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Characterizing mobility lifestyles in Finnish cities

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ABSTRACT

Car-centric urban development and car-dependent mobility practices are causing increasing harm to society and the environment. Achieving transformative changes in urban mobility requires a deeper understanding of citizens' mobility lifestyles. This study investigates mobility lifestyles in three Finnish cities using public participation geographic information system (PPGIS) survey data from 3,260 participants. Cluster analysis identified six distinct lifestyle profiles based on travel attitudes and neighbourhood preferences. These profiles differ in travel behaviour, sociodemographic characteristics, residential locations, and perceived health and well-being.

We identified three car-oriented and three sustainable mobility lifestyle profiles, indicating the coexistence of contrasting orientations within urban populations. Sustainable mobility lifestyles were more commonly associated with car-free attitudes, multimodal travel behaviour, younger age groups, lower income, and women. Attitudes towards active mobility, car use, and car ownership varied and were predictors of travel behaviour across profiles. However, mismatches between travel attitudes and behaviour were also observed, indicating that mobility choices may be caused by contextual factors. Neighbourhood preferences aligned partially with both sustainable and car-oriented profiles, suggesting nuanced associations with mobility behaviour.

The findings advance understanding of the diverse motivations and conditions shaping everyday mobility practices. By revealing group-specific barriers and opportunities for behavioural change, the study provides actionable insights to support targeted interventions and sustainability transitions in urban mobility.

1. Introduction

Concerns regarding problematic environmental and social externalities of mobility have gradually emerged in car-oriented societies. While transport infrastructure is vital for our everyday life and private cars provide superior 'freedom and effortlessness' of movement, a large body of research has shown that car infrastructure has increasingly negative impacts on the environment, economy, and the health and well-being of humans and other species (Bertolini and Le Clercq 2003; Urry 2008; Gössling 2020; Lozzi and Monachino 2021; Miner et al. 2024). Yet in Europe, travel demand and private car use have been increasing steadily over the past two decades (EEA 2022). In Finland, despite increasing urbanisation, the number of private cars has increased by 30 % over the past 25 years (Traficom 2024b). In 2023, 55 % of all trips in Finland were made by private car, and even among citizens residing in inner urban areas, 35 % of trips were travelled by car (Traficom 2024a).

Although technological advances such as vehicle electrification reduce emissions from private car use, automobility will continue to burden socio-ecological systems unless car-oriented mobility practices change (Brand et al., 2020). Sustainability transformations should therefore follow the *avoid–shift–improve* (ASI) framework, which offers an inter- and transdisciplinary basis for sustainable urban planning and policymaking (Abson et al. 2017; Creutzig et al. 2018; Gössling 2020; Brömmelstroet et al. 2022). Beyond improving vehicle efficiency, efforts must primarily avoid unnecessary car travel and shift towards more sustainable transport modes. However, although planning interventions to promote walking, cycling, or public transport are well-known, they often fall short of expectations (Ogilvie et al. 2004). As O'Brien (2018) argues, complex social transformation requires activating both political and personal leverage points. Thus, sustainability transformation demands identifying the root causes of unsustainability, which include dominant beliefs, values, and current paradigms (Meadows, 1999; O'Brien, 2018). In the mobility context, this entails moving beyond 'easy but ineffective' measures toward strategies grounded in deeper insights

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into mobility lifestyles (Haustein and Nielsen 2016; Abson et al. 2017; Ramezani et al. 2021).

In recent decades, mobility lifestyles have been studied as key factors influencing mobility behaviour (Kitamura 2009; Van Acker et al. 2016; Ramezani et al. 2025). Although definitions vary, they are commonly linked to sociodemographic characteristics, life stage, and travel mode choices (Kitamura 2009). However, previous literature suggests that mobility lifestyles cannot be fully understood without considering personal values and behavioural orientations, which reflect internal motivation beyond observed behaviours (Kuppam et al. 1999; Anable 2005; Kitamura 2009; Van Acker et al. 2016).

In transportation research, values and behavioural orientations have typically been examined through travel attitudes or neighbourhood preferences, but rarely in an integrated way (Van Acker et al. 2016; Ramezani et al. 2025). Although travel attitudes are linked to mobility behaviour, their interaction with residential preferences is also crucial: individuals favouring walking or cycling often choose neighbourhoods that support active mobility (Handy et al. 2006; Cao et al. 2009). Studies combining travel attitudes and neighbourhood preferences have revealed diverse mobility profiles (Anable 2005; Prillwitz and Barr 2011; Ramezani et al. 2025).

Associations between travel attitudes, mobility behaviour, and built environment characteristics have been widely examined through interviews (e.g. Lord et al., 2011; Sitra, 2021) and surveys (e.g. Anable, 2005; Handy et al., 2005; Schwanen et al., 2011; Ramezani et al., 2018, 2021; Magdolen et al., 2021). Furthermore, the public participation geographic information system (PPGIS) method has been used to study people's behaviour and preferences related to everyday life in urban contexts (e.g., Brown and Kyttä, 2014; Fagerholm et al., 2021b; Kajosaari, 2024), including mobility (e.g. Schlossberg and Brehm, 2009; Salonen et al., 2014). Studies show that mixed, high-density land use supports active mobility and reduces car dependency through shorter travel distances (Schwanen and Mokhtarian 2005; Ewing and Cervero 2010; Haybatollahi et al. 2015; De Vos et al. 2021). Consequently, central urban living tends to enhance attitudes toward active and sustainable mobility, whereas suburban or rural settings often reinforce car-oriented attitudes (De Vos, Ettema and Witlox, 2018; Ramezani et al., 2021; Soza-Parra and Cats, 2024).

Promoting multimodality has gained attention as a means to reduce car dependence (Buehler and Hamre 2015). In urban environments, individuals often adopt multimodal travel behaviour, whereas only a small proportion are unimodal, relying exclusively on a single mode (Nobis 2007; Buehler and Hamre 2015; Olafsson et al. 2016). Although actual uni- and multimodal mobility styles have been studied (Vij, Carrel and Walker, 2013; Olafsson, Nielsen and Carstensen, 2016), these have not been analysed together with internal mobility lifestyles, limiting understanding of how internal mobility lifestyles relate to actual travel modality.

Moreover, earlier research has demonstrated that mobility behaviour is associated with various socio-demographic variables, life-stage, health status, and mobility resources (Craig and Van Tienoven 2019; Karjalainen et al. 2023; Park and Akar 2024; Soza-Parra and Cats 2024). Men tend to drive cars more than women both in Finland and globally (Craig and Van Tienoven 2019; Traficom 2023; HSL 2024). In Finland, women remain physically active with their mobility choices as they age (Traficom 2022), although aging and health conditions may restrict walking and cycling (Park and Akar 2024). Car-free households are few in Finland and they typically appear among students and elderly women, while families with children usually own a car (Karjalainen et al. 2023). Higher income and occupation generally correlate with car ownership and driving, and may indicate whether households without cars are voluntarily car-free or involuntarily carless (Soza-Parra and Cats 2024). Shared micro-mobility services, such as e-scooters and shared bikes, influence mobility behaviour: while mainly used by younger populations and potentially reducing car dependence, evidence of their contribution to sustainable mobility remains limited (Abduljabbar et al. 2021; Reck and Axhausen 2021). Similarly, car-sharing schemes hold promise for decreasing the demand for car ownership (Nijland and Van Meerkerk 2017).

The associations between well-being outcomes and mobility are intricate. Previous studies have found that physical health and life-satisfaction are positively associated with total travel distance (Ramezani et al. 2025), access to various modes of transport (McCarthy and Habib 2018), and car ownership (Mouratidis 2025). Conversely, car ownership may cause a decline in physical activity by displacing active travel, and potentially undermine overall well-being (De Vos 2018). Thus, promoting walking and cycling can play a crucial role in enhancing the well-being of individuals (Lozzi and Monachino, 2021; Zapata-Diomedi et al., 2023).

Few studies have in detail inspected how mobility lifestyles based on travel attitudes and neighbourhood preferences are associated with socio-demographic background, residential location, perceived well-being, mobility resources and everyday travel modality. Based on previous research, we expect to identify clusters of participants in terms of travel attitudes and neighbourhood preferences. Further, we anticipate that car-oriented attitudes and suburban living environments will relate to car-dependent practices, while sustainable attitudes and preferences of living in central urban areas are expected to be associated with multimodal and active travel practices. Drawing on map-based survey data collected in three Finnish cities, this study seeks to address existing research gaps by: (1) identifying clusters of participants based on travel attitudes and neighbourhood preferences; (2) examining how these clusters differ in terms of socio-demographic characteristics, perceived well-being, and residential locations; (3) analysing mobility resources and exploring travel modalities across clusters using place-based data; and (4) interpreting the findings from steps 2–3 to develop clusters into narrated mobility lifestyles and assess their representation within each study city.

Fig. 1 presents the conceptual framework to guide this research. Our study defines and operationalises mobility lifestyles using travel attitudes and residential preferences. Methodologically, this framework informs the study's clustering approach: the subjective factors serve as the basis for identifying groups of participants with different internal values, after which associations with sociodemographic variables, residential locations, well-being indicators, and mobility options and choices are examined. This sequential approach allows us to uncover how subjective orientations translate into tangible differences in mobility lifestyle profiles.

Building on previous mobility lifestyle research, the study informs policies promoting sustainable urban mobility, advancing climate goals and generating co-benefits for liveability and well-being. While the results are particularly relevant to the context of the case study cities and mobility in Finland, they are also to some extent applicable to other car-dependent societies.

2. Methods

2.1. Study areas

The study cities, Lahti, Oulu, and Espoo, represent a gradient of medium to large cities in Finland with populations of 120,000, 215,000, and 305,000, respectively (Fig. 2) (StatFin 2023). The cities differ in terms of urban structure, density, size, and transportation systems, offering diverse urban contexts. Espoo, the largest city, forms part of the Helsinki metropolitan region and is polycentric rather than centred around a single downtown, comprising five regional centres (Leppävaara, Tapiola, Matinkylä, Espoonlahti, and Espoo Centre) well connected by rail. In terms of population, Oulu, the second largest, covers an area nearly ten times that of Espoo due to municipal mergers in the 2000 s and 2010 s. It features a compact, walkable core surrounded by suburban and sparsely populated areas, with former municipal centres now serving as subcentres. Known as Finland's leading cycling city,

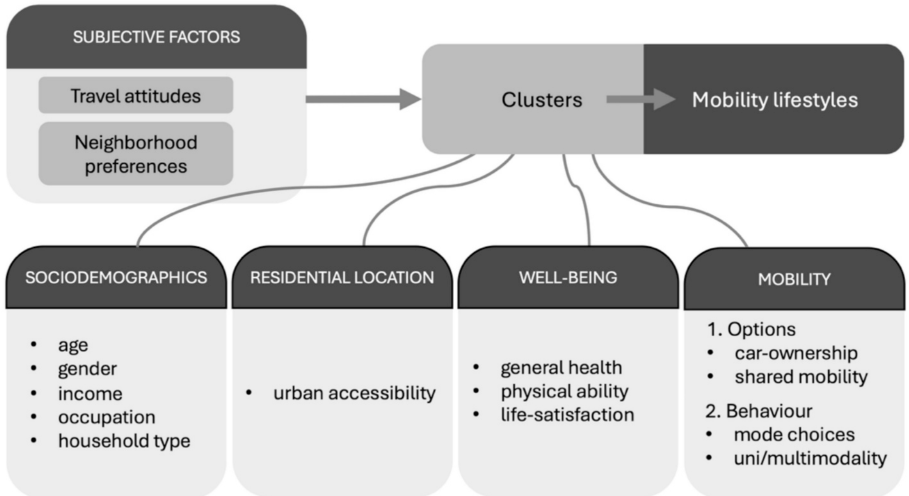

Fig. 1. Conceptual framework of determinants of mobility lifestyles.

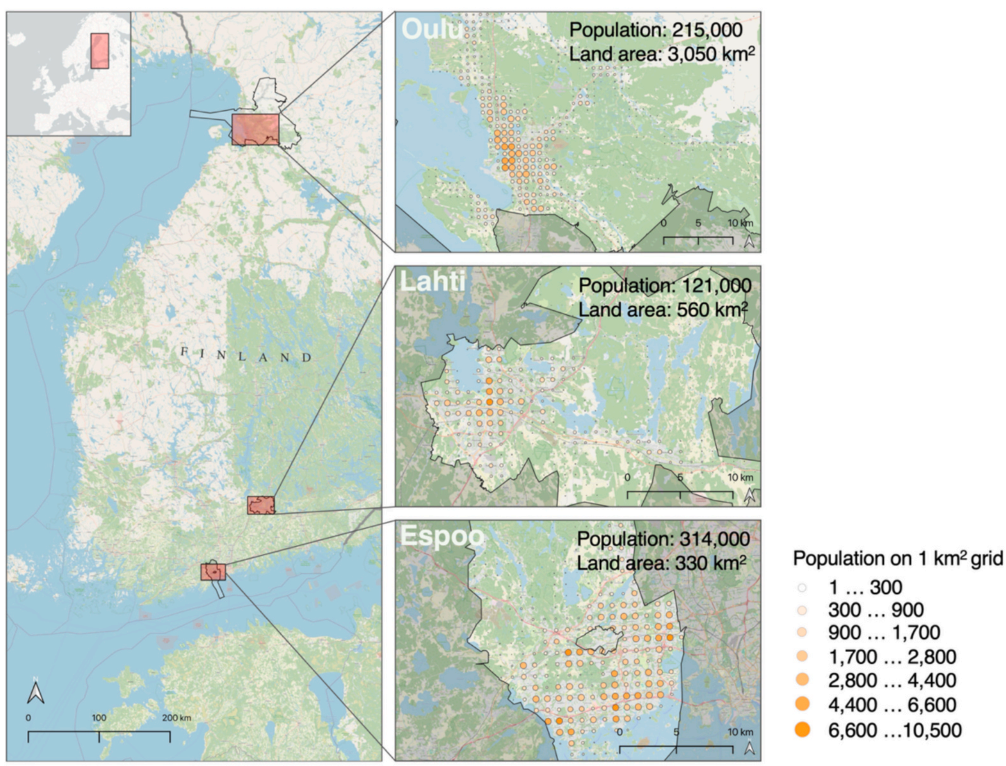

Fig. 2. Geography and populations of the studied cities Oulu, Espoo, and Lahti.

Oulu has promoted cycling since the 1970 s, supported by excellent year-round maintenance (Takala 2021). Lahti, the smallest city, merged with Nastola in the 2010 s and retains a compact, walkable centre similar to Oulu's.

2.2. Data collection and survey contents

The data for this study was collected through Maptionnaire®, a map-based online survey platform frequently applied to collect PPGIS data (Fagerholm et al., 2021a). Data collection took place in the three study cities during September and October 2023. Participants were recruited through a stratified[1] random sample of 26,000 at least 15-year-old citizens obtained from the Finnish Population Register Centre. Survey invitation letters were sent to participants by The letter contained a brief introduction to the research project, a participant information sheet, and a link and a QR code referring to the online questionnaire, which was accessed using an internet browser with smartphone, tablet, or computer.

The survey consisted of seven sections, including questions on socio-demographic background, mobility opportunities, mapping of homes and everyday places, statements on attitudes towards mobility and preferences for neighbourhood qualities, perceived health, physical

[1] Stratification based on city and age group, see Appendix B Table B3.

condition, and life-satisfaction. The survey is attached in Appendix A.

Participants were asked to map their home and everyday locations, indicate their primary and secondary transport modes for each destination, and report travel frequency. Everyday locations were classified into seven categories: workplace, school, dependent's daycare or school, leisure, shopping and errands, dependent's hobby location, and other. Reported travel modes included walking, cycling, car use, public transport, e-scooter, and other. Participants also provided information on car and bike ownership, public transport season tickets, and use of shared mobility services.

Travel and residential preference statements were adapted from previous studies with minor modifications (Handy et al. 2005; Ramezani et al. 2018). All statements were rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). The survey included 17 travel-related and 15 housing-related items (Table 1).

Perceived well-being was measured through scales assessing general health, physical condition, comparative health, and life-satisfaction, following established approaches from previous studies (Kerr et al. 2012; Kyttä et al. 2016).

2.3. Sample representativeness

A total of 4,091 responses were received (overall response rate 16 %): 1,956 from Espoo (16 %), 1,360 from Oulu (16 %), and 754 from Lahti (15 %). Sample representativeness was assessed against census data for gender and age (Appendix B, Table B1). Across cities, women were slightly overrepresented (by 3.4–5.2 percentage points). Participants aged 18–44 were somewhat underrepresented, while those aged 65–79 were overrepresented, and the 80 + group was underrepresented. Educational level was more biased, with higher-educated participants overrepresented by 12.4–18.6 percentage points.

Table 1
Statements regarding mobility and neighbourhood preferences with descriptive statistics. The statements were answered on a scale from 1 to 7.

Attitudes towards travel	*mean*	*sd*
[1] Public transport ticket prices affect how much I travel by public transport	3.7	2.2
[2] I avoid driving because it is harmful for the environment	3.6	1.8
[3] I prefer to walk rather than travel by car whenever possible	4.8	1.9
[4] I want to avoid queues and traffic jams during my travels	5.9	1.4
[5] Vehicles should be taxed based on emissions	4.7	1.9
[6] The change in movement patterns has an impact on the environment	5.8	1.4
[7] The price of fuel and or parking affects how much I travel by car	3.9	2.0
[8] I like to organize my travel in such a way that I can handle many things in the same trip	6.0	1.3
[9] I like to be able to rest or do something while traveling	4.6	1.8
[10] I do not like to have variation in my daily travel time	4.7	1.8
[11] I prefer to take public transport than travel by car whenever possible	3.6	2.1
[12] I prefer to cycle than travel by car whenever possible	4.2	2.1
[13] I would manage pretty well if there was one fewer car or no car in my household	2.9	2.1
[14] I prefer driving to other modes of transportation	4.4	1.9
[15] I don't like to change the mode of transportation/transfer public transit vehicle or wait when traveling	5.2	1.8
[16] I often work or study remotely to avoid travel	3.4	2.2
[17] I can't manage my everyday life without a car	3.9	2.4
Preferences for neighbourhood qualities		
[1] Safe and convenient to walk and bike for errands	5.9	1.3
[2] Easy access to a good public transport service	5.6	1.6
[3] Easy access to city centre or nearest urban centre	5.4	1.5
[4] Easy access to school or university	5.2	1.8
[5] Neighbourhood school quality for my children	4.9	2.1
[6] Proximity to work location	4.6	1.7
[7] Facilities or places to spend free time nearby	5.1	1.6
[8] Easy access to highway network or main road	4.7	1.7
[9] Easy access to the nearest shopping centre	5.1	1.6
[10] Good street lighting	5.2	1.6
[11] Low level of car traffic on neighbourhood streets	4.8	1.5
[12] Quiet neighbourhood	5.6	1.3
[13] Green and tree lined streets	5.6	1.3
[14] Attractive appearance of neighbourhood	5.9	1.1
[15] Parks and green spaces nearby	6.1	1.2

2.4. Data analysis

The overall analytical process is summarised in Fig. 3. The analysis consisted of five main stages: data validation, principal component analysis (PCA) of travel attitudes and neighbourhood preferences, clustering based on PCA factor scores, statistical comparison of cluster characteristics, and establishment of lifestyle profiles. Each step is described in the following subsections.

2.4.1. PCA of travel attitudes and neighbourhood preferences

To reveal the latent factors, a PCA with Varimax rotation and pairwise deletion was conducted separately for travel attitudes and neighbourhood preferences using SPSS 29. Responses with half or more missing items per statement set were excluded. Factor loadings above 0.3 were retained. After confirming consistent results across the three cities, data were combined for final analysis. An item removal procedure based on cross-loadings was applied (Guvendir and Ozkan 2022), resulting in the exclusion of five attitude statements, while all 15 neighbourhood preference items were retained. The scree test indicated five travel attitude factors and four neighbourhood preference factors. The final statements, loadings, and factor labels are shown in Table 2 and Table 3. The travel attitude factors explained 62 % of the total variance, and neighbourhood preference factors explained 55 %.

2.4.2. Cluster analysis

Cluster analysis was conducted based on the PCA results. Factor scores for each participant were calculated using the rotation matrix and component scores, then standardised. If a latent variable had more than one missing item, the corresponding factor score was excluded to avoid bias. Clustering was performed using both travel and residential preference factor scores, requiring each participant to have at least one valid score in both categories. After filtering, 3,260 participants were included in the analysis.

A hierarchical cluster analysis using Ward's method was first conducted to determine the optimal number of clusters in each city. Based on these results, a K-means analysis with six fixed clusters was applied to assign participants. Cluster centres were then used to characterise and compare the clusters. Deviations from the mean were interpreted as follows: factor scores > 1.0 or < –1.0 indicated strong deviation, scores between ± 0.5–1.0 indicated moderate deviation, and scores between ± 0.3–0.5 indicated weak deviation. Scores within ± 0.3 of the mean were disregarded.

2.4.3. Statistical inference of clusters

After assigning each respondent to a cluster, we examined associations between cluster membership and sociodemographic characteristics, mobility options, travel modality, and health indicators using descriptive statistics and statistical inference. Travel modality was defined by the number of unique travel modes used weekly: individuals using a single mode were classified as unimodal, and those using two or more modes as multimodal.

Statistical analyses were performed in SPSS 29 using chi-squared and one-way ANOVA tests. Effect sizes were estimated with Cramér's V and eta-squared (η^2). For Cramér's V, thresholds for small, moderate, and large effects were adjusted for table size (2 × 6: 0.10/0.30/0.50; 3 × 6: 0.07/0.21/0.35; 4 × 6: 0.06/0.17/0.29). For ANOVA, η^2 values of 0.01, 0.06, and 0.14 represented small, medium, and large effects, respectively. Pairwise post-hoc comparisons used Bonferroni-corrected alpha levels to control for Type I errors (Mark Beasley and Randall Schumacker 1995).

To ensure valid chi-squared results, age and income variables were

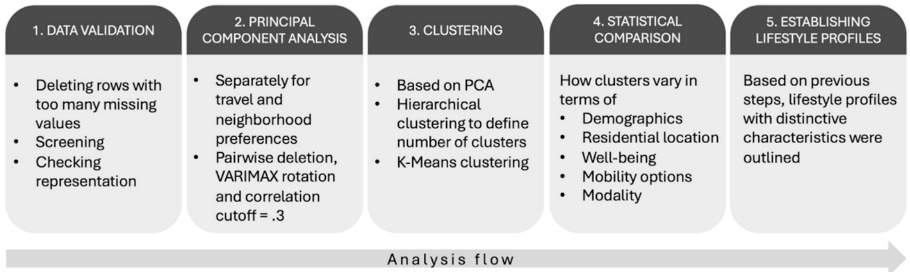

Fig. 3. Overview of the data analysis procedure.

grouped into broader categories (Appendix B, Table B2). As the chi-squared test only indicates whether an association is significant, Cramér's V was also calculated to assess the strength of relationships.

2.4.4. *Residential locations across the urban zones*

Residential locations were analysed using the travel-related urban zone classification developed by the Finnish Environment Institute (SYKE 2022). The zones vary by public transport accessibility, population density, and land-use mix, and are defined on a 250 × 250 m grid. For this study, the zones were reduced from original ten into three categories: pedestrian, public transit, and car zones (Fig. 4). Peripheral areas with minimal housing were treated as extensions of car zones. Differences in residential location distribution across the three zones were examined using cross-tabulation and chi-square analysis.

2.5. *Establishing lifestyle profiles*

Drawing on statistical analyses of sociodemographic data, residential locations, mobility resources, and travel behaviour, we developed the identified clusters into narrated mobility lifestyles, highlighting their distinctive characteristics in contrast to one another. The final profiles integrate both preferred and actualised lifestyles, combining attitudinal dimensions with observed mobility behaviour. Profile names reflect each group's distinctive characteristics. Although the cities were analysed jointly, profile distributions were compared across them.

3. Results

3.1. *Cluster identification*

Clustering based on travel attitudes and neighbourhood preferences revealed six distinct groups reflecting varying orientations (Table 4). Cluster sizes ranged from 339 (10 %) to 711 (22 %) participants.

In terms of travel attitudes, Clusters A and F were similar: both showed low willingness to use active travel modes and strong car-dependent orientations (especially Cluster A). Both groups expressed negative attitudes toward policies limiting driving, though they were not price-sensitive in their mode choices (particularly Cluster F). However, they differed in neighbourhood preferences: while participants generally rated neighbourhood qualities as important, Cluster F valued them consistently low, including below-average preferences for fluent driving environments despite their car dependence. Cluster A, in contrast, scored mildly or moderately high across neighbourhood preferences.

Cluster B members also displayed moderate car-dependence, though they did not favour driving over active modes and supported driving restrictions. They valued effortless and predictable travel. The cluster was neutral regarding neighbourhood preferences, with below-average emphasis on safety and access to nearby amenities.

Clusters C and D were characterised by pro-active travel, car-free, and pro–limit driving attitudes. However, their other travel attitudes differed: Cluster C members were willing to invest more time and effort in travel and were less concerned about mobility costs, whereas Cluster D members preferred effortless and economical travel. In neighbourhood preferences, Cluster C rated accessibility to work or school and fluent driving low, while Cluster D rated them above average and placed high importance on greenery, peacefulness, and access to nearby amenities.

Cluster E was neutral between active travel and driving but showed weakly positive attitudes toward a car-free lifestyle. However, members did not view driving restrictions as necessary and were somewhat price-sensitive. Alongside Cluster F, Cluster E showed below-average preferences for green and peaceful neighbourhoods.

3.2. *Sociodemographics, well-being, and residential locations of clusters*

Gender, age, employment status, household composition, and residential location differed significantly across clusters (all $p < 0.001$; Table 5), aligning with previous findings. Gender distribution showed a small effect size ($V = 0.15$), with Cluster B and Cluster F including more men (53 % and 59 %), and Clusters C and D overrepresented by women (60 % and 63 %).

Age group differences showed a moderate effect ($V = 0.19$). Cluster E included more young adults and adolescents aged 15–29 (46 %), whereas Clusters A and B fewer (15 % and 8 %). Cluster B also had higher proportion of adults aged 30–44 (32 %) and 45–64 (43 %), while Cluster E had fewer individuals aged 45–64 (21 %). Both Clusters B and E had low proportions of 65 + adults (16 % and 14 %, respectively), highlighting the middle-aged profile of Cluster B and a younger one for Cluster E.

Differences in employment status were small in effect. Cluster B had the highest share of employed participants (71 %), while Clusters D and E had fewer (48 % and 45 %), and Cluster D showed the highest unemployment rate (8 %). Cluster E stood out for its high proportion of students (34 %), compared to Clusters A and B (10 % and 6 %). Pensioners were more common in Clusters A and C (29 %) and less common in Cluster E (14 %).

Household composition differences were also small. Single-person households were most common in Clusters C and E (29 %) and least common in Cluster B (14 %). Households with children dominated Cluster B (46 %) but were least frequent in Clusters C (20 %) and F (23 %). Interestingly, Cluster E did not show fewer households with children, likely because some participants were still adolescents.

Residential location in urban zones differed across clusters ($V = 0.14$). While living within public transit zone is balanced in all clusters (53–58 %), there are fluctuations in the proportions of cluster members living in pedestrian and car zones. Clusters C, D, and E are more centralised, as a quarter of their members live in pedestrian zones. Conversely, Clusters B and F are the least represented in pedestrian zones (9 % and 12 %, respectively) and Cluster B is emphasised in car zones.

Monthly household income after taxation differed significantly across clusters ($p < 0.001$), though the effect size was small ($\eta^2 = 0.031$; Table 6). Clusters D and E had the lowest mean incomes (€4,202 and €4,072), while Cluster B showed the highest (€5,440).

Perceived health, physical fitness, and life-satisfaction also differed

Table 2
PCA of travel attitude statements.

Travel attitude statement	Travel Attitude (TA) factors 1–5				
	TA1. Active mobility over car	TA2. Anti-transfer and predictable travel time	TA3. Car-free	TA4. Limit driving attitudes	TA5. Price-sensitivity
I prefer to cycle rather than travel by car whenever possible	0.808				
I prefer to walk rather than travel by car whenever possible	0.738				
I prefer driving to other modes of transportation	−0.685				
I don't like to change the mode of transportation / transfer public transit vehicle or wait when traveling		0.740			
I do not like to have variation in my daily travel time		0.682			
I want to avoid queues and traffic jams during my travels		0.621			
I would manage pretty well if there was one fewer car or no car in my household			0.842		
I can't manage my everyday life without a car			−0.753		
Vehicles should be taxed based on emissions				0.834	
The change in movement patterns has an impact on the environment				0.740	
The price of fuel and or parking affects how much I travel by car					0.807
Public transport ticket prices affect how much I travel by public transport					0.772

Table 3
PCA of neighbourhood preference statements.

Neighbourhood preference statement	Neighbourhood preference (NP) factors 1–4			
	NP1. Green and peaceful neighbourhood	NP2. Safe and easy access to nearby amenities	NP3. Accessibility to school or work	NP4. Fluent driving
Green and tree-lined streets	0.733			
Parks and green spaces nearby	0.710			
Attractive appearance of neighbourhood	0.702			
Quiet neighbourhood	0.677			
Low level of car traffic on neighbourhood streets	0.655			
Easy access to city centre or nearest urban centre		0.762		
Easy access to a good public transport service		0.686		
Easy access to the nearest shopping centre		0.669		0.424
Safe and convenient to walk and bike for errands		0.543		
Good street lighting		0.457		
Facilities or places to spend free time nearby		0.434		
Easy access to school or university			0.861	
Neighbourhood school quality for my children			0.784	
Proximity to work location			0.550	
Easy access to highway network or main road				0.841

significantly across clusters (all $p < 0.001$), with small effect sizes. Overall, mean scores were neutral to good in all clusters. Cluster F reported the lowest general health ($\bar{x} = 3.68$) and physical fitness ($\bar{x} = 3.46$), while life-satisfaction was lowest in Clusters F ($\bar{x} = 7.65$) and E ($\bar{x} = 7.58$). Clusters B, C, and D consistently scored highest across all well-being indicators.

3.3. *Mobility resources, daily destinations, and travel behaviour*

Differences in car ownership across clusters were statistically significant, showing a moderate association (V = 0.24; Table 7). Although availability of shared car and bike services also differed significantly, the associations were negligible. For e-scooter availability, differences were significant with a small effect (V = 0.11). Car-free households were most common in Clusters C, D, and E (32 %, 25 %, and 27 %, respectively), compared to the overall average of 18 %. In contrast, Clusters A, B, and F had higher proportions of households with two or more cars (38 %, 42 %, and 39 %), with Cluster B showing the fewest car-free households (2 %). Availability of shared cars was low overall ($\bar{x} = 4$ %). Cluster E stood out for greater access to shared cars, bikes, and e-scooters, reflecting higher use of shared mobility modes.

Based on the mapped everyday destinations, participants visited an average of 2.82 unique locations weekly. The number was highest in

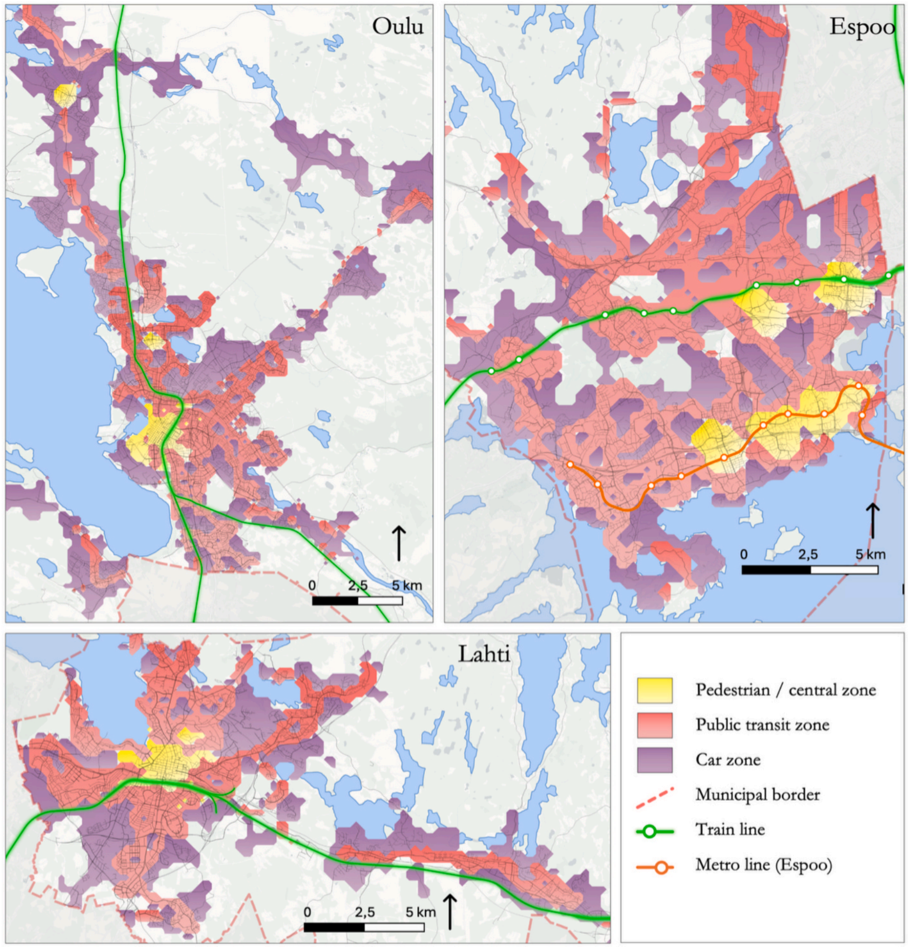

Fig. 4. Classification of urban zones in the three studied cities of Espoo, Lahti, and Oulu.

Table 4
Latent factor loading values in different clusters.

	n = 3,260	A n=480 15%	B n=553 17%	C n=642 20%	D n=711 22%	E n=535 16%	F n=339 10%
	Travel attitudes						
1	Active mobility over car	-0.79	-0.25	0.80	0.65	-0.29	-0.83
2	Anti-transfer and predictable travel time	0.16	0.43	-0.80	0.33	-0.07	0.01
3	Car-free	-0.67	-0.79	0.66	0.37	0.44	-0.41
4	Limit driving attitudes	-0.73	0.34	0.51	0.42	-0.43	-0.70
5	Price-sensitivity	-0.40	-0.31	-0.30	0.78	0.36	-0.50
	Neighbourhood preferences						
1	Green and peaceful neighbourhood	0.49	0.17	0.06	0.64	-0.89	-1.10
2	Safe and easy access to nearby amenities	0.57	-0.70	0.04	0.72	0.09	-1.53
3	Accessibility to school or work	0.36	0.11	-0.40	0.54	0.14	-1.26
4	Fluent driving	0.70	-0.12	-0.61	0.32	0.06	-0.45

very low | low | mildly low | no difference | mildly high | high

Table 5
Distribution of gender, age, employment status, household composition, and residential location across clusters. Chi-square tests were used to assess statistically significant differences, and Cramér's V values indicate the effect sizes. Bolded values denote significant deviations from the mean based on Bonferroni-adjusted alpha levels.

	Cluster A (n = 480)	Cluster B (n = 553)	Cluster C (n = 642)	Cluster D (n = 711)	Cluster E (n = 535)	Cluster F (n = 339)	Total
Gender %	χ^2(5, n = 3230) = 76.193, **p < 0.001**, Cramer's V = 0.15						
Men	46	**53**	**38**	**36**	47	**59**	*45*
Women	54	**46**	**60**	**63**	53	**39**	*55*
Age group %	χ^2(15, n = 3245) = 337.8, **p < 0.001**, Cramer's V = 0.19						
15–29	**15**	**8**	17	19	**46**	22	*21*
30–44	21	**32**	20	24	19	19	*23*
45–64	35	**43**	33	30	**21**	38	*33*
65-	28	**16**	29	26	**14**	20	*23*
Employment %	χ^2(15, n = 3210) = 267.7, **p < 0.001**, Cramer's V = 0.15						
working	54	**71**	52	**48**	**45**	58	*55*
unemployed or not working	6	4	5	**8**	5	5	*6*
student	**10**	**6**	12	15	**34**	13	*15*
Pensioner	29	**18**	**29**	27	**14**	22	*24*
Household composition %							
	χ^2(5, n = 3257) = 59.982, p < 0.001***, Cramer's V = 0.14						
One-person household	18	**14**	**29**	25	**29**	25	*24*
	χ^2(5, n = 3257) = 117.092, p < 0.001***, Cramer's V = 0.19						
Child(ren) in household	32	**46**	**20**	28	30	**23**	*30*
Residential location within urban zones %	χ^2(10, n = 3255) = 376.1, **p < 0.001**, Cramer's V = 0.14						
Pedestrian zone	16	**9**	**24**	**24**	**25**	**12**	19
Public transit zone	58	53	55	56	54	58	56
Car zone	26	**38**	21	**19**	21	30	25

Table 6
Income, perceived health, physical fitness, and life satisfaction across clusters. One-way ANOVA with Tukey's HSD post hoc tests was conducted to identify differences between clusters, and η2-values indicate the effect sizes.

	Cluster A (n = 480)	Cluster B (n = 553)	Cluster C (n = 642)	Cluster D (n = 711)	Cluster E (n = 535)	Cluster F (n = 339)
Monthly income after tax, € (mean)	F(5, 2892) = 18.4, **p < 0.001*****, mean = 4,580, η^2 = 0.031					
Subgroup 1 (lowest)			4,349	4,202	4,072	
Subgroup 2 (low-mid)			4,349			4,761
Subgroup 3 (high-mid)	4,865					4,761
Subgroup 4 (highest)		5,440				
Self-perceived general health, scale 1–5	F(5, 3246) = 7.6, **p < 0.001*****, mean = 3.90, η^2 = 0.12					
Subgroup 1 (lower)						3.68
Subgroup 2	3.87	3.96	3.94	3.96	3.91	
Self-perceived physical fitness, scale 1–5	F(5, 3181) = 9.9, **p < 0.001*****, mean = 3.68, η^2 = 0.015					
Subgroup 1 (lower)						3.46
Subgroup 2 (mid)	3.58	3.67			3.69	
Subgroup 3 (high)		3.67	3.76	3.78	3.69	
Life satisfaction, scale 1–10	F(5, 3243) = 17.5, **p < 0.001*****, mean = 8.00, η^2 = 0.026					
Subgroup 1 (lower)					7.575	7.649
Subgroup 2	8.099	8.240	8.103	8.127		

Table 7
Mobility resources across clusters. Chi-square tests were conducted to identify statistically significant differences. Bolded values indicate significant deviations from the mean, based on Bonferroni-adjusted alpha levels.

	Cluster A (n = 480)	Cluster B (n = 553)	Cluster C (n = 642)	Cluster D (n = 711)	Cluster E (n = 535)	Cluster F (n = 339)	Total
Car ownership in household %	χ^2(10, n = 3255) = 376.1, **p < 0.001**, Cramer's V = 0.24						
0	**6**	**2**	**32**	**25**	**27**	**8**	18
1	56	56	51	55	**44**	53	53
2 or more	**38**	**42**	**16**	**19**	29	**39**	29
Shared car available %	χ^2(5, n = 3260) = 14.7, p = 0.012, Cramer's V = 0.07						
	4	**3**	5	6	**6**	**2**	4
Shared bike available	χ^2(5, n = 3260) = 18.9, p = 0.002, Cramer's V = 0.08						
	7	9	12	11	**14**	9	10
(shared) e-scooter available	χ^2(5, n = 3260) = 38.1, **p < 0.001**, Cramer's V = 0.11						
	10	10	13	10	**20**	13	13

Cluster B (M = 3.30; F(5, 3259) = 12.9, p < 0.001, η^2 = 0.019), while other clusters averaged 2.60–2.85. Similarly, weekly visit frequency was greatest in Cluster B (M = 7.92; F(5, 3259) = 8.9, p < 0.001, η^2 = 0.013), compared to 6.11–6.91 in other clusters.

The daily use of travel modes differed significantly across clusters (Table 8). In general, car use was most common (57 %), followed by walking (37 %), cycling (28 %), and public transport (18 %). Car use showed a moderate association (V = 0.37): Clusters A, B, and F had the highest shares (72 %, 86 %, 73 %), while Clusters C, D, and E were lower (37–45 %). Walking and cycling were more frequent in Clusters C and D, and public transport use was highlighted in Cluster E (32 %), and marginal in Clusters B and F (4 % and 6 %).

46 % of all participants were unimodal travellers, indicating reliance on a single mode of transportation for their everyday mobility needs. Unimodal mobility by car was especially usual among Clusters A, B, and F (40–46 %), and its association with clusters was moderate (V = 0.37). Unimodal walking, cycling, and public transit were rare (<15 %), and their association with clusters was low. Clusters C and D were most multimodal (62 % and 61 %), while A and F were least (46 % and 45 %). Although overall multimodality showed a weak association with clusters, a moderate association appeared among weekly car users (V = 0.30): Clusters C and D tended to combine modes, while A, B, and F remained largely unimodal.

3.4. Mobility lifestyle profiles across the study cities

Based on prior analyses, the following mobility lifestyle profiles were identified:

A) *Car-oriented neighbourhood advocates* (n = 480): the profile members prefer driving over other transport modes, are reliant on driving, and do not support policies limiting driving. The members advocate for greenery, peacefulness, safety, and overall accessibility of their living environments. Quick access by car is appreciated. Students, adolescents and young adults are less represented in this group.

B) *Suburban families* (n = 553): This group typically resides outside central urban areas. Despite exhibiting the highest levels of car dependency and unimodal driving behaviour, the automobile is not necessarily their preferred mode of travel. There is some openness to policies aimed at reducing car use, although public transit is rarely utilised. Interest in the safety and accessibility of nearby amenities is below average. The group is dominated by men and workers, with a notable representation of middle-aged individuals. Households with children are common, and this group reports the highest income levels among all clusters.

C) *Pro-sustainable multimodals* (n = 642): This profile is characterised by the strongest preference for active mobility over private car use, along with the most pronounced car-free attitudes. Members of this group are highly supportive of policies that restrict driving. They also demonstrate the greatest flexibility in terms of switching between transport modes and adapting to changes in travel time. The cluster is slightly dominated by women, pensioners, and one person households. While the group is highly multimodal, unimodal practices such as walking and cycling are also common. Members typically reside in central urban areas.

D) *Price-conscious liveability enthusiasts* (n = 711): This cluster prefers active mobility over driving and demonstrates a degree of car-freeness and multimodal travel behaviour. Unlike other groups, its members are particularly price-sensitive when choosing their travel modes. More than any other cluster, they value neighbourhood qualities such as greenery, peacefulness, safety, and accessibility. The group is dominated by women and is characterised by low average income levels.

E) *Agile urbanists* (n = 535): While members of this cluster exhibit some car-free attitudes, they show below-average support for policies that limit driving. They are slightly price-sensitive in their transportation choices. The group is predominantly residing in central urban areas and is demographically characterised by many young adults and students. Among all clusters, this group most frequently uses shared mobility options, including shared cars, bikes, and e-scooters. It is also marked by lower income levels and lower reported life satisfaction.

F) *Absolute drivers* (n = 339): Members of this group exhibit the strongest preference for car use among all clusters and show no support for policies that restrict driving. However, despite their car-oriented mindset, they are less car-dependent than other car-focused groups. Notably, they show significantly less interest in neighbourhood qualities such as greenery, peacefulness, safety, and accessibility. The group is dominated by men and has fewer households with children. Compared to other clusters, their income levels are moderate, but overall well-being is lower. Few members reside in central urban areas, and most car users in this group follow unimodal travel patterns.

All mobility styles are represented in each study city (Fig. 5). Although statistically significant differences ($p < 0.01^{**}$) occur in the proportions, the association between city and mobility style is weak (V = 0.08): *Car-oriented neighbourhood advocates* are the most represented in Espoo and the least in Oulu, *Pro-sustainable multimodals* are less

Table 8
Use of travel modes across clusters. Chi-square tests were conducted to identify statistically significant differences. Bolded values indicate significant deviations from the mean, based on Bonferroni-adjusted alpha levels.

	Cluster A (n = 480)	Cluster B (n = 553)	Cluster C (n = 642)	Cluster D (n = 711)	Cluster E (n = 535)	Cluster F (n = 339)	Total
Use of modes at least once a week:							
	$\chi^2(5, n = 3260) = 443.1, p < 0.001$, Cramer's V = 0.37						
Car %	**72**	**86**	**37**	**45**	**45**	**73**	57
	$\chi^2(5, n = 3260) = 114.7, p < 0.001$, Cramer's V = 0.19						
Walk %	**28**	**28**	**49**	**44**	38	**24**	37
	$\chi^2(5, n = 3260) = 219.7, p < 0.001$, Cramer's V = 0.26						
Bike %	**12**	**21**	**43**	**39**	28	**15**	28
	$\chi^2(5, n = 3260) = 159.6, p < 0.001$, Cramer's V = 0.22						
Public transit %	16	**4**	22	**22**	**32**	**6**	18
Unimodality (per week)							
	$\chi^2(5, n = 3260) = 57.4, p < 0.001$, Cramer's V = 0.37						
Car %	**40**	**45**	**8**	**11**	**17**	**46**	25
	$\chi^2(5, n = 3260) = 59.8, p < 0.001$, Cramer's V = 0.14						
Walk %	7	**2**	**12**	**11**	7	**3**	7
	$\chi^2(5, n = 3260) = 104.8, p < 0.001$, Cramer's V = 0.18						
Bike %	**2**	**3**	**15**	**12**	10	**4**	8
	$\chi^2(5, n = 3260) = 68.6, p < 0.001$, Cramer's V = 0.15						
Public transit %	6	1	4	5	**11**	2	5
Multimodality (at least 2 modes used per week) %	$\chi^2(5, n = 3260) = 59.3, p < 0.001$, Cramer's V = 0.135						
	46	49	**62**	**61**	55	**45**	54
Multimodality among weekly car users (at least 2 modes used per week) %	$\chi^2(5, n = 1862) = 167.2, p < 0.001$, Cramer's V = 0.30						
	45	**48**	**78**	**75**	63	**37**	56

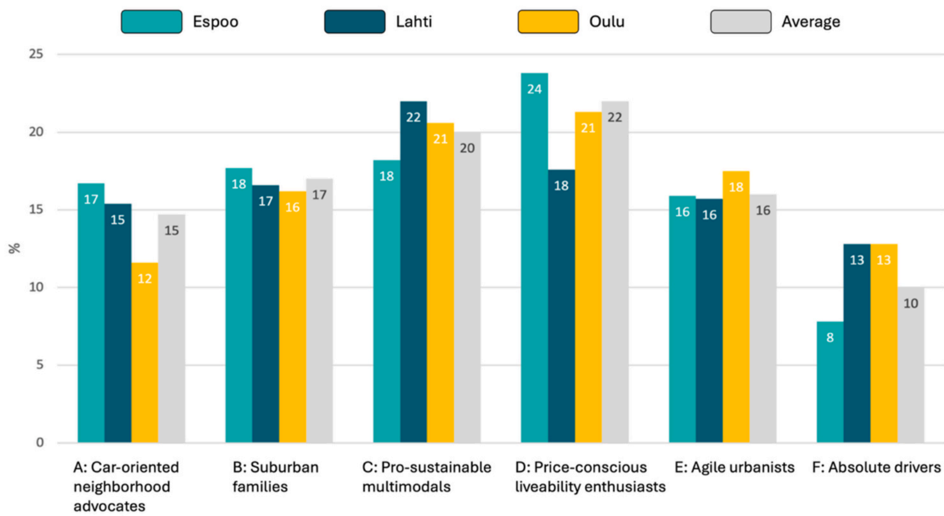

Fig. 5. Distribution of profiles across study cities ($\chi2(10, n = 3260) = 44.7, p < 0.001^{**}$), Cramer's V = 0.08.

represented in Espoo, *Price-conscious liveability enthusiasts* are highlighted in Espoo and less represented in Lahti, *Absolute drivers* are significantly fewer in Espoo.

Profiles A, B, and F were categorised as car-oriented lifestyles, whereas C, D, and E represented sustainable mobility lifestyles. The overall share of car-oriented profiles (42 %) was significantly lower than that of sustainable mobility profiles (58 %) ($\chi^2(1) = 81.38$, $p < 0.001$). The distribution of these two categories was consistent across the cities ($\chi^2(2) = 2.64$, $p = 0.27$) (Fig. 6).

4. Discussion

4.1. Insights into mobility lifestyle profiles

Consistent with expectations, analysing clusters based on travel attitudes and neighbourhood preferences resulted in distinct mobility lifestyle groups differing in terms of sociodemographics, residential location, perceived well-being, car ownership, and travel modality. These findings enhanced understanding of mobility lifestyles across the study cities, Oulu, Lahti, and Espoo. City-level differences in lifestyle distributions were small, which hints towards general pattern in the context of Finnish cities with at least 100,000 inhabitants.

Across the examined variables, the strongest differences between mobility lifestyles were found in active travel attitudes, car ownership, and car use, forming the basis for a dichotomy between "car-oriented" and "sustainable" mobility lifestyles. In the study cities, 55–59 % of participants belonged to sustainable mobility lifestyles: *Pro-sustainable multimodals*, *Price-conscious liveability enthusiasts*, and *Agile urbanists*. These groups were highly multimodal (83–92 % of participants), with walking, cycling, and public transport used more frequently, and fewer than half travelled by car weekly despite widespread car ownership.

In contrast, three profiles – *Car-oriented neighbourhood advocates*, *Suburban families*, and *Absolute drivers* – represented car-oriented lifestyles, characterised by higher car ownership and use. The following sections examine these two lifestyle categories in detail, highlighting their internal diversity and implications for urban planning and strategic work.

4.1.1. Sustainable and car-oriented mobility profiles

Sustainable mobility lifestyles were dominated by women, whereas men were more represented in car-dependent profiles. This pattern aligns with previous findings showing that men drive more and women engage more in active mobility, particularly walking (Craig and Van Tienoven, 2019). Multimodal travel behaviour characterised the sustainable profiles, while car-oriented profiles typically showed unimodal driving, reinforcing earlier evidence that travel attitudes and car ownership strongly predict mobility choices (Vij et al. 2013; Olafsson et al. 2016).

Sustainable lifestyles were also linked to more central residential locations, a lower share of workers, and earlier life stages. This corresponds with prior research showing that inner urban living fosters car-free and multimodal mobility, whereas entering working life and having children increase car-dependent practices (Nobis 2007; De Vos et al. 2018; Ewing and Cervero 2010).

We found that lower household income and higher price sensitivity correlated with sustainable mobility lifestyles. This raises questions

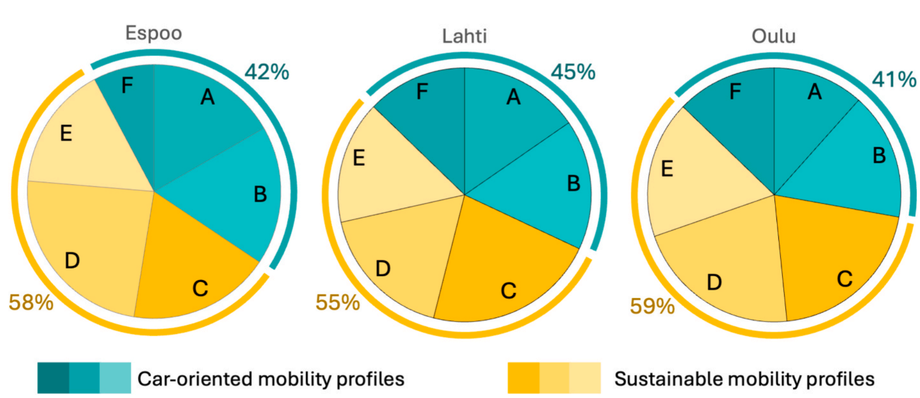

Fig. 6. Distribution of car-oriented and sustainable lifestyle profiles.

about how spatial and economic constraints shape car ownership, involuntary carlessness, and quality of life, especially given evidence that car ownership can increase life satisfaction (Mouratidis 2025). On the other hand, studies indicate that highly car-dependent lifestyles are linked with reduced perceived health, whereas shifting from driving to active travel modes can improve it (Zapata-Diomedi et al. 2023; Saadaoui et al. 2025).

Perceived health and life-satisfaction differed across the lifestyles, but the indicators did not always align with one another. Moreover, neither indicator was consistently associated with sustainable or car-oriented mobility lifestyles: one sustainable group (*Agile urbanists*) and one car-oriented group (*Absolute drivers*) reported the lowest life satisfaction among all profiles. *Absolute drivers* also scored lowest in perceived general health and physical fitness. A shared feature of both groups was their below-average preference for green and peaceful neighbourhoods. Overall, the variations in perceived health and life-satisfaction across mobility lifestyles highlight the complex interplay between attitudes and preferences, travel behaviour, car ownership and well-being (e.g. De Vos, 2018; McCarthy and Habib, 2018; Mouratidis, 2025; Ramezani et al., 2025).

A notable share of participants showed a mismatch between their travel attitudes and actual travel behaviour. For example, even among the least car-dependent group – *Pro-sustainable multimodals* – 68 % had a car in the household, 37 % used a car weekly, and 8 % travelled exclusively by car. Such inconsistencies may reflect residential mismatch, where individuals who prefer active mobility live in environments that do not fully support walking or cycling (Handy et al. 2006; Cao et al. 2009; Kajosaari et al. 2019). Mismatches and out-of-character behaviours appeared in every mobility style, indicating that travel attitudes and residential preferences alone cannot fully explain travel behaviour, and that the built environment influences people differently depending on their preferences. Altogether, the findings reinforce that the relationships between attitudes, preferences, built environment, and travel behaviour are intricate, as previously suggested (Ramezani et al. 2025). This also reflects the well-known value-action gap widely studied in behavioural sciences: although some groups express awareness of sustainability, it does not necessarily translate into changes in behaviour (Flynn et al. 2009).

4.1.2. Variations within car-oriented mobility styles

41–45 % of participants belonged to the three car-oriented mobility lifestyles – *Car-oriented neighbourhood advocates*, *Suburban families*, and *Absolute drivers*. These groups share low rates of car-free households (2–8 %), common ownership of multiple cars, and frequent weekly car use, and more often unimodal driving. Yet clear differences between these profiles highlight the heterogeneous nature of car-dependent lifestyles (Anable 2005; Prillwitz and Barr 2011; Ramezani et al. 2025). Car-oriented profiles were generally associated with middle-aged adults, especially *Suburban families*, who also had high employment rates, higher incomes, and the most households with children, indicating that sociodemographic factors can partly predict car dependency (Haustein and Kroesen, 2022).

In terms of neighbourhood preferences, *Car-oriented neighbourhood advocates* valued greenery, peacefulness, safety, and accessibility, whereas *Absolute drivers* showed remarkably low preference for any neighbourhood qualities, an exception among all groups. This is noteworthy because such qualities are often linked to better health and more active mobility (Handy et al. 2005; Laatikainen et al. 2018). *Absolute drivers* also exhibited the lowest levels of walking, cycling, and public transit use, along with lower perceived health, physical fitness, and life-satisfaction. *Absolute drivers* contained the highest share of carless households among car-oriented groups, revealing a dissonance between strong pro-car attitudes and actual car ownership. In contrast, *Suburban families* were almost never car-free, despite showing positive attitudes toward limiting driving, illustrating another form of attitude-behaviour mismatch.

The findings indicate a link between car ownership and life satisfaction, but only if car-dependent travel attitudes are accounted for, suggesting that the absence of a car may negatively impact the life satisfaction of individuals whose mobility preferences are strongly oriented toward driving.

4.2. Implications for urban and transport planning and strategic work

According to the ASI framework, planning and policy interventions that reduce unnecessary travel and encourage shifts to sustainable modes are essential for changing mobility behaviour (Creutzig et al. 2018). These include developing safe walking and cycling environments, improving public transit accessibility, and implementing traffic-calming measures. On the land-use side, higher density and mixed uses support more car-free lifestyles (Ewing and Cervero 2010). However, as travel attitudes are bidirectionally associated with everyday mobility choices (Lin et al., 2017), sustainability transitions require not only infrastructure and policy changes but also targeted efforts that account for and align with diverse mobility attitudes. Moreover, interventions should take into account that varying health and physical fitness levels can play a significant role in the success of interventions as those with lower levels of physical health may be less prone to changes (Keall et al. 2018; Mattisson et al. 2018).

Neighbourhood preferences were not consistently correlated with either car-oriented or sustainable mobility profiles. Yet, these preferences can help target interventions and identify leverage points for promoting sustainable mobility. We therefore emphasise the significance of storytelling as a tool for effective planning and policymaking: lifestyle-specific narratives of “better urban life” vary by life stage, needs, attitudes, and preferences. Choosing the right narrative may enhance public acceptance of interventions (Freudendal-Pedersen 2020).

As car ownership strongly predicted car use (Van Acker and Witlox 2010), promoting car-free lifestyles would be ideal. However, the sprawled geography of urban areas often makes car ownership practical for many residents. This is reflected in our sample, where 82 % of participants had at least one car in their household. In this context, it is more realistic to support multimodal and intermodal travel rather than directly targeting car ownership, particularly given the prevalence of recreational dwellings in Finland (StatFin 2025). Enhancing park-and-ride solutions and investing in public transit services may offer less car-dependent mobility alternatives for car-oriented lifestyle groups.

To reduce car use, *Suburban families* and *Car-oriented neighbourhood advocates* require a different approach. *Suburban families* appear to drive less by preference than by circumstance: spacious and affordable housing is typically located outside walkable urban areas, making the households dependent on car rides – including driving children to school and hobbies. Supporting more sustainable mobility for this group involves developing affordable housing in walkable areas and fostering local school, hobby, and sustainable transport networks in outer urban areas so that children and adolescents do not necessarily always need car rides.

In contrast, *Car-oriented neighbourhood advocates* are less likely to respond to infrastructure-based push-and-pull measures, as they simply prefer driving. However, their strong preferences for greenery, peacefulness, safety, and accessibility suggest that they may be receptive to co-benefits of sustainable mobility initiatives, especially improvements in neighbourhood liveability. Emphasising individual health benefits may also increase motivation for more active travel (Ramezani et al. 2021).

For sustainable travel groups, particularly *Agile urbanists* – who often are young adults and adolescents anticipating future car ownership – it is crucial to reinforce their current sustainable mobility habits to prevent future shifts towards car dependency, as it is difficult to shift mobility habits from “car-dependent” to “car-free” (Haustein and Kroesen 2022). For this group, reinforcing the narrative of freedom and convenience of car-free living may influence future choices. Simultaneously using public transit and shared mobility, including car-sharing programs, are already common among these individuals, and enhancing these services could prevent car ownership in the future, too.

Two other sustainable mobility groups – *Pro-sustainable multimodals* and *Price-conscious liveability enthusiasts* – showed strong preference for active mobility over driving. Identifying them as early adopters and allies in policymaking is valuable. It is also essential to support affordable mobility for these groups, particularly *Price-conscious liveability enthusiasts*, some of whom were unemployed, and sensitive to travel costs. Above-average physical fitness suggests potential for increased active travel within these profiles if supportive measures are introduced.

These examples illustrate how knowledge of mobility lifestyles can inform planning and policymaking. Although mobility lifestyles were characterised using stereotypes, we want to highlight that all identified profiles were highly multimodal, albeit to a lesser extent among car-oriented groups. Identifying this common ground and embracing multimodality can mitigate the political polarisation between 'driving' and 'non-driving' lifestyles and provide political latitude for sustainability transformations. As imposing sustainable travel habits contradicts the democratic and participatory ethos of planning, targeted interventions that enhance the attractiveness of sustainable travel modes can promote overall multimodality and reduce car dominance while still respecting citizens' everyday needs.

Finally, collaboration with the healthcare and education sectors offers opportunities to shape mobility habits and norms. Strategic interventions in these sectors such as providing families with guidance and support, may encourage both children and parents to adopt more sustainable mobility behaviours. In general, promoting active mobility through healthcare can serve as a low-cost preventive measure and a complementary component in treating various health conditions (Scrivano et al. 2024).

4.3. Limitations and future research needs

While this study offers valuable insights into mobility lifestyles, it has some limitations. The focus on medium to large cities in Finland constrains the generalisability of the findings. Mobility cultures, spatial structures, and transport systems differ internationally, and similar analyses conducted in other geographic or cultural settings might yield different lifestyle patterns.

The reliance on self-reported data introduces potential response biases, and the sample was somewhat skewed toward highly educated and female participants. Furthermore, the study did not comprehensively examine lifestyle variations across age cohorts or include the mobility behaviours of children and young adolescents. Profiling also has inherent limitations, as individuals rarely conform neatly to distinct lifestyle archetypes; personal mobility routines may combine elements of multiple profiles identified in this study.

Future research should explore the transferability of these findings to other national and urban contexts and investigate how local policy frameworks, infrastructure, and cultural norms shape mobility lifestyles elsewhere. Longitudinal studies could also reveal how these lifestyles evolve over time and respond to interventions. Additional research focusing on the mobility of specific population groups, such as children, adolescents, and older adults, would further complement the understanding of diverse mobility needs.

5. Conclusions

This study identified in three Finnish cities six distinct mobility lifestyle based on travel attitudes and neighbourhood preferences. Three profiles reflected car-oriented mobility lifestyles and three represented sustainable mobility lifestyles. These profiles differed not only in car ownership and travel modality but also in socio-demographic characteristics, residential context, and perceived well-being.

A key contribution of this study is showing that car-oriented and sustainable mobility lifestyles coexist across different urban contexts, indicating that individual travel attitudes are a strong predictor of car use alongside residential location. The study also reveals mismatches between travel attitudes and travel behaviour, underscoring the significance of external factors – such as urban context and life-stage – affecting mobility choices. These findings highlight the importance of integrating both individual and contextual perspectives when designing policies for sustainable urban mobility.

By demonstrating how lifestyle profiling can identify groups with specific barriers and motivations, this study supports more targeted and socially equitable strategies for reducing car dependence. While the findings are particularly relevant in the Finnish context, similar car-dependent patterns exist in many other countries.

Data Availability Statement.

Data supporting this study will be available from Zenodo at doi.org/10.5281/zenodo.16760854.

Ethical statement

This study was reviewed and approved by The Ethics Committee for Human Sciences at the University of Turku, Humanities and Social Sciences Division with the approval number: 43/2023, dated 16.8.2023. Informed consent was obtained from the participants before filling in the survey.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used Microsoft Copilot to assist in processing the results of statistical analyses and editing the language of the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

CRediT authorship contribution statement

Felix Hallikainen: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Nora Fagerholm:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Samira Ramezani:** Writing – review & editing, Methodology, Conceptualization. **Tiina Rinne:** Writing – review & editing, Conceptualization. **Marketta Kyttä:** Writing – review & editing, Conceptualization.

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.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.trip.2025.101809.

Data availability

Data is available at https://doi.org/10.5281/zenodo.16760854

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