Transportation Research Part A 176 (2023) 103831

Contents lists available at ScienceDirect

Transportation Research Part A

journal homepage: www.elsevier.com/locate/tra

Exploring motivations for multimodal commuting: A hierarchical means-end chain analysis

Sebastian Timmer [a], Katrin Merfeld [a,b,*], Sven Henkel [a]

[a] Department of Marketing and Sales, EBS Business School, EBS University, 65375, Germany
[b] Utrecht School of Economics, Utrecht University, 3584 EC, the Netherlands

ARTICLE INFO

Keywords:
Multimodal mobility
Commuting
Consumer behavior
Qualitative research
Means-end chain

ABSTRACT

Despite municipal investments in multimodal mobility infrastructure, monomodal automotive travel patterns still dominate work-related mobility. As policymakers aim to reduce associated externalities like traffic congestion, noise, and air pollution, encouraging multimodality can be a promising route toward diversified, more sustainable mobility. However, studies on modal choice and modal shift have mainly focused on investigating the consumer decision-making process concerning specific monomodal travel modes and external factors but are characterized by a lack of dedicated applications in the commuting context. Therefore, insights into consumers' motivational patterns determining intentions to engage in multimodal commuting and factors influencing their willingness to alter the modal mix remain scarce. With a qualitative means-end chain (MEC) analysis, we explore consumers' overarching motivational structures to choose multimodal commuting behavior through laddering interviews with forty employees from two large German employers. We contribute to existing research by revealing five motivational patterns that promote consumers' decision to become multimodal commuters: autonomy, physical health, sustainability, quality of life, and interpersonal connections, which we juxtapose with previous findings. Interestingly, we find that economic interest, security, and fun are only motives of secondary importance. Consequently, we propose implications for academics, policymakers, and practitioners to foster commuters choosing more sustainable, multimodal mobility.

1. Introduction

Cities around the globe are burdened by mobility challenges – often caused by monomodal automotive mobility: the car. Driven by rural exodus, the still increasing number of private cars amplifies external costs like atmospheric pollution and occupies needed urban space (Lemp & Kockelman, 2008). Furthermore, resulting traffic jams and lack of sufficient parking space in urban clusters increase congestion and reinforce the need for political action (Zheng & Geroliminis, 2020).

As a counterproposal to monomodal automotive mobility, the concept of multimodality has found increasing academic attention in previous years (e.g., Buehler & Hamre, 2015; Clauss & Döppe, 2016; Dacko & Spalteholz, 2014; Dastjerdi et al., 2019; Kuhnimhof et al., 2006; Spickermann et al., 2014). Multimodality describes the use of various modes of transport in a specific time period. An exemplary case of multimodality is the daily commute of an individual combining different means of transport such as the car, bike, and public transport within a period of one week, depending on the individual mobility preferences and needs.

* Corresponding author at: Kriekenpitplein 21-22, 3584 EC Utrecht, The Netherlands.
E-mail address: k.merfeld@uu.nl (K. Merfeld).

https://doi.org/10.1016/j.tra.2023.103831
Received 15 February 2022; Received in revised form 25 August 2023; Accepted 9 September 2023
Available online 13 September 2023

Further, political and managerial interest has been sparked based on the benefits multimodality provides to consumers, service providers, and society. For customers, multimodal services offer benefits such as choosing the most feasible means of mobility based on onés personal situation (Willing et al., 2017), decreasing costs through price comparability, and optimized route planning (Becker et al., 2020). Service providers can take advantage of integrating their different services with various other means of transport through a larger client base and gain access to further customer data (Jittrapirom et al., 2018). And from a societal perspective, multimodal mobility can contribute to cleaner, safer, more inclusive, and healthier transport systems (Clauss & Döppe, 2016; Miramontes et al., 2017; Nobis, 2007; Spickermann et al., 2014; Tsirimpa et al., 2019; Willing et al., 2017). Consequent political interest even led the European Union to announce 2018 as the 'Year of Multimodality' (European Union, 2018).

The multimodality agenda has specifically found interest in the commuting context, with countries such as Belgium putting incentives for a shift from monomodal car commuting to multimodal commuting into law (Deloitte, 2019) or the canton Zurich implementing legal mandates to foster multimodal commuting (Regierungsratsbeschluss Nr. 145/2022). Commuting represents an essential element of daily mobility demand and a key source of traffic congestion and environmental pollution (Habib et al., 2011; Romero et al., 2019). Almost 50% of global car mileage results from business-related trips, including commuting, of which two-thirds are covered by individual motorized transport (Nobis & Kuhnimhof, 2018). Furthermore, Chen et al. (2021a), Chen et al. (2021b) found that daily commutes account for a major part of peak demand on street networks, and Santos et al. (2010) highlighted that dealing with commutes is indispensable for resolving the issue of congestion in urban regions.

However, policymakers have not sufficiently exploited the manifold advantages of multimodality in the shaping of transport policies for promoting sustainable mobility. First, there has been relatively little success in policy measures to promote more eco-friendly travel behavior by influencing consumers' mobility decisions through measures such as congestion charging or annual circulation taxes (e.g., Luo et al., 2021; Schneider, 2013). Second, the usefulness of technical improvements regarding reduced vehicle fuel consumption and hence lower CO_2 emissions is questionable in light of an ever-increasing global car fleet, the expanding size of cars as well as a higher frequency of travel and longer trips (Nykvist & Whitmarsh, 2008). Instead of progressive policy or technological enhancements, both scholars and policymakers have acknowledged the need to unveil the motives underlying consumers' mode choices to be able to acquire greater influence on consumers' mobility behavior (Bösehans & Walker, 2020).

Thus, a key challenge for policymakers and multimodal mobility service providers is motivating consumers to choose multimodal mobility for commuting purposes over monomodal car commuting. To support this ambition, the goal of this paper is to explore actual consumers' motivations for using multimodal mobility that have switched from monomodal car commuting to multimodal commuting. Accordingly, we propose the research question: What are the overarching motivational structures of consumers to use multimodal mobility offers? To answer our research question, our research builds on the theoretical basis of means-end chain (MEC) analysis, a qualitative approach designed for an exploration of customers' motivational structures (Gutman, 1982).

Our research offers three contributions to theory and practice. First, we broaden the mainly quantitative discussion on multimodality by adopting a consumer-centric perspective and qualitatively investigating how motivational patterns and cognitive motives could foster a switch to multimodal commuting. The literature on multimodality has commonly been characterized by econometric studies that quantitatively analyze socio-economic data (e.g., Buehler & Hamre, 2015; Diana & Mokhtarian, 2009; Kuhnimhof et al., 2012) while neglecting unobservable variables on consumer behavior.

Consumer behavior research on mobility motives considers car use (Gardner & Abraham, 2007; Lois & López-Sáez, 2009; Steg, 2005), cycle use (Hansen & Nielsen, 2014), carsharing (Schaefers, 2013) or public transport (De Witte et al., 2006; Jaśkiewicz & Besta, 2014). Thus, it is counterintuitive that the underlying motives for an alternation between the mono- and multimodal mobility patterns have not yet been fully researched. By qualitatively investigating factors relevant for a switch to multimodal commuting, our investigation contributes to a greater understanding of non-observable drivers impacting consumer behavior in mobility. It expands previous investigations of the perceptual determinants underlying mono-and multimodal travel mode choice (Clauss & Döppe, 2016) and gains further insights into consumer motives to switch from monomodal to multimodal mobility behavior (e.g., Klinger, 2017; Kroesen & van Cranenburg, 2016). We particularly answer to a call by Clauss and Döppe (2016) to investigate the motivational drivers of real multimodal mobility behavior.

Second, previous multimodality research lacks not only an in-depth consumer perspective but also a focus on commuting, even though commuting represents a major contributor to global car mileage (Nobis & Kuhnimhof, 2018). Aiming to leverage corporate mobility to contribute to more sustainable transportation (e.g., Bartle & Chatterjee, 2019; Hebes et al., 2013; Zijlstra & Vanoutrive, 2018), we contribute a consumer perspective on multimodality in the commuting context, as we explore the underlying motivational patterns. Thus, we extend the academic debate on corporate mobility (e.g., Bartle & Chatterjee, 2019; Zijlstra & Vanoutrive, 2018) with a particular focus on individual travel behavior change by highlighting explicit motivations to engage in multimodal commuting. More specifically, we add to the commuting mode choice literature (e.g., Ha et al., 2020; Li et al., 2019; Ton et al., 2020).

Third, our research offers guidance for mobility service providers, corporate mobility managers, and policymakers for promoting the switch to multimodal commuting. To date, mobility service providers and policymakers have been recommended to assess latent acceptance factors for multimodal service adoption "for designing effective market measures, including communication, product management, regulation or distribution strategy" (Schikofsky et al., 2020, p.308). Nevertheless, motivational structures underlying multimodal mobility behavior in the commuting context still have not been explored, despite policymakers being advised to include "tailoring the [multimodality] interventions and communication to different city inhabitant segments" (Dacko & Spalteholz, 2014, p.1). Thus, our findings will support the development of behavioral segmentation strategies based on consumers' benefits sought.

The remainder of this paper is structured as follows. First, we review the relevant literature on multimodality, travel behavior change, and commuting to further demarcate our research gap. Next, we introduce the MEC theory, followed by a description of the overall data analysis and collection process. Subsequently, research results are presented in-depth and discussed. The paper concludes

Table 1
Overview of consumer-centric literature on multimodal mobility behavior.

Author	Year	Method	Main finding(s)	Peer-reviewed journal
(1) Studies aiming to identify socio-demographic aspects of multimodal travelers				
Frank et al.	2021	Case study analysis	The developed decision support aimed at enhancing intermodal accessibility by a systematic location of multimodal mobility hubs promises a considerable potential to augment accessibility in rural regions. This potential mainly originates from monomodal car sharing journeys.	Journal of Transport Geography
Caggiani et al.	2020	Bike-sharing stations location model; Sensitivity analysis	The sole maximization of coverage or accessibility, without taking into account equality, can result in unequal accessibility distribution among the public, creating discrimination between distinct groups.	Transportation Research Part A
Groth	2019	Principal Components/ Exploratory Factor analysis; Bivariate analysis	Transport poverty impedes the possible production of multimodal behaviors, especially by socially marginalised individuals who are also lacking particular information and communication technologies providing access media to smart mobility.	Transportation Research Part A
Heinen & Mattioli	2019	Descriptive quantitative analysis; Multivariate model	From 1995 to 2015, the multimodality level in the UK decreased. There was a convergence of the trends for age and gender, whereas the trends regarding income showed divergence, implying a growing inequality in mobility opportunities. There is no association between aggregate levels of car usage and the average personal multimodality level.	Transportation
Klinger	2017	Bivariate analyses; Binary logistic regression models	Individuals moving to a public transit or biking-friendly town are more prone to adopt multimodal mobility patterns than those moving to car-centric towns.	Transportation Research Part A
Buehler & Hamre	2016	Bivariate analysis; Logistic regression analysis	The trend analysis suggests a substantial shift toward multimodality among car users from 2001 to 2009. There is a general tendency of multimodal car users to have a lower average age and a higher level of education, as well as to live in car-free households and in urban areas with a railway system.	International Journal of Sustainable Transportation
Scheiner et al.	2016	Mobility biography approach	There is a significant association between particular life course events and changes in the level of multimodality. Parents' level of multimodality grows when their child is leaving the joint household. Withdrawing from the labour market results in an increased level of multimodality, whereas settling into the labour market decreases the level of multimodality. Further factors such as car access, driver's licence holding, the quality of the public transit system in close proximity, and parking availability are also significantly related to increased or decreased levels of multimodality.	Transportation Research Part A
Heinen & Chatterjee	2015	Continuous indicator analysis of intrapersonal modal variability.	Lower modal variability is associated with mobility difficulties, an age above 60, being non-white, full-time employment, place of residence in a small village, lower household income, regular car access, no ownership of a public transit pass and no ownership of a bicycle.	Transportation Research Part A
Kuhnimhof et al.	2012	Descriptive quantitative analysis; Multivariable regression analysis	Since 2000, young adults have reduced their car usage. Two core underlying trends have been identified: First, an increasing proportion of young motorists use alternative travel means, implying a rise in multimodality. Second, gender differences regarding car mobility have decreased to a large extent among young German motorists.	Journal of Transport Geography
(2) Studies aiming to assess psychological constructs underlying multimodal mobility behaviors				
Alonso-González et al.	2020	Latent class cluster analysis	A positive multimodal mindset is associated with positive attitudes toward public transit and low car usage, which are aligned with present travel patterns. Consequently, travellers with higher monomodal car usage are less likely to adopt Mobility as a Service (MaaS).	Transportation Research Part A
Clauss & Döppe	2016	Repertory grid technique	Urban travellers differentiate and choose mobility alternatives on the basis of 28 perceptual determinants. Autonomy, flexibility, and privacy are core indicators of transport mode choice.	Transportation Research Part A
Mao et al.	2016	Multilevel regression modeling; Random-intercept model	Commuting by active travel means yields the highest satisfaction, followed by car and public transit trips. Multimodal commuters have a tendency to feel less satisfied with commutes by alternate travel means than monomodal	Transportation Research Part A

(*continued on next page*)

Table 1 (*continued*)

Author	Year	Method	Main finding(s)	Peer-reviewed journal
			commuters. There is a U-shaped relationship between modal flexibility and trip satisfaction.	
Vij et al.	2013	Latent Class Choice Models	There are habitual car drivers showing a strong bias for car usage as well as multimodal travellers displaying a certain degree of variation regarding their modal preferences. Multimodal individuals can be differentiated by their sensititvity to travel time. Modality styles are significantly associated with life-cycle characteristics and more long-term mobility decisions.	Transportation Research Part A
Diana	2010	Structural equation modelling	In comparison to mobility service characteristics and performances, multimodal travel habits and cognitive attitudes play a more important role for the usage of different new travel modes. The importance of self-related factors increases in the case of respondents being less familiar with the technical background.	Technological Forecasting & Social Change
Kenyon and Lyons	2003	Qualitative focus group approach	Presenting various mobility alternatives for a trip in response to an individual enquiry can potentially put into question present perceptions of the utility of travel means other than the car, transcending psychological and habitual barriers to considering alternative travel means. Reservations toward mobility alternatives can be eliminated and a modal change motivated by extending information on travel costs and duration through additional information on convenience and comort factors.	Transportation Research Part F
(3) Studies aiming to estimate individuals' multimodal travel preferences				
Liao et al.	2020	Scaled mixed logit model	Bike-sharing has the potential to increase the usage of the metro and promotes multimodal mobility. Individuals are not inevitably against multimodal mobility as suggested by the high base preferences for bus and metro as well as car and metro. The real barrier exists in the form of the transfer burden, wherefore seamless connections between distinct travel options are essential.	Transportation Research Part A
Mehdizadeh and Ermagun	2020	Hybrid choice model	Unfavorable attitudes toward environment and safety are positively related to monomodal and multimodal car usage among schoolchildren. A longer driving distance is negatively associated with multimodal mobility.	Transportation
de Freitas et al.	2019	Multimodal recursive logit model	Intermodality is primarily related to ownership of public transit subscriptions.	Transportation Research Part A
Mehdizadeh et al.	2019	Hybrid choice model	The Norm Activation Model theory is related to unimodal and multimodal green travel mode usage during summer, whereas this association is not existent during winter. Situational factors like accessibility to public transport and biking time to campus were more relevant for modality usage during winter than during summer.	Transportation Research Part A
Tsirimpa et al.	2019	Mixed logit model	Incentive-based instruments potentially make a contribution to the encouragement of sustainable and innovative mobility solutions. During the incentive period, respondents significantly increased public transport usage and walking. Public transport travellers were largely motivated by incentives, whereas car drivers and walkers were not motivated toward bicycling.	Transportation Research Part F
Heinen	2018	Multinomial logistic regression analyses	The more multimodal travellers are, the more probably they intend to reduce their car usage. However, it remains unclear whether the level of multimodality is related to mode change intention and actual behavior change.	Transportation Research Part F
Schakenbos et al.	2016	Mixed logit models	The total disutility related to the inter-change is dependent on the entire time, the spent time distribution (transfer, waiting, access time) as well as the headway.	Transport Policy
Arentze and Molin	2013	Scaled error-component-mixed multinomial logit framework	Travel cost valuations are heterogeneous. There is a higher sensitivity regarding clearly visible costs (e.g., parking charge, ticket price), and a lower sensitivity concerning fuel costs. Car travellers require stronger compensations before they are willing to adopt multimodal mobility patterns and use less convenient public transit and park-and-ride systems. Only in conjunction with restricting parking policies in city centers, will park-and-ride usage be considered a viable alternative by car drivers.	Transportation Research Part A
(4) Studies aiming to identify different multimodal travel segments				

(*continued on next page*)

Table 1 (*continued*)

Author	Year	Method	Main finding(s)	Peer-reviewed journal
Schneider et al.	2021	Latent class cluster analysis	There are significant differences between means of transport, in particular between monomodal and multimodal trip chains, but also between the monomodal means of transport bike, car, walking, and public transit trip chains.	Transportation
Kroesen & van Cranenburg	2016	Mixture latent Markov model	There are five categories of travel patterns: unimodal car drivers, public transit and occasional car users, car passengers, car and bike users, bike and occasional public transit users.	European Journal of Transport and Infrastructure Research
Molin et al.	2016	Latent class cluster analysis	Monomodal car users have more negative attitudes toward public transit and cycling, whereas frequent car users who also use public transit show less negative public transit attitudes.	Transportation Research Part A
Buehler & Hamre	2015	Multinomial and logistic regression analyses	A continuum of transportation types exist which ranges from monomodal motorists to walk, bike, and/or public transit only users. Multimodal motorists are situated between these two extremes.	Transportation
Kroesen	2014	Latent class transition analysis	Multimodal travellers in comparison with monomodal travellers have a higher propensity to switch from one behavioral profile to another. Age, the residential location, moving house and job changes are strongly related to the probability of switching between the revealed behavioral travel patterns over the course of time.	Transportation Research Part A
Diana & Mokhtarian	2009	Cluster analysis	Two groups that almost entirely drive cars and two others with a predominant usage of public transit are discovered. For example, the clusters allow differentiating between car travellers who might be prone to drive less and increase public transport usage and those who are mainly satisfied with their present modal portfolios.	Transportation Research Part F
Nobis	2007	Descriptive quantitative analysis; Multivariable regression analysis	There is a significant association between multimodal mobility and life stage. The majority of adolescents exhibit multimodal travel patterns, primarily out of necessity, and the proportion of multimodal travellers decreases strongly with entering professional employment. Multimodality is more present in conurbations because city lifestyles offer optimium preconditions for facilitating multimodal mobility behaviors.	Transportation Research Record: Journal of the Transportation Research Board

with implications and recommendations for policymakers, mobility service providers, and transportation planners, as well as the identification of future research areas in multimodal mobility behavior.

2. Literature review and research gaps

2.1. Multimodality

Multimodality can describe transport systems, transport strategies, and traffic behavior (Kuhnimhof et al., 2012). With respect to passenger transport, it refers to the variation of different means of transport for different routes within a given period of time (Buehler & Hamre, 2015; Kuhnimhof et al., 2006; Nobis, 2007). It incorporates the often-confused concept of intermodality as a subcategory, which describes the linking of means of transport in one trip (Dacko & Spalteholz, 2014; Gebhardt et al., 2016). Monomodality, on the other hand, is discussed as a direct antonym of multimodality, which means the exclusive use of only one mode of transport for all journeys (Buehler & Hamre, 2015; Groth, 2019; Nobis, 2007). Within the academic discourse on the transition from the automobile to a multimodal society, the monomodal use of the private car is particularly problematized (Buehler & Hamre, 2015; Mehdizadeh & Ermagun, 2020; Spickermann et al., 2014).

Even though multimodality is a specific emerging research area, it is an extension of a larger body of research on the intrapersonal variability of travel behavior (Buehler & Hamre, 2016). The stream of literature on multimodality in the domain of transport research is still in its early stages and has been developing over the last decade. Table 1 provides a systematic overview of the consumer-centric studies focusing on multimodal mobility behaviors published since 2002. The essential findings from the most relevant studies are structured and summarised below according to the prevailing categories of relevance for multimodal travel: (1) socio-demographic aspects, (2) psychological constructs, (3) multimodal travel preferences, and (4) multimodal travel segments.

(1) Socio-demographic aspects

A dominant sub-stream of the multimodality literature investigates the socio-economic and built environment factors significantly associated with multimodal mobility behavior. There is general consensus on the positive influence of determinants such as young age, urban place of residence, bicycle, and public transit pass ownership (e.g., Groth, 2019; Heinen & Mattioli, 2019; Kuhnimhof et al., 2012) as well as the negative effect of car availability, driver's license, and employment (e.g., Buehler & Hamre, 2016; Heinen &

Chatterjee, 2015; Scheiner et al., 2016) on multimodality. Furthermore, both Caggiani et al. (2020) and Frank et al. (2021) recently assessed the accessibility of multimodal transport modes and the associated enabling of multimodal mobility.

(2) Psychological constructs

Another direction of multimodality research examines to what extent psychological constructs such as travel attitudes and habits are associated with the adoption of multimodal mobility patterns. Kenyon and Lyons (2003) found that presenting various travel alternatives for a trip and including convenience and comfort factors in the information presented in response to a single inquiry can overcome habits and other psychological barriers to considering travel means. Diana (2010) demonstrated that multimodal mobility habits positively affect the willingness to adopt a novel mobility service comprising innovative concepts (e.g., ridesharing or car-sharing). Vij et al. (2013) explored the impact of modality styles on travel mode choice for work and non-work tours, showing that multimodal travelers have a certain amount of variation with regard to their modal preferences, while Molin et al. (2016) identified multimodal individuals as a function of attitudinal variables. Clauss and Döppe (2016) determined that urban travelers choose mobility options based on 28 cognitive determinants, among which autonomy, flexibility, and privacy are the core indicators of transport mode choice. Satisfaction with particular multimodal mobility behaviors was analyzed by Mao et al. (2016). Most recently, Alonso-González et al. (2020) found that a positive multimodal mindset is linked to positive attitudes toward public transit and a low level of car usage.

(3) Multimodal travel preferences

As opposed to the character of the aforementioned research, there is a range of studies applying discrete-choice models for estimating travelers' inter- and multimodal travel preferences. Schakenbos et al. (2016) estimated the perceived disutility of transfer in multimodal public transit journeys. They determined that the entire interchange disutility depends on the total time, the time expenditure distribution, and the headway. To investigate trade-offs concerning travel time, costs, and convenience, Arentze and Molin (2013) modeled a broad spectrum of mobility alternatives in a multimodal travel system while considering a comprehensive selection of attributes for different trip stages. The most recent stated preference experiment on multimodal travel preferences was conducted by Liao et al. (2020), who included an even more comprehensive array of travel modes than Arentze and Molin (2013). Their study revealed that bike-sharing could promote multimodal transport while the transfer burden is the most important barrier to adopting multimodal travel patterns.

(4) Multimodal travel segments

A further literature stream is comprised of traveler segmentation studies identifying different modality groups based on the combinations of travel means used. For instance, the results of an empirical investigation in Germany by Nobis (2007) suggest unimodal car drivers constitute the most significant fraction of modality groups. Applying cluster analysis, Diana and Mokhtarian (2009) discovered different multimodal mobility groups, two groups that almost entirely drive cars and two others with predominant public transit usage. Buehler and Hamre (2015) differentiated between the three groups of monomodal drivers, multimodal car drivers, and travelers exclusively walking, biking, and/or using public transit in the US. In contrast, the Dutch investigation by Kroesen (2014) revealed five modal clusters (unimodal cyclists, unimodal car drivers, immobile travelers [i.e., infrequent travel by car, bike, or public transit], joint automobile and bike users as well as public transit users). Molin et al. (2016) used Dutch panel data to identify five multimodal travel groups. Their investigation goes beyond previous segmentation studies by integrating associations with attitudinal variables and demonstrates that monomodal car users have more negative attitudes toward public transit and cycling, whereas frequent car users who also use public transit exhibit less negative public transit attitudes. Finally, Kroesen and van Cranenburg (2016) identified five categories of travel patterns (monomodal car drivers, public transit and occasional car users, car passengers, car and bike users, and bike and occasional public transit users) as well as three overarching modality styles (habit-based travelers staying in their particular pattern over a period of three years, auto (in)dependent choice travelers switching within auto and non-auto patterns, and auto drivers with an alternative modal preference switching between auto and non-auto patterns).

In summary, the above review of the existing multimodality literature implies core difficulties and opportunities with regard to shifting travelers to multimodal mobility behavior. In the following two sections, we first review the literature on voluntary as well as involuntary travel behavior changes and afterward address the consumer perspective on commuting to further explore consumer switching motives in the context of commuting.

2.2. Travel behavior change

Switching to multimodal travel implies a change in – often habitual – mobility behavior. For the purpose of this study, and in line with previous studies in transportation research using the term "switch" (e.g., Chen et al., 2021a, 2021b; Wang et al., 2021), we define switching as a consumer's conscious choice to change their mobility behavior. To better understand such switches, various sub-streams of the travel behavior literature have been developing. Two core categories can be distinguished when observing the behavior: involuntary and voluntary travel behavior changes.

Firstly, involuntary travel behavior changes are generally associated with so-called 'hard' policies of travel demand management, which is defined as the application of policies and strategies for reducing travel demand and for redistributing travel demand in time or in space (Meyer, 1997). Instances of hard policies are the introduction of road tolling systems and congestion charging (e.g., Seik, 2000; Vanoutrive, 2017). Even though travelers' needs and motives are entirely disregarded for the development of this type of travel demand management, the enforcement of these policies has historically shown major success in causing a shift toward sustainable travel modes (e.g., Börjesson et al., 2012; Seik, 2000). Against the background of strong public opposition, political unfeasibility, and the limitation to short-term impacts, however, it has been demonstrated that lower car use levels cannot be achieved in the long run by only relying on hard policies (Gärling & Schuitema, 2007; Rye & Hrelja, 2020; Stopher, 2004). In addition, long-term and mostly

involuntary travel behavior changes over the course of individuals' lives have been explored by the life course approach (e.g., Scheiner, 2020; Scheiner & Holz-Rau, 2013; Sharmeen et al., 2014; Zhao & Zhang, 2018), the life trajectory approach (e.g., Bonham & Wilson, 2012; Chatterjee et al., 2013; Jain et al., 2020; Rasouli & Timmermans, 2017; Underwood et al., 2014) and mobility biographies (e.g., De Haas et al., 2018; Müggenburg et al., 2015; Scheiner, 2007, 2018). Klinger (2017) linked the concepts of mobility biographies, mobility cultures, and multimodality and explicitly focused on the transition from monomodality to multimodality against the background of residential relocations. A key insight is that individuals moving to a public transit or biking-friendly town are more prone to adopt multimodal travel patterns than those moving to car-centric towns.

Secondly, there is one research strand focusing on the impacts of voluntary travel behavior change campaigns on modal choice to assess various policy programs like 'soft' transport policy measures (e.g., Roby, 2010; Rose & Marfurt, 2007; Seethaler & Rose, 2009), household-based behavior change techniques (e.g., Brög et al., 2009) and personal travel planning (e.g., Bamberg & Rees, 2017). For instance, personal travel planning – an intervention technique targeted at motivating individuals to voluntarily use the car less frequently and to increase the use of eco-friendly modes – illustrates well the relation between the functioning of such programs and our research goal. The central idea of the policy program is that individuals are provided with assistance, comprehensive information, and incentives in direct contact with a travel advisor, all of which are meant to motivate and facilitate a voluntary alteration of their mobility choices. Another example demonstrating that individuals' mobility motives and needs are at the core of a policy program's success regarding voluntary travel behavior change is represented by soft transport policy measures. These measures are aimed at voluntarily reducing car use and increasing more sustainable options by offering various economic incentives, detailed travel information on alternative modes as well as personalized feedback about travel behavior and also include the improvement of physical infrastructure and service levels of eco-friendly transport modes (e.g., Gärling & Fujii, 2009; Möser & Bamberg, 2008). Examples include workplace travel plans, priority lanes for more eco-friendly travel means, and awareness campaigns (e.g., Gärling & Fujii, 2009). The majority of studies investigating the effectiveness of soft policies found positive effects regarding a mode shift from car use to active and public transport (e.g., Brög et al., 2009; Chatterjee, 2009; Scheepers et al., 2014).

Despite the significance of an in-depth understanding of a consumer's underlying motivational patterns, the research on voluntary travel behavior change campaigns clearly lacks studies on the impact of motives on travel behavior change. On this basis, Skarin et al. (2019) conducted a series of surveys within the scope of a voluntary travel behavior intervention in order to gain an understanding of the significance of various motives as well as of social support, self-efficacy, and travel satisfaction on behavioral change. The results showed that social support and self-efficacy during an intervention increase a traveller' probability of behavioral change. Counter-intuitively, the desire to change and freedom were the two motives in the pre-intervention phase with the strongest influence on travel behavior change, which stands in contrast to the most common participation motives (desire to improve health or desire to help the environment).

In sum, to achieve a switch to multimodal mobility patterns, the sole reliance on involuntary travel behavior changes does not suffice. Thus, to increase the success of voluntary travel behavior programs, it is of vital importance to identify an individual's core motivational patterns underlying mode shifts. However, even though there are extensive insights on the effectiveness of particular programs, knowledge about the motivational patterns by which an individual behavioral change is conditioned remains scarce. Finally, the existing research on travel behavior changes offers limited guidance on what makes consumers voluntarily switch to multimodal travel behavior and provides, in essence, no guidance on how to motivate this switch in the commuting context.

2.3. Commuting

Within the scope of this paper, we focus on the context of commuting. Commuting is a major creater of automotive monomodal traffic (e.g., Oostendorp & Gebhardt, 2018; Salon, 2009), a necessity for many consumers to take part in society (e.g., Chatterjee et al., 2020; Delmelle et al., 2013; Mattisson et al., 2015), a cause of various disadvantageous health impacts (e.g., Talmage & Frederick, 2019; Wener & Evans, 2011) and a very persistent habit for many consumers (e.g., Fu, 2021; Kerr et al., 2010). Taking the consumer perspective, we first outline the manifold adverse impacts of commuting on the consumer and subsequently explore previous findings on consumer mode choice and switch behaviors.

2.3.1. Commuting impacts on the consumer

In general, the effects of commuting on subjective well-being are dependent on the commute duration, the chosen transport mode as well as the conditions experienced during the trip (Chatterjee et al., 2020; Clark et al., 2020). The major determinants of stress arising from commuting are delays caused by transport congestion, the road behavior of other traffic participants (concerns car drivers only), and unreliability of public transport services (e.g., Abou-Zeid & Ben-Akiva, 2011; Evans et al., 2002; Lyons & Chatterjee, 2008). Furthermore, there is a general consensus among transportation researchers that there is a negative relationship between the length of a car commute and the commuter's self-assessed physical health (e.g., Hilbrecht et al., 2014; Oliveira et al., 2015). Apart from stress, several additional potential adverse health effects related to commuting have been reported: elevated accident risks, heightened risk for cardiovascular disorders because of polluted air, less disposable time for doctors' visits, sleep, recreational as well as physical activities (e.g., Gordon-Larsen et al., 2009; Halla & Zweimüller, 2013; Mouratidis, 2019).

Beyond physical health, diverse country-specific cross-sectional investigations have demonstrated an impact of commuting on life satisfaction (e.g., Olsson et al., 2013; Stutzer & Frey, 2008), satisfaction with one's own family (Lorenz, 2018), job (Stutzer & Frey, 2008), and leisure time (Dickerson et al., 2014).

Moreover, light has been shed on the relationship between commuting and mental health. Ohta et al. (2007) found that walking or biking during the commute are related to higher levels of mental health for men. In contrast, Roberts et al. (2011) discovered that

longer commute times are related to lower levels of mental health for women. Last but not least, Martin et al. (2014) revealed that a car commute is related to lower levels of mental health than commutes on foot and by bus.

Another relevant sub-stream of the commuting literature is focused on satisfaction with commuting and the underlying factors. In general, it is shown that higher commute durations have a negative effect on commute satisfaction, whereas commutes by active travel modes and a higher level of flexibility related to the possibility to select the preferred transport mode result in higher satisfaction levels (e.g., Mao et al., 2016; Páez & Whalen, 2010; Ye et al., 2020). With regard to commutes by car, the main driver of dissatisfaction appears to be traffic congestion (Higgins et al., 2018).

2.3.2. Commuting mode choice & switching

Despite the various negative impacts of commuting on consumers' lives and well-being, commuting is a necessity for many and commuting routines are rarely critically reassessed. Previous research has revealed that travel behavior change, as well as mode shifts, occur more frequently with regard to leisure trips than work-related trips (Vedagiri & Arasan, 2009). Regarding the variability of mode usage in commuting over a period of one week, Kuhnimhof (2009) found that the majority of travelers repeatedly choose the same means of transport (72%). The investigation by Lavery et al. (2013) also demonstrated habitual and routine travel behavior with regard to commutes. Considering the societal impact commuting has and the challenges of motivating changes toward alternative travel options in the commuting context (Brög et al., 2009), we now look deeper into mode switches.

In line with the previously presented findings on multimodality and travel behavior change, the existing access to travel modes plays a role in commuting mode choice, just as well-developed public transport fosters a modal switch away from the car (Clark et al., 2016). Multimodal commuters owning a discounted public transport pass are more likely to use alternative travel modes while owning a parking permit negatively affects the selection of alternative modes (Zhou, 2012). The ownership of a private car also significantly influences commute mode choice (Dargay & Hanly, 2007). For developing countries, Van et al. (2014) revealed that attitude variables concerning the car are significant in the choice of the car for commuters. Moreover, the social orderliness aspect was found to be important regarding the choice of public transport (Van et al., 2014).

Furthermore, economic and convenience motives impact the mode choice in commuting. Ha et al. (2020) showed that the differences regarding commuting costs and time between means of transport have an effect on commute mode choice. Commuting by car is preferred when more than one transfer is required. Mode choice is further affected by longer walking distances throughout the commute. In a similar vein, Ton et al. (2020) demonstrated that reimbursement by the employer for the usage of a particular travel option represents the most significant determinant underlying commuting mode choice. In addition, Li et al. (2019) identified a higher effectiveness of congestion pricing strategies than of reward strategies with regard to encouraging mode shifts among more habitual car commuters, whereas the converse was observed for commuters with weaker car usage habits (Li et al., 2019).

Additionally, previous research has also acknowledged the role of sustainability: Low-carbon habits and knowledge affect commute mode choice (Jia et al. (2018), and pro-environmental attitudes favor the switch from commuting by car (Clark et al., 2016). Finally, and in line with travel behavior changes, changing commute distances – due to relocations or job changes – are significantly associated with commuting mode switches (Clark et al., 2016).

In sum, monomodal car commuting has the most negative effects on the commuter's personal life at different levels. Access to travel modes represents a decisive promoting factor of multimodal commuting. Mode choice in the commuting context is mainly influenced by three core motivational drivers: economic, convenience, and sustainability motives.

2.3.3. Research gaps: Switch to multimodal commuting

The literature review of studies in the fields of multimodality, travel behavior change, and commuting reveals three important research gaps. The first research gap was identified in the field of multimodal transport. Multimodality studies have generally concentrated on quantitatively analyzing the socio-economic factors of multimodal travel behavior (e.g., Buehler & Hamre, 2015; Groth, 2019; Heinen & Mattioli, 2019), investigating the extent to which psychological constructs are related to the adoption of multimodality patterns (e.g., Alonso-González et al., 2020; Vij et al., 2013), estimating multimodal travel preferences (e.g., Arentze & Molin, 2013; Liao et al., 2020) and identifying multimodal travel segments (e.g., Diana & Mokhtarian, 2009; Kroesen & van Cranenburg, 2016). Our literature review provides comprehensive insights into multimodality as well as initial insights on the switches between mono- and multimodal mobility patterns over time (Klinger, 2017; Kroesen & van Cranenburg, 2016). Nevertheless, there exists significant ambiguity about the underlying consumer motives for a switch from monomodal to multimodal mobility behavior.

Despite some exceptions (e.g., Clauss & Döppe, 2016; Schuppan et al., 2014), knowledge about consumer motivations to adopt multimodal mobility behavior remains scarce. With a qualitative research design, Schuppan et al. (2014) investigated the motivations and organization of multimodal mobility patterns of urban car owners as well as the potential effect of travel demand management for promoting a mode shift to multimodality. Even though the study provides first empirical information on the motivations of car owners in the city and the participation in multimodal transportation in the German context, the emphasis is placed on the technical perspective of travel demand management. Furthermore, Clauss and Döppe (2016) sought to generate in-depth insights into the determinants of travel mode choice and the adoption of novel multimodal travel modes. However, their study – like the research conducted by Schuppan et al. (2014) – falls short of imparting an in-depth and holistic understanding of the overarching motivational structures that underlie multimodal mobility patterns.

Second, against the background of varying behavioral motives concerning leisure mobility and work-related trips (e.g., Jia & Fu, 2019; Jones et al., 2016), studies of multimodal mobility take insufficient account of travel purpose in the research design. In particular, dedicated applications in the commuting context are lacking. By closing this gap, we also contribute to the literature stream on commuting mode choice and switch, which lacks investigations of multimodal behaviors and a focus on consumer motives.

Third, the travel behavior literature focusing on voluntary travel behavior change lacks investigations on the impact of motives on travel behavior change toward sustainable modes. A first attempt to close this gap was made by Skarin et al. (2019), who demonstrated that social support and self-efficacy increase the likelihood of behavioral change. While a number of motives were tested and determined to be non-significant, the two motives with the highest influence on travel behavior change were the desire to change and freedom. Consequently, there is a significant need for further insights into overarching motivational patterns underlying a voluntary behavioral switch to sustainable mobility alternatives.

Addressing the highlighted research gaps, we apply the means-end chain approach to explore the underlying motivational patterns for switching from monomodal to multimodal commuting.

3. Research process and methodological background

3.1. Means-end chain theory

Often regarded as the foundation of customer behavior, motivations affect the intensity, the orientation, and the tenacity of particular actions (Ford, 1992) and thus enable motivation theories to explain goal-directed customer behavior (Ajzen & Madden, 1986). Especially when addressing behavioral changes for sustainabitliy purposes, research emphasises the relevance of bridging the attitude-behavior gap to enable actual change (Park & Lin, 2020). Recent studies on eco-friendly customer behavior focus on domain-specific motives and variables (e.g., Hawlitschek et al., 2018; Herberz et al., 2020; Noppers et al., 2015; Zoll et al., 2018) to enable more accurate predictions of consumer behavior. Furthermore, modeling approaches suggest that the influence of broad constructs such as attitudes, beliefs, and values on consumer behavior is mediated by individuals' objectives and motives (e.g., Choi & Johnson, 2019; Dastjerdi et al., 2019).

We apply the means-end chain technique, an established qualitative research method for motive analysis (De Ferran & Grunert, 2007; Schaefers et al., 2021), especially in the context of mobility (Merfeld et al., 2019; Schaefers, 2013; Wilhelms et al., 2017). We chose this qualitative research technique as it allows us to investigate unknown customer behavior with the benefit of in-depth knowledge about context and enables us to generate new findings without being required to initially agree on a particular scientific model (Merriam & Tisdell, 2015). The means-end chain enables researchers to find attributes that consumers consider relevant in a decision as well as the reasons underlying this relevance (Olson & Reynolds, 2001). It further allows to create synergies between qualitative and quantitative research elements (Aurifeille & Valette-Florence, 1995). Moreover, the elicited motives provide practical findings for the design of product and service propositions (e.g., Merfeld et al., 2019; Wilhelms et al., 2017), can be used as a basis for market segmenting and developing positioning strategies (e.g., Pezeshki et al., 2019) and thus provide valuable managerial contributions and guidance for practical implementation (e.g., Schaefers et al., 2021).

The means-end chain method is based on the assumption that all constituents of consumer behavior are a result of motivations, which shed light on an individual's goal-directed behavior (Pieters et al., 1995). More particularly, consumer motivation is considered as the outcome of na individual's perception of an offering as sufficiently covering their needs (Olson & Reynolds, 2001). In this sense, every offering is assessed with respect to its appropriateness to function as a means to an end in demand. Thus, MEC theory is rooted in expectancy-value theory (Gutman, 1997), according to which individuals' attitudes toward and assessments of an offering are dependent on both the anticipated performance of the respective offering with regard to the subjacent motives and the value related to the respective motive. For example, commuters' attitudes toward commuting by bike and by bus depend on the anticipated outcome (e.g., cost efficiency) and the value of, for example, saving money. Therefore, the method allows for an in-depth exploration of individuals' behavioral motives and cognitive motivational patterns (e.g., De Ferran & Grunert, 2007).

The resulting MEC framework is structured into four different components: attributes, functional consequences, psychosocial consequences, and values (Reynolds & Gutman, 1988). In the present study, attributes represent the various aspects associated with switching motives toward multimodal commuting (e.g., *situative modal choice*, *active mobility*). Functional consequences can be defined as qualitative outcomes that are directly associated with the mobility behavior (e.g., *flexible use*), whereas psychosocial consequences are social and psychological outcomes (e.g., *stress reduction, variety seeking*). Values, the top-level elements in a MEC, constitute the personal goals or standards (e.g., *autonomy, health*) that are pursued by an individual's behavior (Herrmann & Huber, 2000; Vinson et al., 1977).

To visualize the findings of a MEC, a hierarchical value map (HVM) is created after the aggregation of individual MECs in a summary implication matrix (Olson & Reynolds, 2001). The HVM graphic is made up of lines and nodes. The nodes represent attributes-consequences-values concepts, and the lines connecting the nodes symbolize the frequency of associations between them (Schaefers et al., 2021). Managers, and policymakers in particular, are supported in defining market sectors and creating policies as well as target-oriented communication campaigns by the provision of an intuitive graphical illustration specifying the values that make particular product or service offerings important to a certain group of users (Ter Hofstede et al., 1999).

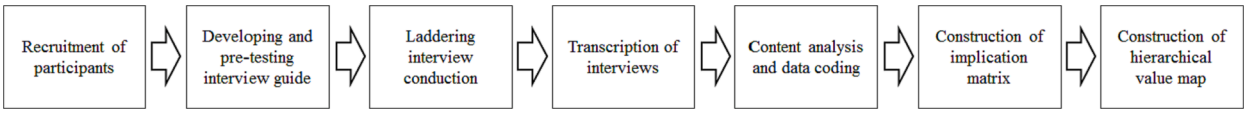


Fig. 1. Visualisation of the research process, .
adapted from Wilhelms et al., 2017

Table 2
Socio-economic and travel characteristics of interview participants ($N = 40$).

Name	Gender	Age	Education	Profession	Place of residence	Commute dist. (km)	Car ownership	Car com (#days/w)	Time since witch (mth)	Job ticket	Mobility opt after switch	Mobility opt leisure time
Katja	F	42	University (Master)	Qualified administration consultant	City	8	Yes	3	7	No	Public Transport Private Car Private Bicycle Carpooling	Public Transport Private Car
Marcel	M	47	University (Master)	Commercial computer scientist	Rural	45	Yes	1	5	No	Public Transport Private Bicycle Private Car	Public Transport Private Bicycle Private Car
Katharina	F	31	University (Master)	Meterologist	Rural	18	Yes	3	3	No	Public Transport Private Bicycle Private Car	Public Transport Private Bicycle Private Car
Thomas	M	59	University (Master)	Meterologist	Rural	92	Yes	3	6	No	Public Transport Private Bicycle Private Car	Public Transport Private Bicycle Private Car
Magdalena	F	35	University (Master)	Meterologist	City	45	Yes	2	8	No	Public Transport Private Bicycle Private Car Carsharing Carpooling	Public Transport Private Bicycle Private Car Carsharing Bikesharing
Jutta	F	52	University (Master)	Administration operation manager	City	11	Yes	2	8	No	Public Transport Private Bicycle Private Car Carpooling Motorbike Walking	Public Transport Private Bicycle Private Car Motorbike Walking
Alexandros	M	32	University (Master)	Research associate	Suburb	8	No	0	10	No	Public Transport Private Scooter	Public Transport
Andrea	F	48	PHD	Researcher	City	35	Yes	2	9	No	Public Transport Private Car	Public Transport Private Car Private Bicycle
Ulrike	F	48	PHD	Physicist	City	13	Yes	0	6	No	Public Transport Private Bicycle	Public Transport Private car Private Bicycle
Rainer	M	58	University (Bachelor)	Weather expert	Rural	20	Yes	1	12	No	Public Transport Private Bicycle Private Car	Public Transport Private Bicycle Private Car Carsharing

(*continued on next page*)

Table 2 (*continued*)

Name	Gender	Age	Education	Profession	Place of residence	Commute dist. (km)	Car ownership	Car com (#days/w)	Time since witch (mth)	Job ticket	Mobility opt after switch	Mobility opt leisure time
Klaus	M	34	University (Master)	Research associate	City	55	Yes	3	12	No	Public Transport	Private Bicycle
Jennifer	F	48	PHD	Official	City	7	No	0	4	No	Private Bicycle Private Car Private Bicycle	Private Car Private Bicycle
Astrid	F	40	Abitur	Secretary	Rural	50	Yes	3	11	No	Public Transport	Carsharing Public Transport
Christa	F	61	PHD	Researcher	Rural	20	Yes	2	12	No	Private Car Bikesharing Public Transport	Private Car Bikesharing Public Transport
Jennifer	F	43	University (Master)	Official	City	17	Yes	1	8	No	Private Bicycle Private Car Public Transport	Private Bicycle Private Car Public Transport
Kai	M	38	Apprenticeship	Administrative support worker	City	6	Yes	1	10	No	Private Bicycle Private Car Public Transport	Private Bicycle Private Car Public Transport
Arne	M	28	University (Master)	Technical co-worker	City	25	Yes	2	10	No	Private Bicycle Private Car Public Transport	Private Bicycle Private Car Public Transport
Axel	M	49	PHD	Physicist	Suburb	22	Yes	1	2	No	Private Bicycle Private Car Public Transport	Private Bicycle Private Car Public Transport
Ivonne	F	46	University (Bachelor)	Official	Suburb	20	Yes	1	11	No	Private Car Public Transport	Private Bicycle Private Car Private Bicycle
Peter	M	60	Abitur	Bookbinder	Suburb	15	Yes	2	12	No	Private Bicycle Private Car Public Transport	Private Car Public Transport
Julieta	F	46	Apprenticeship	Customer advisor	City	10	Yes	1	12	Yes	Private Bicycle Private Car Public Transport	Private Bicycle Private Car Public Transport
Christina	F	24	University (Bachelor)	Manager Customer Data Strategy	Suburb	30	Yes	3	3	No	Private Car Private Car Carpooling	Private Car Public Transport Private Car Private Bicycle Carpooling

(*continued on next page*)

Table 2 (*continued*)

Name	Gender	Age	Education	Profession	Place of residence	Commute dist. (km)	Car ownership	Car com (#days/w)	Time since witch (mth)	Job ticket	Mobility opt after switch	Mobility opt leisure time
Melanie	F	47	University (Master)	Event manager	City	14	No	0	1	Yes	Public Transport Own Pedelec	Public Transport Own Pedelec Carsharing Carpooling
Michael	M	41	University (Master)	IT-Client Manager	Suburb	22	Yes	2	2	No	Private Car Private Bicycle Walking	Private Car Private Bicycle Walking
Hannes	M	53	Secondary school	Insurance salesman	Rural	32	Yes	3	6	No	Public Transport Private Car Carpooling	Public Transport Private Car Private Bicycle Bikesharing Private Scooter
Ute	F	31	University (Master)	Board staff	City	17	Yes	2	10	No	Public Transport Private Car Private Bicycle Carpooling	Public Transport Private Car Private Bicycle Carsharing
Ralph	M	51	PHD	Sustainability manager	City	18	Yes	4	8	No	Public Transport Private Car	Public Transport Private Car Private Bicycle
Sabine	F	53	Abitur	Event manager	Rural	25	Yes	2	11	Yes	Public Transport Private Car Private Bicycle Carpooling	Public Transport Private Car Private Bicycle Carpooling
Dirk	M	51	Abitur	IT-Client Manager	Suburb	13	Yes	1	12	No	Public Transport Private Car Private Bicycle	Public Transport Private Car Private Bicycle Carsharing
Anastasia	F	29	University (Master)	HR Consultant	City	15	No	1	10	Yes	Public Transport Carsharing	Public Transport Private Bicycle Carsharing Bikesharing
David	M	33	University (Master)	IT-Client Manager	City	10	No	0	6	Yes	Public Transport Bikesharing Carpooling	Public Transport Private Bicycle Carsharing Bikesharing Carpooling Taxi

(*continued on next page*)

Table 2 (*continued*)

Name	Gender	Age	Education	Profession	Place of residence	Commute dist. (km)	Car ownership	Car com (#days/w)	Time since witch (mth)	Job ticket	Mobility opt after switch	Mobility opt leisure time
Torben	M	43	University (Master)	ESG Manager	Rural	50	Yes	0	11	Yes	Public Transport Private Car Private Bicycle Carsharing Bikesharing	Public Transport Private Car Private Bicycle Carpooling
Philipp	M	36	University (Master)	Auditor	City	20	Yes	0	12	Yes	Public Transport Private Bicycle	Public Transport Private Car Private Bicycle
Nina	F	42	University (Master)	CEO	City	10	Yes	3	12	No	Company Car Private Car Private Bicycle Carsharing Bikesharing	Company Car Private Car Private Bicycle
Susanne	F	41	Abitur	Insurance broker	City	35	Yes	1	3	Yes	Public Transport Private Bicycle Private Car	Public Transport Private Bicycle Private Car
Nadja	F	26	University (Bachelor)	HR Developer	City	12	Yes	2	2	Yes	Public Transport Private Bicycle Private Car	Public Transport Private Bicycle Private Car
Theresa	F	32	University (Master)	Psychologist	City	10	No	0	5	Yes	Public Transport Private Bicycle	Public Transport Private Bicycle Partner's car
Charlotte	F	25	University (Bachelor)	Management Development	City	10	Yes	2	6	No	Public Transport Private Car	Public Transport Private Bicycle Private Car Carpooling
Tina	F	36	University (Master)	Fitness economist	City	5	Yes	1	7	Yes	Public Transport Private Bicycle	Public Transport Private Bicycle Private Car
Ivonne	F	36	University (Master)	Event manager	City	15	Yes	3	11	No	Public Transport Private Car Carsharing Carpooling	Public Transport Private Car Private Bicycle Carsharing Carpooling

3.2. Data collection and analysis

The multistage research process consists of the following six steps: interviewee recruitment, interview conduction, interview transcription, content analysis, and data coding, setting up of implication matrices, and hierarchical value map construction. Fig. 1 shows the graphical demonstration of the research process.

3.2.1. Recruiting participants

First, as corporate multimodal mobility is a growing, but still niche phenomenon, two large German institutions in the cities Wiesbaden and Offenbach were purposefully chosen by the researcher team based on their advanced corporate mobility management. In these institutions, employees are provided with a multitude of different mobility options for commuting (e.g., car parking, bike-sharing stations, locker rooms with showers for cyclists, and reduced annual tickets for public transport). These corporate mobility offerings extend the public infrastructure of travel options and represent favorable measures for the adoption of multimodal mobility behaviors. Further, the companies were chosen based on their size (>2,500 / 15,000 employees), one belonging to the private and one to the public sector, and their diverse workforce.

Both companies are situated in the Rhein-Main area, characterized by a high motorized private transport volume resulting in very high congestion levels - particularly during rush hours. The city Wiesbaden has a rudimentary bike lane infrastructure and a well-developed network of public transport. As the participating company is on the outskirts of the city, walking as the sole transport mode for commuting is infeasible for the majority of its employees. The German city Offenbach is located in close proximity to Frankfurt a.M., characterized by a well-developed network of public transport and an average bike lane infrastructure. Walking is feasible for some employees of the second company due to the central location of the company site and a well-developed pedestrian infrastructure.

The mobility managers were contacted via e-mail and interviewed in a pre-study setting to ensure the fit with the research purpose as well as alignment on a suitable sampling procedure. Within these two companies, interviewees were recruited by the respective corporate mobility managers as a convenience sample to reduce researcher selection bias (e.g., Etikan et al., 2016). Therefore, the managers sent circular mails to all employees containing a brief explanation of the academic research project, the concept of multimodality, and the request to participate in a 30–60-minute personal interview without monetary compensation. To participate, individuals had to currently be a multimodal commuter who had switched from monomodal car commuting to multimodal commuting within the last twelve months. While this ensured a clear awareness of the perceived personal benefits of multimodality, this also implied a survivorship bias[1] resulting in potentially overly positive perceptions of multimodal commuting.

Further, we assessed the suitability for participating in the interviews through a screening questionnaire. Thereby, commuters first self-selected through volunteering for participation by identifying themselves as having made the switch. In a second step, they were asked to indicate their current means of mobility options after having made the switch. Finally, we asked about their current multimodal mobility behavior in the interview introduction to ensure sufficient understanding and participant suitability.

While sufficient validity could have been reached with a sample of 20 to 25 participants (e.g., Reynolds & Olson, 2001; van Rekom & Wierenga, 2007), we followed suggestions by previous MEC applications and continued to the point of theoretical saturation (Corbin & Strauss, 2014; Merfeld et al., 2019; Wilhelms et al., 2017). We reached this point after analyzing 34 interviews but continued our analysis for all 40 participants, as the data had already been collected with the objective to further strengthen the validity of four findings. Thereby, we ensured a suitable balance in terms of demographics (e.g., gender distribution 40% male, 60% female; average participant age of 41 where the German average employee is 44 years old). See Table 2 for a detailed description of our resulting sample.

3.2.2. Developing and pretesting interview guide

In the second step, laddering interviews represent the core of the data collection process required for the MEC investigation (Pieters et al., 1995; Reynolds & Gutman, 1988). We chose soft laddering interviews to determine the most relevant attributes and the underlying reasons for the respondent, an approach widely used for the analysis of individuals' motives in the context of transportation (e.g., Schaefers, 2013; Wilhelms et al., 2017). The technique applies the four-level MEC structure: after product and service attributes are interrogated at the beginning, the respondents are questioned on the causes for the significance of each attribute. We subsequently asked once again why the reason indicated was essential. The question was repeated to the saturation point where the tier of the terminal value was achieved, or interviewees could not state any additional reasons (Grunert & Grunert, 1995). Afterward, the same procedure was iterated for the residual attributes which had been indicated in the beginning. Hence, a series of ladders for every interviewee result from a laddering interview (Veludo-de-Oliveira et al., 2006).

Before the execution of the interviews, a review of the interview guide and laddering questions was performed by two independent senior qualitative researchers from different universities to ensure interview quality (e.g., singularity, neutrality, open-endedness), according to Patton (2014). In addition, a series of pretests were conducted in order to determine the interview duration and possible issues related to the overall comprehensibility as well as the questionnaire structure.

[1] Through this sampling criterion, this study does not include employees who did not consider switching, who did consider but did not attempt switching, and those who switched back to multimodal commuting.

3.2.3. Conducting laddering interviews

At the beginning of the semi-structured interview, participants were provided with a well-established definition of multimodality by Kuhnimhof et al. (2006) with the aim of achieving a shared understanding of multimodal mobility behavior. The sequence of questions that followed was arranged from easy-to-answer to complex questions with high abstraction levels. Participants were first questioned on their daily experiences with commuting, the means of transport used, and possible exceptions to the routines as well as underlying reasons. These introductory questions were designed to make the respondents feel well-acquainted with the interviewing procedure (Grunert et al., 1995; Søndergaard & Edelenbos, 2007).

Subsequently, the core interview section consisted of the laddering questions, which were conducted in accordance with Reynolds and Gutman (1988). The laddering interview manifests itself by forcing respondents up the ladder of increasing abstraction for the purpose of revealing the structural facets of customer knowledge as defined in MEC theory. Here, the direct elicitation method (Bech-Larsen & Nielsen, 1999) was initially employed in order to determine the behavioral attributes most important to individuals, which then function as the starting point. This was followed by an interrogation of the importance of each attribute and why the stated reason was significant, moving forward on the ladder until the level of terminal value was achieved or interviewees could not specify other reasons (Allen, 2001). The interviews ended with a question about the participant's current state of mind in relation to the recent switch from monomodal to multimodal commuting. The average duration of an interview amounted to 38 min.

3.2.4. Data analysis

We audio-recorded and transcribed all 40 interviews verbatim. As recommended by Guest and MacQueen (2008), data analysis was performed as a collaborative effort within a group of coders composed of two authors and a PhD candidate and facilitated through MAXQDA. Beforehand, the coders examined the interview transcriptions multiple times in order to become acquainted with the subject. Next, the data analysis began with the three-stage content analysis according to Wolcott (1994), a standard approach in examining MEC data (Gengler et al., 1995; Mulvey et al., 1994): First, the data description was conducted by building upon verbatim quotes of the respondents. Second, we analysed the data to determine encompassing connections, factors, and themes. Third, the data was interpreted in order to comprehend meanings in the broader context. Afterward, the resultant codes were allocated to the four distinct hierarchical tiers of the MEC analysis. The codes were then grouped into categories and concepts. To decrease the number of codes even more, related codes on the same hierarchy level were merged. Throughout this process, we followed the guidelines by Guest and MacQueen (2008) and nominated one coder as the codebook editor to ensure a uniform coding procedure, checked the results for intercoder reliability (Kassarjian, 1977) and performed member checks on exemplary ladders to ensure accuracy (Patton, 2014).

Adhering closely to Reynolds and Gutman (1988), individual MECs were developed for each participant and subsequently amalgamated in a summary score matrix. Table 3 displays exemplary, individual means-end chains for seven of the participants for illustration. Consecutive numbers allocated to the distinct MEC elements were employed to score the elements in each participant's MEC ladders. The summary score matrix was used as a foundation for the construction of an encompassing implication matrix, denoting the frequency at which each concept is related directly as well as indirectly to each other concept. Table A1 (see appendix) displays the overall implication matrix.

The implication matrix functions as a base for the subsequent development of the HVM, which is defined as an illustration of the accumulated MECs in the form of a cognitive structural map comprising nodes and lines linking these nodes (Grunert & Grunert, 1995). Every path in an HVM constitutes an indivudal's MECs and can be considered as the motivational base of individual behavior. Consequently, an HVM reveals valuable findings about interviewees' hierarchical cognitive patterns and enables the derivation of conclusions with respect to the underlying motivational components of a switch to multimodal commuting.

As can be seen from Fig. 2, there is a particular meaning associated with each HVM concept. To guarantee a maximum level of clarity and comprehensiveness despite the relatively high complexity of our HVM, we used different shapes and colour tones for the distinct concept types (see also Schaefers, 2013; Wilhelms et al., 2017). Futhermore, the number of participants making an association is illustrated by a varying thickness of the direction arrows. Therefore, we purposefully selected a cut-off level of ten links to gain a clear and deep understanding of the research subject (de Costa et al., 2004; Reynolds & Gutman, 1988), a procedure commonly used in the MEC context (Bagozzi & Dabholkar, 1994; Gengler et al., 1995; Grunert & Grunert, 1995; Gutman, 1997; Reynolds & Gutman, 1988).

Table 3
Exemplary MECs, .

Respondent	Attributes	Functional consequences	Psychosocial consequences	Values
David	Situative modal choice	Flexible use	Independence	Autonomy
Philipp	Active mobility	Urge to move	Feel balanced	Physical health
Hannes	Car avoidance	Avoid negative environmental impacts	Make a contribution	Sustainability
Sabine	Cost efficiency	Save money	Disposable income	Quality of life
Torben	Car avoidance	Prevent inefficiency	Authenticity	Social desirability
Ute	Avoidance of traffic jams	Save time	Stress reduction	Interpersonal connections
Ivonne	Availability of travel options	Try out	Variety seeking	Fun

adapted from Wilhelms et al. (2017)

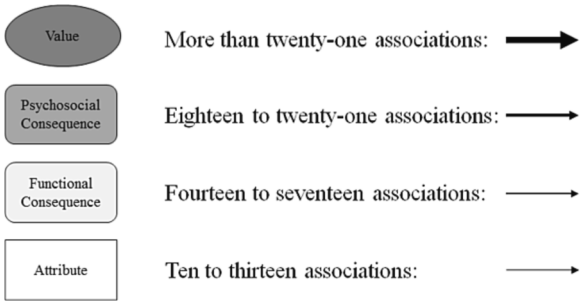


Fig. 2. Description of symbols, .
adapted from Schaefers (2013)

4. Results

4.1. Participant multimodality travel routines

The participants displayed a large variety of multimodal options. However, most of them still use a car regularly (as also visible in Table 2) with an average of 1,6 days per week, 77% still use a private car, and 35% carsharing and carpooling services. For example, Ute states "I would say on three days a week I come by car, on two days I come by bike, although when I come by bike, I just take the S-Bahn for a section in the morning." and Charlotte explained "It always varies when I need the car. Since I live right in the city, during the week, I mostly commute by bus and train, and towards the weekend, because the car is then here at the company, I take the car if I somehow have further trips." Similar to Charlotte, 90% of the participants reported including public transport in their multimodal routing. Their multimodal commuting time varied widely, which can be partially attributed to the divergence in personal commuting distance. While Philip was occasionally fed up with the travel time required "I need, in principle, either with the e-bike about 30 min. That is also completely acceptable for me in terms of time. The other alternative was that I went to the train station, took the train to [town], changed trains there, and then took the bus to[employer], which took an average of 45 min - if things went normally. If things go badly, i.e. worst case scenario, I have been on the road for an hour and a half to an hour and 45 min." Michael cheerfully explained he enjoys the commute "Because it's 22 km from [hometown]. I go with the e-bike and need an hour, and it's a very nice route." Further, many highlighted the use of digital planning tools, such as David "I use a carpool to work, and I got that here through this TwoGo app that we have here at [employer]. (…) it's worked twice this week, I get to work with a carpool. (…) It doesn't work back because the working hours are different. I usually take the bus. If I don't have other appointments, there are also rental bikes directly in front of [employer], NextBike and ESWE Mein Rad, and I usually take the NextBikes, and it works really well to the station and is also faster than in the traffic jam.".

Participants mainly reported positive perceptions of the mobility offers by their companies. As Katja states: "I am completely satisfied with the solution [offered by the company] that I have. There are no frictions." Particularly popular company initiatives included a "mobility day" where employees had the opportunity to test various multimodal options, as well as a mobility challenge where participants were ranked against each other based on the distance commuted by bike. Based on these initiatives, as well as the generally positive attitude towards sustainable mobility, it has to be noted that some participants felt peer pressured to change their behavior. For example, Ute stated "I think it would make me feel bad if everyone rode bikes and I was the only one coming by car. I think that might affect me." In the following, we will elaborate on the specific motivational structures associated with the switch to multimodality.

4.2. Means-end chain and hierarchical value map

The MEC analysis revealed 72 codes as shown in Table 4: 15 attributes, 17 functional and 23 psychosocial consequences, and 17 central values were identified. As multimodal mobility behavior neither constitutes a specific product nor a service offering, the identified attributes relate to the behavioral change from monomodal to multimodal mobility behavior, whereas the values highlight the overarching motivational patterns underlying the switch to multimodal commuting.

On the basis of the intensity of the links between these elements (Gengler & Reynolds, 1989; Reynolds & Gutman, 1988), four dominant routes with five core themes emerge in our hierarchical value map (see Fig. 3): *autonomy, physical health, sustainability, quality of life,* and *interpersonal connections*. We elaborate on the switching motives toward multimodal commuting as well as the additional values and juxtapose our findings with the current state of research in the transportation domain, specifically insights on consumer mobility motives as well as corporate and multimodal mobility behavior.

Table 4
Overview of MEC elements. Attributes Functional consequences Psychosocial consequences Values.

Attributes	Functional consequences	Psychosocial consequences	Values
- Choice to bike	- Urge to move	- Stress reduction	- Autonomy
- Car avoidance	- Flexible use	- Independence	- Quality of life
- Be a passenger	- Save time	- Regeneration	- Physical health
- Availability of travel options	- No need to focus	- Physical well-being	- Sustainability
- Active mobility	- Substitute for sport	- Feel balanced	- Interpersonal connections
- Avoidance of traffic jams	- Recreational use of time	- Environmental consciousness	- Fun
- Cost efficiency	- Prevent negative environmental impacts	- Make a contribution	- Sense of duty
- Avoidance of parking search	- Save money	- Clear conscience	- Fitness
- Situative modal choice	- Be punctual	- Disposable income	- Mental health
- High planability	- Convenience	- Variety seeking	- Economic interest
- Run errands	- Prevent inefficiency	- Reliability	- Security
- Carpooling	- Opportunity for conversations	- Reduced risk perception	- Career
- Unconstrained timing	- Be outside	- Mental and emotional well-being	- Social desirability
- Flexible route choice	- Break habits	- Enhance career opportunities	- To save lifetime
- Accessibility	- Try out	- Disposable time	- Nature
	- Productive use of time	- Time for oneself	- Motivate people
	- Intermodal use	- Fulfil an exemplary role	- Belonging
		- Distinguish oneself	
		- Authenticity	
		- Sense of community	
		- Curiosity	
		- Sociability	
		- Relinquish responsibility	

Elements represented in grey were excluded from the HVM due to associations below cut-off level.

5. Findings and discussion

5.1. Autonomy

The motive *autonomy* links to four main elements: the psychosocial consequence *independence*, the functional consequence *flexible use*, as well as the two attributes *availability of travel options* and *situative modal choice*.

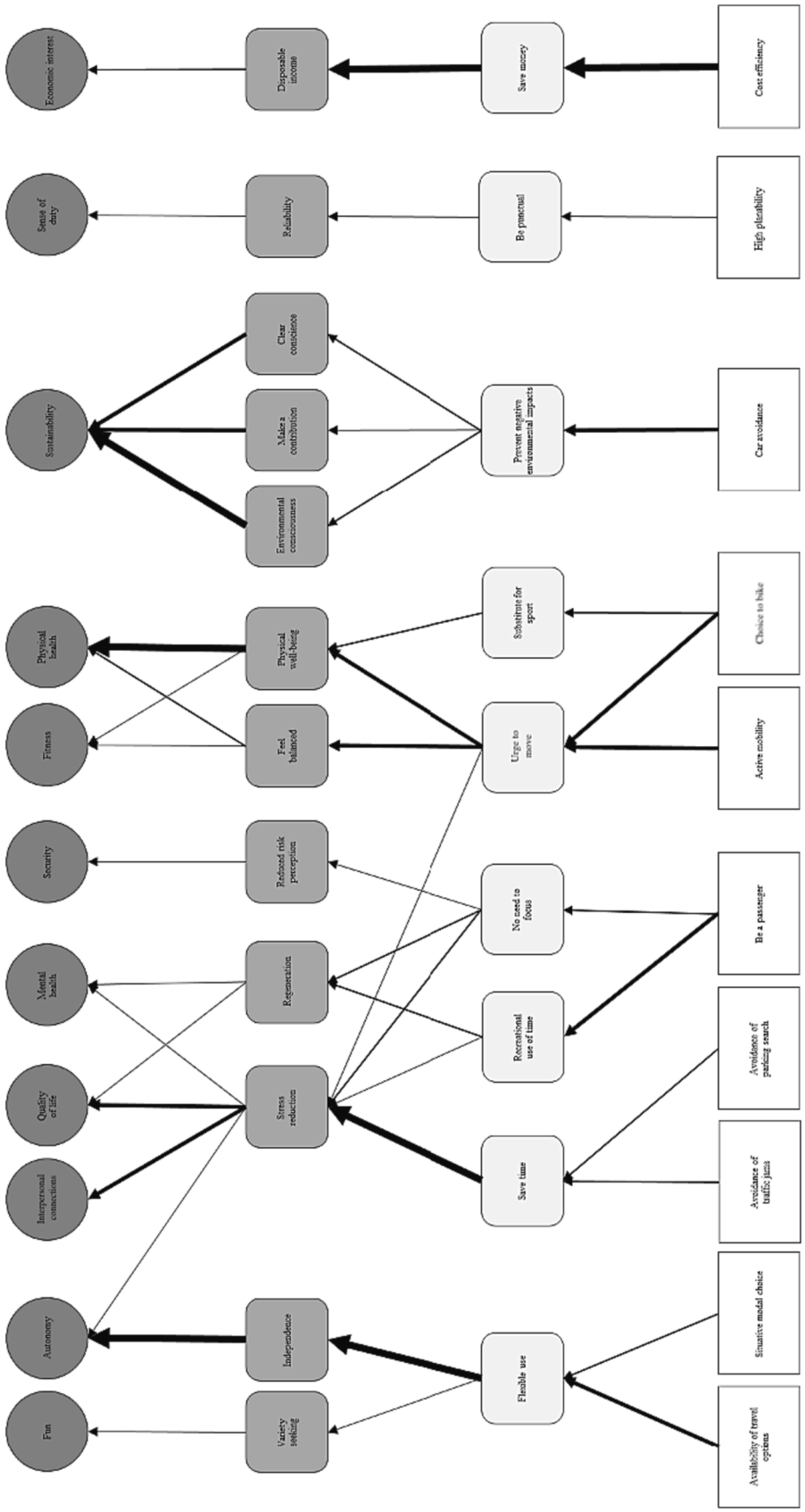
First, the overarching motive of *autonomy* is manifested in the form of a perceived feeling of freedom when commuting multimodally. Michael explains: “You’re just so decoupled from the rest of what is happening in the world and I love that feeling of freedom.”[2] For Katja, the “freedom to say anew every morning that you can choose a means of transport depending on your mood is a privilege.” Furthermore, the desired feeling of freedom goes beyond the commuting context. Katharina explained that she has “a feeling of freedom somewhere. Freedom to know that you can shape your everyday life the way you want.”

Second, interviewees frequently associated the identified core motivational pattern *autonomy* with the psychological consequence of *independence*. As Ralph put it: “What bothered me the most when I still commuted by car every day was the dependency on this one mode of transport. It doesn’t exist anymore.” In addition, the goal of *independence* is rooted in a desire for control. In this context, Torben elaborated: “I feel much more in control of my journey, also because I have the freedom to decide how I want to travel.”

Third, the psychological consequence *independence* links to the functional consequence *flexible use*, which is based on the underlying attributes a*vailability of travel options* and *situative modal choice*. Explaining *flexible use*, Theresa states “Great that, in addition to bus and train, I also have the flexibity to use my bike.” On an attribute level, *flexible use* is associated with the *availability of travel options* for the multimodal commute, as explained by Torben: “If I didn’t have this wide range of travel alternatives for commuting, it wouldn’t be possible to have this flexibility” and Ralph sharing his an appreciation of “this choice between different means of transport.” Beyond attributing the variety of travel options, participants also highlighted the *situative mode choice*, such as Michael and Melanie choosing to bike when the weather is good. She explains “That depends on the weather. I actually look at how the weather is. When it’s like it is today, I like to ride my new e-bike that I bought specifically for that purpose.” And as Ute put it: “I can choose what suits the day best, depending on the day’s program. What is the fastest and most comfortable way to get to my destination? What gives me the most advantages for this day.” The *situative modal choice* is also well elucidated by Susanne: “Depending on what is going on during the day, I can think about what makes sense now and what doesn’t.” and Michael highlights “I’m an avowing fair-weather biker”.

However, there are also multiple participants who address issues associated with *situative modal choice*, *availability of travel options*, and the consequent *flexible use*. The weather as an option limiting factor was mentioned by Katharina, stating “If it is supposed to rain or is too hot, I prefer to take the car” and Ivonne expressing that she feels limited in winter as “If it is so quite bad weather, icy roads, etc., then it [biking] is not necessarily possible”. Also, Jennifer criticised that having multiple mobility options at her proposal can be expensive based on fixed costs “I mean, if I now commit to a weekly ticket or a monthly ticket, I’m often on a business trip or have an appointment somewhere else, and I can use the ticket without fixed costs when I need it or when the weather is good, I don’t buy a ticket but ride my bike.”

[2] All quotes were translated from German by means of the translate–back translate method (Brislin, 1970).



(caption on next page)

Fig. 3. Hierarchical value map with an individual threshold value of 10, .
adapted from Schaefers (2013)

The motive *autonomy* describes the psychologic desire for self-organization of one's own behavior corresponding to personal preferences and internal consistency (Ryan & Deci, 2000; Schikofsky et al., 2020). Moreover, a general perception of freedom of choice as well as a feeling that a person may initiate his or her individual actions, forms the basis of the concept (Deci et al., 2001). At first glance, the *autonomy* motive is at odds with the existing transportation research, which mainly interconnects the concept of autonomy with the private car (e.g., Clauss & Döppe, 2016; Kandt et al., 2015; Kent, 2014; Steg, 2005). For instance, Steg (2005) found that enthusiastic car drivers perceive their automobiles as symbols of social standing, freedom, and independence. The study by Clauss and Döppe (2016) shows that most of the positive affective determinants (e.g., autonomy and freedom) are related to car usage. Furthermore, the study conducted by Jittrapirom et al. (2020) also discussed the issue of an association of private cars with a feeling of independence and freedom, which decreases the likelihood of car users switching to multimodal mobility behavior. A further study by Delbosc and Vella-Brodrick (2015) revealed that mobility independence, due to ownership of cars as well as low levels of mobility disadvantage, were tied to advanced levels of autonomy. Stradling et al. (2001) investigated the attitudes toward different travel modes and revealed that the majority of participants attached great importance to feelings of being in control, independence, and freedom. Their results indicate that the car is associated with these three motives for most respondents. On the other hand, our results support the findings of Schikofsky et al. (2020), who explored the motivational mechanisms underlying the intention to adopt MaaS. According to Schikofsky et al. (2020), MaaS provides a high level of perceived freedom for customized transport solutions as well as transport choices on the basis of individual preferences, which could reinforce a consumer's perceived autonomy to deal with personal transport needs. There are various other studies on MaaS that highlight the need for autonomy and flexibility in the design of MaaS systems (Karlsson et al., 2016; Sochor et al., 2018) and with regard to the structurization of multimodal mobility systems in a broader sense (Spickermann et al., 2014).

Despite the fact that transportation researchers generally agree that many individuals seem to prefer a private car over alternative mobility options due to a number of factors like control and flexibility (Gatersleben & Uzzell, 2007), Stradling et al. (2000) determined that a lack of control (e.g., with regard to sitting in gridlock) is a major cause of stress for motorists. Additionally, Lyons and Chatterjee (2008), as well as Abou-Zeid and Ben-Akiva (2011), demonstrated that situational factors such as delays triggered by traffic congestion, the road behavior of other traffic participants, and the unreliability of public transit services represent the main determinants of stress arising from commutes. This is also reflected in our findings, especially as many participants highlighted the local traffic jams as a burden, such as David stating that multimodal commuting is "faster than being in the traffic jam".

Our findings suggest that in multimodal commuting, the fact that individuals can choose flexibly between a variety of travel options, as opposed to a monomodal car commuter who is restricted to one travel mode, is of relevance. Autonomy, therefore, supports researchers emphasizing the freedom of travelers through increased flexibility in multimodal mobility systems (e.g., Schikofsky et al., 2020; Sochor et al., 2018; Spickermann et al., 2014).

5.2. Physical health

The overarching goal of achieving *physical well-being* represents the psychosocial consequence that influences the interviewees' motive *physical health*. The interviewees mainly highlight the attribute of *active mobility* as being related to the functional consequence of an *urge to move*.

First, Tina argued that multimodal commuting "is also about the idea of using movement on the way to work for the subject of health, getting your cardiovascular system pumping, and so on." Interviewees clearly emphasized different physical components of the *physical health* motive and frequently elaborated on the virtue of becoming "healthier through stronger immune defenses and fresh air", as Jennifer put it.

Second, the psychological consequence *physical well-being* manifests itself in the form of feeling good physically. Sabine elaborated: "You can feel how your own body is doing better." Ralph added that "on the days when I get to work by car, I lack movement. I not only see it on the pedometer of my watch, I feel it. It has to do with well-being. I just feel better when I've taken a few steps."

Third, the functional consequence *urge to move* is best illustrated by Theresa, who explained: "You want to ride your bike more and more, and also for longer distances." Apparently, increasing the degree of movement on the daily commute to work has become a challenge for some of the respondents. Respondents get used to the physical exercise in their everyday working lives and want to increase the level of exercise continuously. Magdalena added that "once you've tried it, you can't get enough of it."

Fourth, the attribute *active mobility* does not only refer to the classical active transport mode of cycling but also to walking, which can occur in an intermodal commuting context, as explained by Charlotte: "And that, of course, I always have to walk to and from the bus stop in the morning and in the evening". For Susanne, every opportunity to move during the commute counts: "Well, you just sit in the office all day, and then I think it's really nice in the morning when you can cover a few more meters on a bike or on foot." Even the commute by public transport can be characterized by the attribute of *active mobility*, as Ralph put it: "When I commute by public transport, I am forced to walk a lot more." However, Ulrike also pointed out that the local infrastructure is not made for active mobility

such as walking: "I also find the pedestrian traffic lights extremely annoying. You can clearly see that they are only designed for cars. I find that simply unacceptable. So if you have to stop somehow three times as a pedestrian to cross a street, I find that impossible."

According to Frederick et al. (2018), car-dependent towns are characterized by negative health outcomes in contrast with multimodal towns. In accordance with this finding, Hilbrecht et al. (2014) and Oliveira et al. (2015) proved a negative relationship between the length of a car commute and the traveler's self-assessed physical health. According to Halla and Zweimüller (2013) and Mouratidis (2019), potential adverse health effects related to commuting comprise, among others, a greater risk of accident and a higer risk for cardiovascular disorders due to polluted air.

Our findings are in line with the existing research agreeing that multimodal usage of active modes of transport is related to a series of positive health-related effects (e.g., Caggiani et al., 2020; Clauss & Döppe, 2016; Kuhnimhof et al., 2010). Clauss and Döppe (2016) find healthy activity to be an underlying reason why individuals select particular travel modes. Furthermore, the Danish study by Olafsson et al. (2016) investigated how biking is part of multimodal mobility behavior and identified five different multimodal travel segments. They emphasized that the advantages of cycling comprise the reduction of CO_2 emissions and noise pollution as well as the improvement of public health and public life in urban areas. A series of further studies also dealt with cycling and related positive health impacts (e.g., Buehler et al., 2019; Dill, 2009). The connection between health and commuting in a broader context has been addressed in distinct ways. Christian (2012) and Künn-Nelen (2016) investigated the relationship between commuting time and health. Moreover, positive impacts of active commuting on individuals' health have been proven by Shephard (2008), Sahlqvist et al. (2012), Singleton (2019) and Ellis et al. (2016). Gatersleben and Uzzell (2007) found that, due to delays and other participants in traffic, individuals commuting by car perceive their journey as more stressful than commuters opting for other modes. They concluded that traveling on foot or by bike is the most relaxed and thrilling, and hence ideal travel means from an affective viewpoint (Gatersleben & Uzzell, 2007). Counterintuitively and contrary to previous research showing that walking in connection with transfers is generally perceived as a burden (e.g., Cheng & Tseng, 2016; Guo & Wilson, 2011; Liao et al., 2020), we find that walking as part of an intermodal commute is partially viewed as positive in terms of potential additional physical activity within our sample.

5.3. Sustainability

The sustainability motive is characterized by *environmental consciousness*; *make a contribution*; and *clear conscience* as psychological consequences; *prevent negative environmental impacts* as a functional consequence; as well as *car avoidance* as an attribute.

First, in contrast with the other motivational patterns, the *sustainability* motive is associated with interviewees' wish for more indirect advantages by means of switching to multimodal commuting and can be classified as altruistic. A frequently occurring sub-aspect of the sustainability motive was the concept of 'intergenerational equity' (i.e., acting fairly towards future generations) (Litman & Burwell, 2006; Sato & Yonekawa, 2003) as outlined by Ulrike "When it comes to mobility, we cannot and should not only think of ourselves. Above all, it is about the lives of our children and grandchildren." Hence, the motive of *sustainability* does not only refer to obvious environmental issues but also to the potential indirect effects of current mobility behaviors on the environmental conditions of subsequent generations (Black, 1996; Greene & Wegener, 1997; Gudmundsson, 2004).

Second, a wide range of respondents attached great importance to the psychosocial consequences *environmental consciousness* - defined as specific psychological factors that are related to the consumers' inclination to engage in pro-environmental behaviors (Sanchez & Lafuente, 2010) – and *clear conscience*, relating to an individual's desire to prevent feeling bad about, for instance, wasting finite resources or harming the environment in some other way. Surprisingly, the respondents repeatedly emphasized the high importance of their desire *to make a contribution* to environmental protection. For instance, this psychological consequence is clarified by Theresa: "It's just my contribution against climate change. Personally, I don't benefit that much from it at first. I don't even feel it at first, but that's my contribution."

Third, among our participants, there was a consensus that the attribute *car avoidance* enables the functional consequence to *prevent negative environmental impacts*. In this context, Jennifer explained: "If even every second employee were to forego driving a car once a week, massive emissions could be saved." Torben further elaborated: "That is also the reason why I try to avoid driving as much as possible." However, it also has to be acknowledged that there some participants felt stigmatized if they commuted unsustainably. For example, Ivonne pointed out: "I drive a [car with a] small gasoline engine (…). I don't want to hear any accusations from colleagues who come by bike every day. […] I'm a person who needs harmony and simply doesn't want to cause any trouble. Otherwise, I'm the one with the bad reputation for polluting the environment."

Environmental motives have been found to be of vital importance in consumer decision-making in the field of mobility behavior (Herberz et al., 2020). Interestingly, the *sustainability* theme and multimodality were frequently mentioned in one breath (e.g., Clauss & Döppe, 2016; Heinen & Chatterjee, 2015; Molin et al., 2016). In contrast to the findings of Barnes and Mattsson (2016) as well as Wilhelms et al. (2017), interviewees clearly indicated that the psychosocial consequence of *environmental consciousness* formed part of their decision to switch from monomodal to multimodal commuting and was not just considered a subsidiary effect of the behavioral decision. Thus, our findings are in line with Clauss and Döppe (2016), who also identified *sustainability* as a key determinant of transportation choice. Our results are also confirmed in the commuting context by Jia et al. (2018) and Clark et al. (2016),

demonstrating that pro-environmental attitudes encourage the switch from car commutes and that low-carbon habits and knowledge affect commute mode choice. Nonetheless, according to Heinen and Mattioli (2019), there is a weak association between the multimodality level and CO_2 emissions. Only if controlling for travel activity levels (travel distance and frequency) can a moderate relation in the expected direction be identified (i.e., a higher multimodality level is related to lower emissions).

5.4. Quality of life

Respondents emphasize the functional consequence of *saving time* in connection with the attributes *avoidance of traffic jams* and *avoidance of parking search* as well as the functional consequences *recreational use of time* and *no need to focus* in connection with the attribute *be a passenger*. All of the three functional consequences are associated with the psychological consequence of *stress reduction*, leading to the motive *quality of life*.

For Katharina, the end of the workday starts early, illustrating the connection between *quality of life* and *stress reduction*: **"**You start to recover as soon as you leave work. With the car, it is more stressful and not the case. My end of work only starts when I am home and have left the car." For Julieta, quality of life lies in "work-life balance because I just think that you need a private compensation for a stressful professional life. The earlier this balance begins or the longer it lasts throughout the day, the better." Apart from the work-life balance aspect, a further manifestation of the overarching motive of *quality of life* was highlighted by Torben: "In everyday life, this could be described as an increased attitude toward life or a better quality of life. If I'm just tense all day long and just working, what kind of life would that be?"

Second*, avoidance of traffic jams* and *avoidance of parking search* allow one to *save time*, as Nina put it: "I can avoid traffic jams really well with my bike." Ralph further elaborated: "When things go smoothly with public transport, I sometimes sit on the train and am happy when I think about the fact that I can spare myself from sitting in a traffic jam at this moment." Michael further explains: "Ok, so when I'm driving, my mind goes to: hopefully, there's no traffic jam, and I'll get across the bridge okay. Otherwise, I find it very stressful, so even when I tell myself: it's just a traffic jam, and it might take 10 min longer. But it still stresses me out. (…) I go with the e-bike and need an hour, and it's a very nice route. (…) This way, I feel really good all day. Instead of taking the car first, then working here, and then going back by car."

Third, to *be a passenger* is an attribute allowing commuters to benefit from a *recreational use of travel time* and leading to the functional consequence that there is *no need to focus* on the driving activity. Anastasia uses her commute for relaxing, stating"I find it relatively relaxing when I don't have to drive myself."

However, there were also participants highlighting negative aspects opposing the functional consequence *save time*. For example, Philipp complains about extra travel time as a result of multimodal commuting; instead of 30 min commute "If things go badly, i.e. worst case scenario, I have been on the road for an hour and a half to an hour and 45 min." and Astrid explains that being a passenger also has downsides as " it varies a lot. Sometimes it goes well, and sometimes it's a bit difficult because then somehow the connections can't be reached or passengers are a bit annoying."

The existing transportation literature shows a controversial picture regarding the interrelation between automobility and quality of life. Traditionally, access to automobility has been positively associated with quality of life on the individual level through e.g., access to relevant activities outside the home (Morris et al., 2020) and comfort, flexibility, and speed (Redman et al., 2013). This individual perspective on quality of life has recently been more challenged in the broader context of societally sustainable transport (e.g., Steg & Gifford, 2005). Also, access to mobility in a broader and more general sense has shown to improve quality of life, e.g., for the elderly (Schwarzlose et al., 2014; Spinney et al., 2009). In their study on consumer motivations to be driven by autonomous vehicles, Merfeld et al. (2019) also highlight the association of the quality-of-life motive with the psychosocial consequences of peace of mind (comparable to our psychosocial consequence of *stress reduction*) and the meaningful utilization of time.

Our findings of *quality of life* as an overarching motivational pattern to commute multimodally are supported by Teunissen et al. (2015) as well as Talmage and Frederick (2019), who showed that multimodality is related to improving quality of life. However, we go significantly beyond previous studies on the link between quality of life and multimodality by providing an in-depth understanding about the relationship between multimodality and quality of life from a consumer perspective. Opposed to mainly objective measures in previous studies, the *quality-of-life* motive identified in our study is a subjective perception that can be classified as a gain goal (Lindenberg & Steg, 2007), which relates to the benefit of time savings and the resulting stress relief in the context of everyday commuting. Hence, our findings can be distinguished from the view of the quality-of-life concept in other studies focusing on a relationship between quality of life and health measures (e.g., Ellis et al., 2016; Talmage & Frederick, 2019), access and quality public transport (e.g., Shafer et al., 2000) or urban livability and environmental sustainability (e.g., Conroy & Beatley, 2007; Speck, 2013).

Many of our participants put the subjective quality of life they experience in multimodality in contrast to automotive commuting and being stuck in traffic. This is in line with previous studies suggesting a negative effect of monomodal car commutes on quality of life (e.g, Crane et al., 2016). Compared to commuting by bicycle, public transport, or walking, the authors demonstrated that unimodal motor vehicle commutes have the strongest negative impact on quality of life. Rüger et al. (2017) further support our results by showing that stress, as experienced in traffic jams, mediates the relationship between commuting and quality of life. The negative

impact of unimodal commuting by car on quality of life has also been investigated in relation to various specific subjective measures of quality of life, such as life satisfaction (e.g., Olsson et al., 2013), satisfaction with one's own family (Lorenz, 2018) and job (Stutzer & Frey, 2008) as well as leisure time (Dickerson et al., 2014).

5.5. Interpersonal connections

The psychosocial consequence *stress reduction* and the connected functional consequences *save time, recreational use of time,* and *no need to focus* through the attributes of *avoidance of traffic jams, avoidance of parking search*, and *be a passenger* are important to interviewees because this improves their *interpersonal connections.*

Before the respondents' switch to multimodal commuting, a commonly raised issue was the adverse effect of commuting stress on one's private life. Hannes explained: "The risk was always that a dispute with my wife or my children was inevitable because I was annoyed by the stress of car driving. Today I come home after work, my daily sports program is already over, and I want to spend some quality time with my family." This quote demonstrates well that by switching to multimodal commuting, interviewees could realize the psychosocial consequence of *stress reduction* leading to a higher level of *interpersonal connections*. For Ute, the advantage of *stress reduction* related to commuting was "coming home in a good mood in the evening so that everyone else involved doesn't have to endure my bad mood when I get home." Similarly, Tina underlined the positive effect of *stress reduction* on personal relationships: "I come home more relaxed and meet my family in a completely different way." In particular, respondents reported a decreased probability of conflicts with relatives or partners. For example, Nadja attached great importance to "arriving at home relaxed, so that you can benefit from me at home and there are no bad moods or arguments."

In sum, in contrast to the motive *quality of life*, the motivational pattern *interpersonal connections* is focused on the impact of one's daily work-related mobility on social relationships in the respondents' private life. Participants stated that stress from car commuting or stress which could not be relieved during commuting impaired their social relations (e.g., family members or partner). This supports the findings of Cohen (1980) and Novaco et al. (1991), which demonstrate that commuting stress can worsen behavioral and emotional deficits upon arrival at home or at the workplace. Whereas other researchers establish a negative connection between commuting time and social isolation (Zhang, 2017), social connections (Putnam, 2000), and social participation (Chatterjee et al., 2020; Mattisson et al., 2015), interviewees explicitly put emphasis on *stress reduction* as a perceived gain, enhancing their private lives through the availability of more balanced and harmonious time with relatives, partners, or friends. A switch from monomodal to multimodal commuting thus offers quality time: time which can be spent harmoniously with family and friends.

5.6. Further motivational structures

In accordance with classical economic thinking, which states that individuals are primarily motivated to decrease the expenses for their transportation and to optimize their individual level of safety, we found that the instrumental motives *economic interest* and *security* were a motivator for respondents to switch from monomodal to multimodal commuting. Torben illustrated the *economic interest* by explaining: "150 euros more or less that I have to pay a month are also an essential point. I save that now with the car and instead I can afford a city apartment and can move from the outside area into the inner city area." Hensher (1985), Schaefers (2013), and Wilhelms et al. (2017) showed that the theme of *economic interest* represents a core motivational driver of particular mobility behaviors. Furthermore, it was shown that *economic interest* has a significant effect on mode choice in commuting (e.g., Ha et al., 2020). Also, according to Ton et al. (2020), reimbursement by the employer for the use of a particular means of transport has the strongest impact on commuting mode choice.

In addition, the *security* motive is demonstrated well by Magdalena, stating that: "To be constantly aware that you are currently in acute danger. You see more and more accidents. I don't have such thoughts when I'm on the train or on my bike." The instrumental motive *security* has been revealed as a decisive motive for using sustainable alternatives instead of the private car (Herberz et al., 2020), although Steg (2003) and Steg (2005) demonstrated a positive association between perceived safety and car usage. Counterintuitively, the two instrumental motives did not emerge as core switching motives.

Another unexpected finding was the motivational pattern of *fun*, which is related to the psychosocial and functional consequences of *variety seeking* and *flexible use* resulting from the attribute *availability of travel options*. Traditionally, hedonic motives related to pleasure and enjoyment have been mainly examined in the context of car driving (e.g., Ellaway et al., 2003; Steg, 2005; Steg et al., 2001). In the context of multimodality, respondents show feelings of fun in a variety of ways. For Thomas, it was "just beautiful and fun to travel in different ways." Similarly, Andrea added that "At the same time, it's just a lot of fun to get over your routines and try something new." For the majority of respondents, the motive of *fun* arises from the opportunity to vary different means of transport, as outlined by Anastasia: "In a way, it's just fun to vary it up a bit."

Lastly, *sense of duty* emerged as another unexpected motive for switching to multimodal commuting. A *high planability* is the prerequisite for *being punctual*. The overarching goal of *reliability* represents the psychosocial consequence which influences the respondents' desire for *sense of duty*. Specifically, participants saw the high planability that multimodal commuting offers (e.g., choosing to bike which means that the exact travel time is known as opposed to the uncertainty of being stuck by car in a traffic jam) as a means

to be on time, thereby being perceived as being reliable and fulfilling their duty at the workplace. This is best illustrated by the extensive explanation by David: "This is about work. I have to be able to plan, and it has to work. I am also time-bound. I can't arrive at work at just any time. Most of the time, the first appointments start at nine o'clock, and that's almost always the case for me so that the calendar starts relatively quickly with appointments. And then you just have to be here. So it's about my sense of duty." There seems to be a convergence of views that work obligations can be met most reliably by commuting in a multimodal way. As Ivonne put it: "On days like this, I clearly prefer to take the train and ride my bike, so that I can always get to work on time and fulfil my obligations on schedule."

However, there are also participants pointing out limited planability and issues with reliability. For example, David states that carpooling has its downsides as "(…) it doesn't always work if the person is on vacation or at a seminar or something, or if my times don't fit one hundred percent (…)". Further, Thomas explains that for extreme times, multimodal commuting becomes less plannable and consequently reliable "For late shifts and night shifts, I always drive. Our late shifts last until 11:15p.m., and after that, the connections with the train are so bad that the train only has to be "pushed aside" to let a delayed Inter City train through, and my last connecting train in Mainz is already gone." and Ivonne agrees "The return trip usually goes worse, so on the return trip in the evening you usually already have to expect delays." For Astrid, this is annoying, "because you actually always have to plan a little bit more [time] if you have a follow-up appointment somewhere else."

A wide range of attitudinal and qualitative research endeavors on transportation choice have shown that the dependability, punctuality, and reliability of a particular means of transport represent highly significant features for travelers (e.g., Bates et al., 2001; Carrion & Levinson, 2012) and higher levels of stress in commuting are reported for situations in which there is less control regarding external factors like deadline pressure and traffic jams (e.g., Gatersleben & Uzzell, 2007; Sposato et al., 2012). However, *sense of duty* has not yet been addressed as a motivational driver of a particular mobility behavior, which is particularly surprising in the field of multimodal commuting.

6. Conclusion

Despite attempts to foster multimodal mobility for commuting to reach sustainability goals, the majority of employees still habitually commute monomodally by car. Accordingly, policymakers, managers, and multimodal mobility service providers require guidance to foster a switch to multimodal mobility. However, there is limited academic guidance on motivating consumers to switch from monomodal to multimodal commutes, despite calls for "further research […] in order to facilitate city travellers' shift to intermodal travel" (Dacko & Spalteholz, 2014, p.231). To this end, this paper explores the overarching motivational structures of consumers who switch to multimodal mobility offers by applying the means-end chain analysis.

6.1. Theoretical implications

Our research has implications for three academic discussions: consumer behavior in multimodality, mode switching, and commuting contexts.

First, we broaden the mainly quantitative discussion on multimodality by adopting a consumer-centric perspective and qualitatively identifying five primary and three secondary motivational patterns. Interestingly, while motivations such as *physical health* and *sustainability* have been more frequently associated with multimodality, we point out that *quality of life* and *interpersonal connections* can also motivate behavioral change. Specifically considering the negative impacts of commuting on the subjective *quality of life*, multimodality could help to overcome these issues. Remarkably, we find the motive *autonomy*, which traditionally has been a selling point of automotive mobility, to be a motive to switch to multimodal commuting. We encourage future research to further investigate the facets and impacts of autonomy in different multimodality contexts.

Second, we contribute to the discussion on switching from monomodal to multimodal transportation and thereby answer the calls by Clauss and Döppe (2016) as well as Skarin et al. (2019) to investigate further how to motivate individuals to change their travel behavior to more sustainable and innovative multimodal modes of transport. We can now point out specific attributes of multimodality (e.g., *availability of travel options*, *situative modal choice*) and the associated consequences (e.g., *independence*, *stress reduction*) and motivations (e.g., *autonomy*, *physical health*) that can lead to this decision. We encourage future researchers to extend our findings to the realm of psychology and marketing to explore the underlying psychological mechanisms to identify specific triggers of the consumer decision to switch to multimodality.

Third, we contribute to the discussion on commuting with the first study of consumer multimodality motivations. Our findings support that multimodal commuting is perceived as means towards better physical health, higher quality of life, sustainability, and better interpersonal connections by consumers. Interestingly, while the literature highlights convenience and economic motives impacting commuting choices (Ha et al., 2020; Van Malderen et al., 2012), those were only of secondary relevance for our participants. Accordingly, we encourage further research to explore the effectiveness of highlighting social and health incentives (e.g., workplace cycling groups) in commuting.

6.2. Policy implications

Our findings provide explicit guidance for policymakers to foster the desired increase of multimodal mobility (European Comission, 2018) and, specifically, a shift to multimodal commuting (Deloitte, 2019).

6.2.1. Awareness through targeted communication

There exists limited awareness of the multimodality concept in general and the personal benefits for the individual in particular in society (e.g., Dacko & Spalteholz, 2014; Groth, 2019). The identified motives provide the base for shaping the perspective of consumers currently unaware of multimodal offers as well as a behavioral segmentation of the mobility consumers based on the individual benefits sought (Assael and Roscoe, 1976). To attract these uninformed consumers and segments, we encourage policymakers to invest in educational campaigns to raise awareness for the multifaceted benefits of multimodality with the goal of broadening the perspective from commuting as part of the job to commuting as part of creating a healthy work-life balance. Campaigns could address, for example, the new form of independence that multimodality provides or highlight the social benefits of arriving at home relaxed.

6.2.2. Investments in infrastructure

To foster the reliability (sense of duty motive), flexibility (autonomy and fun motive), and time savings (quality of life and interpersonal connections motive) of multimodality that motivated our participants, policymakers should invest in providing the physical and digital infrastructure for all multimodality options. In the public sphere, this means, for example, building safe bike lanes or optimizing transfer time for multimodal journeys. Simultaneously subsidizing intelligent corporate infrastructure comprising, for example, bike-, car- and scooter-sharing stations on company premises will be key for a widespread shift to multimodal commuting.

6.2.3. Create employer incentives

Many countries still incentivize employers to offer automotive mobility solutions (e.g., tax exemptions for company cars) to their employees instead of the freedom to choose (e.g., via mobility budgets). While our findings attribute secondary importance to financial incentives from the employee side, providing financial support for the integration of sharing services on the company grounds, showering facilities for runners, or providing educational support for integrating multimodality in social, health, and fitness programmes can lower the barriers to commute in multimodal ways.

6.3. Managerial implications

Our findings provide explicit guidance for corporate mobility managers as well as mobility service providers to develop and communicate attractive multimodal mobility offers.

6.3.1. Service design guidance

First, our findings provide detailed insights into functional attributes associated with motivations for multimodal behavior (e.g., active mobility, availability of travel options). Accordingly, they can serve as the basis for developing distinct multimodality service features, such as displaying a large variety of multimodality options in digital platforms to suggest a broad spectrum for autonomy-seekers (e.g., multiple carsharing providers) or integrating fitness tracking features for healthy multimodal options (e.g., biking).

6.3.2. Marketing strategy implications

Our findings support mobility managers in improving the positioning and communication of their services by emphasising the customer-related consequences, which can be accomplished by adopting multimodal mobility behavior. Offering a workout instead of a transport service, a sense of community instead of bikesharing or a mode of relaxation instead of a public transport ticket can be a useful value proposition. Especially for consumers unaware of multimodal options, this could be a valuable means to shape their perception. For consumer who are aware of such options, but have not changed their behavior so far, this could provide the needed impulse and incentive to change their habits.

6.3.3. Messaging contrasts to automotive monomodality

The motivational structures identified have a common theme – superior mobility experiences and results compared to automotive monomodal mobility. Given that automotive monomodal mobility presently enjoys the connotation of superiority and convenience, we recommend building on the narrative of autonomy in the multimodality context for promoting multimodal services. Being free from the negative externalities, burdens of ownership, and the space limitations of traffic jams and parking spaces, multimodality features should be contrasted with these limitations and emphasized in communicational campaigns.

6.4. Limitations and avenues for future research

When considering the results of our study, the following limitations should be considered. First, the present paper applied a cross-sectional study design and explored motivational patterns influencing the decision to switch from monomodal car commuting to multimodal commuting. As preferences with regard to commute mode choice can evolve over the course of time (Habib et al., 2014), a drawback of this study is that changing mode preferences cannot be accounted for. In order to capture such changes in preferences, a longitudinal design might yield interesting findings on the stability of motive structures against the background of a changing and likely growing offer of mobility alternatives. Fellow researchers are also invited to conduct panel travel surveys (Golob et al., 1997).

Second, MEC analysis has its limitations. First, the assumption of unidirectional relations between the distinct elements has been contested by Rekom and Wierenga (2007), as it constitutes a simplification by virtue of the fact that the existence of recursive relations among MEC elements may be possible in reality (Schaefers, 2013). Despite a lack of substantial evidence that the presence of recursive relations can be derived from our data, it may be an interesting area of future research to identify potential relations. Moreover, MEC

analysis represents a qualitative research method with an exploratory nature (Reynold & Gutman, 2001). Associated with this approach is the relatively small sample size, which does not permit quantitative deductions (Wilhelms et al., 2017). Further, the method does not allow for the results being analyzed based on demographic criteria or allow for differentiations between consumers aware or unaware of multimodal offers and their benefits. Thus, the quantification and validation of the motivational patterns obtained through a structural equation model would offer a promising avenue for future research. Additionally, such a quantification of the results would allow for the assessment of demographic characteristics potentially impacting the motivations to switch. To assess causalities for raising awareness of the identified benefits and consequent actual changed in travel behavior, we suggest conducting a stated preference experiment for determining ideal mobility bundles for distinct target groups as well as highlight the opportunity of a natural experiment (e.g., comparing employee behavior in different companies based on respective multimodal mobility communications).

Third, we defined very restrictive selection criteria for the sampling. Only self-selected commuters who had switched from monomodal to multimodal commuting within the last twelve months were interviewed. However, as noted in the methods section, this implies a survivorship bias by excluding employees who did not consider switching, did not try, or stopped prior to the selection phase, which could have led to overly positive results. To create a more nuanced picture for future studies, the consideration of prospective multimodal commuters who are monomodal car commuters could be promising to reveal motivational patterns based on expectations. In addition, we invite fellow scholars with access to monomodal car commuters who refuse to change their mobility behavior toward multimodality - despite having alternative modes of transport for commuting at their disposal - to conduct a study with a focus on behavioral change barriers. In that way, in-depth knowledge about resistance factors could be obtained, which may be useful for sustainable transportation policy development. The same applies to current monomodal public transport users. Further, exploring motivations of consumers to switch back to monomodal commuting after being multimodal could provide valuable insights into sustaining such behavior.

Fourth, as previous research indicates that infrastructural and demographic developments are essential in understanding changes in mobility behavior (e.g., Klinger, 2017), we chose a sampling approach that provided us with a sample of comparatively stable personal circumstances (e.g., constant employment, infrastructure) and that was based on a conscious choice to switch mobility mode. We further explicitly investigated the reason for changing mobility behavior to exclude such factors. While only one participant reported a significant change (removing her car), we can not fully exclude that participants were exposed to an unconscious change in their environment. We accordingly encourage future research to experimentally contrast our findings with structural changes to explore their comparative relevance to consumers in their mobility decision.

We intentionally restricted our investigation to corporate mobility, more precisely commuting. Nevertheless, because behavioral motives and travel preferences regarding leisure mobility and work-related trips can vary (e.g., Feng et al., 2014; Jia & Fu, 2019; Jones et al., 2016), future studies should assess the motive structures underlying multimodal mobility behavior related to leisure activities. Also, the study did not consider potential rebound effects of consumers changing their leisure travel behavior, despite potential sustainability impacts. When taking these two aspects into account, an even wider portfolio of multimodality motives can be elaborated, and target-group-specific sustainable transport policies developed.

In addition, our study is characterized by a geographical restriction to Germany. However, variations with regard to cultural circumstances, perspectives toward private passenger vehicles, willingness to change and adopt novel behaviors, and further local idiosyncrasies may have an impact on the motivational patterns underlying a switch from monomodal to multimodal mobility behavior (Heinen, 2018). For instance, the mobility budget law in Belgium[3] could cause diverging results in light of a highly favorable treatment of various mobility alternatives to the car and fewer tax advantages for the car (Zijlstra et al., 2019). Thus, an area of further research may be the juxtaposition of our results to findings from other cultural and geographical territories.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CRediT authorship contribution statement

Sebastian Timmer: Conceptualization, Methodology, Formal analysis, Visualization, Writing – original draft. **Katrin Merfeld:** Conceptualization, Methodology, Supervision, Validation, Writing – review & editing. **Sven Henkel:** Conceptualization, Methodology, Supervision, Writing – review & editing.

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.

[3] The Belgian government introduced legislation to make multimodal mobility for commuting financially more attrative compared to the traditional subsidies for a company car. In the mobility budget, employees can choose to take an environmentally friendly company car, sustainable transportation solutions (e.g., biking, shared mobility, public transport) and a cash payout (Deloitte, 2019).

Appendix A

Table A1. Implication matrix.

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
(1) Choice to bike	18,0	5,0	1,0	5,0	15,0	3,0	5,0	1,0	1,0		7,0	10,0	3,0		1,0		1,0	0,9	0,4	0,11	0,18	0,11	0,2	0,5	0,1	0,3			0,5	0,2		0,4	0,1	0,1	0,4		0,6		0,1		0,8	0,10	0,19	0,3	0,5	0,7	0,1	0,2	0,13	0,5	0,4	0,3		0,5	0,1	0,1	0,6
(2) Car avoidance	1,0	1,0	1,0	5,0			1,0	17,0	20,0	1,0			4,0		4,0			0,6	0,2	0,1	0,1	0,1	0,21	0,2	0,15	0,17	0,1	0,3		0,2			0,8	0,2	0,6	0,6	0,1	0,3		0,1	0,2	0,1	0,1	0,26	0,6	0,4	0,10	0,4		0,12	0,2	0,1	0,1	0,2	0,2	0,5	
(3) Be a passenger			1,0	16,0		2,0	20,0		1,0		3,0					11,0		0,15	0,2	0,19		0,2	0,1	0,3	0,2	0,1		0,14	0,3			0,9	0,3		0,1		0,2	0,3	0,4	0,10	0,1	0,1	0,4	0,3	0,5	0,16		0,8	0,5		0,5		0,1	
(4) Availability of travel options	2,0	19,0	1,0		1,0	3,0	2,0	1,0	1,0			4,0		8,0		7,0	0,4	0,17	0,4			0,1	0,1	0,3	0,1		0,1	0,1	0,8	0,2	0,1	0,3						0,5	0,1		0,19	0,7	0,1	0,3	0,3	0,11	0,1	0,2		0,1					0,4	
(5) Active mobility	21,0			8,0		1,0					9,0			1,0		1,0	0,10		0,5	0,16	0,15		0,3				0,2	0,1			0,1			0,1					0,2	0,6	0,21		0,3	0,2		0,1	0,9	0,1	0,5		0,4				
(6) Avoidance of traffic jams			15,0	8,0		1,0	3,0						8,0					0,20	0,3	0,2				0,3			0,2	0,6		0,4		0,5								0,4	0,5		0,7		0,6	0,2		0,2	0,6		0,1	0,6			
(7) Cost efficiency										25,0																0,25														0,1	0,9			0,2						0,16					
(8) Avoidance of parking search			14,0		1,0		1,0						1,0					0,14		0,1				0,2				0,6		0,1											0,1	0,7		0,6		0,1			0,1	0,1		0,1				
(9) Situative modal choice		15,0			4,0								1,0					0,4	0,11					0,2				0,1	0,3	0,1										0,14	0,5		0,1	0,1										
(10) Run errands		5,0	3,0		5,0													0,6	0,5																					0,5	0,3		0,1									0,1		
(11) Carpooling					1,0		3,0		1,0	4,0		1,0						0,1					0,2	0,2	0,2	0,2	0,1	0,3					0,2				0,1	0,3				0,3		0,3	0,1	0,3		0,1		0,1		0,1	
(12) Unconstrained timing		4,0	3,0		5,0													0,4	0,7	0,1								0,1	0,1	0,1			0,1							0,8	0,2			0,1						0,1				
(13) High plannability			1,0										11,0					0,5	0,2											0,10										0,1	0,1			0,9	0,1		0,1		0,2					
(14) Flexible route choice		6,0	1,0	1,0							2,0	2,0					1,0	0,3	0,5											0,2				0,1							0,6		0,1		0,1	0,1						0,2	0,1		
(15) Accessibility			2,0		5,0				1,0					1,0				0,2		0,1			0,1	0,2				0,1	0,2							0,1		0,1	0,1	0,2	0,3			0,1	0,1	0,1								
(16) Urge to move																		13,0		7,0	20,0	21,0		3,0		1,0		2,0		1,0		1,0	1,0		1,0					0,2	0,8	0,27		0,3	0,4		0,2	0,14	0,1	0,4		0,4		0,1	
(17) Flexible use																		9,0	27,0					2,0					10,0	1,0		1,0		1,0		1,0	1,0			0,30	0,5	0,1		0,3	0,9			0,2				0,1			
(18) Save time																		22,0	4,0	2,0				4,0				2,0	12,0		2,0	1,0		2,0					0,5	0,10	0,1		0,10		0,1	0,3	0,1		0,3	0,7		0,1	0,1		
(19) No need to focus																		17,0	1,0	14,0		2,0		3,0				5,0	1,0		3,0		10,0					2,0	0,2	0,7	0,1		0,7	0,2		0,6			0,4	0,5		0,1	0,12	
(20) Substitute for sport																		3,0		3,0	14,0	5,0		2,0	1,0				7,0			3,0							0,4	0,6	0,13		0,4	0,2		0,1	0,11		0,1	0,2		0,2		
(21) Convenience																		9,0	9,0	3,0	1,0	1,0		2,0				3,0	2,0	1,0	3,0	1,0							1,0	0,10	0,10		0,2	0,1	0,1	0,3		0,1		0,1				
(22) Recreational use of time																		13,0	1,0	16,0	2,0	2,0		2,0				3,0	2,0			8,0							1,0	0,2	0,12	0,1		0,3	0,1		0,5	0,1		0,8	0,6				
(23) Prevent inefficiency																		3,0	1,0			9,0	2,0	9,0	7,0			2,0					4,0	1,0	2,0	3,0	1,0		1,0	0,1	0,2		0,15	0,1		0,9	0,2		0,5					0,3	
(24) Prevent negative environmental impacts																		1,0				17,0		11,0	14,0								5,0		2,0	3,0					0,21	0,2			0,4		0,6	0,1			0,1		0,3	
(25) Save money																			1,0								25,0													0,2	0,9			0,2						0,16				
(26) Opportunity for conversations																								2,0	1,0			2,0									7,0	1,0	6,0		0,2			0,4	0,1	0,2		0,3						0,7
(27) Be outside																		3,0	1,0	5,0	8,0	6,0		2,0										1,0				1,0		0,1	0,4	0,9		0,1	0,2		0,5		0,2		0,4	0,1		
(28) Break habits																			1,0				3,0	1,0	1,0	2,0		1,0		6,0		3,0		3,0	1,0	1,0	3,0			0,3			0,4		0,5	0,2	0,1		0,4				0,2	0,1
(29) Be punctual																		7,0	3,0									1,0			11,0		1,0							0,2	0,1				0,11	0,2		0,1		0,1		0,1		
(30) Try out																								1,0	4,0				5,0			2,0		1,0		5,0			0,1			0,3		0,8	0,1	0,1		0,1					0,3	
(31) Productive use of time																		3,0		2,0				1,0				9,0	1,0			1,0												0,1	0,4	0,9			0,2	0,2				
(32) Intermodal use																		2,0	4,0	1,0				1,0						2,0	1,0		1,0							0,5	0,2	0,1		0,1	0,2		0,1					0,1	
(33) Stress reduction																																								11,0	18,0	7,0		18,0	7,0	7,0	8,0	2,0	1,0	12,0	9,0		3,0	7,0		
(34) Independence																																								33,0	4,0	1,0		2,0	2,0	1,0				1,0		1,0		
(35) Regeneration																																								6,0	12,0	2,0		8,0	4,0		5,0	2,0		12,0	2,0		1,0	2,0		
(36) Physical well-being																																									4,0	23,0		1,0	1,0		2,0	12,0		1,0		2,0				
(37) Feel balanced																																								1,0	4,0	14,0		2,0	4,0		1,0	11,0		7,0		2,0				
(38) Environmental consciousness																																											23,0	1,0	1,0	5,0	1,0		2,0		1,0				
(39) Mental and emotional well-being																																								2,0	4,0	2,0	2,0	5,0	2,0		3,0			5,0	2,0		1,0		1,0	1,0
(40) Make a contribution																																									1,0		18,0			8,0		3,0			1,0		2,0	
(41) Clear conscience																																								1,0		19,0	1,0		4,0		1,0	2,0	1,0				2,0	
(42) Disposable income																																								1,0	9,0			2,0					16,0				
(43) Enhance career opportunities																																										1,0			4,0	20,0			2,0				
(44) Disposable time																																								1,0	8,0	1,0		7,0		1,0	1,0			5,0				
(45) Variety seeking																																								8,0	1,0			11,0			1,0	1,0			1,0			
(46) Reliability																																								2,0	2,0		2,0		10,0	1,0			1,0				
(47) Time for oneself																																								2,0	5,0		1,0			1,0			7,0	1,0		2,0		
(48) Fulfil an exemplary role																																										3,0		1,0	2,0	2,0		4,0					9,0	
(49) Reduced risk perception																																								1,0				1,0					1,0		11,0	
(50) Distinguish oneself																																										2,0					7,0					1,0	
(51) Authenticity																																										2,0			3,0	2,0	1,0					
(52) Sense of community																																												1,0			4,0				1,0	7,0
(53) Curiosity																																											1,0		7,0			1,0				
(54) Sociability																																										3,0			4,0							1,0
(55) Relinquish responsibility																																								3,0	1,0										2,0	
(56) Autonomy																																																				
(57) Quality of life																																																				
(58) Physical health																																																			
(59) Sustainability																																																			
(60) Interpersonal connections																																																			
(61) Fun																																																			
(62) Sense of duty																																																			
(63) Career																																																			
(64) Fitness																																																			
(65) Social desirability																																																			
(66) Mental health																																																			
(67) To save lifetime																																																			
(68) Economic interest																																																			
(69) Nature																																																			
(70) Security																																																			
(71) Motivate people																																																			
(72) Belonging																																																			

[1] According to Reynolds and Gutman (1988), fractional numbers within the implication matrice are applied to differentiate between direct (to the left of the comma) and indirect (to the right of the comma) associations. The sequential numbers in the column headers indicate the associated MEC elements in the first column. There are no associations between the attribute elements.

References

Abou-Zeid, M., Ben-Akiva, M., 2011. The effect of social comparisons on commute well-being. Transp. Res. A Policy Pract. 45 (4), 345–361. https://doi.org/10.1016/j.tra.2011.01.011.

Ajzen, I., Madden, T.J., 1986. Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. J. Exp. Soc. Psychol. 22 (5), 453–474. https://doi.org/10.1016/0022-1031(86)90045-4.

Allen, M.W., 2001. A practical method for uncovering the direct and indirect relationships between human values and consumer purchases. J. Consum. Mark. https://doi.org/10.1108/07363760110385983.

Alonso-González, M.J., Hoogendoorn-Lanser, S., van Oort, N., Cats, O., Hoogendoorn, S., 2020. Drivers and barriers in adopting Mobility as a Service (MaaS)–A latent class cluster analysis of attitudes. Transp. Res. A Policy Pract. 132, 378–401. https://doi.org/10.1016/j.tra.2019.11.022.

Arentze, T.A., Molin, E.J., 2013. Travelers' preferences in multimodal networks: Design and results of a comprehensive series of choice experiments. Transp. Res. A Policy Pract. 58, 15–28. https://doi.org/10.1016/j.tra.2013.10.005.

Assael, H., Roscoe Jr, A.M., 1976. Approaches to market segmentation analysis. J. Mark. 40 (4), 67–76. https://doi.org/10.2307/1251070.

Aurifeille, J.M., Valette-Florence, P., 1995. Determination of the dominant means-end chains: A constrained clustering approach. Int. J. Res. Mark. 12 (3), 267–278.

Bagozzi, R.P., Dabholkar, P.A., 1994. Consumer recycling goals and their effect on decisions to recycle: A means-end chain analysis. Psychol. Mark. 11 (4), 313–340. https://doi.org/10.1002/mar.4220110403.

Bamberg, S., Rees, J., 2017. The impact of voluntary travel behavior change measures–A meta-analytical comparison of quasi-experimental and experimental evidence. Transp. Res. A Policy Pract. 100, 16–26. https://doi.org/10.1016/j.tra.2017.04.004.

Barnes, S.J., Mattsson, J., 2016. Understanding current and future issues in collaborative consumption: A four-stage Delphi study. Technol. Forecast. Soc. Chang. 104, 200–211. https://doi.org/10.1016/j.techfore.2016.01.006.
Bartle, C., Chatterjee, K., 2019. Employer perceptions of the business benefits of sustainable transport: A case study of peri-urban employment areas in South West England. Transp. Res. A Policy Pract. 126, 297–313. https://doi.org/10.1016/j.tra.2019.04.012.
Bates, J., Polak, J., Jones, P., Cook, A., 2001. The valuation of reliability for personal travel. Transp. Res. Part E: Logist. Transp. Rev. 37 (2–3), 191–229. https://doi.org/10.1016/S1366-5545(00)00011-9.
Bech-Larsen, T., Nielsen, N.A., 1999. A comparison of five elicitation techniques for elicitation of attributes of low involvement products. J. Econ. Psychol. 20 (3), 315–341. https://doi.org/10.1016/S0167-4870(99)00011-2.
Becker, H., Balac, M., Ciari, F., Axhausen, K.W., 2020. Assessing the welfare impacts of Shared Mobility and Mobility as a Service (MaaS). Transp. Res. A Policy Pract. 131, 228–243. https://doi.org/10.1016/j.tra.2019.09.027.
Black, W.R., 1996. Sustainable transportation: A US perspective. J. Transp. Geogr. 4 (3), 151–159. https://doi.org/10.1016/0966-6923(96)00020-8.
Bonham, J., Wilson, A., 2012. Bicycling and the life course: The start-stop-start experiences of women cycling. Int. J. Sustain. Transp. 6 (4), 195–213. https://doi.org/10.1080/15568318.2011.585219.
Börjesson, M., Eliasson, J., Hugosson, M.B., Brundell-Freij, K., 2012. The Stockholm congestion charges—5 years on. Effects, acceptability and lessons learnt. Transp. Policy 20, 1–12. https://doi.org/10.1016/j.tranpol.2011.11.001.
Bösehans, G., Walker, I., 2020. Do supra-modal traveller types exist? A travel behavior market segmentation using Goal framing theory. Transportation 47 (1), 243–273. https://doi.org/10.1007/s11116-018-9874-7.
Brislin, R.W., 1970. Back-translation for cross-cultural research. J. Cross Cult. Psychol. 1 (3), 185–216. https://doi.org/10.1177/135910457000100301.
Brög, W., Erl, E., Ker, I., Ryle, J., Wall, R., 2009. Evaluation of voluntary travel behavior change: Experiences from three continents. Transp. Policy 16 (6), 281–292. https://doi.org/10.1016/j.tranpol.2009.10.003.
Buehler, R., Hamre, A., 2015. The multimodal majority? Driving, walking, cycling, and public transportation use among American adults. Transportation 42 (6), 1081–1101. https://doi.org/10.1007/s11116-014-9556-z.
Buehler, R., Hamre, A., 2016. An examination of recent trends in multimodal travel behavior among American motorists. Int. J. Sustain. Transp. 10 (4), 354–364. https://doi.org/10.1080/15568318.2014.945672.
Buehler, R., Kuhnimhof, T., Bauman, A., Eisenmann, C., 2019. Active travel as stable source of physical activity for one third of German adults: Evidence from longitudinal data. Transp. Res. A Policy Pract. 123, 105–118. https://doi.org/10.1016/j.tra.2018.09.022.
Caggiani, L., Colovic, A., Ottomanelli, M., 2020. An equality-based model for bike-sharing stations location in bicycle-public transport multimodal mobility. Transp. Res. A Policy Pract. 140, 251–265. https://doi.org/10.1016/j.tra.2020.08.015.
Carrion, C., Levinson, D., 2012. Value of travel time reliability: A review of current evidence. Transp. Res. A Policy Pract. 46 (4), 720–741. https://doi.org/10.1016/j.tra.2012.01.003.
Chatterjee, K., 2009. A comparative evaluation of large-scale personal travel planning projects in England. Transp. Policy 16 (6), 293–305. https://doi.org/10.1016/j.tranpol.2009.10.004.
Chatterjee, K., Sherwin, H., Jain, J., 2013. Triggers for changes in cycling: The role of life events and modifications to the external environment. J. Transp. Geogr. 30, 183–193. https://doi.org/10.1016/j.jtrangeo.2013.02.007.
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. Transp. Rev. 40 (1), 5–34. https://doi.org/10.1080/01441647.2019.1649317.
Chen, C.F., Eccarius, T., Su, P.C., 2021a. The role of environmental concern in forming intentions for switching to electric scooters. Transp. Res. A Policy Pract. 154, 129–144. https://doi.org/10.1016/j.tra.2021.10.010.
Chen, Y., Zheng, N., Vu, H.L., 2021b. A novel urban congestion pricing scheme considering travel cost perception and level of service. Transp. Res. Part C: Emerg. Technol. 125, 103042 https://doi.org/10.1016/j.trc.2021.103042.
Cheng, Y.-H., Tseng, W.-C., 2016. Exploring the effects of perceived values, free bus transfer, and penalties on intermodal metro–bus transfer users' intention. Transp. Policy 47, 127–138. https://doi.org/10.1016/j.tranpol.2016.01.001.
Choi, D., Johnson, K.K., 2019. Influences of environmental and hedonic motivations on intention to purchase green products: An extension of the theory of planned behavior. Sustain. Prod. Consum. 18, 145–155. https://doi.org/10.1016/j.spc.2019.02.001.
Christian, T.J., 2012. Trade-offs between commuting time and health-related activities. J. Urban Health 89 (5), 746–757. https://doi.org/10.1007/s11524-012-9678-6.
Clark, B., Chatterjee, K., Melia, S., 2016. Changes to commute mode: The role of life events, spatial context and environmental attitude. Transp. Res. A Policy Pract. 89, 89–105. https://doi.org/10.1016/j.tra.2016.05.005.
Clark, B., Chatterjee, K., Martin, A., Davis, A., 2020. How commuting affects subjective wellbeing. Transportation 47 (6), 2777–2805. https://doi.org/10.1007/s11116-019-09983-9.
Clauss, T., Döppe, S., 2016. Why do urban travelers select multimodal travel options: A repertory grid analysis. Transp. Res. A Policy Pract. 93, 93–116. https://doi.org/10.1016/j.tra.2016.08.021.
Cohen, S., 1980. Aftereffects of stress on human performance and social behavior: A review of research and theory. Psychol. Bull. 88 (1), 82. https://doi.org/10.1037/0033-2909.88.1.82.
Conroy, M.M., Beatley, T., 2007. Getting it done: An exploration of US sustainability efforts in practice. Plan. Pract. Res. 22 (1), 25–40. https://doi.org/10.1080/02697450701455983.
Corbin, J., Strauss, A., 2014. Basics of qualitative research: Techniques and procedures for developing grounded theory. Sage publications.
Crane, M., Rissel, C., Greaves, S., Gebel, K., 2016. Correcting bias in self-rated quality of life: An application of anchoring vignettes and ordinal regression models to better understand QoL differences across commuting modes. Qual. Life Res. 25 (2), 257–266. https://doi.org/10.1007/s11136-015-1090-8.
Dacko, S.G., Spalteholz, C., 2014. Upgrading the city: Enabling intermodal travel behavior. Technol. Forecast. Soc. Chang. 89, 222–235. https://doi.org/10.1016/j.techfore.2013.08.039.
Dargay, J., Hanly, M., 2007. Volatility of car ownership, commuting mode and time in the UK. Transp. Res. A Policy Pract. 41 (10), 934–948. https://doi.org/10.1016/j.tra.2007.05.003.
Dastjerdi, A.M., Kaplan, S., e Silva, J. de A., Nielsen, O. A., & Pereira, F. C., 2019. Use intention of mobility-management travel apps: The role of users goals, technophile attitude and community trust. Transp. Res. A Policy Pract. 126, 114–135. https://doi.org/10.1016/j.tra.2019.06.001.
de Costa, A., A., Dekker, M., & Jongen, W. M. F., 2004. An overview of means-end theory: Potential application in consumer-oriented food product design. Trends Food Sci. Technol. 15 (7–8), 403–415. https://doi.org/10.1016/j.tifs.2004.02.005.
De Ferran, F., Grunert, K.G., 2007. French fair trade coffee buyers' purchasing motives: An exploratory study using means-end chains analysis. Food Qual. Prefer. 18 (2), 218–229. https://doi.org/10.1016/j.foodqual.2005.11.001.
de Freitas, L.M., Becker, H., Zimmermann, M., Axhausen, K.W., 2019. Modelling intermodal travel in Switzerland: A recursive logit approach. Transp. Res. A Policy Pract. 119, 200–213. https://doi.org/10.1016/j.tra.2018.11.009.
De Haas, M.C., Scheepers, C.E., Harms, L.W.J., Kroesen, M., 2018. Travel pattern transitions: Applying latent transition analysis within the mobility biographies framework. Transp. Res. A Policy Pract. 107, 140–151. https://doi.org/10.1016/j.tra.2017.11.007.
De Witte, A., Macharis, C., Lannoy, P., Polain, C., Steenberghen, T., Van de Walle, S., 2006. The impact of "free" public transport: The case of Brussels. Transp. Res. A Policy Pract. 40 (8), 671–689. https://doi.org/10.1016/j.tra.2005.12.008.
Deci, E.L., Ryan, R.M., Gagné, M., Leone, D.R., Usunov, J., Kornazheva, B.P., 2001. Need satisfaction, motivation, and well-being in the work organizations of a former eastern bloc country: A cross-cultural study of self-determination. Pers. Soc. Psychol. Bull. 27 (8), 930–942. https://doi.org/10.1177/0146167201278002.
Delbosc, A., Vella-Brodrick, D., 2015. The role of transport in supporting the autonomy of young adults. Transp. Res. Part F: Traffic Psychol. Behav. 33, 97–105. https://doi.org/10.1016/j.trf.2015.03.011.

Delmelle, E.C., Haslauer, E., Prinz, T., 2013. Social satisfaction, commuting and neighborhoods. J. Transp. Geogr. 30, 110–116. https://doi.org/10.1016/j.jtrangeo.2013.03.006.
Deloitte. (2019, March 1). Individual tax alert - Belgian parliament finally approves Mobility Budget measure. Deloitte. Retrieved from https://www2.deloitte.com/content/dam/Deloitte/be/Documents/tax/TaxAlerts/IndividualTaxAlerts/Individual%20tax%20alert%20-%20Belgian%20parliament%20finally%20approves%20Mobility%20Budget%20measure%20-%201%20Mar%202019.pdf.
Diana, M., 2010. From mode choice to modal diversion: A new behavioral paradigm and an application to the study of the demand for innovative transport services. Technol. Forecast. Soc. Chang. 77 (3), 429–441. https://doi.org/10.1016/j.techfore.2009.10.005.
Diana, M., Mokhtarian, P.L., 2009. Desire to change one's multimodality and its relationship to the use of different transport means. Transp. Res. Part F: Traffic Psychol. Behav. 12 (2), 107–119. https://doi.org/10.1016/j.trf.2008.09.001.
Dickerson, A., Hole, A.R., Munford, L.A., 2014. The relationship between well-being and commuting revisited: Does the choice of methodology matter? Reg. Sci. Urban Econ. 49, 321–329. https://doi.org/10.1016/j.regsciurbeco.2014.09.004.
Dill, J., 2009. Bicycling for transportation and health: The role of infrastructure. J. Public Health Policy 30 (1), S95–S110. https://doi.org/10.1057/jphp.2008.56.
Ellaway, A., Macintyre, S., Hiscock, R., Kearns, A., 2003. In the driving seat: Psychosocial benefits from private motor vehicle transport compared to public transport. Transp. Res. Part F: Traffic Psychol. Behav. 6 (3), 217–231. https://doi.org/10.1016/S1369-8478(03)00027-5.
Ellis, G., Hunter, R., Tully, M.A., Donnelly, M., Kelleher, L., Kee, F., 2016. Connectivity and physical activity: Using footpath networks to measure the walkability of built environments. Environ. Plann. B. Plann. Des. 43 (1), 130–151. https://doi.org/10.1177/0265813515610672.
Etikan, I., Musa, S.A., Alkassim, R.S., 2016. Comparison of convenience sampling and purposive sampling. Am. J. Theor. Appl. Stat. 5 (1), 1–4. https://doi.org/10.11648/j.ajtas.20160501.11.
Evans, G.W., Wener, R.E., Phillips, D., 2002. The morning rush hour: Predictability and commuter stress. Environ. Behav. 34 (4), 521–530. https://doi.org/10.1177/0011650203400407.
Feng, J., Dijst, M., Wissink, B., Prillwitz, J., 2014. Understanding Mode Choice in the Chinese Context: The Case of Nanjing Metropolitan Area. Tijdchr. Econ. Soc. Geogr. 105 (3), 315–330. https://doi.org/10.1111/tesg.12068.
Ford, M.E., 1992. Motivating humans: Goals, emotions, and personal agency beliefs. Sage.
Frank, L., Dirks, N., Walther, G., 2021. Improving rural accessibility by locating multimodal mobility hubs. J. Transp. Geogr. 94, 103111 https://doi.org/10.1016/j.jtrangeo.2021.103111.
Frederick, C., Riggs, W., Gilderbloom, J.H., 2018. Commute mode diversity and public health: A multivariate analysis of 148 US cities. Int. J. Sustain. Transp. 12 (1), 1–11. https://doi.org/10.1080/15568318.2017.1321705.
Fu, X., 2021. How habit moderates the commute mode decision process: Integration of the theory of planned behavior and latent class choice model. Transportation 48 (5), 2681–2707. https://doi.org/10.1007/s11116-020-10144-6.
Gardner, B., Abraham, C., 2007. What drives car use? A grounded theory analysis of commuters' reasons for driving. Transp. Res. Part F: Traffic Psychol. Behav. 10 (3), 187–200. https://doi.org/10.1016/j.trf.2006.09.004.
Gärling, T., Fujii, S., 2009. Travel behavior modification: Theories, methods, and programs. Expand. Sphere Travel Behav. Res. 97–128.
Gärling, T., Schuitema, G., 2007. Travel demand management targeting reduced private car use: Effectiveness, public acceptability and political feasibility. J. Soc. Issues 63 (1), 139–153. https://doi.org/10.1111/j.1540-4560.2007.00500.x.
Gatersleben, B., Uzzell, D., 2007. Affective appraisals of the daily commute: Comparing perceptions of drivers, cyclists, walkers, and users of public transport. Environ. Behav. 39 (3), 416–431. https://doi.org/10.1177/0013916506294032.
Gebhardt, L., Krajzewicz, D., Oostendorp, R., Goletz, M., Greger, K., Klötzke, M., Wagner, P., Heinrichs, D., 2016. Intermodal urban mobility: Users, uses, and use cases. Transp. Res. Procedia 14, 1183–1192. https://doi.org/10.1016/j.trpro.2016.05.189.
Gengler, C.E., Klenosky, D.B., Mulvey, M.S., 1995. Improving the graphic representation of means-end results. Int. J. Res. Mark. 12 (3), 245–256. https://doi.org/10.1016/0167-8116(95)00024-V.
Gengler, C.E., Reynolds, T.J., 1989. Means-end structural analysis: Computer-generated hierarchical value maps. Extending the Cognitive Structure Perspective, Brussels, Belgium, EIASM Workshop on Consumer Behavior.
Golob, T.F., Kitamura, R., Long, L., 1997. Panels for transportation planning: Methods and applications. Springer Science & Business Media.
Gordon-Larsen, P., Boone-Heinonen, J., Sidney, S., Sternfeld, B., Jacobs, D.R., Lewis, C.E., 2009. Active commuting and cardiovascular disease risk: The CARDIA study. Arch. Intern. Med. 169 (13), 1216–1223. https://doi.org/10.1001/archinternmed.2009.163.
Greene, D.L., Wegener, M., 1997. Sustainable transport. J. Transp. Geogr. 5 (3), 177–190. https://doi.org/10.1016/S0966-6923(97)00013-6.
Groth, S., 2019. Multimodal divide: Reproduction of transport poverty in smart mobility trends. Transp. Res. A Policy Pract. 125, 56–71. https://doi.org/10.1016/j.tra.2019.04.018.
Grunert, K.G., Grunert, S.C., 1995. Measuring subjective meaning structures by the laddering method: Theoretical considerations and methodological problems. Int. J. Res. Mark. 12 (3), 209–225. https://doi.org/10.1016/0167-8116(95)00022-T.
Grunert, K.G., Grunert, S.C., Sørensen, E., 1995. Means-end chains and laddering: An inventory of problems and an agenda for research. MAPP.
Gudmundsson, H., 2004. Sustainable transport and performance indicators. Issues Environ. Sci. Technol. 20, 35–64.
Guest, G., & MacQueen, K.M., 2008. Handbook for Team-based Qualitative Research. Rowman Altamira.
Guo, Z., Wilson, N.H., 2011. Assessing the cost of transfer inconvenience in public transport systems: A case study of the London Underground. Transp. Res. A Policy Pract. 45 (2), 91–104. https://doi.org/10.1016/j.tra.2010.11.002.
Gutman, J., 1982. A Means-End Chain Model Based on Consumer Categorization Processes. J. Mark. 46 (2), 60–72. https://doi.org/10.2307/3203341.
Gutman, J., 1997. Means-end chains as goal hierarchies. *Psychology & Marketing*, *14*(6), 545–560. Doi: 10.1002/(SICI)1520-6793(199709)14:6<545::AID-MAR2>3.0.CO;2-7.
Ha, J., Lee, S., Ko, J., 2020. Unraveling the impact of travel time, cost, and transit burdens on commute mode choice for different income and age groups. Transp. Res. A Policy Pract. 141, 147–166. https://doi.org/10.1016/j.tra.2020.07.020.
Habib, K.M.N., Tian, Y., Zaman, H., 2011. Modelling commuting mode choice with explicit consideration of carpool in the choice set formation. Transportation 38 (4), 587–604. https://doi.org/10.1007/s11116-011-9333-1.
Habib, K.M.N., Swait, J., Salem, S., 2014. Using repeated cross-sectional travel surveys to enhance forecasting robustness: Accounting for changing mode preferences. Transp. Res. A Policy Pract. 67, 110–126. https://doi.org/10.1016/j.tra.2014.06.004.
Halla, M., Zweimüller, M., 2013. The effect of health on earnings: Quasi-experimental evidence from commuting accidents. Labour Econ. 24, 23–38. https://doi.org/10.1016/j.labeco.2013.04.006.
Hansen, K.B., Nielsen, T.A.S., 2014. Exploring characteristics and motives of long distance commuter cyclists. Transp. Policy 35, 57–63. https://doi.org/10.1016/j.tranpol.2014.05.001.
Hawlitschek, F., Teubner, T., Gimpel, H., 2018. Consumer motives for peer-to-peer sharing. J. Clean. Prod. 204, 144–157. https://doi.org/10.1016/j.jclepro.2018.08.326.
Hebes, P., Menge, J., Lenz, B., 2013. Service-related traffic: An analysis of the influence of firms on travel behavior. Transp. Policy 26, 43–53. https://doi.org/10.1016/j.tranpol.2011.10.003.
Heinen, E., 2018. Are multimodals more likely to change their travel behavior? A cross-sectional analysis to explore the theoretical link between multimodality and the intention to change mode choice. Transp. Res. Part F: Traffic Psychol. Behav. 56, 200–214. https://doi.org/10.1016/j.trf.2018.04.010.
Heinen, E., Chatterjee, K., 2015. The same mode again? An exploration of mode choice variability in Great Britain using the National Travel Survey. Transp. Res. A Policy Pract. 78, 266–282. https://doi.org/10.1016/j.tra.2015.05.015.
Heinen, E., Mattioli, G., 2019. Does a high level of multimodality mean less car use? An exploration of multimodality trends in England. Transportation 46 (4), 1093–1126. https://doi.org/10.1007/s11116-017-9810-2.

Hensher, D.A., 1985. An econometric model of vehicle use in the household sector. Transp. Res. B Methodol. 19 (4), 303–313. https://doi.org/10.1016/0191-2615(85)90038-4.
Herberz, M., Hahnel, U.J., Brosch, T., 2020. The importance of consumer motives for green mobility: A multi-modal perspective. Transp. Res. A Policy Pract. 139, 102–118. https://doi.org/10.1016/j.tra.2020.06.021.
Herrmann, A., Huber, F., 2000. Value-oriented brand positioning. Int. Rev. Retail Distrib. Consum. Res. 10 (1), 95–112. https://doi.org/10.1080/095939600342424.
Higgins, C.D., Sweet, M.N., Kanaroglou, P.S., 2018. All minutes are not equal: Travel time and the effects of congestion on commute satisfaction in Canadian cities. Transportation 45 (5), 1249–1268. https://doi.org/10.1007/s11116-017-9766-2.
Hilbrecht, M., Smale, B., Mock, S.E., 2014. Highway to health? Commute time and well-being among Canadian adults. World Leisure Journal 56 (2), 151–163. https://doi.org/10.1080/16078055.2014.903723.
Jain, T., Johnson, M., Rose, G., 2020. Exploring the process of travel behavior change and mobility trajectories associated with car share adoption. Travel Behav. Soc. 18, 117–131. https://doi.org/10.1016/j.tbs.2019.10.006.
Jaśkiewicz, M., Besta, T., 2014. Heart and mind in public transport: Analysis of motives, satisfaction and psychological correlates of public transportation usage in the Gdańsk–Sopot–Gdynia Tricity Agglomeration in Poland. Transp. Res. Part F: Traffic Psychol. Behav. 26, 92–101. https://doi.org/10.1016/j.trf.2014.06.012.
Jia, Y., Fu, H., 2019. Association between innovative dockless bicycle sharing programs and adopting cycling in commuting and non-commuting trips. Transp. Res. A Policy Pract. 121, 12–21. https://doi.org/10.1016/j.tra.2018.12.025.
Jia, N., Li, L., Ling, S., Ma, S., Yao, W., 2018. Influence of attitudinal and low-carbon factors on behavioral intention of commuting mode choice–A cross-city study in China. Transp. Res. A Policy Pract. 111, 108–118. https://doi.org/10.1016/j.tra.2018.03.010.
Jittrapirom, P., Marchau, V., van der Heijden, R., Meurs, H., 2018. Dynamic adaptive policymaking for implementing Mobility-as-a Service (MaaS). Res. Transp. Bus. Manag. 27, 46–55. https://doi.org/10.1016/j.rtbm.2018.07.001.
Jittrapirom, P., Marchau, V., van der Heijden, R., Meurs, H., 2020. Future implementation of mobility as a service (MaaS): Results of an international Delphi study. Travel Behavior and Society 21, 281–294. https://doi.org/10.1016/j.tbs.2018.12.004.
Jones, T., Harms, L., Heinen, E., 2016. Motives, perceptions and experiences of electric bicycle owners and implications for health, wellbeing and mobility. J. Transp. Geogr. 53, 41–49. https://doi.org/10.1016/j.jtrangeo.2016.04.006.
Kandt, J., Rode, P., Hoffmann, C., Graff, A., Smith, D., 2015. Gauging interventions for sustainable travel: A comparative study of travel attitudes in Berlin and London. Transp. Res. A Policy Pract. 80, 35–48. https://doi.org/10.1016/j.tra.2015.07.008.
Karlsson, I.M., Sochor, J., Strömberg, H., 2016. Developing the 'Service'in Mobility as a Service: Experiences from a field trial of an innovative travel brokerage. Transp. Res. Procedia 14, 3265–3273. https://doi.org/10.1016/j.trpro.2016.05.273.
Kassarjian, H.H., 1977. Content Analysis in Consumer Research. J. Consum. Res. 4 (1), 8–18. https://doi.org/10.1086/208674.
Kent, J.L., 2014. Driving to save time or saving time to drive? The enduring appeal of the private car. Transp. Res. A Policy Pract. 65, 103–115. https://doi.org/10.1016/j.tra.2014.04.009.
Kenyon, S., Lyons, G., 2003. The value of integrated multimodal traveller information and its potential contribution to modal change. Transp. Res. Part F: Traffic Psychol. Behav. 6 (1), 1–21. https://doi.org/10.1016/S1369-8478(02)00035-9.
Kerr, A., Lennon, A., Watson, B., 2010. The call of the road: Factors predicting students' car travelling intentions and behavior. Transportation 37 (1), 1–13. https://doi.org/10.1007/s11116-009-9217-9.
Klinger, T., 2017. Moving from monomodality to multimodality? Changes in mode choice of new residents. Transp. Res. A Policy Pract. 104, 221–237. https://doi.org/10.1016/j.tra.2017.01.008.
Kroesen, M., 2014. Modeling the behavioral determinants of travel behavior: An application of latent transition analysis. Transp. Res. A Policy Pract. 65, 56–67. https://doi.org/10.1016/j.tra.2014.04.010.
Kroesen, M., van Cranenburg, S., 2016. Revealing transition patterns between mono- and multimodal travel patterns over time: A mover-stayer model. Eur. J. Transp. Infrastruct. Res. 16 (4), 754–771. https://doi.org/10.18757/ejtir.2016.16.4.3169.
Kuhnimhof, T., Chlond, B., von der Ruhren, S., 2006. Users of Transport Modes and Multimodal Travel Behavior Steps Toward Understanding Travelers' Options and Choices. Transp. Res. Rec.: J. Transp. Res. Board 1985, 40–48. https://doi.org/10.3141/1985-05.
Kuhnimhof, T., Chlond, B., Huang, P.-C., 2010. Multimodal travel choices of bicyclists: Multiday data analysis of bicycle use in Germany. Transp. Res. Rec. 2190 (1), 19–27. https://doi.org/10.3141/2190-03.
Kuhnimhof, T., Buehler, R., Wirtz, M., Kalinowska, D., 2012. Travel trends among young adults in Germany: Increasing multimodality and declining car use for men. J. Transp. Geogr. 24, 443–450. https://doi.org/10.1016/j.jtrangeo.2012.04.018.
Kuhnimhof. 2009. Measuring and modeling multimodal mode use in the longitudinal section. Transportation Research Board 88th Annual Meeting, Washington DC, United States.
Künn-Nelen, A., 2016. Does commuting affect health? Health Econ. 25 (8), 984–1004. https://doi.org/10.1002/hec.3199.
Lavery, T.A., Páez, A., Kanaroglou, P.S., 2013. Driving out of choices: An investigation of transport modality in a university sample. Transp. Res. A Policy Pract. 57, 37–46. https://doi.org/10.1016/j.tra.2013.09.010.
Lemp, J.D., Kockelman, K.M., 2008. Quantifying the external costs of vehicle use: Evidence from America's top-selling light-duty models. Transp. Res. Part D: Transp. Environ. 13 (8), 491–504. https://doi.org/10.1016/j.trd.2008.09.005.
Li, Y., Guo, Y., Lu, J., Peeta, S., 2019. Impacts of congestion pricing and reward strategies on automobile travelers' morning commute mode shift decisions. Transp. Res. A Policy Pract. 125, 72–88. https://doi.org/10.1016/j.tra.2019.05.008.
Liao, F., Tian, Q., Arentze, T., Huang, H.-J., Timmermans, H.J., 2020. Travel preferences of multimodal transport systems in emerging markets: The case of Beijing. Transp. Res. A Policy Pract. 138, 250–266. https://doi.org/10.1016/j.tra.2020.05.026.
Lindenberg, S., Steg, L., 2007. Normative, gain and hedonic goal frames guiding environmental behavior. J. Soc. Issues 63 (1), 117–137. https://doi.org/10.1111/j.1540-4560.2007.00499.x.
Litman, T., Burwell, D., 2006. Issues in sustainable transportation. Int. J. Glob. Environ. Issues 6 (4), 331–347.
Lois, D., López-Sáez, M., 2009. The relationship between instrumental, symbolic and affective factors as predictors of car use: A structural equation modeling approach. Transp. Res. A Policy Pract. 43 (9), 790–799. https://doi.org/10.1016/j.tra.2009.07.008.
Lorenz, O., 2018. Does commuting matter to subjective well-being? J. Transp. Geogr. 66, 180–199. https://doi.org/10.1016/j.jtrangeo.2017.11.019.
Luo, R., Fan, Y., Yang, X., Zhao, J., Zheng, S., 2021. The impact of social externality information on fostering sustainable travel mode choice: A behavioral experiment in Zhengzhou, China. Transp. Res. A Policy Pract. 152, 127–145. https://doi.org/10.1016/j.tra.2021.07.003.
Lyons, G., Chatterjee, K., 2008. A human perspective on the daily commute: Costs, benefits and trade-offs. Transp. Rev. 28 (2), 181–198. https://doi.org/10.1080/01441640701559484.
Mao, Z., Ettema, D., Dijst, M., 2016. Commuting trip satisfaction in Beijing: Exploring the influence of multimodal behavior and modal flexibility. Transp. Res. A Policy Pract. 94, 592–603. https://doi.org/10.1016/j.tra.2016.10.017.
Martin, A., Goryakin, Y., Suhrcke, M., 2014. Does active commuting improve psychological wellbeing? Longitudinal evidence from eighteen waves of the British Household Panel Survey. Prev. Med. 69, 296–303. https://doi.org/10.1016/j.ypmed.2014.08.023.
Mattisson, K., Håkansson, C., Jakobsson, K., 2015. Relationships between commuting and social capital among men and women in southern Sweden. Environ. Behav. 47 (7), 734–753. https://doi.org/10.1177/0013916514529969.
Mehdizadeh, M., Ermagun, A., 2020. "I'll never stop driving my child to school": On multimodal and monomodal car users. Transportation 47 (3), 1071–1102. https://doi.org/10.1007/s11116-018-9949-5.
Mehdizadeh, M., Zavareh, M.F., Nordfjaern, T., 2019. Mono-and multimodal green transport use on university trips during winter and summer: Hybrid choice models on the norm-activation theory. Transp. Res. A Policy Pract. 130, 317–332. https://doi.org/10.1016/j.tra.2019.09.046.
Merfeld, K., Wilhelms, M.-P., Henkel, S., 2019. Being driven autonomously–A qualitative study to elicit consumers' overarching motivational structures. Transp. Res. Part C: Emerg. Technol. 107, 229–247. https://doi.org/10.1016/j.trc.2019.08.007.

Merriam, S.B., Tisdell, E.J., 2015. Qualitative research: A guide to design and implementation. John Wiley & Sons.
Meyer, M.D., 1997. A toolbox for alleviating traffic congestion and enhancing mobility. United States, Federal Highway Administration.
Miramontes, M., Pfertner, M., Rayaprolu, H.S., Schreiner, M., Wulfhorst, G., 2017. Impacts of a multimodal mobility service on travel behavior and preferences: User insights from Munich's first Mobility Station. Transportation 44 (6), 1325–1342. https://doi.org/10.1007/s11116-017-9806-y.
Molin, E., Mokhtarian, P., Kroesen, M., 2016. Multimodal travel groups and attitudes: A latent class cluster analysis of Dutch travelers. Transp. Res. A Policy Pract. 83, 14–29. https://doi.org/10.1016/j.tra.2015.11.001.
Morris, E.A., Blumenberg, E., Guerra, E., 2020. Does lacking a car put the brakes on activity participation? Private vehicle access and access to opportunities among low-income adults. Transp. Res. A Policy Pract. 136, 375–397. https://doi.org/10.1016/j.tra.2020.03.021.
Möser, G., Bamberg, S., 2008. The effectiveness of soft transport policy measures: A critical assessment and meta-analysis of empirical evidence. J. Environ. Psychol. 28 (1), 10–26. https://doi.org/10.1016/j.jenvp.2007.09.001.
Mouratidis, K., 2019. Built environment and leisure satisfaction: The role of commute time, social interaction, and active travel. J. Transp. Geogr. 80, 102491 https://doi.org/10.1016/j.jtrangeo.2019.102491.
Müggenburg, H., Busch-Geertsema, A., Lanzendorf, M., 2015. Mobility biographies: A review of achievements and challenges of the mobility biographies approach and a framework for further research. J. Transp. Geogr. 46, 151–163. https://doi.org/10.1016/j.jtrangeo.2015.06.004.
Mulvey, M.S., Olson, J.C., Celsi, R.L., Walker, B.A., 1994. Exploring the relationships between means-end knowledge and involvement. *ACR North American.* Advances.
Nobis, C., 2007. Multimodality: Facets and Causes of Sustainable Mobility Behavior. Transp. Res. Rec.: J. Transp. Res. Board. https://doi.org/10.3141/2010-05.
Nobis, C., Kuhnimhof, T., 2018. Mobilität in Deutschland-. Ergebnisbericht, MiD.
Noppers, E.H., Keizer, K., Bockarjova, M., Steg, L., 2015. The adoption of sustainable innovations: The role of instrumental, environmental, and symbolic attributes for earlier and later adopters. J. Environ. Psychol. 44, 74–84. https://doi.org/10.1016/j.jenvp.2015.09.002.
Novaco, R.W., Kliewer, W., Broquet, A., 1991. Home environmental consequences of commute travel impedance. Am. J. Community Psychol. 19 (6), 881–909. https://doi.org/10.1007/BF00937890.
Nykvist, B., Whitmarsh, L., 2008. A multi-level analysis of sustainable mobility transitions: Niche development in the UK and Sweden. Technol. Forecast. Soc. Chang. 75 (9), 1373–1387. https://doi.org/10.1016/j.techfore.2008.05.006.
Ohta, M., Mizoue, T., Mishima, N., Ikeda, M., 2007. Effect of the physical activities in leisure time and commuting to work on mental health. J. Occup. Health 49 (1), 46–52. https://doi.org/10.1539/joh.49.46.
Olafsson, A.S., Nielsen, T.S., Carstensen, T.A., 2016. Cycling in multimodal transport behaviors: Exploring modality styles in the Danish population. J. Transp. Geogr. 52, 123–130. https://doi.org/10.1016/j.jtrangeo.2016.03.010.
Oliveira, R., Moura, K., Viana, J., Tigre, R., Sampaio, B., 2015. Commute duration and health: Empirical evidence from Brazil. Transp. Res. A Policy Pract. 80, 62–75. https://doi.org/10.1016/j.tra.2015.07.020.
Olson, J.C., & Reynolds, T.J., 2001. The means–end approach to understanding consumer decision making. In Understanding consumer decision making—The means–end approach to marketing and advertising strategy (pp. 3–23). Lawrence Erlbaum Associates.
Olsson, L.E., Gärling, T., Ettema, D., Friman, M., Fujii, S., 2013. Happiness and satisfaction with work commute. Soc. Indic. Res. 111 (1), 255–263. https://doi.org/10.1007/s11205-012-0003-2.
Oostendorp, R., Gebhardt, L., 2018. Combining means of transport as a users' strategy to optimize traveling in an urban context: Empirical results on intermodal travel behavior from a survey in Berlin. J. Transp. Geogr. 71, 72–83. https://doi.org/10.1016/j.jtrangeo.2018.07.006.
Páez, A., Whalen, K., 2010. Enjoyment of commute: A comparison of different transportation modes. Transp. Res. A Policy Pract. 44 (7), 537–549. https://doi.org/10.1016/j.tra.2010.04.003.
Park, H.J., Lin, L.M., 2020. Exploring attitude–behavior gap in sustainable consumption: Comparison of recycled and upcycled fashion products. J. Bus. Res. 117, 623–628. https://doi.org/10.1016/j.jbusres.2018.08.025.
Patton, M.Q., 2014. Qualitative research & evaluation methods: Integrating theory and practice. Sage publications.
Pezeshki, F., Ardekani, S.S., Khodadadi, M., Almodarresi, S.M.A., Hosseini, F.S., 2019. Cognitive structures of Iranian senior tourists towards domestic tourism destinations: A means-end chain approach. J. Hosp. Tour. Manag. 39, 9–19. https://doi.org/10.1016/j.jhtm.2019.01.008.
Pieters, R., Baumgartner, H., Allen, D., 1995. A means-end chain approach to consumer goal structures. Int. J. Res. Mark. 12 (3), 227–244. https://doi.org/10.1016/0167-8116(95)00023-U.
Putnam, R.D., 2000. Bowling alone: The collapse and revival of American community. Simon and schuster.
Rasouli, S., Timmermans, H., 2017. Models of behavioral change and adaptation. In *Life-oriented behavioral research for urban policy*. Springer, pp. 451–477.
Redman, L., Friman, M., Gärling, T., Hartig, T., 2013. Quality attributes of public transport that attract car users: A research review. Transp. Policy 25, 119–127. https://doi.org/10.1016/j.tranpol.2012.11.005.
Reynold, T.J., & Gutman, J., 2001. Laddering theory, method, analysis, and interpretation. In Understanding Consumer Decision Making: The Means-End Approach to Marketing and Advertising Strategy (pp. 25–62). Lawrence Erlbaum, Associates.
Reynolds, T.J., Gutman, J., 1988. Laddering theory, method, analysis, and interpretation. J. Advert. Res. 28 (1), 11–31.
Reynolds, T.J., Olson, J.C., 2001. Understanding consumer decision making: The means-end approach to marketing and advertising strategy. Psychology Press.
Roberts, J., Hodgson, R., Dolan, P., 2011. "It's driving her mad": Gender differences in the effects of commuting on psychological health. J. Health Econ. 30 (5), 1064–1076. https://doi.org/10.1016/j.jhealeco.2011.07.006.
Roby, H., 2010. Workplace travel plans: Past, present and future. J. Transp. Geogr. 18 (1), 23–30. https://doi.org/10.1016/j.jtrangeo.2008.11.010.
Romero, F., Gomez, J., Rangel, T., Vassallo, J.M., 2019. Impact of restrictions to tackle high pollution episodes in Madrid: Modal share change in commuting corridors. Transp. Res. Part D: Transp. Environ. 77, 77–91. https://doi.org/10.1016/j.trd.2019.10.021.
Rose, G., Marfurt, H., 2007. Travel behavior change impacts of a major ride to work day event. Transp. Res. A Policy Pract. 41 (4), 351–364. https://doi.org/10.1016/j.tra.2006.10.001.
Rüger, H., Pfaff, S., Weishaar, H., Wiernik, B.M., 2017. Does perceived stress mediate the relationship between commuting and health-related quality of life? Transp. Res. Part F: Traffic Psychol. Behav. 50, 100–108. https://doi.org/10.1016/j.trf.2017.07.005.
Ryan, R.M., Deci, E.L., 2000. The darker and brighter sides of human existence: Basic psychological needs as a unifying concept. Psychol. Inq. 11 (4), 319–338. https://doi.org/10.1207/S15327965PLI1104_03.
Rye, T., Hrelja, R., 2020. Policies for reducing car traffic and their problematisation. Lessons from the mobility strategies of British, Dutch, German and Swedish cities. Sustainability 12 (19), 8170. https://doi.org/10.3390/su12198170.
Sahlqvist, S., Song, Y., Ogilvie, D., 2012. Is active travel associated with greater physical activity? The contribution of commuting and non-commuting active travel to total physical activity in adults. Prev. Med. 55 (3), 206–211. https://doi.org/10.1016/j.ypmed.2012.06.028.
Salon, D., 2009. Neighborhoods, cars, and commuting in New York City: A discrete choice approach. Transp. Res. A Policy Pract. 43 (2), 180–196. https://doi.org/10.1016/j.tra.2008.10.002.
Sanchez, M.J., & Lafuente, R., 2010. Defining and measuring environmental consciousness.
Santos, G., Behrendt, H., Teytelboym, A., 2010. Part II: Policy instruments for sustainable road transport. Res. Transp. Econ. 28 (1), 46–91. https://doi.org/10.1016/j.retrec.2010.03.002.
Sato, T., Yonekawa, M., 2003. Evaluation of transport investment focusing on interregional and intergenerational equity. J. East. Asia Soc. Transp. Stud. 5, 3054–3069.
Schaefers, T., 2013. Exploring carsharing usage motives: A hierarchical means-end chain analysis. Transp. Res. A Policy Pract. 47, 69–77. https://doi.org/10.1016/j.tra.2012.10.024.
Schaefers, T., Ruffer, S., Böhm, E., 2021. Outcome-based contracting from the customers' perspective: A means-end chain analytical exploration. Ind. Mark. Manag. 93, 466–481. https://doi.org/10.1016/j.indmarman.2020.06.002.

Schakenbos, R., La Paix, L., Nijenstein, S., Geurs, K.T., 2016. Valuation of a transfer in a multimodal public transport trip. Transp. Policy 46, 72–81. https://doi.org/10.1016/j.tranpol.2015.11.008.
Scheepers, C.E., Wendel-Vos, G.C.W., Den Broeder, J.M., Van Kempen, E., Van Wesemael, P.J.V., Schuit, A.J., 2014. Shifting from car to active transport: A systematic review of the effectiveness of interventions. Transp. Res. A Policy Pract. 70, 264–280. https://doi.org/10.1016/j.tra.2014.10.015.
Scheiner, J., 2007. Mobility biographies: Elements of a biographical theory of travel demand (Mobilitätsbiographien: Bausteine zu einer biographischen Theorie der Verkehrsnachfrage). Erdkunde 161–173. https://doi.org/10.3112/erdkunde.2007.02.03.
Scheiner, J., 2018. Why is there change in travel behavior? In search of a theoretical framework for mobility biographies. Erdkunde 72 (1), 41–62. https://doi.org/10.3112/erdkunde.2018.01.03.
Scheiner, J., 2020. Changes in travel mode use over the life course with partner interactions in couple households. Transp. Res. A Policy Pract. 132, 791–807. https://doi.org/10.1016/j.tra.2019.12.031.
Scheiner, J., Chatterjee, K., Heinen, E., 2016. Key events and multimodality: A life course approach. Transp. Res. A Policy Pract. 91, 148–165. https://doi.org/10.1016/j.tra.2016.06.028.
Scheiner, J., Holz-Rau, C., 2013. A comprehensive study of life course, cohort, and period effects on changes in travel mode use. Transp. Res. A Policy Pract. 47, 167–181. https://doi.org/10.1016/j.tra.2012.10.019.
Schikofsky, J., Dannewald, T., Kowald, M., 2020. Exploring motivational mechanisms behind the intention to adopt mobility as a service (MaaS): Insights from Germany. Transp. Res. A Policy Pract. 131, 296–312. https://doi.org/10.1016/j.tra.2019.09.022.
Schneider, R.J., 2013. Theory of routine mode choice decisions: An operational framework to increase sustainable transportation. Transp. Policy 25, 128–137. https://doi.org/10.1016/j.tranpol.2012.10.007.
Schneider, F., Ton, D., Zomer, L.-B., Daamen, W., Duives, D., Hoogendoorn-Lanser, S., Hoogendoorn, S., 2021. Trip chain complexity: A comparison among latent classes of daily mobility patterns. Transportation 48 (2), 953–975. https://doi.org/10.1007/s11116-020-10084-1.
Schuppan, J., Kettner, S., Delatte, A., Schwedes, O., 2014. Urban Multimodal Travel Behavior: Towards Mobility without a Private Car. Transp. Res. Procedia 4, 553–556. https://doi.org/10.1016/j.trpro.2014.11.042.
Schwarzlose, A.A.I., Mjelde, J.W., Dudensing, R.M., Jin, Y., Cherrington, L.K., Chen, J., 2014. Willingness to pay for public transportation options for improving the quality of life of the rural elderly. Transp. Res. A Policy Pract. 61, 1–14. https://doi.org/10.1016/j.tra.2013.12.009.
Seethaler, R., Rose, G., 2009. Using odometer readings to assess VKT changes associated with a voluntary travel behavior change program. Transp. Policy 16 (6), 325–334. https://doi.org/10.1016/j.tranpol.2009.10.006.
Seik, F.T., 2000. An advanced demand management instrument in urban transport: Electronic road pricing in Singapore. Cities 17 (1), 33–45. https://doi.org/10.1016/S0264-2751(99)00050-5.
Shafer, C.S., Lee, B.K., Turner, S., 2000. A tale of three greenway trails: User perceptions related to quality of life. Landsc. Urban Plan. 49 (3–4), 163–178. https://doi.org/10.1016/S0169-2046(00)00057-8.
Sharmeen, F., Arentze, T., Timmermans, H., 2014. An analysis of the dynamics of activity and travel needs in response to social network evolution and life-cycle events: A structural equation model. Transp. Res. A Policy Pract. 59, 159–171. https://doi.org/10.1016/j.tra.2013.11.006.
Shephard, R.J., 2008. Is active commuting the answer to population health? Sports Med. 38 (9), 751–758. https://doi.org/10.2165/00007256-200838090-00004.
Singleton, P.A., 2019. Walking (and cycling) to well-being: Modal and other determinants of subjective well-being during the commute. Travel Behav. Soc. 16, 249–261. https://doi.org/10.1016/j.tbs.2018.02.005.
Skarin, F., Olsson, L.E., Friman, M., Wästlund, E., 2019. Importance of motives, self-efficacy, social support and satisfaction with travel for behavior change during travel intervention programs. Transp. Res. Part F: Traffic Psychol. Behav. 62, 451–458. https://doi.org/10.1016/j.trf.2019.02.002.
Sochor, J., Arby, H., Karlsson, I.M., Sarasini, S., 2018. A topological approach to Mobility as a Service: A proposed tool for understanding requirements and effects, and for aiding the integration of societal goals. Res. Transp. Bus. Manag. 27, 3–14. https://doi.org/10.1016/j.rtbm.2018.12.003.
Søndergaard, H.A., Edelenbos, M., 2007. What parents prefer and children like–Investigating choice of vegetable-based food for children. Food Qual. Prefer. 18 (7), 949–962. https://doi.org/10.1016/j.foodqual.2007.03.009.
Speck, J., 2013. Walkable city: How downtown can save America, one step at a time. Macmillan.
Spickermann, A., Grienitz, V., Heiko, A., 2014. Heading towards a multimodal city of the future?: Multi-stakeholder scenarios for urban mobility. Technol. Forecast. Soc. Chang. 89, 201–221. https://doi.org/10.1016/j.techfore.2013.08.036.
Spinney, J.E., Scott, D.M., Newbold, K.B., 2009. Transport mobility benefits and quality of life: A time-use perspective of elderly Canadians. Transp. Policy 16 (1), 1–11. https://doi.org/10.1016/j.tranpol.2009.01.002.
Sposato, R.G., Röderer, K., Cervinka, R., 2012. The influence of control and related variables on commuting stress. Transp. Res. Part F: Traffic Psychol. Behav. 15 (5), 581–587. https://doi.org/10.1016/j.trf.2012.05.003.
Steg, L., 2003. Can public transport compete with the private car? IATSS Research 27 (2), 27–35. https://doi.org/10.1016/S0386-1112(14)60141-2.
Steg, L., 2005. Car use: Lust and must. Instrumental, symbolic and affective motives for car use. Transp. Res. A Policy Pract. 39 (2), 147–162. https://doi.org/10.1016/j.tra.2004.07.001.
Steg, L., Gifford, R., 2005. Sustainable transportation and quality of life. J. Transp. Geogr. 13 (1), 59–69. https://doi.org/10.1016/j.jtrangeo.2004.11.003.
Steg, L., Vlek, C., Slotegraaf, G., 2001. Instrumental-reasoned and symbolic-affective motives for using a motor car. Transp. Res. Part F: Traffic Psychol. Behav. 4 (3), 151–169. https://doi.org/10.1016/S1369-8478(01)00020-1.
Stopher, P.R., 2004. Reducing road congestion: A reality check. Transp. Policy 11 (2), 117–131. https://doi.org/10.1016/j.tranpol.2003.09.002.
Stradling, S.G., Meadows, M.L., Beatty, S., 2000. Helping drivers out of their cars Integrating transport policy and social psychology for sustainable change. Transp. Policy 7 (3), 207–215. https://doi.org/10.1016/S0967-070X(00)00026-3.
Stradling, S.G., Meadows, M.L., Beatty, S., 2001. Identity and independence: Two dimensions of driver autonomy. Behavioral Research in Road Safety: Proceedings of the 10th Seminar on Behavioral Research in Road Safety.
Stutzer, A., Frey, B.S., 2008. Stress that doesn't pay: The commuting paradox. Scand. J. Econ. 110 (2), 339–366. https://doi.org/10.1111/j.1467-9442.2008.00542.x.
Talmage, C.A., Frederick, C., 2019. Quality of life, multimodality, and the demise of the autocentric metropolis: A multivariate analysis of 148 mid-size US cities. Soc. Indic. Res. 141 (1), 365–390. https://doi.org/10.1007/s11205-017-1829-4.
Ter Hofstede, F., Steenkamp, J.-B.-E., Wedel, M., 1999. International market segmentation based on consumer–product relations. J. Mark. Res. 36 (1), 1–17. https://doi.org/10.1177/002224379903600101.
Teunissen, T., Sarmiento, O., Zuidgeest, M., Brussel, M., 2015. Mapping equality in access: The case of Bogotá's sustainable transportation initiatives. Int. J. Sustain. Transp. 9 (7), 457–467. https://doi.org/10.1080/15568318.2013.808388.
Ton, D., Bekhor, S., Cats, O., Duives, D.C., Hoogendoorn-Lanser, S., Hoogendoorn, S.P., 2020. The experienced mode choice set and its determinants: Commuting trips in the Netherlands. Transp. Res. A Policy Pract. 132, 744–758. https://doi.org/10.1016/j.tra.2019.12.027.
Tsirimpa, A., Polydoropoulou, A., Pagoni, I., Tsouros, I., 2019. A reward-based instrument for promoting multimodality. Transp. Res. Part F: Traffic Psychol. Behav. 65, 121–140. https://doi.org/10.1016/j.trf.2019.07.002.
Underwood, S.K., Handy, S.L., Paterniti, D.A., Lee, A.E., 2014. Why do teens abandon bicycling? A retrospective look at attitudes and behaviors. J. Transp. Health 1 (1), 17–24. https://doi.org/10.1016/j.jth.2013.12.002.
European Union. 2018. Logistics and multimodal transport: 2018—Year of Multimodality. https://ec.europa.eu/transport/themes/logistics-and-multimodal-transport/2018-year-multimodality_en.
Van, H.T., Choocharukul, K., Fujii, S., 2014. The effect of attitudes toward cars and public transportation on behavioral intention in commuting mode choice—A comparison across six Asian countries. Transp. Res. A Policy Pract. 69, 36–44. https://doi.org/10.1016/j.tra.2014.08.008.
Van Malderen, L., Jourquin, B., Thomas, I., Vanoutrive, T., Verhetsel, A., Witlox, F., 2012. On the mobility policies of companies: What are the good practices? The Belgian case. Transp. Policy 21, 10–19. https://doi.org/10.1016/j.tranpol.2011.12.005.

van Rekom, J., Wierenga, B., 2007. On the hierarchical nature of means–end relationships in laddering data. J. Bus. Res. 60 (4), 401–410. https://doi.org/10.1016/j.jbusres.2006.10.004.
Vanoutrive, T., 2017. Don't think of them as roads. Think of them as road transport markets: Congestion pricing as a neoliberal political project. Prog. Plan. 117, 1–21. https://doi.org/10.1016/j.progress.2016.04.001.
Vedagiri, P., Arasan, V.T., 2009. Modelling modal shift due to the enhanced level of bus service. Transport 24 (2), 121–128. https://doi.org/10.3846/1648-4142.2009.24.121-128.
Veludo-de-Oliveira, T.M., Ikeda, A.A., Campomar, M.C., 2006. Discussing laddering application by the means-end chain theory. Qual. Rep. 11 (4), 626–642. https://doi.org/10.46743/2160-3715/2006.1651.
Vij, A., Carrel, A., Walker, J.L., 2013. Incorporating the influence of latent modal preferences on travel mode choice behavior. Transp. Res. A Policy Pract. 54, 164–178. https://doi.org/10.1016/j.tra.2013.07.008.
Vinson, D.E., Scott, J.E., Lamont, L.M., 1977. The role of personal values in marketing and consumer behavior. J. Mark. 41 (2), 44–50. https://doi.org/10.1177/002224297704100215.
Wang, Y., Douglas, M., Hazen, B., 2021. Diffusion of public bicycle systems: Investigating influences of users' perceived risk and switching intention. Transp. Res. A Policy Pract. 143, 1–13. https://doi.org/10.1016/j.tra.2020.11.002.
Wener, R.E., Evans, G.W., 2011. Comparing stress of car and train commuters. Transp. Res. Part F: Traffic Psychol. Behav. 14 (2), 111–116. https://doi.org/10.1016/j.trf.2010.11.008.
Wilhelms, M.-P., Henkel, S., Falk, T., 2017. To earn is not enough: A means-end analysis to uncover peer-providers' participation motives in peer-to-peer carsharing. Technol. Forecast. Soc. Chang. 125, 38–47. https://doi.org/10.1016/j.techfore.2017.03.030.
Willing, C., Brandt, T., Neumann, D., 2017. Intermodal mobility. Bus. Inf. Syst. Eng. 59 (3), 173–179. https://doi.org/10.1007/s12599-017-0471-7.
Wolcott, H.F., 1994. Transforming Qualitative Data: Description, Analysis. and Interpretation. SAGE.
Ye, R., De Vos, J., Ma, L., 2020. Analysing the association of dissonance between actual and ideal commute time and commute satisfaction. Transp. Res. A Policy Pract. 132, 47–60. https://doi.org/10.1016/j.tra.2019.10.011.
Zhang, J., 2017. Life-oriented behavioral research for urban policy. Springer.
Zhao, P., Zhang, Y., 2018. Travel behavior and life course: Examining changes in car use after residential relocation in Beijing. J. Transp. Geogr. 73, 41–53. https://doi.org/10.1016/j.jtrangeo.2018.10.003.
Zheng, N., Geroliminis, N., 2020. Area-based equitable pricing strategies for multimodal urban networks with heterogeneous users. Transp. Res. A Policy Pract. 136, 357–374. https://doi.org/10.1016/j.tra.2020.04.009.
Zhou, J., 2012. Sustainable commute in a car-dominant city: Factors affecting alternative mode choices among university students. Transp. Res. A Policy Pract. 46 (7), 1013–1029. https://doi.org/10.1016/j.tra.2012.04.001.
Zijlstra, T., Goos, P., Verhetsel, A., 2019. A mixture-amount stated preference study on the mobility budget. Transp. Res. A Policy Pract. 126, 230–246.
Zijlstra, T., Vanoutrive, T., 2018. The employee mobility budget: Aligning sustainable transportation with human resource management? Transp. Res. Part D: Transp. Environ. 61, 383–396. https://doi.org/10.1016/j.trd.2017.10.005.
Zoll, F., Specht, K., Opitz, I., Siebert, R., Piorr, A., Zasada, I., 2018. Individual choice or collective action? Exploring consumer motives for participating in alternative food networks. Int. J. Consum. Stud. 42 (1), 101–110. https://doi.org/10.1111/ijcs.12405.