and stress, travel itself must have positive aspects since it is not emotionally deleterious (Morris & Guerra 2015).

According to Friman et al. (2017a) different components of the transport system, such as travel time, number of departures, fair pricing, and accessibility, can affect life satisfaction. The lack of access to a car can be a notable disadvantage in terms of activity participation (Morris et al. 2020). Bergstad et al. (2011) discuss the possibility that households that have no access to car may have less complex travel needs or have adjusted their travel habits in a way that they are satisfied with daily travel. Households might also have chosen to live close to good public transport services. However, Bergstad et al. (2011) speculate that for households with a car, forced reduction in car use could have a significant impact on subjective wellbeing.

Barriers in travel

Duvarci and Mizokami (2009) analyse how travel demand has been classified in the past literature, such as derived demand, latent demand, induced demand, and suppressed demand. They suggest that suppressed demand could be considered as contrary to induced demand, thus improving travel conditions would increase mobility (Duvarci & Mizokami 2009). According to Rahman et al. (2020), induced travel demand can be defined as "an increase in travel as a result of any increase in the capacity of a transportation system" (Rahman et al. 2020, p. 3439). Thereby, induced demand could be just the release of the once suppressed demand that was only realized when the transport infrastructure conditions were improved (Duvarci & Mizokami 2007). Alternatively, suppressed demand could be a socio-spatially produced oppression where disadvantaged people avoid troublesome travel when the utility gain is not sufficient compared to the effort (Duvarci & Mizokami 2009).

Duvarci and Mizokami (2009) recognise multiple barriers in travel that could cause suppressed demand, such as limited travel choices, excessive distances to public transport services and other problems including the time required to reach destinations, poor service reliability, limited availability of public transport information, and the cost of using public transport. Nevertheless, improved travel environments (e.g. perceived safety, aesthetics of the road, street design, traffic calming, rest facilities etc.), can be reasons for increasing in trip rates. Removing barriers can lead suppressed demand to be realised demand, thus increasing mobility and the level of personal satisfaction (Duvarci & Mizokami 2009).

Physical disabilities, lack of understanding of public transport routes, weak public transport frequencies, service quality, lack of cycling or walking infrastructure, and not having a driving licence, a car or a bicycle can complicate the use of different transport modes (De Vos 2018). According to residential self-selection, people choose a residential location that supports the use of preferred transport modes (Mokhtarian & Cao 2008; Schwanen & Mokhtarian 2005). Alternatively, residential neighbourhood type dissonance occurs, when people choose a location that does not match travel or residential preferences (De Vos 2018). In this paper, the residential areas that are studied are very similar with

good public transport options and services located close.

Materials and methods

The analyses are based on a survey conducted during autumn 2020 in the suburbs of Hervanta and Kaleva in Tampere, Finland. Hervanta is located to the southeast of Tampere and Kaleva is towards the east, both suburbs are close to the city centre. The population of Hervanta is approximately 21,600 persons and Kaleva has a population of approximately 9000 persons. Both areas are popular among students and have good public transport supply (Fig. 1). In Fig. 1, headways depict the average amount of journeys between two stop areas on a regular weekday (20.4.2021 was used) between 6 am and 10 pm calculated from regional GTFS (General Transit Feed Specification) -data (ITS Factory 2021).

The population of the survey included all native Finnish speakers aged at least 18, and the sample size was 2000 persons. The sample was drawn from the Population Information System by the Digital and Population Data Services Agency in Finland. Of the 2000 people in the sample, 29% lived in the Kaleva area and 71% in the Hervanta area. The sample was stratified by age and gender according to the population’s age and gender groups in each survey area. Non-native Finnish speakers were excluded from the sample. The respondents were offered the option to answer either online or with postal survey. No incentives were offered for answering. The respondents were provided with privacy notice, but no other ethical approval was needed to conduct the study. The respondents were given the opportunity to answer the survey from the beginning of November until December 16th, 2020. The total response rate in the survey was 24.2% with 484 respondents.

The survey consisted of five parts: 1) Travel habits, 2) Experiences on travel, 3) Barriers in travel, 4) Improving travel possibilities, and 5) Background (Appendix 1). The analyses in this paper focuses on the background questions and question 13, which addresses barriers in making trips important to wellbeing. The question that is used in grouping the respondents is question 11b (Statement: “My wellbeing would increase if I was able to make more trips”). Responses were measured

on a five point Likert scale (“Agree completely”, “Agree somewhat”, “Neither agree nor disagree”, “Disagree somewhat” and “Disagree completely”). However, categories were collapsed into three groups (positive, neutral and negative responses) for statistical analysis. The responses were regrouped accordingly: 1) Group “Agree” (n = 110) included all who had answered “Agree completely” or “Agree somewhat”, 2) Group “Neither agree nor disagree” (n = 138) included all who had answered “Neither agree nor disagree” and 3) Group “Disagree” (n = 224) included all who had answered “Disagree completely” or “Disagree somewhat”.

All analyses were conducted using IBM SPSS 27 -software with alpha (α) set to 0.05. Research question 1 (RQ1) was analysed using cross-tabulation and Pearson Chi-square (χ^2) (nonparametric) which can be used to analyse nominal and ordinal variables. Chi-square is used to measure the amount of discrepancy between observed frequencies and the expected frequencies (Willard 2020, p. 255). The null hypothesis attributes any differences between the obtained sample and the population to chance (Willard 2020, p. 116).

To analyse research question 2 (RQ2), we used Kruskal-Wallis H test, which is the nonparametric alternative to a one-way ANOVA and suitable for testing statistically significant differences in variables measured with ordinal scale (Willard 2020 p. 277). The Kruskal-Wallis test indicates that at least one of the k samples is different from the other samples. However, Kruskal-Wallis test itself does not indicate where differences are found (Frey 2018, p. 938). To find out which groups have statistically significant differences, pairwise comparisons were conducted using the Dunn-Bonferroni approach (Frey 2018, p. 938). The analyses present unweighted results.

Results

RQ1: Who agree that their wellbeing would increase if they could make more trips?

Of the respondents, 23.3% agreed that their wellbeing would increase if they were able to make more trips, 29.2% neither agreed or

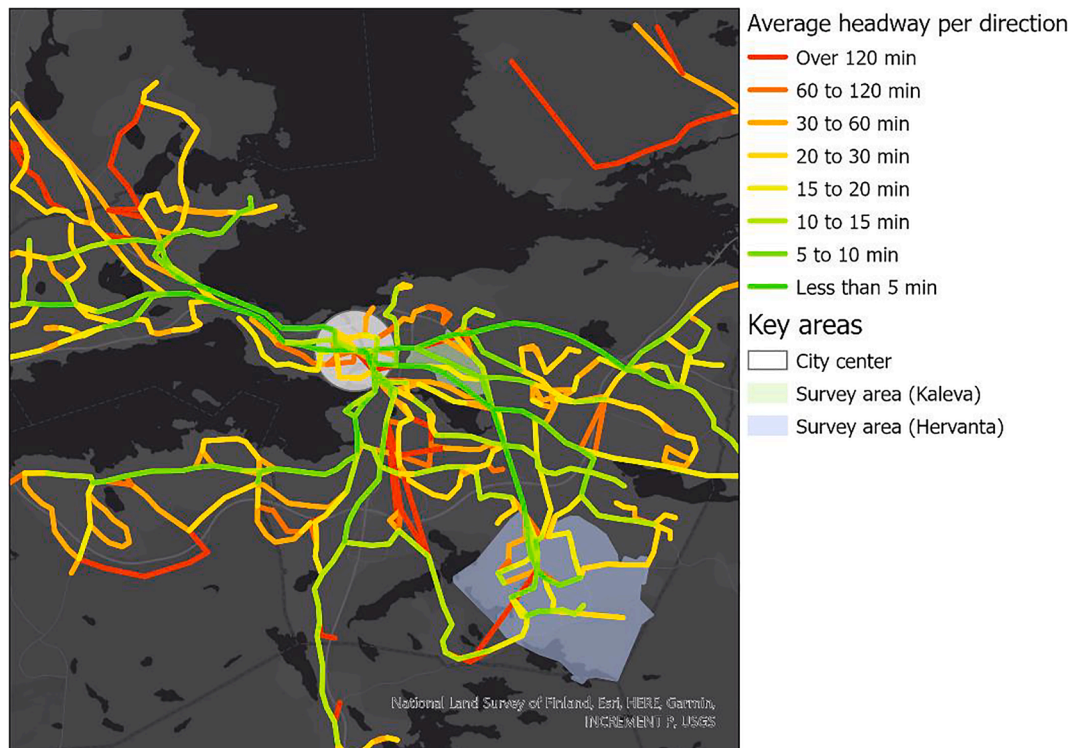


Fig. 1. Survey areas and public transport headways.

disagreed and 47.5% disagreed. To answer research question 1, analyses on the background variables were conducted between the three response categories. Of all the respondents, 47% were male and 53% were female (*other/I don't want to say* was excluded from analysis on gender due to low number of cases) (Table 1). Of those who agreed that their wellbeing would increase if they were able to make more trips, 44% were male and 56% were female. However, there were no statistically significant differences between genders ($\chi^2(2) = 1.779, p = 0.411$).

Those who had agreed that their wellbeing would increase if they were able to make more trips were more often over 64 years old compared to those who disagreed or neither agreed nor disagreed with the statement. Although there were no statistically significant differences between age groups ($\chi^2(8) = 5.851, p = 0.664$). Similarly, there were no statistically significant differences when comparing household size ($\chi^2(6) = 1.738, p = 0.942$), however those who agreed that their

wellbeing could increase if they were able to make more trips lived more often in single households (47%) compared to those who disagreed with the statement (43%) or neither agreed or disagreed (41%). There were also no significant difference when comparing household income before taxes ($\chi^2(10) = 14.060, p = 0.170$) or occupation ($\chi^2(10) = 5.981, p = 0.817$).

Of those who agreed that their wellbeing could increase if they were able to make more trips, 77% had a driving licence, compared to 84% who disagreed with the statement. The difference was not statistically significant ($\chi^2(2) = 2.632, p = 0.268$). There was also no statistically significant difference in bus card ownership ($\chi^2(2) = 0.927, p = 0.629$), even though those who agreed that their wellbeing would increase if they were able to make more trips had a bus card more often than those who disagreed or neither agreed or disagreed with the statement.

Those who agree that their wellbeing would increase if they were

Table 1
Background of the respondents in different groups.

		My wellbeing would increase if I was able to make more trips				Chi-Square p-value
		Agree	Neither agree nor disagree	Disagree	All	
Gender (N = 460)	Man	44%	43%	50%	47%	0.411
	Woman	56%	57%	50%	53%	
	Total	100%	100%	100%	100%	
Age (N = 471)	18–29 years	27%	33%	30%	30%	0.664
	30–44 years	19%	24%	21%	21%	
	45–64 years	21%	18%	25%	22%	
	65–74 years	19%	17%	15%	17%	
	over 74 years	14%	8%	9%	10%	
	Total	100%	100%	100%	100%	
Household size (N = 471)	1	47%	41%	43%	43%	0.942
	2	43%	48%	44%	45%	
	3	5%	6%	7%	6%	
	4 or more	5%	6%	6%	6%	
	Total	100%	100%	100%	100%	
Household income (thousand euros) (N = 464)	under 10 000 e	16%	21%	15%	17%	0.170
	10–20	19%	10%	22%	18%	
	20–40	32%	34%	25%	29%	
	40–60	20%	19%	19%	19%	
	60–80	9%	10%	10%	10%	
	over 80 000 e	4%	6%	9%	7%	
	Total	100%	100%	100%	100%	
Occupation (N = 469)	Working full-time	30%	35%	36%	34%	0.817
	Working part-time or occasionally	4%	5%	4%	4%	
	Unemployed, laid-off or on sick leave	7%	5%	6%	6%	
	Student	18%	24%	24%	23%	
	Pensioner or part-time pensioner	35%	28%	28%	30%	
	Other	5%	3%	3%	4%	
	Total	100%	100%	100%	100%	
Driving licence (N = 471)	Yes	77%	83%	84%	82%	0.268
	No	23%	17%	16%	12%	
	Total	100%	100%	100%	100%	
Bus card (N = 472)	Yes	89%	86%	85%	86%	0.629
	No	11%	14%	15%	14%	
	Total	100%	100%	100%	100%	
Household cars (N = 472)	No car	50%	35%	36%	39%	0.010
	1 car	46%	52%	57%	53%	
	2 cars or more	4%	13%	7%	8%	
	Total	100%	100%	100%	100%	
Access to use car (N = 470)	Always or almost always	38%	59%	56%	53%	<0.001
	Sometimes	28%	11%	12%	15%	
	Rarely or never	35%	30%	32%	32%	
	Total	100%	100%	100%	100%	
Trip number on a regular weekday (N=)	I don't usually make trips	12%	4%	7%	7%	0.456
	1 trip	15%	15%	12%	14%	
	2–3 trips	49%	50%	52%	51%	
	4–5 trips	17%	25%	24%	23%	
	over 5 trips	6%	6%	5%	6%	
	Total	100%	100%	100%	100%	

able to make more trips lived more often in households with no car, whereas those who disagreed lived most often in households with two cars or more, the difference was statistically significant ($\chi^2(4) = 13.182, p = 0.010$). Stated access to use a car for trips was also analysed. Of those who agreed that their wellbeing could increase if they were able to make more trips, 38% stated that they had access to a car for their trips always or almost always, whereas the corresponding share for those who disagreed was 56% and for those who neither agreed or disagreed was 59%. There was also a difference in the share of those who answered that they had access to a car sometimes, with 28% of group Agree responding to have access to a car sometimes. The corresponding share for those who disagreed was 12% and for those who neither agreed or disagreed 11%. The difference was statistically significant ($\chi^2(4) = 20.404, p < 0.001$).

Next, trip numbers and the use of different transport modes were analysed. Participants who agreed that their wellbeing could increase if they were able to make more trips reported making fewer trips on a regular weekday compared to those who disagreed or neither agreed nor disagreed with the statement. The difference was, however, not statistically significant ($\chi^2(8) = 7.772, p = 0.456$).

Analysis on the use of different transport modes (Table 2) reveals that there was a statistically significant difference in how often the respondents use a car as a driver for their trips ($\chi^2(8) = 20.171, p = 0.010$). Those who agree that their wellbeing could increase if they were able to make more trips make fewer trips with car as a driver than other groups. There was no statistically significant difference between the groups in the use of other modes.

RQ2: What are the transport-related barriers identified in making trips important to wellbeing?

The survey included a question regarding barriers identified in making trips important to wellbeing (Appendix 1: question 13) (Fig. 2). The respondents were asked to evaluate each barrier (“Do you think that

the following things are barriers in making trips important to your wellbeing?”) with the response options of “Not a barrier” (=1), “Small barrier” (=2), “Moderate barrier” (=3) and “Significant barrier” (=4). The means and standard deviations of the barriers are listed in Appendix 2.

Insufficient options for car parking was recognised most often as a barrier among all respondents. Among group Agree, having no car, travel time and that destinations are located far from home, were also often recognised as barriers in making trips important to wellbeing. Also, the cost of travel, insufficient public transport connections, no driving licence, lack of pavements and bicycle ways or insufficient maintenance, and insufficient options for storing and parking a bicycle were often recognised as a barrier among the group Agree.

To answer research question 2, we used Kruskal-Wallis H test to determine if there is a statistically significant difference between the groups in barriers identified in making trips important to wellbeing. A statistically significant ($p < 0.05$) difference between the mean ranks of at least one pair of groups was found in 11 barriers listed in Table 3. The question whether having no car is a barrier was analysed only among those who had answered living in households with no car.

Dunn’s pairwise tests were carried out for the three groups. The results are presented in Appendix 3. A statistically significant difference between groups “Agree” and “Disagree” and groups “Agree” and “Neither agree nor disagree” was found in barriers *Cost of travel, Destinations are located far from my home, Travel time, Accessibility, Illness or disability, Insecurity in travel* and *No car* (only respondents living in households with no car). For barriers *Insufficient public transport connections, Finding information about public transport timetables and routes, Lack of pavements and bicycle ways or insufficient maintenance*, and *Other*, there was a statistically significant difference only between groups “Agree” and “Disagree”.

No statistically significant ($p \geq 0.05$) difference between the mean ranks was found in 5 barriers listed in Table 4. The question whether having no driving licence is a barrier was analysed only among those

Table 2
Use of different transport modes.

		My wellbeing would increase if I was able to make more trips				Chi-Square p-value
		Agree	Neither agree nor disagree	Disagree	All	
Walking	Daily or almost daily	69%	58%	70%	66%	0.181
	Weekly	18%	26%	19%	21%	
	1–3 times a month	9%	7%	6%	7%	
	Less often than once a month	2%	7%	4%	4%	
	Never	3%	2%	1%	2%	
	Total	100%	100%	100%	100%	
Cycling	Daily or almost daily	23%	16%	20%	20%	0.701
	Weekly	15%	15%	17%	16%	
	1–3 times a month	13%	12%	15%	14%	
	Less often than once a month	21%	18%	18%	18%	
	Never	28%	39%	30%	32%	
	Total	100%	100%	100%	100%	
Car (as a driver)	Daily or almost daily	21%	32%	23%	25%	0.010
	Weekly	16%	22%	26%	23%	
	1–3 times a month	17%	4%	8%	9%	
	Less often than once a month	11%	7%	11%	10%	
	Never	35%	35%	32%	33%	
	Total	100%	100%	100%	100%	
Car (as a passenger)	Daily or almost daily	3%	5%	3%	4%	0.133
	Weekly	21%	29%	22%	24%	
	1–3 times a month	29%	18%	28%	25%	
	Less often than once a month	39%	30%	33%	34%	
	Never	9%	18%	14%	14%	
	Total	100%	100%	100%	100%	
Public Transport	Daily or almost daily	23%	13%	14%	16%	0.105
	Weekly	25%	20%	24%	23%	
	1–3 times a month	29%	29%	25%	27%	
	Less often than once a month	17%	33%	32%	29%	
	Never	6%	5%	6%	6%	
	Total	100%	100%	100%	100%	

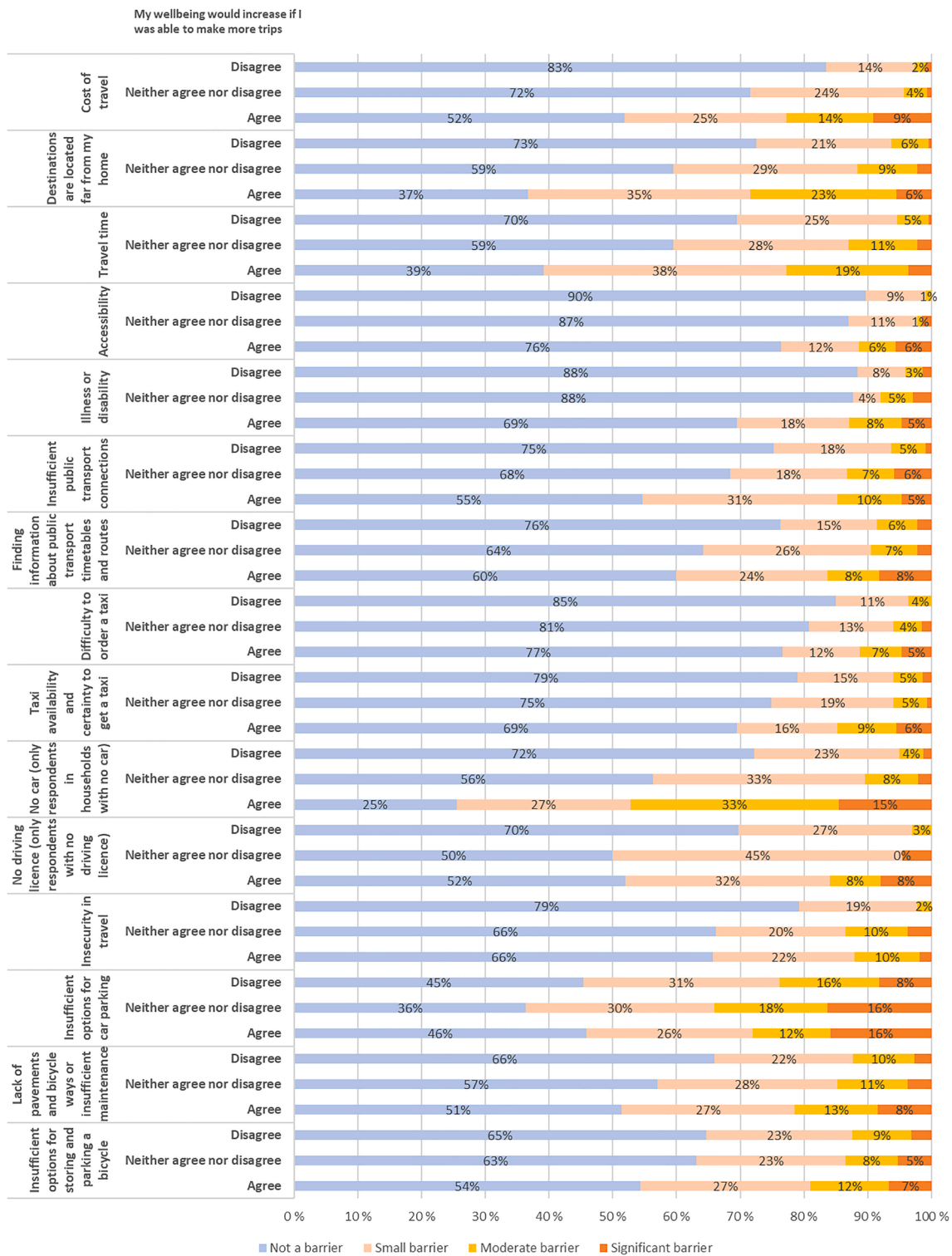


Fig. 2. Barriers identified in making trips important to wellbeing.

who had answered that they do not have a driving licence. Barriers related to taxis weren't notable among the respondents, as can be seen from Table 4. There were no statistically significant differences between the respondents either. Insufficient options for car parking was recognised to be a barrier often among all the respondents, regardless of the group. That was also the case with insufficient options for storing and parking a bicycle. Surprisingly, there were no statistically significant differences between the groups in not having a driving licence.

Discussion and conclusions

This paper analysed how making trips is perceived in relation to wellbeing, and what are the barriers identified in making wellbeing-related trips. The analyses are based on a survey conducted in Tampere, Finland in autumn 2020 with a sample of 484 respondents. The research questions were: 1) Who agree that their wellbeing would increase if they could make more trips? and 2) What are the transport-related barriers identified in making trips important to wellbeing?

Table 3

Identified barriers in making trips important to wellbeing with statistically significant differences between the mean ranks of at least one pair of groups analysed with Kruskal-Wallis H test.

Barrier	My wellbeing would increase if I was able to make more trips						Test statistics		
	Agree		Neither agree nor disagree		Disagree		Kruskal-Wallis H	df	p
	Ranks		Ranks		Ranks				
	N	Mean Rank	N	Mean Rank	N	Mean Rank			
Cost of travel	110	290.18	137	235.31	223	208.65	43.482	2	<0.001
Destinations are located far from my home	109	297.84	138	235.65	222	203.74	46.374	2	<0.001
Travel time	110	288.99	138	237.44	223	208.97	33.312	2	<0.001
Accessibility	106	257.83	138	231.10	223	224.47	12.254	2	0.002
Illness or disability	108	268.39	138	226.84	223	223.88	20.834	2	<0.001
Insufficient public transport connections	108	265.71	136	236.23	222	216.16	14.818	2	0.001
Finding information about public transport timetables and routes	110	259.10	137	244.28	223	218.47	11.154	2	0.004
Insecurity in travel	108	248.09	133	248.43	221	213.20	12.958	2	0.002
Lack of pavements and bicycle ways or insufficient maintenance	107	254.93	135	236.73	220	216.90	7.990	2	0.018
No car (only for respondents living in households with no car)	55	124.33	48	85.88	79	72.06	39.744	2	<0.001

Table 4

Identified barriers in making trips important to wellbeing with no statistically significant differences between the mean ranks of groups analysed with Kruskal-Wallis H test.

Barrier	My wellbeing would increase if I was able to make more trips						Test statistics		
	Agree		Neither agree nor disagree		Disagree		Kruskal-Wallis H	df	p
	Ranks		Ranks		Ranks				
	N	Mean Rank	N	Mean Rank	N	Mean Rank			
Difficulty to order a taxi	107	245.14	135	233.78	220	223.45	4.355	2	0.113
Taxi availability and certainty to get a taxi	108	248.59	135	231.71	219	222.95	4.729	2	0.094
Insufficient options for car parking	107	228.03	135	250.27	218	219.47	5.081	2	0.079
Insufficient options for storing and parking a bicycle	105	247.61	133	225.59	218	221.07	3.960	2	0.138
No driving licence (only respondents with no driving licence)	25	44.40	22	43.32	33	35.67	3.236	2	0.198

As for RQ1, it seems that the differences between the groups come down to car ownership, being able to use it for trips, and using a car as a driver. The findings suggest that the use of a car as a driver is significant in recognising that being able to make more trips could increase wellbeing. Respondents who agreed that their wellbeing could increase if they were able to make more trips were found to currently make fewer trips with car as a driver. The possibility to use a car and the actual car use habits seem to be related to how respondents evaluate their wellbeing if they were able to make more trips. This is in line with past findings where car travel has been found to be more positively associated with life satisfaction than travelling by other modes such as public transport (Morris et al. 2020). If forced reduction in car use can have a negative effect on subjective wellbeing as suggested in a study by Bergstad et al. (2011), could it be, that increasing access to use car could have a positive effect on subjective wellbeing?

As for RQ2, there were many barriers that were identified by those who agree that their wellbeing would increase if they were able to make more trips compared to those who disagreed or neither agreed nor disagreed with the statement. Out of 16 barriers, there was a statistically significant difference in 11 barriers among those who agree that their wellbeing would increase if they were able to make more trips compared to those who disagreed with the statement. This implies that those who think that their wellbeing could increase with more travel encounter many barriers in travel. This could be seen as a sign of suppressed travel demand (Duvarci & Mizokami 2009) that could be realised if the number of barriers in travel were decreased.

Bergstad et al. (2011) suggest that households with no car access may have less complex travel habits, have adjusted their travel, or have chosen to live close to public transport connections. A similar effect is found in our analyses, only with driving licence. Not having a driving licence was not statistically significant when assessing who think that their wellbeing would increase if they were able to make more trips. Not having a driving licence was also not seen as a barrier in making trips

important to wellbeing among the group who think making more trips could increase their wellbeing compared to other groups. This suggests that not having a driving licence is not a key component in making trips important to wellbeing. However, not having access to a car played a significant role. This suggests that having no driving licence is more a voluntary decision than not having a car or having no access to use the car in the household.

In past literature, there is evidence that transport can have a measurable impact on wellbeing (Delbosc 2012), and according to this study it seems that people recognise that travel can affect their wellbeing. Over 23% of the respondents agreed that their wellbeing would increase if they were able to make more trips. This is a significant percentage and should be taken into account in political decision-making. Yet, a recent study showed that travel only accounts for a few percent of the variance in daily mood (Morris and Guerra 2015) which indicates that wellbeing is a more complex issue and cannot be affected only by improving travel possibilities. What also needs to be recognised is that when subjective measures for transport disadvantage are used instead of objective measures, more consistent evidence for the effects of transport on wellbeing are found (Delbosc 2012). In this study, both wellbeing and the travel-related barriers were measured as a subjective view of the respondents. However, it is important not to overlook the importance of travel and its benefits. For example, during the time of COVID-19 pandemic, out-of-home activities may become inaccessible especially to the ones with no car, which might lead to lower wellbeing (De Vos 2020).

This research has limitations. First, the survey was conducted only to a small population with good access to public transport. The results could be different if comparisons between different types of residential areas were made. The population in the survey areas was also younger than the population of Finland in general, which can affect the identified barriers. The sample also included only native Finnish speakers and there are likely to be differences in e.g. car ownership among non-native

and native Finnish speakers. Second, wellbeing was not measured or defined for the respondents, for which the respondents may have defined wellbeing differently. The findings may be biased by reliance on self-report and the survey questions were not psychometrically validated. Third, there is a high risk for residual confounding since the background variables were not controlled and there may be other confounding factors that were not included in the study. This might affect the internal validity of the study. Fourth, grouping of the respondents into three groups instead of using five groups may cause uncertainties in the results. A larger sample would have allowed more comprehensive analysis. Fifth, the methods used in this paper are not multivariate methods that might provide more information. However, we ran ordinal regression models, but unfortunately they did not show any additional information beyond the analysis conducted. Sixth, the effect of COVID-19 pandemic during the survey cannot be overlooked. People might have travelled less due to the pandemic situation and they might hesitate to use public transport which could overemphasize the importance of car use and access to car. Thus, the results cannot be generalized as such, but can be seen as an indication of suppressed travel demand.

In future, further work should be done on developing measures for travel-related wellbeing (Van den Berg et al. 2019) and the

operationalization of different measures should be carefully studied. Further future research could also seek to validate the questionnaire presented in this paper. Future research on travel behaviour and wellbeing should be done when the COVID-19 epidemic has passed, and travel behaviour has normalised again. The relationship between suppressed travel demand, barriers in travel and wellbeing should also be studied more closely with areal comparisons.

CRedit authorship contribution statement

Hanne Tiikkaja: Conceptualization, Methodology, Validation, Formal analysis, Writing – original draft, Writing – review & editing, Visualization. **Steve O'Hern:** Methodology, Writing – review & editing. **Riku Viri:** Writing – review & editing, Visualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix 1. Survey form

Experiences on travel

10. How long does it take for you to get to the following places when you are travelling with the transport mode you usually travel with?

	Less than 10 minutes	10–20 minutes	21–30 minutes	31–45 minutes	46–59 minutes	1–1,5 hours	Over 1,5 hours
Grocery store	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post office or Parcel Point	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pharmacy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Health center	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Work or study place (only employed and students)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Most important friend or relative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. Do you agree or disagree with the following statements?

	Agree completely	Agree somewhat	Neither agree nor disagree	Disagree somewhat	Disagree completely
I can make all the trips important to my wellbeing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My wellbeing would increase if I was able to make more trips	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I pay all my travel costs myself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I pay travel costs of my spouse, parents or adult children	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I could afford to buy a public transport season ticket regularly if I needed to (55 euros/month)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I think it is safe for me to travel in my own residential area during daytime	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I think it is safe for me to travel in my own residential area during evenings and night-time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I think that air quality is bad in my own residential area due to road traffic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I think that traffic noise is disturbing in my own residential area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. Do you agree or disagree with the following statements?

	Agree completely	Agree somewhat	Neither agree nor disagree	Disagree somewhat	Disagree completely
I can travel to destinations important to my wellbeing in a reasonable time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I can travel to destinations important to my wellbeing with reasonable effort	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I can travel to destinations important to my wellbeing at a reasonable cost	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I can travel to destinations important to my wellbeing safely and without risking my health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Barriers in travel

13. Do you think that the following things are barriers in making trips important to your wellbeing?

	Not a barrier	Small barrier	Moderate barrier	Significant barrier
Cost of travel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Destinations are located far from my home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Travel time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accessibility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Illness or disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insufficient public transport connections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Finding information about public transport timetables and routes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Difficulty to order a taxi	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Taxi availability and certainty to get a taxi	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No car	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No driving licence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insecurity in travel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insufficient options for car parking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of pavements and bicycle ways or insufficient maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insufficient options for storing and parking a bicycle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. Do the barriers identified in the previous question hinder the following things?

	Not at all	Hinder a little	Hinder a lot	I don't know/not suitable in my situation
Accepting a job	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Work trips or travel to study place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Taking kids to day care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Going to grocery store	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Going to other stores	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Using post services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Going to pharmacy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Going to health center or child health center	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Visiting friends and relatives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Participating in interesting hobbies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Going to the cinema, theatre, museums or concerts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Visiting summer cottage or nature attractions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Improving travel possibilities

15. Would the following changes make it easier for you to travel to destinations important to your wellbeing?

	No	A little	A lot
More affordable public transport prices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More frequent public transport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More comprehensive public transport network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Less need for changing vehicles in public transport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More affordable taxi prices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Easier ways to order a taxi and better taxi availability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lower costs for car travel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhancing car parking options	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Less congestion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Better pavements and cycling ways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increasing the number of pedestrian crossings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhancing parking options for bicycles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Background

16. Gender

- female male other/I don't want to answer

17. Age

- 18–29 years
 30–44 years
 45–64 years
 65–74 years
 over 74 years

18. What reflects your situation best?

- working full-time
 working part-time or occasionally
 unemployed, laid-off or on sick-leave
 stay at home mom or dad
 student
 pensioner or part-time pensioner
 other

19. How many people are there in your household (including yourself)?

- 1 person
 2 persons
 3 persons
 4 persons
 over 4 persons

20. How much is your yearly household gross income (income before taxes)?

- less than 10 000 e 40 001–60 000 e
 10 000–20 000 e 60 001–80 000 e
 20 001–40 000 e over 80 000 e

21. Do you have a driving licence for passenger car?

- yes no

22. Do you have a bus card?

- yes no

23. How many passenger cars are there in your household?

- none
 1 car
 2 cars or more

24. Do you have access to use a car for your trips?

- always or almost always
 sometimes
 rarely or never

THANK YOU FOR YOUR RESPONSE!

Appendix 2. Means and standard deviations for barriers presented in Fig. 2 (1 = not a barrier, 2 = small barrier, 3 = moderate barrier, 4 = significant barrier)

Barrier	Group	n	Mean	Std. Deviation
Cost of travel	Agree	110	1.80	0.994
	Neither agree nor disagree	137	1.34	0.585
	Disagree	223	1.20	0.502
	All	470	1.38	0.711
Destinations are located far from my home	Agree	109	1.97	0.907
	Neither agree nor disagree	138	1.54	0.756
	Disagree	222	1.34	0.609
	All	469	1.55	0.771
Travel time	Agree	110	1.87	0.847
	Neither agree nor disagree	138	1.56	0.774
	Disagree	223	1.36	0.599
	All	471	1.54	0.742
Accessibility	Agree	106	1.41	0.837
	Neither agree nor disagree	138	1.17	0.492
	Disagree	223	1.11	0.344
	All	467	1.19	0.547
Illness or disability	Agree	108	1.48	0.837
	Neither agree nor disagree	138	1.23	0.676
	Disagree	223	1.17	0.526
	All	469	1.26	0.664
Insufficient public transport connections	Agree	108	1.65	0.846
	Neither agree nor disagree	136	1.51	0.869
	Disagree	222	1.32	0.618
	All	466	1.45	0.764
Finding information about public transport timetables and routes	Agree	110	1.65	0.944
	Neither agree nor disagree	137	1.47	0.728
	Disagree	223	1.35	0.699
	All	470	1.45	0.779
Difficulty to order a taxi	Agree	107	1.39	0.810
	Neither agree nor disagree	135	1.27	0.613
	Disagree	220	1.19	0.475
	All	462	1.26	0.611
Taxi availability and certainty to get a taxi	Agree	108	1.51	0.881
	Neither agree nor disagree	135	1.32	0.607
	Disagree	219	1.28	0.615
	All	462	1.35	0.689
No car (only respondents in households with no car)	Agree	55	2.36	1.025
	Neither agree nor disagree	48	1.56	0.741
	Disagree	79	1.34	0.618
	All	182	1.71	0.903
No driving licence (only respondents with no driving licence)	Agree	25	1.72	0.936
	Neither agree nor disagree	22	1.59	0.734
	Disagree	33	1.33	0.540
	All	80	1.53	0.746
Insecurity in travel	Agree	108	1.48	0.755
	Neither agree nor disagree	133	1.51	0.822
	Disagree	221	1.23	0.473
	All	462	1.37	0.671
Insufficient options for car parking	Agree	107	1.98	1.107
	Neither agree nor disagree	135	2.14	1.087
	Disagree	218	1.87	0.963
	All	460	1.97	1.039
Lack of pavements and bicycle ways or insufficient maintenance	Agree	107	1.79	0.972
	Neither agree nor disagree	135	1.61	0.828
	Disagree	220	1.49	0.779
	All	462	1.60	0.848
Insufficient options for storing and parking a bicycle	Agree	105	1.71	0.927
	Neither agree nor disagree	133	1.56	0.856
	Disagree	218	1.51	0.793
	All	456	1.57	0.846
Other	Agree	58	1.53	1.063
	Neither agree nor disagree	78	1.27	0.767
	Disagree	130	1.14	0.539
	All	266	1.26	0.761

Appendix 3. Kruskal-Wallis H test's pairwise comparisons using Dunn-Bonferroni approach.

	Comparison groups		Asymp.Sig. adjusted using the Bonferroni correction
Cost of travel	Agree	Disagree	<0.001
	Agree	Neither agree nor disagree	<0.001
	Disagree	Neither agree nor disagree	0.062
Destinations are located far from my home	Agree	Disagree	<0.001
	Agree	Neither agree nor disagree	<0.001
	Disagree	Neither agree nor disagree	0.038
Travel time	Agree	Disagree	<0.001
	Agree	Neither agree nor disagree	0.002
	Disagree	Neither agree nor disagree	0.082
Accessibility	Agree	Disagree	0.002
	Agree	Neither agree nor disagree	0.038
	Disagree	Neither agree nor disagree	1.000
Illness or disability	Agree	Disagree	<0.001
	Agree	Neither agree nor disagree	0.001
	Disagree	Neither agree nor disagree	1.000
Insufficient public transport connections	Agree	Disagree	<0.001
	Agree	Neither agree nor disagree	0.114
	Disagree	Neither agree nor disagree	0.283
Finding information about public transport timetables and routes	Agree	Disagree	0.005
	Agree	Neither agree nor disagree	0.886
	Disagree	Neither agree nor disagree	0.095
Insecurity in travel	Agree	Disagree	0.014
	Agree	Neither agree nor disagree	0.006
	Disagree	Neither agree nor disagree	1.000
Lack of pavements and bicycle ways or insufficient maintenance	Agree	Disagree	0.017
	Agree	Neither agree nor disagree	0.688
	Disagree	Neither agree nor disagree	0.363
Other	Agree	Disagree	0.006
	Agree	Neither agree nor disagree	0.227
	Disagree	Neither agree nor disagree	0.614
No car (only for respondents living in households with no car)	Agree	Disagree	<0.001
	Agree	Neither agree nor disagree	<0.001
	Disagree	Neither agree nor disagree	0.342

References

- Archer, M., Paleti, R., Konduri, K.C., Pendyala, R.M., Bhat, C.R., 2013. 2013 modeling the connection between activity-travel patterns and subjective well-being. *Transp. Res. Rec.* 2382 (1), 102–111. <https://doi.org/10.3141/2382-12>.
- Bergstad, C.J., Gamble, A., Gärling, T., Hagman, O., Polk, M., Ettema, D., Friman, M., Olsson, L.E., 2011. Subjective well-being related to satisfaction with daily travel. *Transportation* 38 (1), 1–15. <https://doi.org/10.1007/s11116-010-9283-z>.
- Chatman, D., Broaddus, A., Spevack, A., 2019. Are movers irrational? On travel patterns, housing characteristics, social interactions, and happiness before and after a move. *Travel Behav. Soc.* 16 (2019), 262–271. <https://doi.org/10.1016/j.tbs.2018.11.004>.
- Chatterjee, K., Chng, S., Clark, B., Davis, A., De Vos, J., Ettema, D., Handy, S., Martin, A., Reardon, L., 2020. Commuting and wellbeing: a critical overview of the literature with implications for policy and future research. *Transport Rev.* 40 (1), 5–34. <https://doi.org/10.1080/01441647.2019.1649317>.
- Chen, S., Fan, Y., Cao, Y., Khattak, A., 2019. Assessing the relative importance of factors influencing travel happiness. *Travel Behav. Soc.* 16 (2019), 185–191. <https://doi.org/10.1016/j.tbs.2019.01.002>.
- De Kruijf, J., Ettema, D., Dijkstra, M., 2019. A longitudinal evaluation of satisfaction with e-cycling in daily commuting in the Netherlands. *Travel Behav. Soc.* 16 (2019), 192–200. <https://doi.org/10.1016/j.tbs.2018.04.003>.
- De Vos, J., 2018. Do people travel with their preferred transport mode? Analysing the extent of transport mode dissonance and its effect on travel satisfaction. *Transp. Res. Part A* 117, 261–274. <https://doi.org/10.1016/j.tra.2018.08.034>.
- De Vos, J., 2020. The effect of COVID-19 and subsequent social distancing on travel behavior. *Transp. Res. Interdiscip. Perspect.* 5 (2020), 100121 <https://doi.org/10.1016/j.trp.2020.100121>.
- De Vos, J., Schwanen, T., Van Acker, V., Witlox, F., 2013. Travel and subjective well-being: a focus on findings, methods and future research needs. *Transp. Res.* 33 (4), 421–442. <https://doi.org/10.1080/01441647.2013.815665>.
- De Vos, J., Singleton, P.A., Dill, J., 2020. Travel, health and well-being: a focus on past studies, a special issue, and future research. *J. Transp. Health* 19 (2020), 100973. <https://doi.org/10.1016/j.jth.2020.100973>.
- Delbosc, A., 2012. The role of well-being in transport policy. *Transp. Policy* 23, 25–33. <https://doi.org/10.1016/j.tranpol.2012.06.005>.
- Delbosc, A., Currie, G., 2011. Exploring the relative influences of transport disadvantage and social exclusion on well-being. *Transp. Policy* 18 (4), 555–562. <https://doi.org/10.1016/j.tranpol.2011.01.011>.
- Diener, E., Wirtz, D., Tov, W., Kim-Prieto, C., Choi, D.W., Oishi, S., Biswas-Diener, R., 2010. New well-being measures: short scales to assess flourishing and positive and negative feelings. *Soc. Indic. Res.* 97 (2), 143–156. <https://doi.org/10.1007/s11205-009-9493-y>.
- Duvarci, Y., Mizokami, S., 2007. What if the suppressed travel demands of the transport disadvantaged were released: results of a simulation approach. *J. Eastern Asia Soc. Transp. Stud.* 7 (2007), 1433–1445. <https://doi.org/10.11175/eastpro.2007.0.184.0>.
- Duvarci, Y., Mizokami, S., 2009. A suppressed demand analysis method of the transportation disadvantaged in policy making. *Transp. Planning Technol.* 32 (2), 187–214. <https://doi.org/10.1080/03081060902861400>.
- Ettema, D., Gärling, T., Olsson, L.E., Friman, M., 2010. Out-of-home activities, daily travel, and subjective well-being. *Transp. Res. Part A* 44 (9), 723–732. <https://doi.org/10.1016/j.tra.2010.07.005>.
- Ettema, D., Gärling, T., Eriksson, L., Friman, M., Olsson, L.E., Fujii, S., 2011. Satisfaction with travel and subjective well-being: development and test of a measurement tool. *Transp. Res. Part F* 14 (3), 167–175. <https://doi.org/10.1016/j.trf.2010.11.002>.
- Frey, B., 2018. The SAGE encyclopedia of educational research, measurement, and evaluation (Vols. 1-4). Thousand Oaks, CA: SAGE Publications, Inc. doi: 10.4135/9781506326139.
- Friman, M., Gärling, T., Ettema, D., Olsson, L.E., 2017a. How does travel affect emotional well-being and life satisfaction? *Transp. Res. Part A* 106 (2017), 170–180. <https://doi.org/10.1016/j.tra.2017.09.024>.
- Friman, M., Olsson, L.E., Ståhl, M., Ettema, D., Gärling, T., 2017b. Travel and residual emotional well-being. *Transp. Res. Part F* 49 (2017), 159–176. <https://doi.org/10.1016/j.trf.2017.06.015>.
- Handy, S., Thigpen, C., 2019. Commute quality and its implications for commute satisfaction: exploring the role of mode, location, and other factors. *Travel Behav. Soc.* 16 (2019), 241–248. <https://doi.org/10.1016/j.tbs.2018.03.001>.
- ITS Factory 2021. Tampere Public Transport GTFS feed. Available at: <http://data.itsfactory.fi/journeys/files/gtfs/>.
- Jenelius, E., Cebecauer, M., 2020. Impacts of COVID-19 on public transport ridership in Sweden: analysis of ticket validations, sales and passenger counts. *Transp. Res. Interdiscip. Perspect.* 8 (2020), 100242 <https://doi.org/10.1016/j.trp.2020.100242>.
- Lucas, K., 2012. Transport and social exclusion: where are we now? *Transp. Policy* 20, 105–113. <https://doi.org/10.1016/j.tranpol.2012.01.013>.
- Mokhtarian, P.L., 2019. Subjective well-being and travel: retrospect and prospect. *Transportation* 46 (2), 493–513. <https://doi.org/10.1007/s11116-018-9935-y>.
- Mokhtarian, P.L., Cao, X., 2008. Examining the impacts of self-selection on travel behavior: a focus on methodologies. *Transp. Res. Part B* 42, 204–228. <https://doi.org/10.1016/j.trb.2007.07.006>.
- Mokhtarian, P.L., Salomon, I., 2001. How derived is the demand for travel? Some conceptual and measurement considerations. *Transp. Res. Part A: Policy Pract.* 35 (8), 695–719. [https://doi.org/10.1016/S0965-8564\(00\)00013-6](https://doi.org/10.1016/S0965-8564(00)00013-6).
- Morris, E.A., Guerra, E., 2015. Mood and mode: does how we travel affect how we feel? *Transportation* 2015 (42), 25–43. <https://doi.org/10.1007/s11116-014-9521-x>.

- Morris, E.A., Blumenberg, E., Guerra, E., 2020. Does lacking a car put the brakes on activity participation? Private vehicle access and access to opportunities among low-income adults. *Transp. Res. Part A* 136 (2020), 375–397. <https://doi.org/10.1016/j.tra.2020.03.021>.
- Rahman, M.L., Baker, D., Shafiq-Ur Rahman, M., 2020. Modelling induced travel demand in a developing country: evidence from Dhaka, Bangladesh. *World Conference on Transport Research – WCTR 2019, Mumbai, 26-30 May 2019*. *Transp. Res. Procedia* 48, 3439–3456. <https://doi.org/10.1016/j.trpro.2020.08.108>.
- Schwanen, T., Mokhtarian, P.L., 2005. What affects commute mode choice: neighborhood physical structure or preferences toward neighborhoods? *J. Transp. Geogr.* 13 (1), 83–99. <https://doi.org/10.1016/j.jtrangeo.2004.11.001>.
- Singleton, P., 2019. Walking (and cycling) to well-being: modal and other determinants of subjective well-being during the commute. *Travel Behav. Soc.* 16 (2019), 249–261. <https://doi.org/10.1016/j.tbs.2018.02.005>.
- Spinney, J.E.L., Scott, D.M., Newbold, K.B., 2009. Transport mobility benefits and quality of life: a time-use perspective of elderly Canadians. *Transp. Policy* 16 (1), 1–11. <https://doi.org/10.1016/j.tranpol.2009.01.002>.
- Tiikkaja, H., Viri, R., 2021. The effects of COVID-19 epidemic on public transport ridership and frequencies. A case study from Tampere, Finland. *Transp. Res. Interdiscip. Perspect.* 10, 100348. <https://doi.org/10.1016/j.trip.2021.100348>.
- Van den Berg, P., Kemperman, A., Waygood, E.O.D., 2019. Editorial for the special issue on travel and well-being. *Travel Behav. Soc.* 16 (2019), 182–184. <https://doi.org/10.1016/j.tbs.2019.04.002>.
- Västhjäll, D., Friman, M., Gärling, T., Kleiner, M., 2002. The measurement of core affect: a Swedish self-report measure derived from the affect circumplex. *Scand. J. Psychol.* 43 (1), 19–31. <https://doi.org/10.1111/1467-9450.00265>.
- Waygood, E.O.D., Friman, M., Taniguchi, A., Olsson, L.E., 2019. Children's life satisfaction and travel satisfaction: evidence from Canada, Japan, and Sweden. *Travel Behav. Soc.* 16 (2019), 214–223. <https://doi.org/10.1016/j.tbs.2018.04.004>.
- Willard, C. A. 2020. *Statistical Methods: An Introduction to Basic Statistical Concepts and Analysis*. 2nd Edition. Milton: Taylor and Francis, 2020. Web. 367 p. ISBN: 978-0-429-26103-9 (ebk).
- Ye, R., Titheridge, H., 2019. The determinants of commuting satisfaction in low-income population: a case study of Xi'an, China. *Travel Behav. Soc.* 16 (2019), 272–283. <https://doi.org/10.1016/j.tbs.2019.01.005>.