

Travel barriers affecting subjective wellbeing in Tampere, Finland

Jussi Sjögren^{1}, Hanne Tiikkaja¹, Steve O'Hern^{1,2}*

¹ *Transport Research Centre Verne, Tampere University, FI-33014 Tampere, Finland*

² *Monash University Accident Research Centre, Clayton, VIC 3800, Australia*

** Correspondence: jussi.sjogren@tuni.fi*

Abstract

Travel is an important activity enabling everyday life, as well as a recognised factor for the wellbeing of people. This study examined how experienced travel barriers and their effect on access to important destinations influenced subjective wellbeing (SWB). The study comprised a survey of 772 people living in two suburban areas of Tampere, Finland. The survey included questions about everyday travel, travel barriers, and their effect on access to destinations. SWB was measured using the Personal Wellbeing Index (PWI). Responses were analysed by comparing PWI scores with travel barriers and access to destinations using one way ANOVA. Results indicate a significant connection between several experienced barriers and SWB. Some travel barriers were associated with a worrying decline to critically low level of SWB, which raised questions about transport equity and connections between travel and wellbeing in the context of Finnish transport system.

Keywords: Subjective wellbeing, Personal Wellbeing Index, travel behaviour, travel barriers, Finland,

1. Introduction

Travel is an activity with intrinsic value that enables a person to participate in their desired activities (Choo et al., 2005; Mokhtarian and Salomon, 2001). The relationship between travel and subjective wellbeing (SWB) has been investigated extensively from a diverse range of perspectives including commuting (Chatterjee et al., 2020; Tao et al., 2022), social exclusion (Delbosc and Currie, 2011), transport poverty (Awaworyi Churchill and Smyth, 2019), mental health (Liu et al., 2022), residential location (De Vos et al., 2013), built environment (Mouratidis, 2021), travel modes and travel mode shift (Ettema et al., 2016), and mobility of older people (Nordbakke and Schwanen, 2014).

SWB describes the level of wellbeing an individual experiences by subjectively evaluating their life in that moment (Diener and Ryan, 2009). Diener (1984) defined SWB as an experience of the individual which consists of negative and positive matters. SWB measures typically include an extensive evaluation of aspects of a person's life to emphasis an integrated judgement of the person's life.

The importance of wellbeing lies in the multifaceted effects it has on a person, which can in turn affect the whole society. As an example, wellbeing has been linked with various aspects of health such as, mortality (Chida and Steptoe, 2008), coronary heart diseases (Kubzansky and Kawachi, 2000), healthy behaviours (Lyubomirsky et al., 2005), and has been shown to be a protective factor for health (Ostir et al., 2001; Steptoe et al., 2015). Other relevant example of the importance of wellbeing can be found in the connection with working life, as wellbeing has been connected to productivity of the workers (Oswald et al., 2015), job satisfaction (Bowling et al., 2010), and income (De Neve and Oswald, 2012; Ferrer-i-Carbonell, 2005). The national economy is an important area that is affected by health (Suhreke et al., 2006) and work life (Schaufeli, 2018), further highlighting the importance of wellbeing, in addition to its intrinsic

value in people's life. These benefits are of such significance and importance that wellbeing is noted within the Sustainable Development goals of the United Nations (2023). In this study we examined how different travel barriers and their effect on access to different important destinations affect SWB.

The Personal Wellbeing Index (PWI) is one of many ways of measuring SWB (International Wellbeing Group, 2013). PWI was developed by Cummins (1995) to find a "gold standard" for measuring SWB by surveying respondent's satisfaction in different areas of their lives. The PWI studies respondent's satisfaction with life with a validated set of questions regarding different aspects of their life (International Wellbeing Group, 2013).

It has been established that normative range of the PWI is from 49 (70%) to 56 (80%) in Northern European countries (Cummins, 1998; Cummins et al., 2003). Most people within the normative range can maintain their life satisfaction, however the ability to maintain life satisfaction has been predicted to change when the PWI scores fall below the normative range, indicating a shift of control in life satisfaction maintenance from internal mechanisms to external circumstances (Cummins, 2003). Cummins (2003) implies based on these finding that the relationship between objective life conditions and life satisfaction may be heavily influenced by the level of life satisfaction and therefore by the level of SWB. Furthermore, when compared to the Depression, Anxiety and Stress Scale, PWI scores below 44.2 (63.2%) are connected to moderate depression score, and scores below 41 (58.5%) to severe depression (Cummins et al., 2012). Although it is outside the scope of this study to speculate if respondents were suffering from depression, the connection with lowered PWI and depressive inclinations is a reinforcing factor to examine with importance the decreased SWB within respondents who experienced certain barriers to travel.

The survey was conducted in two suburbs of Tampere, Finland: Kaleva and Hervanta. Tampere is one of the fastest growing cities in

Finland (Tilastokeskus, 2023) and in recent times has seen notable investments in infrastructure, such as the new tram system which improved the public transit system of Kaleva and Hervanta. Furthermore, the city of Tampere has included wellbeing as a measure in the city strategy (City of Tampere, 2023). Results from a recent survey of the well-being amongst Tampere's residents show that in general residents are satisfied with transport connections and routes (City of Tampere, 2023). However, the study did not consider the reasons behind these experiences.

This paper seeks to investigate: How experienced travel barriers are connected to SWB? and how are identified barriers related to access to destinations important to wellbeing? The gap in the knowledge that this study is contributing to is the connection of the travel barriers and SWB in an urban Finnish context. The findings of this study have the potential to demonstrate the connection between SWB and the travel barriers in Tampere. Furthermore, the findings have potential to guide similar reflection in comparable environments in Finland and other Nordic countries.

2. Method

2.1 Procedure

The analysis presented in this manuscript is derived from a survey conducted between March and September 2022 in the suburbs of Hervanta and Kaleva in Tampere, Finland (Sjögren and Tiikkaja, 2022). A representative sample of 4,000 persons, aged 18 or older, was drawn from the Finnish Digital and Population Data Services Agency's Population Information System. The sample was stratified by age and gender with only native Finnish speakers included in the sample. No persons with a marketing ban were included in the sample.

An invitation letter and accompanying documents were sent to respondents in mid-March 2022 (Sjögren and Tiikkaja, 2022). The letter included a cover letter, explanatory statement, instructions on

how to answer the survey, a paper copy of the survey, a return envelope, and a privacy notice. Participants could answer the survey online or by returning the completed paper copy of the survey. No incentives were offered for participating the study. In total, 772 respondents completed sufficient questions to be included in the analysis. A summary of self-reported demographics for the participants are presented in Table 1. The institutional ethics committee deemed the project low risk, as such ethical approval was not required for the study.

Variable		n	%
Gender (n = 756)	Female	400	52.9
	Male	347	45.9
	Non-binary or do not want to answer	9	1.2
Age (n = 768)	18-29	209	27.1
	30-44	167	21.7
	45-64	172	22.3
	65-74	147	19.1
	75+	73	9.5
Employment (n = 771)	Full-time	272	35.3
	Part-time or work occasionally	47	6.1
	Unemployed, laid off or on sick leave	44	5.8
	Stay home parent	12	1.6
	Student	139	18.0
	Part-time pension or retired	244	31.7
	Other	13	1.7
Household size (n = 768)	1	343	44.5
	2	317	41.1
	3	50	6.5
	4 or more	58	7.5
Household income (n= 750)	Less than 10,000 euros	83	11.1
	10,000 - 20,000 euros	160	21.3
	20,001 – 40,000 euros	199	26.5
	40,001 – 60,000 euros	145	19.3
	60,001 – 80,000 euros	82	10.9
	Over 80,000 euros	81	10.8
Driver's licence (n = 768)	Yes	611	79.6
	No	157	20.4
Public transport ticket (n = 770)	Yes	700	90.9
	No	70	9.1

Table 1: Demographic characteristics.

2.2 Materials

The survey comprised questions on demographic characteristics, travel barriers, difficulties reaching destinations due to barriers, and subjective wellbeing. Travel barriers were measured on a four-point scale (1 – not a barrier, 2 – a small barrier, 3 – a moderate barriers, 4 – a substantial barrier), while their effect on accessing destinations were measured on a three-point scale (1 – does not complicate, 2 – complicates a little, 3 – complicates a lot). SWB was measured using the Personal Wellbeing Index (PWI) (International Wellbeing Group, 2013). The PWI consists of seven items with total scores calculated by summing the seven items. Each item was measured on an 11-point scale from 0 to 10 (International Wellbeing Group, 2013). This results in an overall score with maximum of 70. Summary statistics for the PWI items are presented in Table 2.

Item	M	SD
Cronbach's Alpha (.905)		
Standard of living	7.57	1.86
Health	7.15	2.14
Achieving in life	7.47	2.03
Personal relationships	7.58	2.02
Safety	7.83	1.82
Community	7.03	2.00
Future security	7.03	2.13

Table 2: Personal Wellbeing Index item scores.

2.3 Analysis

All analyses were conducted using IBM SPSS 28. Descriptive statistics are presented for survey questions including demographics, SWB, and travel barriers. Cronbach's alpha was used to assess the reliability of the PWI items. One way ANOVA was used to identify statistically significant differences between SWB, demographic, barriers to travel, and destinations with effect size measured using eta-squared (η^2). Tukey HSD was used to conduct post-hoc testing. Statistical significance was evaluated with alpha (α) set to 0.05.

3. Results

A comparison of SWB from the PWI by demographic characteristics is presented in Table 3. Statistically significant differences in self-reported SWB were identified based on employment, household size, household income, and having a driver licence. No significant differences were identified for SWB by age, gender and having access to public transport.

When considering employment, the highest levels of SWB were reported by stay-at-home parents, followed by those in full-time work. Unemployed respondents had significantly lower rates of SWB compared to other employment categories. Regarding household size, persons living in single person households had significantly lower rates of SWB compared to all other groups, with no significant differences in SWB reported amongst other household sizes. SWB was also found to increase with household income, with significant differences observed between households based on income level. Finally, having a driver's licence was associated with higher levels of SWB.

Next, travel barriers were assessed, including analysing if there were significant differences in self-reported SWB by travel barrier (Table 4). The barriers were measured on 4-point scale evaluating if the item causes no-barrier (1), slight barrier (2), moderate barrier (3), or substantial barrier (4).

Participants identified insufficient options for car parking, and a lack of cycling infrastructure as the greatest travel barriers (mean scores of 2.19 and 2.10 respectively). These were followed by insufficient bicycle parking options, insufficient public transport, and long travel distances. However, overall participants reported low scores for each of the travel barrier items. For each item, participants' self-reported SWB scores were assessed using one-way ANOVA. Significant

differences in SWB were reported for most items except for insufficient options for car parking and insufficient options for storing and parking bicycles. This was an interesting finding as these items were identified as some of the greatest travel barriers. The largest differences were identified for cost, with significantly lower rates of SWB for those who felt cost was a travel barrier. Differences in SWB were also observed when considering distance to destinations, illness or disability and accessibility.

Variable		M	SD	F	p	η^2
Gender (n = 756)	Female	51.50	10.78	1.175	.309	.003
	Male	51.85	11.80			
	Non-binary or do not want to answer	46.11	8.72			
Age (n = 768)	18-29	51.81	10.07	.969	.424	.005
	30-44	50.51	11.78			
	45-64	52.80	10.77			
	65-74	51.92	11.27			
	75+	51.16	12.27			
Employment (n = 771)	Full-time	53.87	9.00	11.70	<.001	.084
	Part-time or work occasionally	51.21	9.59			
	Unemployed, laid off or on sick leave	39.80	14.66			
	Stay home parent	57.08	5.79			
	Student	52.00	9.63			
	Part-time pension or retired	51.11	12.13			
	Other	48.23	18.52			
Household size (n = 768)	1	48.95	12.53	12.78	<.001	.048
	2	53.89	9.65			
	3	54.10	9.50			
	4 or more	53.47	8.30			
Household income (n = 750)	Less than 10,000 euros	48.05	14.15	9.91	<.001	.062
	10,000 - 20,000 euros	48.92	12.70			
	20,001 – 40,000 euros	50.50	11.50			
	40,001 – 60,000 euros	53.68	8.14			
	60,001 – 80,000 euros	55.00	8.23			
	Over 80,000 euros	56.37	7.66			
Driver's licence (n = 768)	Yes	52.55	10.26	19.78	<.001	.025
	No	48.14	13.85			
Public transport ticket (n = 770)	Yes	51.60	11.34	0.141	.708	.000
	No	52.13	9.81			

Table 3: Total PWI scores stratified by demographics.

Items	Item scores		PWI		
	M	SD	F	p	η^2
Cost (n=763)	1.61	0.80	28.68	<.001	.102
Destinations are located far from my home (n=757)	1.75	0.87	19.44	<.001	.072
Travel time (n=759)	1.73	0.87	6.64	<.001	.026
Accessibility (n=750)	1.23	0.58	10.15	<.001	.039
Illness or disability (n=756)	1.29	0.69	15.99	<.001	.060
Insufficient public transport connections (n=752)	1.77	0.95	4.61	.003	.018
Finding information about public transport timetables and routes (n=759)	1.58	0.90	7.32	<.001	.028
Difficulty to order a taxi (n=745)	1.54	0.92	3.79	.010	.015
Taxi availability and certainty to get a taxi (n=741)	1.65	0.94	4.56	.004	.018
No car (n=373)	1.73	0.94	7.18	<.001	.055
No driving licence (n=245)	1.56	0.94	2.66	.049	.032
Insecurity in travel (n=754)	1.35	0.67	9.17	<.001	.035
Insufficient options for car parking (n=720)	2.19	1.10	1.61	.186	.007
Lack of pavements and bicycle ways or insufficient maintenance (n=754)	2.10	1.01	3.93	.008	.015
Insufficient options for storing and parking a bicycle (n=727)	1.75	0.95	0.86	.469	.004

Table 4: Travel barrier items and differences in total PWI.

Figure 1 further explores the travel barriers, by showing mean PWI scores of the four barrier levels. The normative range of SWB as specified by Cummins is also shown as vertical lines (PWI scores 49 and 56) (Cummins, 1998; Cummins et al., 2003). It is noted that for some travel barrier items there are relatively low sample sizes in some groups within the item’s answer. Nevertheless, notable decreases are important to consider, despite affecting only a small proportion of respondents.

As expected, the mean PWI score for the respondents who did not experience a barrier was in the normative range for each item. Similarly, mean PWI scores for the respondents who experienced slight barriers were in the normative range for all items except those related to accessibility, and illness or disability. For respondents who experienced moderate travel barriers, mean scores were below the normative range for cost, travel time, accessibility, illness or disability, finding information about public transport timetables and routes, not having a car, not having a driving licence, and insecurity in travel, with similar patterns found for respondents who experience substantial travel barriers. Post-hoc testing confirmed

significant differences in PWI when comparing to respondents experiencing no barrier with the respondents experiencing moderate or sustainable barriers for cost, accessibility, illness or disability, not having a car, not having a driver's license, and insecurity in travel.



Figure 1: PWI means in the travel barrier items between different answer options.

Finally, participants were asked to identify if there were locations and activities that were more difficult to engage in due to the travel barriers. These items were evaluated on a scale of 1 to 3 evaluating if the respondent experienced no barrier (1), slight barrier (2), or moderate/substantial barrier (3) to access the destinations important for their wellbeing.

Overall, the majority of respondents noted that travel barriers do not cause them difficulties when accessing destinations. The greatest effects that barriers had to access destinations were associated with destinations related to recreational activities including visiting summer cottages or nature activities or visiting friends and relatives. However, there were also some respondents who reported

difficulties in accepting jobs, commuting, and accessing retail and medical services. Considering wellbeing, again those who did not experienced difficulties tended to report higher levels of SWB, with statistically significant differences identified for most activities except for taking children to day care.

Items	Item scores		PWI		
	M	SD	F	p	η^2
Accepting a job (n = 487)	1.35	0.60	10.73	<.001	.042
Work trips or travel to study place (n = 524)	1.37	0.61	6.40	.002	.024
Taking kids to day care (n = 281)	1.15	0.43	.006	.994	.000
Going to grocery store (n = 743)	1.17	0.44	8.32	<.001	.022
Going to other stores (n = 746)	1.35	0.59	15.19	<.001	.039
Using post services (n = 740)	1.19	0.47	9.73	<.001	.026
Going to pharmacy (n = 745)	1.14	0.41	12.88	<.001	.034
Going to health centre or child health centre (n = 737)	1.20	0.48	16.34	<.001	.043
Visiting friends and relatives (n = 735)	1.58	0.71	13.90	<.001	.037
Participating in interesting hobbies (n = 706)	1.45	0.64	11.60	<.001	.032
Going to the cinema, theatre, museums or concerts (n = 717)	1.33	0.59	11.93	<.001	.032
Visiting summer cottage or nature attractions (n = 683)	1.65	0.78	13.35	<.001	.039

Table 5: Item means evaluating access to destinations affected by travel barriers and PWI.

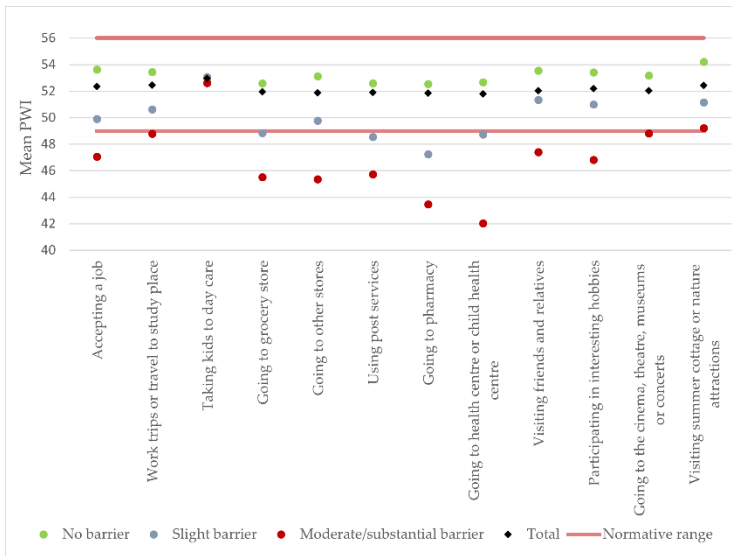


Figure 2: Item means evaluating access to destinations affected by travel barriers and personal wellbeing index

Figure 2 presents the mean PWI for each answer option within the items of Table 5. For each item, mean PWI was in the normative range among the respondents who did not experience travel barriers that affected their access to destinations. Those who experienced slight barriers with going to grocery store, usage of post services, and going to a health centre or a child health centre had a mean PWI below the normative range. For those experiencing moderate/substantial barriers to access their destinations, only the items Visiting summer cottage or nature attractions ($M = 49.20$, $SD = 12.91$, $N = 129$), and Taking kids to day care ($M = 52.63$, $SD = 14.49$, $N = 8$) had mean PWI within the normative range. The lowest mean PWIs within these items was among those who experienced moderate/substantial barrier for going to health centre or child health centre ($M = 42.04$, $SD = 17.37$, $N = 25$), going to pharmacy ($M = 43.37$, $SD = 18.92$, $N = 19$). Other notable low mean PWI results were connected to moderate/substantial barriers to accessing grocery store ($M = 45.53$, $SD = 17.24$, $N = 19$), going to other stores ($M = 45.36$, $SD = 14.74$, $N = 45$), and using post services ($M = 45.74$, $SD = 16.31$, $N = 27$). Post-hoc tests confirmed significant differences between every item, except taking kids to day-care, when compared to those who reported no barriers.

4. Discussion

The transport system can influence SWB through access to important activities, physical mobility, and physical infrastructure (Delbosc, 2012). As personal characteristics will influence how people define their expectations for a good life, SWB can be impacted if barriers prevent people from meeting their expectations (Delbosc, 2012). Satisfaction with daily travel and daily activities has been shown to have an influence on SWB (Bergstad et al., 2011). Improving SWB can have an impact on individuals and society as a

whole, as SWB can have an effect on health, social issues, employment, education, and environment (Maccagnan et al., 2019). Also, these issues are acknowledged in the Sustainable Growth Programme for Finland as a point of interest and national aim, with the programme's general objectives being productivity growth, raising the employment rate, faster access to care, and progress in equality (Finnish Government, 2021).

According to our study, employment, driver's licence, household size and household income are significantly connected with PWI results. According to the mean PWI scores within each category it can be interpreted that being unemployed, laid off, or on a sick leave may have a critical effect on SWB. The findings indicate that household income is also connected to SWB. This result may be connected to household size, as single person households had notably lower mean PWI compared to households with two or more residents. Because SWB is a complex subjective experience, it is important to be aware of the effects of demographic factors when interpreting the results, as they may affect or explain the connections with the PWI results of the other items.

Results of this study displayed the connections that travel barriers had on SWB. The only barriers that were non-significant were insufficient options for car parking and storing and parking a bicycle. Cost was the travel barrier with highest effect size, and the respondents experiencing cost as a substantial barrier had the lowest mean PWI of 39.08, which is a PWI score as low as people with severe depression (Cummins et al., 2012). Other notable findings were the considerable decline in mean PWI among the respondents who experienced accessibility, illness, or disability as a travel barrier. Insecurity in travel, and not owning a car had a connection with lower mean PWI as well.

Access to destinations affected by travel barriers had a significant connection to PWI results, with the exception of taking kids to day care not being significant. Respondents experiencing slight barriers

towards going to grocery store, pharmacy, post services, or health centres reported mean PWI below the normative range, but the reported mean PWI was in the normative range for respondents experiencing slight barriers with other access to destination items. Results found that experiencing moderate or substantial barriers with access to different destinations decreases the mean PWI near to the lower limit of normative range, or considerably below it. Especially experiencing moderate or substantial barriers towards going to health centre or child health centre, pharmacy, grocery store, other stores, or post services had a relationship to the respondents reporting low PWI results. The common factor between the items that had the lowest mean PWI scores, may be the essential nature of the services and the lack of voluntariness to use them when in need.

PWI total of 44.2 has been connected to moderate depression scores (Cummins et al., 2012). However, it could be argued that it is not responsible to unambiguously reference the findings of Cummins et al. (2012) as a flawless instrumentation to identify depressed individuals, as the research is quite limited. Especially since the results of this study finding a connection between low mean PWI and the experienced barriers had a relatively low sample size and high standard deviation in many instances. Despite this limitation, the noteworthy decreases in SWB as an effect of travel barriers or other travel related circumstances is a topic of great importance and deserves more attention and further research in the future.

This study highlights connections between experienced travel barriers and how they affect access to important destinations, which may lead to issues with transport equity (Litman, 2022) and fluctuation in SWB. Barriers that could be connected to these conditions are for example not having a car, destinations being located far from home, cost, travel time, insecurity in travel, accessibility, illness or disability, and the barriers to access destination presented in the study. These connections may imply

that people who experience substantial or moderate barriers from certain travel barriers, or for accessing important destinations, may be exposed to the risk of declining SWB. Stanley et al. (2011) had a similar finding by presenting the indirect association of improved mobility as a mean to improve wellbeing by reducing the risk of social exclusion. Also, Currie et al. (2010) presented strong links between wellbeing and social exclusion, and a link between transport disadvantage and the travel poverty construct which led to lower ratings of SWB.

Measures to affect equity and wellbeing in transport are varied. Measures can be aimed towards spatial planning (Church et al., 2000), public transit (Stanley and Lucas, 2008), and fiscal factors (Litman, 2022). Although, the decline of SWB affected only a fraction of respondents, it is important to acknowledge the consequences, as they may cause serious negative outcomes to the person themselves and to the society in multiple different ways. Nevertheless, the study contributes important information about the transport related declining of SWB among the citizens of Tampere, Finland.

Potential limitations of the study include having the sample framed to two areas without notable shortages in services, and all respondents being Finnish speakers. When interpreting the decline of PWI results of those who experienced barriers, potential limitations can be noted as some of the sample sizes within independent answer options were relatively low in comparison to the rest of the sample, and the standard deviation is relatively high within some cases.

As a conclusion, this study demonstrated a connection between SWB and travel barriers and how they affect access to destinations. Connections between certain experienced travel barriers and access to destinations affected by travel barriers with the decline of SWB were significant, and therefore answers the research question by demonstrating this connection among the residents of Hervanta and

Kaleva, which may also be applicable to other similar areas, such as Finland in general, Nordic countries, or other high-income countries.

5. Acknowledgements

This paper is based on survey conducted as a part of the Smart Rail project which was funded by Business Finland.

6. References

Awaworyi Churchill, S., Smyth, R., 2019. Transport poverty and subjective wellbeing. *Transportation Research Part A: Policy and Practice* 124, 40–54. <https://doi.org/10.1016/j.tra.2019.03.004>

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, 1–15. <https://doi.org/10.1007/s11116-010-9283-z>

Bowling, N.A., Eschleman, K.J., Wang, Q., 2010. A meta-analytic examination of the relationship between job satisfaction and subjective well-being. *Journal of Occupational and Organizational Psychology* 83, 915–934. <https://doi.org/10.1348/096317909X478557>

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 Reviews* 40, 5–34. <https://doi.org/10.1080/01441647.2019.1649317>

Chida, Y., Steptoe, A., 2008. Positive Psychological Well-Being and Mortality: A Quantitative Review of Prospective Observational Studies. *Psychosomatic Medicine* 70, 741–756. <https://doi.org/10.1097/PSY.0b013e31818105ba>

Choo, S., Collantes, G.O., Mokhtarian, P.L., 2005. Wanting to travel, more or less: Exploring the determinants of the deficit and surfeit of personal travel. *Transportation* 32, 135–164. <https://doi.org/10.1007/s11116-004-2219-8>

Church, A., Frost, M., Sullivan, K., 2000. Transport and social exclusion in London. *Transport Policy* 7, 195–205. [https://doi.org/10.1016/S0967-070X\(00\)00024-X](https://doi.org/10.1016/S0967-070X(00)00024-X)

City of Tampere, 2023. Tampereen strategia 2030, tekemisen kaupunki.

Cummins, R.A., 2003. Normative Life Satisfaction: Measurement Issues and a Homeostatic Model. *Social Indicators Research* 64, 225–256. <https://doi.org/10.1023/A:1024712527648>

Cummins, R.A., 1998. The Second Approximation to an International Standard for Life Satisfaction. *Social Indicators Research* 43, 307–334. <https://doi.org/10.1023/A:1006831107052>

Cummins, R.A., 1995. On the Trail of the Gold Standard for Subjective Well-Being. *Social Indicators Research* 35, 179–200. <https://doi.org/10.1007/BF01079026>

Cummins, R.A., Eckersley, R., Pallant, J., Van Vugt, J., Misajon, R., 2003. Developing a national index of subjective wellbeing: The Australian Unity Wellbeing Index. *Social indicators research* 64, 159–190. <https://doi.org/10.1023/A:1024704320683>

Cummins, R.A., Lau, A.L.D., Davern, M.T., 2012. Subjective Wellbeing Homeostasis, in: Land, K.C., Michalos, A.C., Sirgy, M.J. (Eds.), *Handbook of Social Indicators and Quality of Life Research*. Springer Netherlands, Dordrecht, pp. 79–98. https://doi.org/10.1007/978-94-007-2421-1_4

Currie, G., Richardson, T., Smyth, P., Vella-Brodrick, D., Hine, J., Lucas, K., Stanley, Janet, Morris, J., Kinnear, R., Stanley, John, 2010. Investigating links between transport disadvantage, social exclusion, and well-being in Melbourne – Updated results. *Research in Transportation Economics* 29, 287–295. <https://doi.org/10.1016/j.retrec.2010.07.036>

De Neve, J.-E., Oswald, A.J., 2012. Estimating the influence of life satisfaction and positive affect on later income using sibling fixed effects. *Proc. Natl. Acad. Sci. U.S.A.* 109, 19953–19958. <https://doi.org/10.1073/pnas.1211437109>

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. *Transport Reviews* 33, 421–442.
<https://doi.org/10.1080/01441647.2013.815665>
- Delbosch, A., 2012. The role of well-being in transport policy. *Transport Policy* 23, 25–33. <https://doi.org/10.1016/j.tranpol.2012.06.005>
- Delbosch, A., Currie, G., 2011. Exploring the relative influences of transport disadvantage and social exclusion on well-being. *Transport Policy* 18, 555–562. <https://doi.org/10.1016/j.tranpol.2011.01.011>
- Diener, E., 1984. Subjective well-being. *Psychological Bulletin* 95, 542–575. <https://doi.org/10.1037/0033-2909.95.3.542>
- Diener, E., Ryan, K., 2009. Subjective well-being: A general overview. *South African journal of psychology* 39, 391–406. <https://doi.org/10.1177/008124630903900402>
- Ettema, D., Friman, M., Gärling, T., Olsson, L.E., 2016. Travel Mode Use, Travel Mode Shift and Subjective Well-Being: Overview of Theories, Empirical Findings and Policy Implications, in: Wang, D., He, S. (Eds.), *Mobility, Sociability and Well-Being of Urban Living*. Springer Berlin Heidelberg, Berlin, Heidelberg, pp. 129–150. https://doi.org/10.1007/978-3-662-48184-4_7
- Ferrer-i-Carbonell, A., 2005. Income and well-being: an empirical analysis of the comparison income effect. *Journal of Public Economics* 89, 997–1019. <https://doi.org/10.1016/j.jpubeco.2004.06.003>
- Finnish Government, 2021. Sustainable Growth Programme for Finland. Recovery and Resilience Plan (No. 2021:69), Publications of the Finnish Government. Finnish Government, Helsinki, Finland.
- International Wellbeing Group, 2013. *Personal Wellbeing Index: 5th Edition*. The Australian Centre on Quality of Life, Deakin University, Melbourne.
- Kubzansky, L.D., Kawachi, I., 2000. Going to the heart of the matter. *Journal of Psychosomatic Research* 48, 323–337. [https://doi.org/10.1016/S0022-3999\(99\)00091-4](https://doi.org/10.1016/S0022-3999(99)00091-4)

Litman, T.M., 2022. Evaluating Transportation Equity: Guidance for Incorporating Distributional Impacts in Transport Planning. Institute of Transportation Engineers. ITE Journal 92, 43–49.

Liu, J., Ettema, D., Helbich, M., 2022. Systematic review of the association between commuting, subjective wellbeing and mental health. Travel Behaviour and Society 28, 59–74. <https://doi.org/10.1016/j.tbs.2022.02.006>

Lyubomirsky, S., King, L., Diener, E., 2005. The Benefits of Frequent Positive Affect: Does Happiness Lead to Success? Psychological Bulletin 131, 803–855. <https://doi.org/10.1037/0033-2909.131.6.803>

Maccagnan, A., Wren-Lewis, S., Brown, H., Taylor, T., 2019. Wellbeing and Society: Towards Quantification of the Co-benefits of Wellbeing. Soc Indic Res 141, 217–243. <https://doi.org/10.1007/s11205-017-1826-7>

Mokhtarian, P.L., Salomon, I., 2001. How derived is the demand for travel? Some conceptual and measurement considerations. Transportation Research Part A: Policy and Practice 35, 695–719. [https://doi.org/10.1016/S0965-8564\(00\)00013-6](https://doi.org/10.1016/S0965-8564(00)00013-6)

Mouratidis, K., 2021. Urban planning and quality of life: A review of pathways linking the built environment to subjective well-being. Cities 115, 103229. <https://doi.org/10.1016/j.cities.2021.103229>

Nordbakke, S., Schwanen, T., 2014. Well-being and Mobility: A Theoretical Framework and Literature Review Focusing on Older People. Mobilities 9, 104–129. <https://doi.org/10.1080/17450101.2013.784542>

Ostir, G.V., Markides, K.S., Peek, M.K., Goodwin, J.S., 2001. The Association Between Emotional Well-Being and the Incidence of Stroke in Older Adults. Psychosomatic Medicine 63, 210–215. <https://doi.org/10.1097/00006842-200103000-00003>.

Oswald, A.J., Proto, E., Sgroi, D., 2015. Happiness and Productivity. Journal of Labor Economics 33, 789–822. <https://doi.org/10.1086/681096>

Schaufeli, W.B., 2018. Work engagement in Europe. Organizational Dynamics 47, 99–106. <https://doi.org/10.1016/j.orgdyn.2018.01.003>

Sjögren, J., Tiikkaja, H., 2022. Liikkumismahdollisuudet Tampereen Hervannassa ja Kalevassa 2022. Yhteenvetoraportti kyselytutkimuksen päätuloksista. Tampereen yliopisto, Rakennetun ympäristön tiedekunta, Liikenteen tutkimuskeskus Verne.

Stanley, J., Lucas, K., 2008. Social exclusion: What can public transport offer? *Research in Transportation Economics, Reforms in Public Transport* 22, 36–40. <https://doi.org/10.1016/j.retrec.2008.05.009>

Stanley, J.K., Hensher, D.A., Stanley, J.R., Vella-Brodrick, D., 2011. Mobility, social exclusion and well-being: Exploring the links. *Transportation Research Part A: Policy and Practice* 45, 789–801. <https://doi.org/10.1016/j.tra.2011.06.007>

Stephoe, A., Deaton, A., Stone, A.A., 2015. Subjective wellbeing, health, and ageing. *The Lancet* 385, 640–648. [https://doi.org/10.1016/S0140-6736\(13\)61489-0](https://doi.org/10.1016/S0140-6736(13)61489-0)

Suhrcke, M., McKee, M., Stuckler, D., Sauto Arce, R., Tsoлова, S., Mortensen, J., 2006. The contribution of health to the economy in the European Union. *Public Health* 120, 994–1001. <https://doi.org/10.1016/j.puhe.2006.08.011>

Tao, Y., Petrović, A., Van Ham, M., 2022. Commuting behaviours and subjective wellbeing: a critical review of longitudinal research. *Transport Reviews* 1–23. <https://doi.org/10.1080/01441647.2022.2145386>

Tilastokeskus, 2023. . Väestö ja yhteiskunta. URL https://www.tilastokeskus.fi/tup/suoluk/suoluk_vaesto.html#vaestotietoj_a-maakunnittain (accessed 5.30.23).

United Nations, 2023. Goal 3: Ensure healthy lives and promote well-being for all at all ages [WWW Document]. Health - United Nations Sustainable Development. URL <https://www.un.org/sustainabledevelopment/health/> (accessed 5.3.23).

7. Appendix

Appendix 1: Responses by the level of barrier with sample size, mean, and standard deviation.

Item	Response	N	Mean	SD
Cost	No barrier	432	54.29	9.44
	Slight barrier	224	49.62	10.44
	Moderate barrier	83	46.67	13.61
	Substantial barrier	24	38.08	19.00
	Total	763	51.61	11.22
Destinations are located far from my home	No barrier	371	54.26	9.73
	Slight barrier	236	50.89	10.54
	Moderate barrier	118	46.40	12.46
	Substantial barrier	32	46.31	16.93
	Total	757	51.65	11.21
Travel time	No barrier	382	53.11	10.32
	Slight barrier	233	51.40	11.07
	Moderate barrier	109	48.06	12.21
	Substantial barrier	35	49.17	14.85
	Total	759	51.68	11.20
Accessibility	No barrier	627	52.53	10.39
	Slight barrier	81	48.16	11.60
	Moderate barrier	33	45.12	14.65
	Substantial barrier	9	42.11	26.07
	Total	750	51.61	11.23
Lines or disability	No barrier	617	52.84	10.17
	Slight barrier	81	47.65	11.93
	Moderate barrier	35	46.37	11.85
	Substantial barrier	23	41.13	20.60
	Total	756	51.63	11.21
Insufficient public transport	No barrier	387	53.01	10.19
	Slight barrier	205	50.27	11.53
	Moderate barrier	104	49.24	13.67
	Substantial barrier	56	51.11	11.13
	Total	752	51.60	11.25
Finding information about public transport timetables and routes	No barrier	483	52.83	10.28
	Slight barrier	157	51.29	11.10
	Moderate barrier	72	46.90	12.00
	Substantial barrier	47	49.06	14.85
	Total	759	51.72	11.08
Difficulty to order a taxi	No barrier	515	52.37	10.67
	Slight barrier	99	52.08	9.50
	Moderate barrier	86	49.12	11.33
	Substantial barrier	45	48.11	17.22
	Total	745	51.70	11.16
Taxi availability and certainty to get a taxi	No barrier	451	52.73	10.34
	Slight barrier	146	51.12	11.08
	Moderate barrier	93	48.68	11.89
	Substantial barrier	51	49.24	15.40
	Total	741	51.66	11.17
No car	No barrier	198	51.83	10.76
	Slight barrier	108	49.77	11.22
	Moderate barrier	36	48.50	13.27
	Substantial barrier	31	41.19	19.70
	Total	373	50.03	12.41
No driving licence	No barrier	166	50.47	12.05
	Slight barrier	41	52.05	9.27
	Moderate barrier	18	42.78	14.56
	Substantial barrier	20	48.30	14.31
	Total	245	50.07	12.15
Insecurity in travel	No barrier	559	52.94	10.52
	Slight barrier	138	49.15	11.12
	Moderate barrier	43	48.09	10.43
	Substantial barrier	14	43.36	21.94
	Total	754	51.79	11.10
Insufficient options for car parking	No barrier	261	52.33	10.75
	Slight barrier	178	52.80	10.39
	Moderate barrier	161	51.19	9.93
	Substantial barrier	120	50.25	13.34
	Total	720	51.84	11.12
Lack of pavements and bicycle ways or insufficient maintenance	No barrier	262	53.07	10.95
	Slight barrier	245	50.19	11.42
	Moderate barrier	156	50.58	11.74
	Substantial barrier	91	53.22	9.60
	Total	754	51.64	11.19
Insufficient options for storing and parking a bicycle	No barrier	385	52.43	11.49
	Slight barrier	200	51.12	10.23
	Moderate barrier	82	51.07	8.58
	Substantial barrier	60	51.07	14.12
	Total	727	51.80	11.11

Item	Response	N	Mean	SD
Accepting a job	No barrier	347	53.62	9.41
	Slight barrier	108	49.90	10.12
	Moderate/substantial barrier	32	47.06	13.69
	Total	487	52.36	10.10
	Work trips or travel to study place	No barrier	366	53.43
Slight barrier		121	50.83	9.91
Moderate/substantial barrier		37	48.78	12.96
Total		524	52.46	9.99
Taking kids to day care		No barrier	247	52.95
	Slight barrier	26	53.08	10.87
	Moderate/substantial barrier	8	52.63	14.49
	Total	281	52.85	10.09
	Going to grocery store	No barrier	636	52.59
Slight barrier		88	48.83	12.27
Moderate/substantial barrier		19	45.53	17.24
Total		743	51.96	10.84
Going to other stores		No barrier	531	53.11
	Slight barrier	170	49.77	10.30
	Moderate/substantial barrier	45	45.36	14.74
	Total	746	51.88	10.90
	Using post services	No barrier	630	52.60
Slight barrier		83	48.55	11.85
Moderate/substantial barrier		27	45.74	16.31
Total		740	51.90	10.91
Going to pharmacy		No barrier	663	52.53
	Slight barrier	63	47.24	12.25
	Moderate/substantial barrier	19	43.47	18.92
	Total	745	51.85	10.92
	Going to health centre or child health centre	No barrier	616	52.67
Slight barrier		96	48.74	11.57
Moderate/substantial barrier		25	42.04	17.39
Total		737	51.80	10.93
Visiting friends and relatives		No barrier	402	53.55
	Slight barrier	237	51.35	10.29
	Moderate/substantial barrier	96	47.40	13.06
	Total	735	52.04	10.75
	Participating in interesting hobbies	No barrier	447	53.40
Slight barrier		203	51.00	9.37
Moderate/substantial barrier		56	46.82	14.82
Total		706	52.19	10.67
Going to the cinema, theatre, museums or concerts		No barrier	528	53.19
	Slight barrier	146	48.84	10.32
	Moderate/substantial barrier	45	48.82	15.79
	Total	719	52.03	10.72
	Visiting summer cottage or nature attractions	No barrier	358	54.22
Slight barrier		176	51.15	9.51
Moderate/substantial barrier		129	49.20	12.91
Total		663	52.43	10.39