Consumer perceptions of urban mobility: future desires, underlying motives and changing emotions

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The President:

Prof. Dr. Bernhard Ehrenzeller

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St. Gallen, July 31st, 2021 Beatrice Hügler

Table of Contents

Summary (English)

The mobility environment is currently changing worldwide. New technologies and mobility solutions are entering the market and environmental concerns are increasing. Mobility providers and governments are reacting to these changes and challenges and many of them are adapting their product strategies and policies accordingly. At the end of the activity chain, however, is the consumer, who ultimately needs to be convinced of new offers – for where there is no will, there is no way to change. This dissertation explores the topic of mobility from a consumer's perspective: what do consumers desire in terms of mobility in the future, why do they use different modes of transport in cities and how can they be motivated to switch to more environmentally friendly alternatives?

Article I. The first article investigates global future customer insights on mobility issues in the US, Europe and China. Via the use of qualitative in-depth interviews conducted by means of a trend receiver approach, this article develops a prospect of people's aspirations for mobility options for the year 2030 and beyond. Findings show that some of the current strategies of mobility providers are in line with people's expectations while others may need some reconsideration.

Article II. The second article explores people's hidden motives for mode choice in cities using psychological projection. Furthermore, the effectiveness of different promotional measures to increase the attractiveness of alternative modes of transport is evaluated by applying a repeated evaluation technique. The article shows a significant variation in the motives for choosing different transport modes depending on sociodemographic factors. In addition, results demonstrate how various promotional measures to increase familiarity are only effective for certain modes of transport.

Article III. The third article examines people's emotions towards alternative modes of transport and towards cars. It presumes that emotions towards the latter are currently changing due to negative consequences of extensive car use. In contrast, it supposes that positive emotions towards alternative transport modes can be strengthened and that focusing on them could be an effective way to promote their use in the long-term. Findings show that emotional perceptions regarding various modes strongly depend upon people’s sociodemographic background. In particular, the article demonstrates that some groups in society are very reluctant to show positive emotions towards modes of transport other than cars.

Summary (German)

Der Mobilitätssektor befindet sich in einem weltweiten Wandel. Neue Technologien und Mobilitätslösungen drängen auf den Markt und Umweltbelange sind von zunehmender Bedeutung. Mobilitätsanbieter und Politiker reagieren auf diese Veränderungen und passen ihre Strategien entsprechend an. Am Ende der Handlungskette steht jedoch der Konsument, der letztlich von neuen Angeboten überzeugt werden muss. Die vorliegende Dissertation beleuchtet das Thema der Mobilität aus der Konsumentenperspektive: Was streben diese in der Zukunft an, warum präferieren sie bestimmte Verkehrsmittel und wie können sie zu einem Umstieg auf alternative, umweltfreundlichere Transportoptionen motiviert werden?

Artikel I. Der erste Artikel untersucht Kundeneinblicke bezüglich zukünftiger Mobilität in den USA, in Europa und in China. Auf Basis qualitativer Tiefeninterviews, die mit Hilfe eines Trendreceiver-Ansatzes durchgeführt wurden, entwickelt dieser Artikel einen Ausblick über die Erwartungen der Menschen in Bezug auf Mobilitätsoptionen für das Jahr 2030 und darüber hinaus. Die Ergebnisse weisen darauf hin, dass einige Strategien von Mobilitätsanbietern mit den Vorstellungen der Menschen übereinstimmen, während andere überdacht werden sollten, damit sie profitabel sein können.

Artikel II. Der zweite Artikel beleuchtet verborgene Motive der Menschen für deren Verkehrsmittelwahl mittels psychologischer Projektion. Zudem wird die Wirksamkeit verschiedener Werbemaßnahmen zur Steigerung der Attraktivität alternativer Verkehrsmittel durch Anwendung einer Technik der wiederholten Evaluierung bewertet. Der Artikel zeigt signifikante Variationen in den Motiven für die Wahl verschiedener Verkehrsmittel bezüglich soziodemographischer Faktoren. Weiterhin kann eine Steigerung der Attraktivität durch die untersuchten Werbemaßnahmen nur für bestimmte Verkehrsmittel festgestellt werden.

Artikel III. Der dritte Artikel befasst sich mit Emotionen der Menschen gegenüber alternativen Verkehrsmitteln und dem Auto. Es wird angenommen, dass sich Emotionen in Bezug auf Letzteres derzeit aufgrund negativer Folgen extensiver Autonutzung verändern. Im Gegensatz dazu wird unterstellt, dass positive Emotionen bezüglich alternativer Verkehrsmittel gestärkt werden können und eine Fokussierung auf diese ein effektiver Weg zur Intensivierung ihrer Nutzung darstellt. Die Ergebnisse verdeutlichen, inwiefern emotionale Wahrnehmungen gegenüber verschiedener Verkehrsmittel zwischen gesellschaftlichen Gruppen variieren und dass einige von ihnen empfänglicher für emotionsbasierte Werbung sind als andere.

Introduction

Companies need customers who are willing to spend money on buying the company's products or services. Without demand, there is no business. However, what if companies have to conform to environmental and political pressure and adapt their offers thereupon, but consequentially, making consumers less likely to purchase their offers? This situation can currently be observed in the field of mobility (Müller, 2019; Schlüter & Weyer, 2019; Wang, Tang & Pan, 2018; Wells & Nieuwenhuis, 2012).

For many decades, automobile use has been flourishing and having a car was more than just a convenient status symbol enabling people go places. It was a lifestyle (Gardner & Abraham, 2007; Sheller, 2004). This lifestyle is now changing due to a rising awareness of the negative consequences of car use such as air pollution boosting climate change, congestion resulting in delays, as well as noise exposure and stress, among many others (Delbosc & Currie, 2013; Raimond & Milthorpe, 2010). Hence, more and more people are raising their voices for a sustainable revolution in the mobility sector. As a result, politicians, technology companies and mobility providers have started to alter their strategies and are introducing more environmentally friendly concepts and vehicles, such as shared, electric and micro mobility (Bohnsack, Pinkse & Kolk, 2014; Cohen & Kietzmann, 2014). Although these new mobility innovations prove popular among many, particularly those living in cities, they have not yet convinced the masses of their usefulness (Schlüter & Weyer, 2019; Wang, Tang & Pan, 2018). This means that those new concepts remain comparatively expensive and inconvenient due to lack of extension.

What is it that people love so much about driving a car? How do they perceive other modes of transport and would they be willing to switch to those? How do they envision a future world of mobility – more sustainable in any way? Existing academic literature sought to answer those questions. However, research on forecasts of consumers' future mobility expectations is usually limited to certain aspects of new mobility solutions rather than taking a holistic approach (e.g., De Souza, De Mello & Marx, 2019). Further, research on mode choice is mostly conducted by investigating people's rational reasons for choosing certain modes of transport over others (e.g., Gardner & Abraham, 2006; Steg, 2003; 2005), without considering the currently transforming mobility sector. This dissertation fills these gaps by applying consumer forecasts in a broader mobility context and by exploring people's underlying motives for choosing certain transport modes in light of the changing mobility environment. In doing so, this dissertation deploys customer-centric methods, as are

commonly applied in marketing and consumer research, placing them in a mobility context. The scarcity of such methods in a mobility-related research field, particularly in the case of Articles II and III, provides the opportunity to gain unique and novel insights, expanding existing literature. The aim of the dissertation is to supply some answers for policy makers and mobility providers currently trying to meet consumers' mobility needs, influence them in a more sustainable direction and still allow a profitable trade and successful policy campaign. Thereby, this dissertation sheds some light onto deeply rooted psychological mobility needs worthwhile of consideration in promoting sustainable alternatives to cars.

Overall, the dissertation consists of three different articles. The first article provides an explorative basis for understanding consumer needs regarding future mobility. Via thirty qualitative trend receiver interviews conducted in the US, Europe and in China, it assesses people's desires and expectations towards future mobility in 2030. The trend receiver approach originates from Hofmann (2014) and allows the exploration of changing environments particularly well, providing an appropriate instrument for the investigation of the transforming mobility sector. In this context, queries of how consumers seek to move around in the future, how they feel about ownership of one's own car and whether they fear fully autonomous vehicles are answered, among others. Article I unveils how some current strategies of mobility providers are meeting future demands from a consumer perspective, while others may need to be adjusted in order to be successful. Article I is very broad in its scope, allowing the approach of many mobility-related topics.

The second and third articles both stem from the same project seeking to explore people's underlying reasons for the use of various modes of transport, including cars and alternative modes, to eventually reduce car use in cities. The overall project concentrates on the areas of Greater London and urban Switzerland, enabling a cross-country comparison. Article II focuses on mode choice and promotional measures. More specifically, the article reveals people's motives for using certain modes of transport, for switching to other modes and how this both depends on people's sociodemographic backgrounds. In this context, Article II employs psychological projection, a method of indirect questioning, seeking to reveal people's underlying opinions by reducing social desirability bias (Edwards, 1957; Szollosy, 2017). Moreover, Article II demonstrates how different promotional measures influence people's perception of alternative modes of transport via the use of a repeated evaluation technique (Carbon & Leder, 2005). The analysis discloses a distinct effectiveness of

promotional measures regarding different modes of transport, insightful for mobility providers.

Article III, in turn, focuses on people's emotions towards cars and towards alternative modes of transport, supposing that emotions are a pivotal tool in advertising (Holbrook & O'Shaughnessy, 1984; Zajonc, 2001). In this context, Article III determines people's levels of emotions in various mobility scenarios and while switching from one mode of transport to another. The applied method is a Self-Assessment Manikin method, assessing people's levels of emotions on a non-verbal scale, reducing variations in interpretation given the multi-cultural background of the study (Bradley & Lang, 1994; Isbister et al., 2006). The analysis of Article III presents a basis for understanding current levels of emotions given the momentarily changing mobility environment. As was true for Article II, emotions are also highly dependent on people's sociodemographic backgrounds. Both Articles II and III manifest how young and environmentally concerned people are most likely to switch to alternative modes of transport and are most receptive towards promotions of these. The resulting insights are crucial for targeting policies and marketing strategies appropriately.

The following overview presents further information about each article, including its titles, authors, abstracts and current publication statuses.

Overview of Article I

Title	Future mobility insights: a trend receiver approach
Author(s)	Beatrice Hügler, Birte Manke
Abstract	The mobility sector is changing due to its negative consequences and companies' reactions thereupon. New mobility solutions enter the market quickly, while it is uncertain where the shift in the industry will lead. Thus, companies ought to understand people's future mobility needs to successfully adjust their innovations accordingly. This study examines customers' insights into future mobility via trend receiver interviews in Europe, the United States and China. Findings reveal that some companies' current strategies align with future customers' mobility expectations, while other innovations may be under- or overestimated. These insights are of value for automobile manufacturers, marketing managers as well as for governments and city planners in order to positively influence the future of mobility.

Keywords	future mobility, trend receiver, customer insight, autonomous vehicles
Status	• Accepted at the European Marketing Academy Conference (EMAC) 2020 • Published in Technium Social Science Journal, Volume 10, 611-620. https://doi.org/10.47577/tssj.v10i1.1318

Overview of Article II

Title	What keeps us driving? Exploring sociodemographic patterns and underlying motives of mode choice in cities
Author(s)	Beatrice Hügler, Rebecca Flynn, Catarina Heeckt, Nuno Ferreira Da Cruz, Philipp Rode
Abstract	Despite existing policy interventions increasing the cost of car ownership and the attractiveness of alternative modes of transport, car use remains high in many cities. This research explores the application of methodologies traditionally used in consumer research to assess underlying factors influencing transport decisions, and perceptions of transport modes. Techniques of familiarisation and psychological projection were employed in an online survey. Findings show that motives for different mode choices vary significantly according to sociodemographic factors. Further, we found that most common motives for selecting a particular main mode were not necessarily the same motives that would most commonly influence others to switch to that particular mode. Lastly, we demonstrate that promotional measures based on increasing familiarisation are only effective for walking, cycling and carsharing. This research offers additional methodological approaches to the study of transport behaviour and provides further insights into individual mode choice, valuable for future car reduction initiatives.
Keywords	urban car use, sustainable mobility, mode choice, psychological projection, familiarisation
Status	• Submitted to Transportation Research Part A: Policy and Practice • Accessible on Research Platform Alexandria Link: https://www.alexandria.unisg.ch/publications/263509

Overview of Article III

Title	An exploration of levels of emotions towards different modes of transport and when switching between them
Author(s)	Beatrice Hügler
Abstract	Urban car use remains high despite various policies attempting to reduce it. A factor that may have been overlooked by such initiatives is people's emotions towards cars, which may currently be changing due to increasing issues such as congestion and pollution. This study explores people's current emotions towards both cars and alternative modes of transport to provide a basis for targeting emotions in promoting alternative modes and reducing car use. Results show that emotional perceptions towards modes strongly depend on people's sociodemographic background. The younger, the more health-conscious and environmentally concerned people are, the more positive their emotions towards alternative modes. Further, results reveal that some groups in society generally have no positive emotions towards modes of transport other than cars. Such findings are relevant for developing emotion-based promotional measures by mobility providers and policymakers.
Keywords	urban car use, sustainable mobility, transport psychology, self-assessment manikin
Status	• Submitted to Transportation Research Part F: Traffic Psychology and Behaviour • Accessible on Research Platform Alexandria Link: https://www.alexandria.unisg.ch/publications/263508

Implications and Future Research

The three articles of this dissertation further our comprehension of consumers' perceptions towards mobility-related issues in its transforming environment. Moreover, they advance our understanding of where and how to exert efforts as a mobility provider or policy maker to foster the use of alternative modes of transport. This contributes to maintaining the profitability and success of companies and campaigns in the long-term.

Article I adds to the literature of predictive methods and foresight (Chesbrough, 2003; Hofmann, 2014; von Hippel, 1986). Moreover, it broadens research streams of customer-

centric innovations and future demand (Foss, Laursen & Pedersen, 2011) in a mobility-related context. Regarding practical implications, Article I is of value for mobility providers in terms of comprehending consumers' future desires. This enables them to meet long-term demands more successfully, accelerating their products' acceptance and profitability.

Article II and III contribute to the research of mode choice and people's attitudes towards various modes of transport (Kent, 2014; 2015; Steg, 2003; 2005; Wells & Xenias, 2015). In this context, Article II adds to existing findings by unveiling people's deeply rooted motives and by accounting for switches between transport modes. Further, it highlights how different groups in society have very distinct attitudes towards various modes of transport. In terms of practical implications, this finding is relevant for policy makers seeking to implement measures to reduce car use: provided there is no intention of banning cars, it will be difficult to keep some, especially older people away from their vehicles. In contrast, focusing on young and environmentally concerned people may be more effective in promoting the use of alternative modes of transport as they are more prone toward these. In addition, Article II demonstrates the effectiveness of promotional strategies in advancing the use of alternative modes of transport. While the promotion for some of the modes is very successful, the opposite applies to others. Therefore, another practical implication of Article II is to supply mobility providers and policy makers with insights on which transport mode is best promoted and how.

Article III conduces to the research stream of emotional advertising (Holbrook & O'Shaughnessy, 1984) and the concept of pleasure and arousal (Bradley & Lang, 1994; Russel & Mehrabian, 1977). Moreover, as emotions towards cars have been studied widely (Laird, 1996; Schorman, 2010), this article further contributes to this field of research, however, putting it into a more critical context. In this respect, it complements recent research findings examining how the relevance of the mobility sector is changing in people's minds, placing a greater focus on active and sustainable modes of transport (Kachaner et al., 2020; Li et al., 2021; Thigpen & Handy, 2018). In addition, Article III adds to the yet rather unexplored field of emotions towards alternative transport modes, showing that they can indeed be emotionalised. In terms of practical implications, Article III presents how emotions may be utilised in promoting sustainable modes and turn neutral or negative emotions towards those into positive emotional associations. Overall, findings of Article II and III are valuable for both mobility providers and policy makers seeking to strengthen the positive acceptance and use of alternative transport modes and eventually reduce car use in the long-term.

The articles of this dissertation do not come without limitations and points of connection for future research. First, the mobility environment has started to change but will continue to constantly evolve. Thus, current findings viable today may need to be updated on a regular basis to maintain the status quo. In a re-evaluation process, future research may want to broaden the scope of the studies by focusing on further data collection sites. Thereby, it could test whether existing insights are also valid in other geographical areas of the world in order to gain further global knowledge. Second, data collection of Articles II and III took place during the time of the Covid-19 pandemic. Although measures were adopted to reduce potential bias, future research may seek to compare people's perceptions during and after times of crisis. Third, although the wide list of sociodemographic influences explored in Article II and III are selected with care, they are by no means exhaustive. Future research may for instance seek to examine whether additional factors such as topography, climate and seasonality have significant influences on people's assessments.

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Article I

Future mobility insights: a trend receiver approach

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Abstract

The mobility sector is changing due to its negative consequences and companies' reactions thereupon. New mobility solutions are entering the market quickly, while it is uncertain where the shift in the industry will lead. Thus, companies ought to understand people's future mobility needs to successfully adjust their innovations accordingly. This study examines customers' insights into future mobility via trend receiver interviews in Europe, the United States and China. Findings reveal that some companies' current strategies align with future customers' mobility expectations, while other innovations may be under- or overestimated. These insights are of value for automobile manufacturers, marketing managers as well as for governments and city planners in order to positively influence the future of mobility.

Keywords: future mobility, trend receiver, customer insight, autonomous vehicles

Introduction

The large-scale introduction of cars was one of the decisive changes in the 20th century (Geels, 2012). The car's development resulted in an increased quality of life for many, becoming a status symbol itself (Urry, 2004). Yet, the introduction of cars is also associated with disadvantages. Consequently, mobility providers began reconsidering their business models and the mobility industry is experiencing a shift. The question arising is what customers expect of the future of mobility in order for companies to adapt their innovation processes accordingly. This paper is structured as follows: the first part identifies reasons for the shifting mobility sector and demonstrates companies' current solutions. The topic is then put into a theoretical context, followed by an explanation of the applied method. Subsequently, the findings section explores the research questions, which are evaluated in more detail in the discussion. Lastly, the study's limitations are presented.

Theoretical background and research questions

There are several negative consequences of the mass use of cars causing the current shift in the mobility sector. Firstly, the global political and financial situation is putting pressure on economies, including the mobility industry (Strauss, 2019). However, these factors will not be considered in this study as they are not customer-driven. Secondly, mass

car adoption results in road congestion in many regions. Consequences include loss of time, car crashes and high stress levels of those involved (Dixon et al., 2019; WHO, 2018). For instance, an average car commute in the US lasts 27 minutes, corresponding to 225 hours per year (USCB, 2018). Furthermore, traffic jams are associated with negative economic consequences, as time spent in traffic cannot be used otherwise. Thirdly, the car sector is a major contributor to climate change. It emits large amounts of fine dust and CO_2 and represents 9% of global greenhouse gas emissions (United Nations, 2017; Stephan et al., 2019). Fourthly, there are further ecological factors such as noise pollution, land use and biodiversity loss, to only name a few, resulting from intensive car use. Overall, those factors are related to costs of respective countries and harm the environment and society (van Essen et al., 2011). Additionally, urbanisation, i.e., people moving from rural to urban areas, has been increasing in past decades. It is estimated that by 2050 approximately 68% of the human population will be living in cities (United Nations, 2018). While urbanisation has various benefits, its downsides include growing population density, resulting in an intensification of aforementioned factors (Dixon et al., 2019; Pojani & Stead, 2015).

People are becoming more aware of the drawbacks of individual car use and have begun to reconsider their mobility patterns. There is a shift in people's mindset towards a more thoughtful and sustainable mobility behaviour (Sheth et al., 2011; White et al., 2019). This shift is fostering the development of the *sharing economy*, creating new business models based on sharing instead of owning. According to Belk (2014), shared business models depend on the Internet and provide temporary access to consumer goods without possessing them long-term. Industries already using sharing models include the finance, music, clothing and hotel industry, among others (Puschmann & Alt, 2016). The *sharing economy* also provides new opportunities in the mobility sector, as one shared vehicle can meet the needs of multiple customers (Belk, 2009; 2014). Thus, mobility providers are adapting their business models to shifting customers' mobility patterns. Current technological advances are facilitating this adaption which will be reinforced by the fifth generation (5G) of cellular network technology (Cohen & Kietzmann, 2014; Heineke et al., 2019). Moreover, governments also reinforce adaptions in mobility providers' business models by demanding a more sustainable mobility industry via, for instance, the implementation of costly CO_2 certificates (Docherty et al., 2018; Solaymani, 2019).

Some adaptations by companies to the negative consequences of individual car use already exist today in the form of new mobility solutions, usually introduced by automotive

or technological companies (Hanley et al., 2013). Many of these solutions benefit from the advantages of the sharing economy (Cassetta et al., 2017). Firstly, some new mobility solutions are based on the use of cars. Here, the car functions as a means of transport in the form of carpooling (one driver picking up several people to share a ride to the same or near-by destination/s) or carsharing options (people sharing the same car, either privately or commercially via sharing-platforms) (Bardhi & Eckhardt, 2012). Moreover, fully autonomous vehicles (AVs) are currently being developed and will enter the market at some point in the future. They will either be used individually or via carpooling/carsharing offers (Kässer et al., 2019). Today, most car-based mobility solutions run on internal combustion or electric engines with the long-term goal of increasing the share of the electric drives (Mounce & Nelson, 2019). Secondly, further new mobility solutions rely on so-called micro mobility solutions, e.g., scooters and bicycles, which usually function electrically on shared models (Schellong et al., 2019). Thirdly, investments in mobility solutions include the enhancement of public transport. This encompasses faster trains and buses, tighter timings, additional stops and more efficient routing (Loxton et al., 2019).

Overall, some scholars assert that new mobility solutions are advantageous for society and the environment and conclude that their development should be intensified in the future (De Souza et al., 2019). In contrast, some authors criticise that mobility companies are not adapting fast enough to the shift in the mobility sector and the relevance of their business models will stagnate (Collie et al., 2019). Further, some studies even stress the downsides of new mobility solutions: according to Ke, Chai and Cheng (2019), there may be too few carsharing options available for people to refrain from using private cars. Regarding micro mobility offers, authors argue they are a burden for pedestrians and vehicles lying around impair the cityscape and obstruct paths (Schellong et al., 2019). Additionally, improving public transport can be problematic as construction is often outpaced by population growth (PTUA, 2018). In general, mobility solutions launch in short intervals and customers regularly face new options. Many companies are pressured to adjust their business models by a fear of losing customers in the future. Yet, it is unclear where the shift in the mobility industry is leading to and companies are left wondering if current mobility developments are still going to meet customers' needs in the future (Collie et al., 2019).

Using customer insights to create new innovations has been widely examined in innovation research. Studies show that processing customer-based knowledge influences companies' innovation capabilities (Holmström & Roberts, 1998). Cohen and Levinthal

(1990) establish the construct *absorptive capacity* as an organisation's competence to influence the ability to innovate and be competitive. This ability requires identifying new external knowledge, assimilating it, and using it profitably. Moreover, the construct *open innovation* introduced by Chesbrough (2003) suggests opening innovation processes towards external stakeholders such as customers or partners to use their knowledge for maximising innovation potentials. Further innovation research includes consulting lead users (von Hippel, 1986). According to the author, lead users are people whose needs anticipate mass market needs and who expect high benefits from problem solving. Thus, asking lead users for their opinion may be profitable for companies' innovations, as their opinions are transferable to mass markets (Baldwin et al., 2006).

Although these constructs are not new, they are still relevant today due to fast changing environments. As claimed by Foss, Laursen and Pedersen (2011), companies require close relationships with customers to gain insights into their needs. Nowadays, customer bases change faster, and current customers may not inevitably be future customers. Hence, while mobility companies might know what their customers expect within a short-term period of *two* years, they may not know what is needed within a long-term period of *ten* years and more. The research questions (RQs) this study aims to explore read as follows:

RQ1: How do customers expect future mobility within the next ten years?

RQ2: How can companies base their future offerings on customers' future expectations?

Methodology

To answer the RQs, this study uses the construct of trend receivers (TRs) to generate knowledge into future customer insights. According to Hofmann (2014, p.10), TRs are people "who perceive changes and potentials of the new in a specific domain in a highly sensitive and differentiated way". Thus, in contrast to lead users, TRs can better understand changing environments and perceive potentials of new trends in a certain area in a highly sensitive and differentiated way. TRs are valuable for companies due to their visionary competence which is beneficial in managing immaterial assets such as changing customer expectations. Therefore, on the basis of TRs' future insights, companies may better prepare their long-term (product) strategy adjusted to customers' future needs and expectations (Hofmann, 2014).

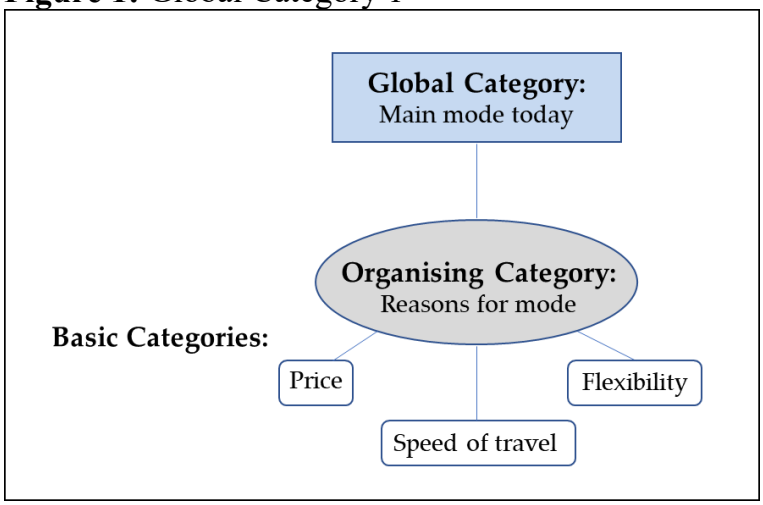
In total, thirty TR interviews were conducted. Semi-structured interviews were applied to obtain explorative, subjective, and comparative insights by offering standardised questions, allowing for flexible in-depth discussion of specific topics (Denzin & Lincoln, 2000). Overall, this study uses a subjectivist ontology and interpretivist epistemology. All TRs were acquired via pyramiding contacts. Pyramiding stands for systematically networking by recommendation from human to human until a person with desired characteristics is found (von Hippel et al., 2006). Here, TR characteristics, as described above, were searched for. The face-to-face interviews took place in Europe (London, Munich, St. Gallen, Zurich), in the US (New York, Boston) and in China (Shanghai). The interviews took place in large cities in order to gain insights for urban environments, rather than rural areas. Thus, findings and implications only cover urban areas. Although the selection of countries could have allowed for an identification of cultural differences, this was not the aim of the study. Rather, similarities across these countries other than potential cultural differences were searched for. Ten TRs were chosen from each country. TRs were both men and women aged 20 to 30 as this group of people may influence both their parents' generation and their children's generation and are therefore highly valuable for companies.

The duration of interviews ranged from 1:30 hours to 2:45 hours, while not all questions targeted the topic of future mobility. Some questions approached different topics (e.g., future working, cooking, shopping), but are not included in this study. All interviews were audio recorded and essential questions were transcribed verbatim. Interviewees were provided with informed consent forms and were able to withdraw from the interview at any time. Analysis was conducted in the form of coding to subdivide insights into Global Categories while identifying thematical patterns and create Organising and Basic Categories, based on the analytical tool for qualitative research by Attride-Stirling (2001).

Findings

All interview findings are presented based on the established categories. Overall, there are two Global Categories with respective Organising and Basic Categories. Firstly, findings for Global Category 1 "Main mode today" (Figure 1) with one Organising and three Basic Categories will be presented, followed by a demonstration of Global Category 2.

Figure 1: Global Category 1

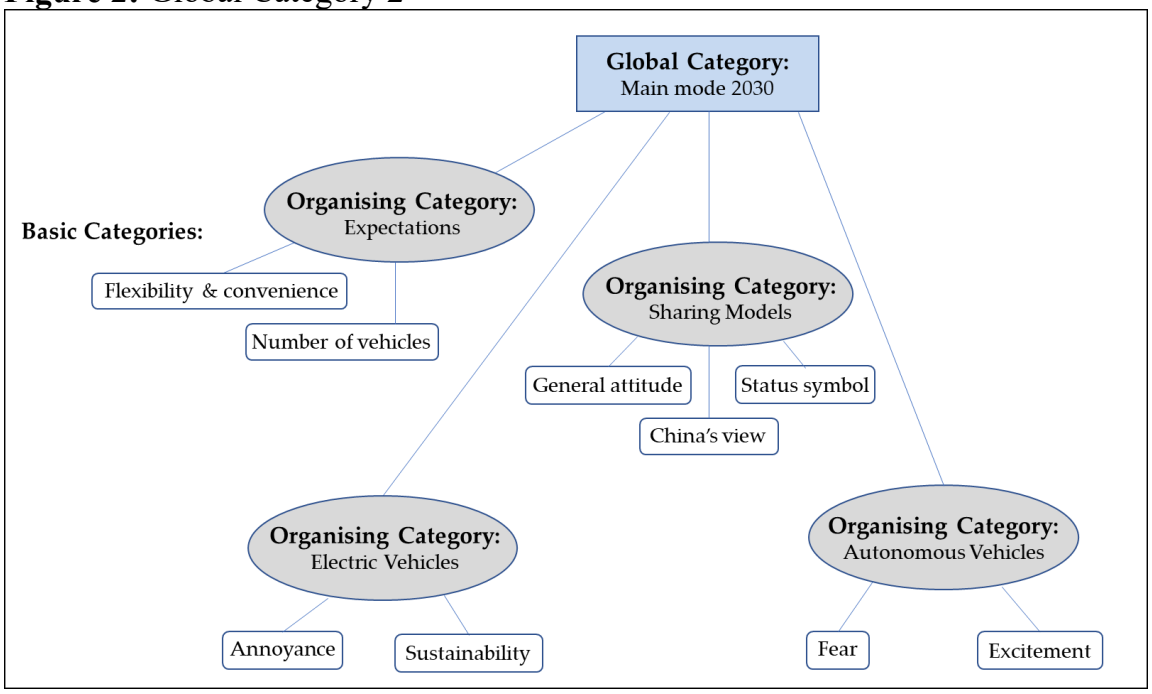


Today, public transport is the main mode of transport for TRs due to diverse motivations. For some TRs it is the lower cost option, yet the more prevalent reason was the fact that public transport provides more flexibility and does not require searching for parking spaces. TRs travelling by car drive because public transport does not offer routes – or only routes taking much longer – to their desired destination. Thus, flexibility, speed of travel and pricing are the main factors influencing TRs in their mobility behaviour. TRs from Europe also mentioned sustainability as a motive for using public transport as, in their view, busses and trains are eco-friendlier. TRs from the US were less concerned with sustainability and most TRs from China did not show any reservations at all. Their explanation was that if ecological mobility is not enforced by government, they will choose the most convenient mode of transport, regardless of its level of sustainability.

"Anywhere I go […] I can just take the subway. We have too many cars here, finding parking slots takes a long time and parking fees are quite high." (Male TR from Shanghai)

"I take the subway and I always want to take the quickest way. […] I'm considering all factors regarding price, time, safety." (Female TR from New York)

Figure 2: Global Category 2



In the next step, TRs were asked to imagine living in 2030. Figure 2 depicts the Global Category "Main mode 2030", from which four Organising and nine Basic Categories emerged. When questioned how their ideal mobility environment would look like in 2030, TRs described that mobility has evolved and sharing rather than owning cars has become the norm. This shift was perceived positively, and most TRs claimed that owning a car would no longer be a status symbol, or at least would be diminishing strongly.

"I think mobility is going to drastically change. […] We will progressively move away from individuals owning cars to individuals being able to access them, use them whenever they want. […] I think this is a great shift as it offers more flexibility for the user and also for society." (Male TR from Zurich)

As many of the interviewed TRs lived close to the city centre where parking tickets are expensive, cars were not perceived as nice-to-have but rather as an unnecessary burden. According to them, new status symbols will be experiences (Europe) and material objects such as purses and smart products (US). As per Chinese TRs, cars will still be status symbols for poorer populations, otherwise it will rather be education and smartphones.

"[…] none of my friends own a car. It's just very inconvenient here. I don't think it is a status symbol here in New York to own a car. It's more about which kind of bag you have." (Female TR from New York)

The main expectation that TRs envisioned for the future of mobility was even greater flexibility to increase convenience. More shared vehicles and higher public transport frequencies should enhance current offers to shorten searching or waiting times. Simultaneously, many TRs claimed they would appreciate having fewer vehicles on the roads to reduce congestion and noise pollution. When asked if they would carpool with strangers to decrease the overall number of vehicles on the roads, most TRs agreed, provided that the journey itself would not take any longer. Generally, the faster a journey, the higher its perceived quality.

"Streets will be a lot quieter in the next 10 years, which I'm looking forward to. With hybrid cars and electric cars, I do believe that this will become the standard pretty quickly, I'm hoping I could see that." (Female TR from London)

"Overall, I prefer using my own Uber just because it is faster. It takes so much longer to go everywhere. If it took the same time, I wouldn't mind at all, though." (Female TR from Boston)

Most TRs did not specify which mode of transport they would choose in the future, but they would intend to use the most convenient, i.e., the fastest, safest, and cheapest option, including micro mobility. An exception was if something heavy needs to be transported. In this situation, TRs would consider booking a carsharing ride. Chinese TRs described how they will own a car once they have a family. Owning a car as a family is part of their culture and unlikely to change soon. Yet, many of these TRs were open for sharing a car with neighbours to reduce costs and congestion.

"If I have a family I would probably rent or share a car with another family. If my colleague lives near me, we can very possibly have a shared car if it can fit 6-7 people in it. So, we can get from A to B without having to pay ridiculous amounts of money for parking, gas or electricity." (Male TR from Shanghai)

Overall, the majority will accept paying higher prices if mobility options improve and some TRs are willing to pay more for premium shared cars. According to them, *owning* a car will no longer be a status symbol, but *driving* will always be an enjoyment. It should be noted, however, that this group of TRs was rather exceptional in contrast to most TRs who consider cars solely as mobility objects.

"It will no longer be about selling cars individually, but more about how to get the most value out of people without selling a car […]. There are always people who want to buy their cars individually, but that will be much less." (Male TR from Munich)

TRs had an indecisive attitude towards electric vehicles. Although electric cars may be more sustainable in their eyes, they would not be willing to pay higher prices for them. Some TRs expressed annoyance over poor charging infrastructures and high prices, and thus electric propulsions were not mentioned in their ideal mobility environments in 2030.

Concerning AVs, all TRs were receptive but hesitant towards their use. Most TRs did not seek to be early adopters of AVs but would use them as soon as many people have experienced them in a positive way. The rationale behind this assertion is lack of trust, which was stressed when asked if TRs' (future) children should use AVs to drive to school. This option was declined by TRs as they did not feel confident entrusting the safety of their children to a machine. Besides lack of trust, TRs had positive associations with AVs and are excited for them to enter the market. When asked what an ideal AV should look like, many TRs suggested several types of AV should be available on-demand to perfectly meet various needs (e.g., for working or sleeping).

"I'm all for autonomous vehicles, I think it is a really fascinating and potentially exciting technological advancement […]. It obviously has its own issues but for the most part I can see its potentials." (Male TR from New York)

"I'm definitely not going to be the first one to jump in an AV. Right now, they're still very underdeveloped. They would have to pay me at least a million to sit in such a car right now. But […] once the technology is mature enough, I would love to try one of those and even start eating my breakfast in the car […]." (Male TR from Shanghai)

Discussion and implementation

Findings from global interviews revealed that, across countries, there were different expectations regarding future mobility, yet similar patterns could be identified. A desire for increased convenience was obvious among all TRs. In 2030, mobility solutions need to be more flexible, enabling people to move safely with minimised restrictions and delays. The current introduction of various sharing solutions is a positive development as most TRs do not mind sharing if convenience and speed are not impeded. This finding is in line with current

developments in the *sharing economy* and a factor that future mobility could make greater use of. According to data, current offers are not adequate to meet (spontaneous) demands without having to wait and walk. Thus, it can be assumed that although mobility providers are already aiming for providing high levels of flexibility, this level is not yet adequate.

Mobility providers may consider enlarging their sharing offers without impairing cityscapes, as roads should be less congested in the future. The challenge for these companies is, therefore, to find a *balance* between an adequate offer of mobility options and fewer vehicles overall. One way to achieve this is to install more organised stands for all types of vehicles for easy access, a tidy cityscape, and empty streets. For instance, instead of providing electric scooters all over the city with no fixed place to park them, which would result in them blocking the way for pedestrians, providers could set up dedicated places where the electric scooters could be collected and returned.

Moreover, interviews showed how privately owned vehicles will be far less common in 2030. Whilst this finding may not be new (e.g., Collie et al., 2019; Hensher, 2018), the extent of this shift is remarkable. Perceiving cars as an expensive burden and not as a status symbol – as interviews revealed – creates a new need and thus new basis of selling strategy for carmakers. Current business models targeted at solely selling cars might need to be reconsidered faster and more diversely than previously expected. Carsharing options could be offered by carmakers in addition to selling them. Furthermore, carmakers may need to re-think their promotional strategy to target potential consumers' convenience and flexibility rather than their emotions and alleged luxurious associations with cars.

Additionally, while mobility providers currently try to be more eco-friendly, data showed that customers are less concerned with sustainability than is expected by scholars and industries (e.g., Sheth et al., 2011; White et al., 2019). Reducing one's ecological footprint should yet be a noteworthy competitive factor for companies, particularly if governmental pressure increases. However, it is decisive to notice that overall convenience will still be foremost in the mind of customers in the future. Companies offering electric vehicles may consider alternative ways to increase sustainability in order to attract future customers. Thereby, companies could comply with environmental regulations and still meet customers' demand.

Regarding AVs, interviews demonstrated how TRs are fascinated by them albeit being anxious about their unfamiliar functionality. The level of AVs' novelty is high, resulting in

their acceptance depending on other people using them first. Since barely any TR was open for trying them as soon as they are available, it could be assumed that many people have similar reservations. Thus, for companies producing AVs, it will be crucial to find early adopters to quickly increase the share of people using them. A means of finding those early users could be financial incentives for the use of AVs, e.g., by paying testimonials or influencers for trying and reporting on them. Another option could be the provision of AV testing areas to facilitate people's familiarisation with them. The more people familiarise with and create an understanding for the technology of AVs, the less fear they may show towards them. AV providers should not assimilate customers' insecurity towards AVs as a barrier for inventing them, as overall theoretical acceptance towards them is very high among TRs. A crucial step towards their acceptance and use is reducing this uncertainty.

In summary, data showed that companies already adapting their business model have good prerequisites to manage the shifting mobility sector. Companies need to consider today what customers expect within ten years to successfully adjust mobility offerings. As per TRs, not all current developments are perceived as positively as assumed, while other factors may be underestimated. These findings are relevant not only for mobility companies, but also for governments and urban planners to prepare infrastructures for new mobility solutions.

Conclusion and limitations

The aim of the study was to gain insights into customers' expectations regarding future mobility and how companies should adapt their offerings thereupon. These questions were answered by interviewing thirty TRs in Europe, in the US and in China. Findings revealed that some companies' current strategies are likely to meet future needs, such as introducing sharing solutions and thus encouraging more flexibility. However, some relevant factors may be over- and underestimated, for instance electric vehicles and insecurity towards AVs. As with all foresight methods, a limitation of this study involves the occurrence of unforeseen circumstances (war, natural disasters, etc.), affecting the validity of the findings. Another limitation is the disregard of TRs from emerging countries and from rural areas, which could be subject to future studies. Moreover, the findings of the study cannot be generalised as they only provide qualitative insights from a selected, non-representative sample of the population. Future studies could quantify the findings and test them for statistical significance.

Nonetheless, this study provides a basis of understanding for customers' expectations regarding future mobility, valuable for various stakeholders.

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Article II

What keeps us driving? Exploring sociodemographic patterns and underlying motives of mode choice in cities

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Abstract

Despite existing policy interventions increasing the cost of car ownership and the attractiveness of alternative modes of transport, car use remains high in many cities. This research explores the application of methodologies traditionally used in consumer research to assess underlying factors influencing transport decisions, and perceptions of transport modes. Techniques of familiarisation and psychological projection were employed in an online survey. Findings show that motives for different mode choices vary significantly according to sociodemographic factors. Further, we found that most common motives for selecting a particular main mode were not necessarily the same motives that would most commonly influence others to switch to that particular mode. Lastly, we demonstrate that promotional measures based on increasing familiarisation are only effective for walking, cycling and carsharing. This research offers additional methodological approaches to the study of transport behaviour and provides further insights into individual mode choice, valuable for future car reduction initiatives.

Keywords: urban car use, sustainable mobility, mode choice, psychological projection, familiarisation

Introduction

The transport sector is responsible for nearly a quarter of the European Union's total greenhouse gas emissions (EEA, 2018). A large share of these emissions is related to urban transport and particularly the use of private cars, which accounts for 61% of total road transport CO_2 emissions in the EU (European Parliament, 2019). At the global level, 45% of transport-related CO_2 emissions stem from private vehicles (IEA 2019). In addition to CO_2, car use is a major contributor to air pollution, congestion, noise pollution and traffic accidents in cities around the globe (Douglas et al., 2011; Lauper et al., 2016; Ma et al., 2018; WHO, 2018). Reducing car use has therefore been a long-standing objective for urban policy makers. Existing policies aimed at reversing car dependency largely focus on increasing the instrumental costs of driving compared to other, more sustainable modes. Congestion charging and fuel taxes introduced in many cities aim to make driving more expensive than other alternatives, while restrictions on vehicle access, e.g., via car-free zones and limitations on parking spaces aim to make travelling by car less convenient. At the same time, many European cities have invested billions to improve access to alternative modes of transport

(ECA, 2020). However, despite these policy measures and investments, the rate of car use and ownership across most European cities remains fairly high, particularly in more suburban areas (EEA, 2020). Therefore, focusing on instrumental motives for car use alone – such as economic cost, travel time and convenience – does not seem to be sufficient to reduce car use in cities to an acceptable level (Steg, 2005; Steg et al., 2001). There appear to be certain underlying and non-instrumental motives driving continued car use, such as emotional attachment and status-related considerations. This suggests that for some people, a car is not merely a means of getting from A to B efficiently, but something of a more profound importance to their lives.

Recognising the need to target non-instrumental motives for car use, policy makers in many cities have begun to design advertising campaigns that focus on the pleasurable experiences and positive cultural associations linked to more sustainable modes of transport. However, in order to design effective interventions to reduce car use, we need to develop a more nuanced understanding of the underlying motives shaping different individual preferences for certain modes, and the potential non-instrumental factors motivating a shift from car use to alternative modes. Policy interventions may be particularly impactful at the point where an individual is considering purchasing a car, as once they own their own car, the chances of them using this car over alternative modes is much higher (Paulley et al., 2006).

The aims of this research are to explore the underlying motives influencing individuals' mode choice, as well as to provide insights about what drives the perceived attractiveness of alternative mobility choices. To accomplish this, we draw on two separate exploratory studies that test the applicability and potential usefulness of marketing research methodologies in the realm of transport policy. Both studies are based on an online survey conducted in two urban settings. Prevalent in consumer and marketing research (e.g., Marshall & Barbour, 2015; Szollosy, 2017; Zervakis & Mazuka, 2013), the methodological approaches used in these studies have frequently been used by scholars to highlight the underlying factors that can help to promote car use and car sales (e.g., Carbon & Leder, 2005; Landwehr et al., 2013). This research subverts this pattern and applies the consumer-centric research methods traditionally used to understand and nudge purchasing behaviour to uncover mechanisms to achieve the opposite. In doing so, it broadens the research toolkit used to understand the underlying motives that shape the mobility behaviours of different segments of the population. This will provide new insights that could be relevant to efforts to reduce car dependency and increase alternative mode use in cities.

Study 1 assesses the motives for individual mode choice and explores motives for switching from one mode to another and how this varies for different sociodemographic groups. Study 2 tests the suitability of three promotional instruments based around consumer familiarisation to increase the level of attractiveness of alternative modes. In combination, these two studies seek to provide new methodological approaches that can help urban policy makers to design more effective strategies to reduce car use and, eventually, ownership in cities. Understanding the motives underpinning transport choices is an important first step to devising policy interventions to promote the use of sustainable modes, and ultimately disrupt car purchase intention. The remainder of this paper is structured as follows: the next section provides a brief overview of the relevant literature framing this research. In the third section, the methods and results of the two studies are presented and discussed. The overall results are discussed in section four. The paper concludes with a brief outline of the policy implications of the findings as well as opportunities for future research.

Brief literature review

Factors influencing modal split

Several scholars have explored the drivers of continued car use, but most studies emphasise rational and economic motives such as safety, convenience and costs (De Groot & Steg, 2007; Hiscock et al., 2002; Gardner & Abraham, 2006; Kent, 2014; 2015; Sheller, 2004; Wells & Xenias, 2015). There have been some attempts, however, to broaden this discussion. Steg (2005) theorises that cars provide three sets of functions: instrumental, symbolic and affective functions. Instrumental functions for car use can roughly be defined as the convenience or inconvenience of car use: the speed, flexibility, comfort and safety it provides (Basmajian, 2010; Hagman, 2003). The symbolic functions of car use relate to the extent to which individuals can express their self-identity or social position through cars (Sheller & Urry, 2006). This is connected to how people compare their car use to others and to social norms, in particular prestige, empowerment and masculinity (Hiscock et al., 2002, Sheller, 2004, Bamberg & Schmidt, 2003). Lastly, the affective functions of car use refer to the emotions and feelings aroused through owning and driving a car. Steg (2005) found that symbolic and affective motives could account for the variance of car use frequency. The feeling of being in control over the car itself while driving, and the added sensory experience provided by contemporary cars with their built-in sound and thermal management systems,

are often cited as affective motives for car use (Gardner & Abraham, 2006; Kent, 2014; 2015; Wells & Xenias, 2015).

Steg's categorisation can be applied to other forms of transport. According to Beirão and Cabral (2007), low costs and low emission levels are instrumental functions of using public transport. The authors also investigate car users' opinions towards public transport and conclude that service quality and reliability are key factors for its use. In terms of symbolic motives, De Groot and Steg (2007) find that people were more inclined to travel by public transport rather than by car when they believed that others approved of this choice. Steg (2003) also noted that affective functions of public transport include its perceived attractiveness in comparison to cars, which increases the less a car is used as a main mode.

Concerning walking and cycling, (so-called 'active' modes), several studies show that travel satisfaction is stronger for walking and cycling than for using public transport (e.g., De Vos et al., 2013; Ye & Titheridge, 2017). Reasons for this preference include its instrumental functions such as physical and mental health benefits, an increased level of fitness with adaptable personal energy consumption, as well as the fact that these modes neither produce emissions nor contribute to congestion (Cavill & Watkins, 2007; Frank et al., 2006; Garrard et al., 2006; Gatersleben & Appleton, 2007; Giles-Corti et al., 2010; Haines et al., 2009; Lumsdon & Tolley, 2001). For cycling, speed over short distances is an additional instrumental function (Gatersleben & Appleton, 2007; Lumsdon & Tolley, 2001). In terms of affective functions, Gatersleben and Uzzel (2007) found that cyclists and walkers are more likely than car users to find their commute relaxing, and more likely than public transport users to describe it as exciting.

With regards to carsharing, convenience, time saving, flexibility, favourable pricing models, comfort, and safety are most cited instrumental factors (Schaefers, 2013). In addition, carsharing is considered an environmentally friendly mode of transport. Yet, environmental concerns are not considered to be the most prominent factor in influencing people to choose this mode (Costain et al., 2012). As carsharing is currently a lifestyle product, highly visible car brands and vehicle designs are symbolic functions of carsharing which relate to personal social status (Schaefers, 2013). Moreover, there is a sense of belonging to the carsharing community and members often identify as part of this carsharing community. Users of carsharing services often consider themselves to be tech-savvy and can exchange information about this new form of transport. This also relates to social status and is thus a symbolic function (Schaefers, 2013).

Methodological approaches to uncovering users' choices

There are various reasons why people may choose means of transport other than cars, and some modes such as active transport and carsharing are currently gaining in popularity. Yet, the stickiness towards cars in cities remains high. Motives for car use have been explored widely by applying either interviews or surveys (e.g., De Groot & Steg, 2007; Gardner & Abraham, 2006; Hiscock et al., 2002; Kent, 2014; 2015; Sheller, 2004; Wells & Xenias, 2015). By using these methods, the studies mainly focus on instrumental or symbolic motives for car use and less on affective ones. While these methods were certainly appropriate for the aim of the studies, given the rapidly changing context surrounding mobility services, some may now be partly outdated. Furthermore, exploring and understanding symbolic and particularly affective motives for car use is more complex, as people may not be able to express these in a survey or interview situation or simply not want to fully reveal them. To a large extent, existing studies have also not analysed motives underpinning transport behaviour, broken down by sociodemographic factors. Although there are recent studies which consider sociodemographic differences (e.g., Herberz et al., 2020; Hoffmann et al., 2020), these studies do not explore the same range of mode choices and potential motives that this research is employing.

In light of this, firstly, this study applies a projection method which is designed to prompt respondents to project their own thoughts onto other people, reducing potential bias in their answers. Depending on how questions are asked, people tend to answer questions in a way they consider to be socially acceptable instead of revealing their true attitudes towards certain issues. This distortion is referred to as social desirability bias (Edwards, 1957; Fisher, 1993). One mechanism that can reduce social desirability bias is indirect questioning (Fisher, 1993). Indirect questioning is a projective approach in which respondents are asked to answer questions from another person's perspective (Anderson, 1978; Fisher, 1993; Haire, 1950). By making use of psychological projection[1] through indirect questioning, social desirability bias is reduced as less socially desirable attitudes are subconsciously projected onto others and are more likely to be revealed (Fisher, 1993; Krueger, 1998; Szollosy, 2017).

Secondly, to assess various strategies increasing the attractiveness of alternative modes, this study uses a repeated evaluation technique, which enables quick familiarisation with an object through repeated engagement (Carbon & Leder, 2005; Zajonc, 2001). While

[1] The psychological projection approach is based on psychological projection theory, according to which inner conflicts are subconsciously projected onto others (Katz et al., 1931; Szollosy, 2017).

familiarisation with an object or setting usually takes weeks or months, the repeated evaluation technique accelerates this process by allowing survey respondents to engage with a certain object in a targeted manner during a short period of time. The method was combined with the phenomenon of observational learning which stems from social cognitive theory (SCT) as introduced by Bandura (1986; 1989). According to SCT, people learn by observing others being punished or rewarded for certain behaviours and are therefore more inclined to exhibit (or not exhibit) this observed behaviour themselves. Combining the task of repeatedly evaluating an object by seeing someone being rewarded/punished for a certain behaviour associated with the object may increase familiarisation.

Research questions

As discussed above, understanding people's underlying attitude towards car use and alternative modes is an important precondition to the creation of successful policies to reduce car use. The question at the starting point of this research is: how can car use in cities be reduced? This research question can be fragmented into two core elements, static and dynamic, resulting in the following sub-questions:

Static

(1.1) What are people's current motives for using different means of transport and how do these motives differ according to sociodemographic factors?

Dynamic

(2.1) What are people's motives for switching to alternative means of transport and how do these motives differ according to sociodemographic factors?

(2.2) Does increasing familiarity with alternative modes of transport have a positive impact on their attractiveness?

To tackle the research questions, we used an online survey to assess motives for mode choice via the mechanism of psychological projection (Study 1) and reveal changes in the level of attractiveness in terms of willingness to experience, comfort, safety and stress (Study 2) via a familiar technique. Overall, 1,400 population-representative respondents aged 18 to 69 from the area of Greater London (1,000 participants; 50.5% female) and the German-speaking urban area of Switzerland (400 participants; 51.7% female) participated in the online survey. These areas were selected due to their disproportionately high rate of car ownership

that continues to persist despite their well-established public transport systems and plethora of policy interventions to promote more sustainable mode choices. Therefore, these two urban areas are suitable real-world examples of cities that continue to struggle to reduce car use to sustainable levels.

All respondents were pre-selected to ensure that they had intentions to buy a car within the next three years. This pre-screening was based on the fact that a car purchase is a crucially important moment in determining a person's future mobility habits. Car purchases have been shown to have strong long-term effects on transport behaviour: consumers invest large sums of money at the point of purchase which in effect locks them into car use for years to come (Mattioli et al., 2020; Simma & Axhausen, 2001). Therefore, policies designed to disrupt car purchase intentions are likely to be particularly effective at reducing future car use. The survey was created on Unipark, a survey software, and was provided both in English and German.

Data collection took place during three weeks in June 2020. To avoid potential biases in peoples' responses as a result of Covid-19, all participants were directed to imagine a post-Covid-19 scenario in which there is a widely available, effective vaccine and chances of an infection are down to zero per cent. All participants gave their consent to take part in the survey and could withdraw at any time. No personal information that could have identified participants was collected. Respondents were paid for their participation in the survey.

Empirical research

Study 1: method

According to Ames (2004), projection is positively correlated with perceived similarity between oneself and the subject in question. Thus, the more the subject reflects personal characteristics, the higher the chance of actual projection instead of simply stereotyping while answering questions about the subject. To achieve this similarity of respondent and subject, we designed several fictional personas who resemble respondents in relation to gender, age, income and place of residence. In the end, we created 36 personas, 18 female and 18 male. Every respondent was shown a persona to match their sociodemographic characteristics, which they provided at the beginning of the survey. Further, every persona was depicted with

an accompanying short text briefly describing the persona's background[2]. Respondents were not told that their persona was chosen based on their likeness, or that they should answer with any relation to their own attitudes.

Based on the information provided about the persona, respondents were asked to state which mode of transport they thought the persona uses most often out of the options: personal car, public transport, bicycle, motorbike, carsharing, scooter and walking. Subsequently, respondents had to provide motives why they thought the persona most often chooses the selected mode of transport[3]. Respondents could choose a maximum of three different motives. Next, respondents were randomly shown three of the seven modes (excluding the mode they selected as the persona's main mode) and asked which factors would influence the persona to switch to this mode[4]. Then, respondents were asked how they would rate the persona's environmental attitude[5]. Finally, respondents indicated their own level of environmental concern via a 5-point-Likert scale ranging from not worried at all to extremely worried.

Study 1: results

Motives for persona main mode choice

To answer the first sub-question, we initially tested which main mode respondents selected for their persona which is shown in table 1. In the next step, the motives for the main mode choice were assessed. These are the motives respondents selected on the basis of what they considered most appropriate for their persona[6]. The results for both GL and uGS are

[2] For instance, '*This is Anna. Anna lives in an apartment close to the city centre with her partner. She works in a large insurance firm in the city and travels in and out to work every day.'*

[3] Answer options included the motives *to save money, to be flexible, to be safe while travelling, to help reduce carbon emissions, conform to what others around her/him are doing, to be fit, to enhance her/his social status, to have privacy when travelling, to be comfortable whilst travelling, to help reduce local traffic congestion, to have fun* and *to be at her/his destination quickly.*

[4] For instance, '*If Anna switches to public transport as her main mode of transport, what are her most important motives?'.* The answer options provided were the same as those provided in the main mode question.

[5] Respondents were given the following answer options: The person …*believes that environmental concerns are overplayed, …accepts that the environment is in danger, and something should be done to protect it, but believes that individual behaviour does not make a difference, … is worried about the impact of environmental destruction and supports government action to protect the environment, but she/he has not changed her/his own behaviour to reduce her(his impact on the environment, … tries to make environmentally sustainable decisions in her/his everyday life, insofar as these decisions do not come at a significant personal cost, … is deeply concerned about environmental destruction and has considerably changed her/his lifestyle to reduce her/his impact on the environment.*

[6] The motives were saving money, flexibility, safety, reducing congestion, conforming with others, fitness, social status, privacy, comfort, reducing congestion, fun and fastest way.

shown in table 2. Chi-square tests revealed that all motives were significantly different for all modes in GL with $p < .05$, both with and without removing the modes with very few cases, i.e., motorbike, carsharing and scooter. The same mostly applied for uGS, with two exceptions: the motives *safety* and *conforming others* (both with $p > .05$). There is no robust evidence that the different modes perform differently for these two criteria.

Table 1. Respondents' selection of main mode for their persona in %.

	Persona Main Mode Selection						
	Car	Public Transport	Bike	Walking	Motorbike	Scooter	Carsharing
GL	12.5	40.6	13.6	31.1	1.5	0.4	0.3
uGS	18.3	40.0	28.4	6.7	3.0	1.0	2.7

Sociodemographic factors correlated with the motives for persona main mode choice

The motives respondents selected as influencing their persona's mode choice were analysed according to the respondents' sociodemographic characteristics. These motives were assessed via chi-square tests for all modes. The choice of the test was determined by the different levels of scale of the data as some of the data was nominally scaled. Further, the chosen tests allowed for the best comparability of the results across all cases as respondents indicated their top three motives and not just the main one. These potential influencing factors were age, gender, levels of income, healthy lifestyle, the distance from the place of residence to the centre and the level of environmental concern[7]. In addition to the chi-square tests, the effect size Cramér's V was regarded for the variables as well as the bar charts showing the relations to identify their directions.

[7] For the environmental concern both the level of environmental concern of the respondent and of the persona were assessed. The latter is taken to represent the indirect and true level of the respondent's environmental concern.

Table 2. Motives for main mode choice in Greater London and in the urban German-speaking part of Switzerland in %.

	Save Money		Flexibility		Safety		Reduce CO_2		Conform with others		Fitness	
	GL	uGS	GL	uGS	GL	uGS	GL	uGS	GL	uGS	GL	uGS
Car	4.23	8.60	16.29	25.81	14.66	6.45	1.95	2.69	2.93	2.69	3.91	4.30
Public Transport	17.59	21.01	12.47	11.90	6.18	5.06	10.02	12.91	3.41	2.53	2.24	5.32
Bike	18.36	17.75	9.04	19.57	3.67	2.54	16.95	7.97	1.98	2.54	21.75	20.65
Motorbike	11.43	7.41	22.86	14.81	2.86	14.81	5.71	7.41	0.00	7.41	5.71	7.41
Carsharing	11.11	9.09	22.22	9.09	11.11	9.09	0.00	9.09	0.00	27.27	0.00	9.09
Scooter	20.00	0.00	20.00	30.00	0.00	0.00	20.00	0.00	0.00	10.00	10.00	10.00
Walking	23.36	28.79	5.68	12.12	3.54	1.52	11.74	1.52	0.76	0.00	24.37	24.24

	Social Status		Privacy		Comfort		Reduce Congestion		Fun		Fastest Way	
	GL	uGS	GL	uGS	GL	uGS	GL	uGS	GL	uGS	GL	uGS
Car	5.86	6.45	15.31	10.75	17.26	11.83	0.00	3.76	1.63	5.91	15.96	10.75
Public Transport	0.53	1.01	0.21	1.01	7.14	5.06	14.61	15.19	0.11	1.52	25.48	17.47
Bike	3.39	1.81	1.69	1.81	3.95	2.17	6.78	5.43	2.26	6.52	10.17	11.23
Motorbike	8.57	3.70	0.00	7.41	5.71	0.00	5.71	3.70	11.43	11.11	20.00	14.81
Carsharing	11.11	0.00	11.11	18.18	11.11	9.09	0.00	0.00	0.00	0.00	22.22	0.00
Scooter	10.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	10.00	10.00	10.00	30.00
Walking	0.63	1.52	0.88	0.00	5.05	1.52	7.58	6.06	1.01	6.06	15.40	16.67

The motives selected by respondents as underpinning the personas' choice of car as the main mode were compared with respondents' sociodemographic characteristics and results are shown in table 3 for both GL and uGS. In GL, *comfort* was mostly selected as a motive for car use by respondents with high income levels. Further, the greater the importance respondents placed on having a healthy lifestyle, the less they chose *comfort* as a motive for using a car. The environmental concern of the persona also showed a significant relation with *comfort*, the more concerned the persona, the more *comfort* was chosen. *Fastest way* was less frequently selected by respondents who have an extremely healthy lifestyle. In uGS, *fastest way* was chosen more often by women and by those with moderate levels of income. *Saving money* was more relevant for respondents with higher environmental concern. Lastly, *fitness* showed a significant relation with the distance to the city centre as those living closest to the centre chose this motive most frequently.

The sociodemographic characteristics of those who selected public transport as their persona's main mode were compared with their selection of underpinning motives. Results are presented in table 4 for both GL and uGS. In GL, more women and people with high levels of environmental concern selected *fastest way* as the persona's main motive for public transport use. In addition, people with lower incomes were more likely to select *saving mone*y, *reducing congestion* and *fastest way* as motives. The motives *fastest way* and s*aving money* were also correlated with distance to city centre as those living far away from the centre chose this motive most often. *Reducing* CO_2 was correlated with the levels of environmental concern of both the respondent and of the persona and the higher the level of concern, the more frequently was the motive selected. In uGS, the motive *saving money* was chosen more often by younger respondents. In contrast, *safety* and *privacy* were most often selected by older respondents. *Fitness* and *reducing congestion* were both related to distance to city centre. Here, the closer respondents live to the centre, the more frequently they chose these motives. The motive to *conform with others* revealed a positive relation with environmental concern, both of the respondent and of the persona.

Table 3. Relations between underlying motives for personas' car use and respondents' sociodemographic characteristics.

		Save Money		Flexibility		Safety		Reduce CO_2		Conform with others		Fitness		Social Status		Privacy		Comfort		Reduce Congestion		Fun		Fastest Way	
		χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V
Age	GL	9.39	.28	4.24	.19	3.04	.16	4.08	.18	10.05	.29	8.27	.26	6.48	.23	5.95	.22	9.21	.28	-	-	9.51	.28	8.25	.26
	uGS	3.35	.21	3.75	.23	4.92	.26	4.80	.26	3.80	.23	1.19	.13	2.31	.18	5.54	.27	3.98	.23	3.35	.21	4.76	.25	8.69	.34
Gender	GL	3.81	.18	1.07	.94	.09	.03	4.29	.19	.21	.04	.28	.05	.79	.08	.15	.07	.89	.09	-	-	.91	.09	.66	.07
	uGS	1.16	.13	.59	.09	.06	.03	.03	.02	1.28	.13	.51	.08	.06	.03	.03	.02	.001	.003	.14	.04	.45	.08	4.05*	.23
Income	GL	5.39	.21	1.38	.11	2.85	.15	3.36	.17	1.15	.09	4.28	.19	1.55	.11	5.36	.21	8.91*	.27	-	-	2.18	.13	6.55	.23
	uGS	1.86	.16	1.78	.16	3.34	.21	4.16	.24	6.28	.29	1.14	.12	5.55	.27	.86	.11	1.88	.16	1.22	.13	1.69	.19	8.59*	.34
Distance to city centre	GL	1.39	.11	.48	.06	2.37	.14	.26	.05	.08	.03	4.90	.20	4.26	.19	1.25	.10	2.07	.13	-	-	.83	.08	3.75	.17
	uGS	1.81	.16	.22	.05	.28	.06	1.29	.13	4.45	.25	7.71*	.32	3.86	.23	2.21	.17	3.26	.21	.07	.03	.67	.09	1.47	.14
Healthy lifestyle	GL	1.02	.09	3.36	.17	3.96	.18	11.88	.31	4.37	.19	3.47	.17	2.49	.14	1.03	.09	10.42*	.29	-	-	17.02	.38	15.55**	.36
	uGS	3.78	.23	5.48	.27	.98	.12	3.23	.21	2.69	.19	2.72	.19	2.29	.18	8.73	.34	1.29	.13	1.26	.13	4.33	.24	6.26	.29
Environ-mental concern	GL	6.98	.24	5.19	.21	4.13	.18	3.65	.17	3.83	.18	7.71	.25	2.18	.13	2.19	.14	2.49	.14	-	-	1.6	.12	5.54	.21
	uGS	12.43*	.41	7.64	.32	8.69	.34	3.86	.23	3.86	.22	3.91	.23	2.25	.17	5.55	.27	5.99	.29	.93	.11	9.39	.36	5.55	.27
Environ-mental concern of the persona	GL	4.76	.19	1.67	.12	4.07	.18	2.71	.15	2.51	.14	8.77	.27	10.63	.29	1.09	.95	10.29*	.29	-	-	6.70	.24	6.61	.23
	uGS	1.01	.12	7.94	.33	1.61	.15	.88	.11	15.54	.46	5.50	.27	5.92	.28	2.01	.16	1.08	.12	12.27	.41	2.89	.19	1.59	.15

Note: V refers to Cramér's V and shows the effect size between the relations. If – is shown, statistics could not be computed as the variable was a constant. $^*p < .05$ $^{**}p < .01$ $^{***}p < .001$.

Table 4. Relations between underlying motives for personas' use of public transport and respondents' sociodemographic characteristics.

		Save Money		Flexibility		Safety		Reduce CO_2		Conform with others		Fitness		Social Status		Privacy		Comfort		Reduce Congestion		Fun		Fastest Way	
		χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V
Age	GL	6.69	.13	2.87	.09	.92	.05	2.82	.09	5.98	.12	7.87	.14	6.96	.13	3.79	.09	4.56	.11	3.94	.10	3.32	.09	9.19	.15
	uGS	13.68*	0.29	1.89	.11	15.96**	.31	7.34	.21	1.99	.11	.69	.07	4.29	.16	14.86*	.30	1.01	.08	7.83	.22	4.96	.18	3.67	.15
Gender	GL	2.16	.07	1.07	.05	1.05	.05	.91	.05	.24	.02	2.78	.08	.25	.03	.001	.001	.10	.02	.06	.01	1.04	.05	9.73**	.16
	uGS	.25	.04	1.27	.09	.13	.03	.66	.06	.06	.02	.02	.01	.02	.01	.02	.01	1.17	.09	1.11	.08	.03	.02	.88	.07
Income	GL	62.86***	.40	1.39	.06	2.62	.08	4.14	.10	4.39	.11	1.17	.05	4.34	.11	1.73	.07	1.40	.06	22.00***	.28	3.01	.09	10.66*	.17
	uGS	5.34	.18	2.06	.11	4.11	.16	3.31	.14	2.58	.13	1.73	.10	1.69	.10	4.00	.16	2.04	.11	3.98	.16	1.58	.09	2.81	.13
Distance to city centre	GL	8.84*	.15	4.41	.11	.94	.05	.47	.04	.78	.05	2.88	.09	8.72	.15	1.43	.06	.02	.01	5.94	.12	3.36	.09	13.76**	.19
	uGS	13.76	.18	1.26	.09	.21	.04	.49	.06	.43	.05	11.66**	.27	3.28	.14	2.98	.14	.02	.01	7.21*	.21	1.14	.08	8.84	.15
Healthy lifestyle	GL	7.14	.14	4.17	.10	.62	.04	1.45	.06	.88	.05	1.21	.06	2.86	.09	1.79	.07	1.35	.06	1.93	.07	.89	.05	7.29	.17
	uGS	2.03	.11	3.25	.14	9.81	.25	2.31	.12	1.64	.10	5.62	.19	4.99	.18	2.65	.13	1.68	.10	3.91	.16	9.05	.24	1.35	.09
Environ-mental concern	GL	1.75	.07	2.71	.08	1.46	.06	12.43*	.41	1.67	.06	10.11	.02	10.76	.17	.99	.05	6.96	.13	5.97	.12	.9.34	.15	2.52	.80
	uGS	4.85	.17	3.00	.14	1.53	.09	4.01	.16	34.80***	.46	2.17	.12	20.02	.35	2.66	.13	2.12	.11	.76	.07	7.97	.22	2.93	.14
Environ-mental concern of the persona	GL	10.57	.16	7.59	.14	1.71	.07	20.05***	.23	3.49	.09	1.41	.06	4.55	.11	10.39	.16	1.79	.07	20.05	.23	3.32	.09	19.05**	.22
	uGS	2.38	.12	5.93	.19	6.69	.20	4.38	.16	10.14*	.25	4.26	.16	3.25	.14	4.40	.16	3.41	.15	4.56	.17	4.44	.17	7.19	.21

Note: V refers to Cramér's V and shows the effect size between the relations. $*p < .05$ $**p < .01$ $***p < .001$.

The relations between respondents' sociodemographic characteristics with the motives they chose as underpinning the choice of cycling as the persona's main mode are shown in table 5 for both GL and uGS. In GL, the motives *reducing CO_2* and *privacy* were more prevalent among older respondents. Moreover, *reducing CO_2* showed a strong positive correlation with income. In contrast, the motive *safety,* was more important for respondents with lower income. Further, results revealed that the motive *fitness* was mostly selected by respondents with a moderately healthy lifestyle. Lastly, the motive *social status* showed a relation with distance to city centre and only respondents living close to the centre selected this motive. In uGS, the motive *fun* was more prevalent among men and the motive *saving money* was increasingly selected with lower levels of income. Further, the latter motive had a significant relation with the environmental concern of the persona, i.e., for levels of moderate concern, the motive was chosen least. In addition, the motive was positively related with a healthy lifestyle. *Fitness* showed a significant correlation with higher incomes and the motive *fastest way* was chosen more often among respondents with high levels of environmental concern.

For the respondents who chose walking as the persona's main mode, results of sociodemographic factors correlated with motives for the mode choice are shown in table 6. In GL, the motives *saving money* and *fitness* differed across age groups with younger people choosing the first motive more frequently and the second motive was mostly chosen among middle-aged respondents. Unsurprisingly, the motive *reducing CO_2* revealed a positive relation with environmental concern – both the respondents' and the personas'. *Reducing CO_2* also differed across income groups, with lower income groups choosing this motive less frequently. The motive *reducing congestion* was also positively related with the environmental concern of the persona. In uGS, there were no statistically significant correlations between motives for walking and the sociodemographic characteristics that could be detected via a chi-square or Fisher's exact test. For the modes motorbike, carsharing and scooter, neither chi-square nor Fisher's exact tests could be conducted to test any significant relations with demographic factors and motives due to the small case number in both locations. Therefore, these modes were not further considered in the discussion.

Table 5. Relations between underlying motives for personas' bike use and respondents' sociodemographic characteristics.

		Save Money		Flexibility		Safety		Reduce CO_2		Conform with others		Fitness		Social Status		Privacy		Comfort		Reduce Congestion		Fun		Fastest Way	
		χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V
Age	GL	2.73	.14	6.47	.22	3.29	.16	11.44*	.29	4.64	.19	5.46	.20	5.37	.20	14.35*	.33	1.93	.12	11.04	.29	8.89	.26	10.31	.28
	uGS	6.03	.23	5.36	.22	12.29	.33	3.25	.17	3.53	.18	1.56	.12	6.23	.23	5.86	.23	4.37	.19	8.94	.28	3.43	.17	1.88	.13
Gender	GL	1.50	.11	.001	.001	2.43	.14	.02	.01	.11	.03	1.66	.11	.01	.01	.87	.82	3.61	.17	.01	.01	.04	.20	.95	.09
	uGS	1.29	.11	.38	.06	1.01	.09	.39	.06	1.79	.13	.21	.04	.36	.07	.10	.03	2.33	.14	.001	.002	5.47*	.22	.06	.02
Income	GL	.53	.06	2.98	.15	12.61**	.31	16.08**	.35	.81	.08	3.55	.16	1.11	.09	4.94	.19	6.39	.22	1.31	.10	5.12	.19	.95	.09
	uGS	11.01*	.31	4.96	.21	5.89	.23	5.01	.21	2.17	.14	9.53*	.29	3.26	.17	4.29	.19	3.63	.18	1.68	.12	2.29	.14	1.26	.11
Distance to city centre	GL	.28	.05	1.09	.09	2.66	.14	.14	.03	.24	.04	1.89	.12	13.16**	.32	.11	.03	1.76	.12	4.81	.19	1.12	.09	2.08	.13
	uGS	3.86	.18	5.36	.22	1.79	.13	2.05	.13	1.79	.13	.25	.05	.64	.08	.64	.08	.16	.04	1.19	.10	1.14	.10	1.47	.11
Healthy lifestyle	GL	.53	.06	3.12	.15	5.26	.20	1.48	.11	.87	.08	16.41*	.35	3.87	.17	5.09	.19	1.15	.09	1.79	.12	.80	.08	3.91	.17
	uGS	8.24*	.27	1.16	.10	2.14	.14	2.32	.14	1.19	.10	4.84	.21	3.85	.18	3.31	.17	2.02	.13	3.88	.18	1.72	.12	2.21	.14
Environ-mental concern	GL	6.74	.23	5.88	.21	4.51	.19	.47	.06	11.07	.29	3.53	.16	.88	.08	1.22	.09	13.45	.32	3.48	.16	2.37	.13	3.27	.16
	uGS	5.29	.22	7.74	.26	1.47	.11	7.09	.25	6.62	.24	3.32	.17	24.01	.46	3.28	.17	3.33	.17	2.99	.16	.70	.08	3.19	.17
Environ-mental concern of the persona	GL	2.52	.14	3.59	.17	9.19	.27	5.21	.19	1.89	.12	3.56	.17	4.62	.19	5.32	.20	2.06	.13	4.54	.19	4.29	.18	4.09	.18
	uGS	11.34*	.31	1.78	.12	4.47	.19	2.52	.15	3.05	.16	4.36	.19	1.75	.12	12.19	.33	2.86	.16	5.86	.23	6.32	.23	16.44**	.38

Note: V refers to Cramér's V and shows the effect size between the relations. *$p < .05$ **$p < .01$ ***$p < .001$.

Table 6. Relations between underlying motives for personas' walking and respondents' sociodemographic characteristics.

		Save Money		Flexibility		Safety		Reduce CO_2		Conform with others		Fitness		Social status		Privacy		Comfort		Reduce Congestion		Fun		Fastest Way	
		χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V
Age	GL	18.36**	.25	4.97	.13	3.11	.10	2.52	.09	6.89	.15	11.55*	.19	7.54	.16	6.59	.15	2.74	.09	3.17	.10	.69	.05	5.79	.14
	uGS	7.18	.52	2.94	.33	4.57	.41	3.64	.37	10.09	.61	5.97	.47	-	-	-	-	3.64	.37	1.51	.24	1.51	.24	4.98	.43
Gender	GL	.06	.01	.45	.04	.93	.06	.003	.003	3.77	.11	.02	.01	.04	.01	.01	.01	.60	.05	2.65	.10	.11	.12	2.10	.08
	uGS	.22	.09	1.74	.25	1.29	.22	.83	.18	-	-	.01	.02	1.29	.22	-	-	.83	.18	1.78	.26	3.76	.37	.01	.02
Income	GL	.91	.06	1.75	.08	.24	.03	8.78*	.17	7.79	.16	4.44	.12	1.49	.07	1.14	.06	2.72	.90	4.88	.13	1.39	.07	3.47	.11
	uGS	2.74	.32	2.21	.29	4.57	.41	1.12	.20	-	-	4.76	.42	1.12	.20	-	-	5.97	.47	1.31	.22	1.31	.22	1.45	.23
Distance to city centre	GL	2.06	.08	3.50	.11	1.50	.07	1.99	.08	1.32	.07	2.27	.09	17.02	.24	1.27	.07	.80	.05	.50	.04	.61	.05	4.75	.13
	uGS	1.55	.24	.62	.15	12.98	.69	.71	.16	-	-	1.49	.24	2.08	.28	-	-	2.08	.28	.64	.15	3.72	.37	1.92	.27
Healthy lifestyle	GL	3.80	.11	3.97	.12	4.07	.12	3.66	.11	1.13	.07	3.42	.11	2.81	.10	3.19	.10	8.53	.17	1.92	.08	1.04	.06	3.48	.11
	uGS	1.53	.24	1.53	.24	.52	.14	.52	.14	-	-	1.13	.20	.52	.14	-	-	.52	.14	.85	.18	3.40	.36	9.28	.59
Environ-mental concern	GL	3.85	.11	6.75	.15	5.03	.13	17.24**	.24	1.77	.08	2.92	.10	6.57	.15	3.69	.11	.91	.06	6.05	.14	18.99	.25	2.91	.09
	uGS	7.29	.52	2.89	.33	2.47	.30	12.98	.69	-	-	3.20	.34	2.47	.30	-	-	4.57	.41	5.80	.46	.76	.17	2.63	.31
Environ-mental concern of the persona	GL	5.19	.13	5.17	.13	4.59	.12	13.03*	.21	2.72	.09	7.29	.16	2.31	.09	3.63	.11	.56	.04	16.49**	.23	2.99	.10	.81	.05
	uGS	5.10	.43	6.34	.49	1.12	.20	2.47	.30	-	-	2.75	.32	1.12	.20	-	-	1.12	.20	1.89	.26	7.80	.54	3.26	.35

Note: V refers to Cramér's V and shows the effect size between the relations. If – is shown, statistics could not be computed as the variable was a constant. *$p < .05$ **$p < .01$ ***$p < .001$.

Table 7. Motives for switching to other modes in Greater London and in the urban German-speaking part of Switzerland in %.

	Save money		Gain flexibility		More safety		Help reduce CO_2		Conform with others		Become fitter		Increase social status		Gain privacy		Increase comfort		Help reduce congestion		Have more fun		Have a faster journey	
	GL	uGS	GL	uGS	GL	uGS	GL	uGS	GL	uGS	GL	uGS	GL	uGS	GL	uGS	GL	uGS	GL	uGS	GL	uGS	GL	uGS
Switch to Car	4.23	4.62	14.17	24.62	12.87	6.15	1.63	1.92	2.12	3.46	1.47	3.08	7.82	7.69	19.71	17.31	19.87	13.46	0.65	2.31	2.12	5.00	15.96	10.38
Switch to Public transport	17.59	13.46	9.82	9.62	9.82	9.62	10.49	14.74	7.59	7.05	4.46	5.77	2.46	4.49	2.01	1.28	11.16	9.62	10.27	10.26	1.34	1.92	21.65	12.18
Switch to Bike	18.36	17.30	6.82	16.03	2.23	1.69	17.06	12.24	1.63	5.06	25.07	18.99	1.78	2.95	0.89	1.27	1.93	1.27	8.16	9.28	4.30	5.06	10.68	8.86

Note: the highlighted boxes indicate identical top motives for choosing main mode and switching to this mode.

Motives for personas switching to other modes

Results revealed that the most commonly chosen motive for each main mode in the static scenario were not necessarily the same as the most common switching motives for the same modes in the dynamic scenario. For example, *comfort* was most commonly selected as the main motive for car use, but *speed* was most commonly selected as the factor that would most likely influence personas to switch to cars from other modes. The motives for GL for uGS are shown in table 7. For switching to car, the main motives in GL were to *increase comfort,* to *gain privacy* and to *have a faster journey*. In uGS, the main motives were to *gain flexibility*, to *gain privacy* and to *increase comfort*. For switching to public transport, the motives in GL were to *have a faster journey,* to *increase comfort* and to *help reduce* CO_2. The motives for switching to public transport in uGS were to *help reduce* CO_2*,* to *save money* and to *have a faster journey.* In GL, the main motives for switching to bike were to *become fitter,* to *save money* and to *reduce more* CO_2. In uGS, they were also to *become fitter,* to *save money* and to *gain flexibility.* It is notable, that the motives for switching to bike are the same as using bike as a main mode in both locations. Lastly, for switching to carsharing the predominant motives in GL were to *save money,* to *increase comfort* and to *help reduce congestion*. In uGS, the main motives for switching to carsharing were to *gain flexibility*, to *save money* and to *increase comfort*.

Sociodemographic factors influencing the motives for personas switching to other modes

To assess potential sociodemographic influences on the respondents' selection of motives for the personas to switch modes, again, chi-square tests were conducted for all modes and motives. Further, Cramér's V was regarded for all variables as well as the bar charts indicating the direction of the relations. Sociodemographic factors compared with motives for switching to car use are presented in table 8 for both GL and uGS. In GL, lower income groups chose the motive to *have a faster journey* more often than others. Health-conscious respondents chose the motive to *conform with others* less often than the others. Moreover, healthy lifestyles were also correlated with the motive to *increase social status*. The motive *comfort* was chosen most often by those with low to moderate levels of environmental concern. In uGS, the motive to *have a faster journey* was more often chosen by women than by men. Moreover, the motive to *conform with others* was related with persona's environmental concern; those who assumed that their persona was not particularly

concerned about the environment chose this motive whereas those who assumed their persona had a high to very high concern did not.

Sociodemographic factors correlated with motives for switching to public transport are presented in table 9 for both GL and uGS. In GL, the motive to *have a faster journey* was most often chosen by women. Moreover, this motive showed a negative correlation with income, respondents with low incomes were more likely to select this motive. The motive *help reduce* CO_2 showed a higher prevalence among those with high levels of health-consciousness and high levels of income. Further, among health-conscious respondents, the motive to *gain flexibility* was chosen more often. In contrast, to *increase comfort* negatively correlated with health-consciousness. To *increase social status* also showed a correlation with health-consciousness, and respondents with healthier lifestyles selected this motive more often. Further, this motive was chosen more often by respondents who live two to five kilometres from the city centre and by those with high levels of concern for the environment. In uGS, the motive to *become fitter* was particularly relevant for respondents up to the age of 24 and older than 55. Further, the lower the respondent's income, the more prevalent was the motive to *increase comfort*. To *gain flexibility* had a significant relation with healthy lifestyle and, lastly, for respondents with higher levels of health-consciousness the motive to *gain flexibility* was more important than for others.

Sociodemographic factors compared with motives to switch to cycling are presented in table 10 for both GL and uGS. In GL, the motive to *increase social status* was chosen more often by men. In turn, the motive *to have a faster journey* was selected more frequently by women and by those living close to the city centre. For respondents living far away from the city centre, the motive *saving money* became more relevant. The motive to *have a faster journey* was more prevalent among the lower income groups. To *help reduce* CO_2 and to *become fitter* were further motives with significant correlation to income, with increasing importance of these motives the higher the income. To *help reduce* CO_2, to *become fitter* and to *help reduce congestion* all revealed a correlation with the environmental concern of the persona, i.e., the higher the concern, the greater the importance of these motives. In addition, respondents who were moderately or highly health-conscious chose the motives to *gain flexibility* and to *become fitter* more often. In uGS, the motive to *have a faster journey* was surprisingly more relevant for older age groups. Moreover, this was more common among those living close to the city centre. Further, this motive was positively correlated with the

persona's environmental concern. The motive to *become fitter* was selected more often among respondents with moderate to low levels of concern for a healthy lifestyle.

Sociodemographic factors correlated with motives to switch to carsharing are presented in table 11 for both GL and uGS. In GL, men and the ones older than 65 years chose the motive to *conform with others* more often than others. The motive to *gain privacy* was also selected more often by men than by women. The motive to *have a faster journey,* in turn, was most prevalent among women and those in lower income groups. The motive to *help reduce* CO_2 was most often selected by respondents in moderate income groups. Both motives s*aving money* and *more safety* were most prevalent among those with moderate levels of health-consciousness. The two motives were also significantly related with distance to the city centre; the further away respondents live from the city centre, the more important was the motive *saving money*, and for those with a moderate distance to the city centre *more safety* was less important. Further, *to increase comfort* was most often selected by respondents who were concerned about the environment, and *saving money* was least often selected by these respondents. In uGS, the motive *more safety* was only relevant for respondents aged 35-44 and older. Moreover, respondents with healthy lifestyles selected the motive to *become fitter* more often than others. The motives to *gain privacy* and to *increase comfort* both revealed a correlation with the distance to the city centre: those who lived further from the city centre chose these motives most often.

Table 8. Relations between respondents' **s**ociodemographic characteristics and motives for personas switching to car use.

		Save money		Gain flexibility		More safety		Help reduce CO_2		Conform with others		Become fitter		Increase social status		Gain privacy		Increase comfort		Help reduce congestion		Have more fun		Have a faster journey	
		χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V
Age	GL	3.22	.12	7.19	.18	3.82	.13	4.43	.14	7.90	.19	9.56	.20	9.58	.20	7.31	1.8	4.79	.14	5.71	.16	7.32	.18	6.81	.17
	uGS	9.88	.31	3.45	.19	4.86	.22	3.54	.19	1.25	.11	4.38	.21	1.82	.13	9.06	.30	6.69	.26	4.25	.21	7.38	.27	6.84	.26
Gender	GL	4.27	.14	.36	.04	1.21	.07	.59	.05	.02	.01	3.32	.12	.91	.06	.001	.002	3.05	.12	1.18	.07	1.00	.07	2.63	.11
	uGS	1.79	.13	.65	.08	.02	.01	.28	.05	2.74	.17	2.44	.16	.72	.08	.54	.07	.17	.04	2.60	.16	3.87	.20	4.86*	.29
Income	GL	2.20	.09	.69	.06	2.86	.11	3.84	1.3	1.88	.09	2.39	.10	3.02	.11	.75	.06	.24	.03	.41	.04	2.15	.09	8.70*	.19
	uGS	4.49	.21	6.35	.25	.43	.07	1.69	.13	.63	.08	.99	.10	3.71	.19	3.97	.20	1.44	.12	1.55	.12	3.00	.17	2.86	.17
Distance to city centre	GL	.01	.01	.39	.04	.29	.04	2.39	.10	.58	.05	3.69	.13	2.03	.09	.01	.01	.17	.03	3.93	.13	.48	.05	1.93	.10
	uGS	.28	.05	3.84	.19	.78	.09	.47	.07	1.71	.13	.14	.04	1.03	.10	.61	.08	5.55	.23	.02	.02	.42	.06	.58	.08
Healthy lifestyle	GL	10.31	.21	2.39	.10	1.00	.07	5.75	.16	15.93**	.26	8.69	.19	13.21**	.24	7.08	.18	6.52	.17	2.31	.10	1.78	.09	5.83	.16
	uGS	.65	.08	5.63	.24	5.04	.22	3.04	.17	4.17	.20	2.11	.14	2.62	.16	2.95	.17	6.02	.24	1.82	.13	5.36	.23	2.83	.17
Environ-mental concern	GL	6.56	.17	4.47	.14	.93	.06	1.34	.08	8.18	.19	.37	.04	5.24	.15	6.42	.17	10.44*	.21	1.37	.08	2.99	.11	3.30	.12
	uGS	.89	.94	.56	.08	3.52	.19	8.38	.29	4.01	.20	5.65	.24	7.78	.28	2.15	.15	7.32	.27	1.67	.13	3.05	.17	2.64	.16
Environ-mental concern of the persona	GL	9.43	.20	3.95	.13	5.18	.15	8.32	.19	11.11	.22	4.77	.144	1.22	.07	3.98	.13	22.48***	.21	9.76	.21	6.86	.17	1.95	.09
	uGS	5.13	.23	4.84	.22	2.02	.14	3.81	.19	13.71**	.37	2.28	.15	1.54	.12	2.75	.17	3.99	.20	4.24	.21	1.69	.13	3.51	.19

Note: V refers to Cramér's V and shows the effect size between the relations. $^*p < .05$ $^{**}p < .01$ $^{***}p < .001$.

Table 9. Relations between respondents' sociodemographic characteristics and motives for personas switching to public transport.

		Save money		Gain flexibility		More safety		Help reduce CO_2		Conform with others		Become fitter		Increase social status		Gain privacy		Increase comfort		Help reduce congestion		Have more fun		Have a faster journey	
		χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V
Age	GL	8.25	.21	8.65	.21	7.66	.20	5.70	.17	4.58	.15	8.19	.21	7.10	.19	2.66	.12	2.80	.12	2.28	.11	7.80	.19	10.17	.23
	uGS	3.47	.22	1.64	.15	7.89	.33	7.76	.32	3.32	.21	12.69*	.41	3.58	.22	7.45	.32	8.77	.34	2.09	.17	2.80	.19	6.28	.29
Gender	GL	.33	.04	2.18	.11	2.18	.11	.74	.06	.65	.06	.67	.06	.97	.07	.26	.04	.58	.06	.13	.03	4.48	.15	3.94*	.14
	uGS	1.39	.14	2.91	.19	.44	.08	.27	.06	2.39	.18	1.24	.13	.04	.02	.10	.04	1.58	.15	.54	.09	2.02	.17	.09	.04
Income	GL	5.22	.16	1.80	.10	.66	.06	17.79***	.30	1.32	.08	2.85	.12	6.86	.19	2.49	.11	10.62*	.24	5.39	.17	.11	.02	21.34***	.33
	uGS	1.91	.16	3.15	.21	2.67	.19	5.47	.27	2.29	.18	1.01	.12	6.82	.30	4.56	.25	9.22	.35	1.45	.14	2.09	.17	9.22*	.35
Distance to city centre	GL	.98	.07	3.77	.14	.02	.01	.69	.06	1.67	.09	2.91	1.2	11.20**	.24	.36	.04	1.48	.09	1.79	.10	.39	.05	5.27	.17
	uGS	5.29	.27	4.63	.25	1.11	.12	2.99	.20	2.66	.19	2.62	.19	4.13	.24	1.41	.14	3.58	.22	.20	.05	3.17	.21	.60	.09
Healthy lifestyle	GL	1.92	.10	9.47*	.22	4.60	.15	8.21*	.21	4.53	.15	7.19	.19	10.22*	.26	1.97	.10	10.22*	23	1.57	.09	5.05	.16	13.84	.27
	uGS	5.75	.28	20.03***	.52	1.63	.15	2.99	.20	5.19	.27	5.67	.28	7.29	.31	1.59	.15	2.87	.20	2.82	.20	12.30	.41	6.91	.31
Environ-mental concern	GL	4.42	.15	1.47	.09	7.34	.20	5.09	.16	.82	.07	2.32	.11	12.94	.26	3.79	.14	5.90	.18	4.40	.15	1.54	.09	4.58	.15
	uGS	6.43	.29	4.28	.24	1.03	.12	8.43	.30	7.99	.33	2.96	.20	1.42	.14	.55	.09	1.05	.12	4.70	.25	1.72	.15	1.72	.15
Environ-mental concern of the persona	GL	5.68	.17	.47	.05	2.89	.12	6.71	.19	6.52	.18	3.99	.14	8.26	.21	1.44	.09	7.08	.19	8.11	.21	1.97	.10	9.11	.22
	uGS	6.73	.30	6.02	.29	.98	.12	.98	.12	3.33	.21	.87	.11	4.45	.25	1.99	.16	2.53	.19	2.93	.20	3.89	.23	2.69	.19

Note: V refers to Cramér's V and shows the effect size between the relations. *$p < .05$ **$p < .01$ ***$p < .001$.

Table 10. Relations between respondents' **s**ociodemographic characteristics and motives for personas switching to cycling.

		Save money		Gain flexibility		More safety		Help reduce CO_2		Conform with others		Become fitter		Increase social status		Gain privacy		Increase comfort		Help reduce congestion		Have more fun		Have a faster journey	
		χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V
Age	GL	4.18	.13	3.24	.12	3.57	.12	3.22	.11	5.02	.14	5.75	.15	11.38	.22	8.76	.19	16.67	.26	3.47	.12	4.29	.13	1.95	.09
	uGS	7.04	.28	3.43	.19	2.36	.16	7.10	.28	3.27	.19	4.78	.23	7.90	.30	3.87	.21	2.10	.15	7.79	.29	5.52	.25	13.35*	.38
Gender	GL	2.45	.10	.18	.03	.002	.002	.10	.02	.25	.03	1.03	.07	6.63**	.16	.02	.01	.42	.04	.11	.02	.28	.03	4.98*	.14
	uGS	.60	.08	1.02	.11	1.19	.11	.21	.05	.02	.01	.27	.06	1.62	.13	3.31	.19	.42	.07	.64	.08	.25	.05	2.47	.17
Income	GL	3.99	.13	1.27	.07	8.24	.18	12.88**	.23	2.68	.10	8.87*	.19	1.38	.08	.66	.05	4.71	.14	1.90	.09	7.21	.17	21.18***	.29
	uGS	2.48	.17	1.50	.13	2.22	.16	1.69	.14	4.87	.23	3.49	.20	3.99	.21	1.42	.13	2.49	.17	4.90	.23	1.42	.13	4.12	.21
Distance to city centre	GL	7.16*	.17	1.39	.08	.17	.03	1.88	.09	1.28	.07	1.51	.08	.81	.06	.20	.03	1.51	.08	.20	.03	.93	.06	11.60**	.22
	uGS	3.50	.20	5.20	.24	.96	.10	2.09	.15	5.90	.26	.61	.08	3.55	.20	.83	.10	.44	.07	1.07	.11	2.14	.15	6.02*	.26
Healthy lifestyle	GL	2.60	.10	11.83**	.22	10.74	.21	3.07	.11	.86	.06	9.55*	.19	5.43	.15	2.63	.10	2.92	.11	4.48	.14	2.20	.10	2.32	.10
	uGS	4.09	.21	1.00	.11	3.40	.19	.91	.10	1.70	.14	11.02*	.35	1.07	.11	.94	.10	.94	.10	.66	.09	5.97	.26	5.01	.26
Environ-mental concern	GL	2.59	.10	6.77	.17	2.66	.10	4.56	.14	4.31	.13	3.74	.12	2.45	.10	1.61	.08	5.11	.14	.88	.06	5.14	.15	1.25	.07
	uGS	2.98	.18	.59	.08	2.38	.16	1.74	.14	2.56	.16	12.88	.38	5.38	.24	4.14	.21	6.66	.27	4.55	.22	11.34	.35	5.60	.25
Environ-mental concern of the persona	GL	9.40	.20	1.86	.09	4.34	.13	16.48**	.26	13.87	.24	17.52**	.27	1.57	.08	1.66	.08	14.87	.25	17.08**	.26	1.51	.08	5.77	.15
	uGS	2.26	.16	5.27	.24	8.02	.30	5.06	.24	3.71	.20	3.61	.20	3.86	.21	.72	.09	6.31	.26	1.02	.11	2.10	.15	11.64*	.36

Note: V refers to Cramér's V and shows the effect size between the relations. $^*p < .05$ $^{**}p < .01$ $^{***}p < .001$.

Table 11. Relations between respondents' **s**ociodemographic characteristics and motives for personas switching to carsharing.

		Save money		Gain flexibility		More safety		Help reduce CO_2		Conform with others		Become fitter		Increase social status		Gain privacy		Increase comfort		Help reduce congestion		Have more fun		Have a faster journey	
		χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V	χ^2	V
Age	GL	1.42	.07	7.43	.16	8.52	.17	2.49	.09	22.03**	.27	5.40	.14	6.16	.14	3.20	.10	3.90	.12	9.66	.18	10.08	.19	5.52	.14
	uGS	8.29	.24	3.46	.16	14.06*	.32	2.32	.13	10.35	.27	3.99	.17	2.66	.14	2.90	.14	7.35	.23	6.97	.22	1.69	.11	4.46	.18
Gender	GL	.01	.01	.003	.003	1.56	.07	.01	.01	3.93*	.12	.22	.03	1.99	.08	11.29**	.19	2.00	.08	3.13	.10	.07	.02	6.39*	.15
	uGS	.13	.03	2.43	.13	.01	.01	.02	.01	.03	.01	.44	.06	.97	.08	.12	.03	.03	.01	3.31	.02	.94	.08	.53	.06
Income	GL	.63	.05	4.99	.13	4.99	.13	14.66**	.22	.97	.06	3.67	.11	1.38	.07	2.44	.09	1.45	.07	7.81	.16	5.21	.13	14.26**	.22
	uGS	2.01	.12	1.49	.10	.11	.03	3.44	.16	4.08	.17	1.47	.10	4.34	.18	3.42	.16	7.55	.23	1.69	.11	2.81	.14	1.29	.10
Distance to city centre	GL	9.94**	.18	1.23	.07	13.05**	.21	1.90	.08	5.49	.14	5.63	.14	2.05	.08	1.50	.02	3.17	.10	1.55	.07	.04	.01	1.27	.07
	uGS	3.06	.15	.88	.08	3.53	.16	.87	.08	.46	.06	6.47	.22	.93	.08	6.89*	.22	9.74**	.27	1.34	.10	.86	.08	.78	.08
Healthy lifestyle	GL	8.45*	.17	3.37	.11	13.81**	.22	6.86	.15	4.86	.13	1.40	.07	2.93	.10	8.75	.17	3.48	.11	4.99	.13	4.90	.13	9.60	.18
	uGS	2.88	.14	4.68	.18	3.59	.16	.27	.04	1.63	.11	11.46*	.29	2.67	.14	1.98	.12	1.06	.09	1.51	.10	3.47	.16	.42	.06
Environ-mental concern	GL	9.17*	.18	4.16	.12	3.26	.11	.62	.05	1.93	.08	2.52	.09	1.81	.08	10.65	.19	9.71*	.18	5.72	.14	2.21	.09	4.16	.12
	uGS	.90	.08	4.12	.17	.34	.05	4.02	.17	6.38	.21	2.13	.12	3.91	.17	4.16	.17	4.64	.18	5.31	.20	3.40	.16	.60	.07
Environ-mental concern of the persona	GL	3.34	.11	7.37	.16	2.74	.10	3.14	.10	9.29	.18	7.73	.16	3.38	.11	6.99	.15	4.23	.12	2.45	.09	6.99	.15	2.03	.08
	uGS	4.24	.18	1.62	.11	.28	.05	3.28	.15	3.29	.15	4.01	.17	5.05	.19	3.72	.16	1.33	.10	2.67	.14	.91	.08	5.06	.19

Note: V refers to Cramér's V and shows the effect size between the relations. *p < .05 **p < .01 ***p < .001.

Study 1: discussion

Results of study 1 revealed the motives why various modes of transport are chosen and how these motives differ according to sociodemographic characteristics. We assume that by answering on behalf of a persona who is similar to them, respondents actually reveal their own and true opinions. An overall pattern emerged from the data across the regions of GL and uGS. For cycling and walking, the main motives across all age and income groups were health- and environment-related, i.e., *fitness* and *reducing CO_2 emissions*. The motive *saving money* was common, too, however, mostly for young respondents in lower-income groups. For public transport, the main motives *saving money, reducing congestion* and *fastest way* were all mostly chosen by middle-aged respondents in lower income groups. The motives *flexibility*, *comfort* and *fastest journey* for car use were clearly more frequently selected by respondents in higher income groups who are less health- and environmentally-conscious. These main motives support existing findings from other studies (e.g., De Groot & Steg, 2007; Gardner & Abraham, 2006; Hiscock et al., 2002; Kent, 2014; 2015; Sheller, 2004; Steg 2003; 2005; Wells & Xenias, 2015). Further, carsharing has previously been described as a lifestyle product which creates a sense of belonging to a social group by Schaefers (2013). The results for carsharing can also be seen to be in line with this description, given that *conforming with others* was one of the main motives to choose carsharing as a main mode. In addition to supporting existing findings, our results revealed further sociodemographic correlations with motives underpinning mode choice. For instance, the motive *fastest way* was predominantly chosen by women, regardless of the mode and the motive *reducing CO_2* varied in significance according to the mode selected.

Going beyond understandings of static mode choice, this study examined the factors that would motivate a switch from one mode to another and analysed these factors against respondents' sociodemographic characteristics. Besides cycling, not all motives commonly chosen for each main mode choice in the static scenario corresponded with the most common motives for switching to the respective modes. Yet, the same pattern across modes emerged: switching to public transport, cycling or carsharing was associated with health- and environment-promoting motives, such as to *help reduce CO_2* and *congestion* as well as to *become fitter.* In contrast, the factors *privacy* and *comfort* were more relevant for motivating a switch to car use, especially among respondents who are not particularly concerned about the environment. Interestingly, however, a major motive for switching to public transport was to *increase comfort*, also. This predominantly applied for low-income respondents who are

not particularly health-conscious. Thus, in comparison to cycling and carsharing, switching to public transport was associated with higher levels of comfort among this group of people. Overall, results from study 1 uncovered that motives for using a certain mode as the main transport mode are different from the motives that might explain switching to this mode. Therefore, measures or policies promoting a switch from one mode to another should consider these differences and apply them appropriately.

Study 2: method

Having assessed the motives underpinning mode choice in study 1, study 2 explored the application of promotional strategies based on mechanisms traditionally used in consumer research to enhance the attractiveness of alternatives to car use. The study was conducted using the same online survey and sample as study 1, and respondents answered the questions for study 2 directly after the questions for study 1. The survey was designed in a way that respondents were unaware of any direct relationships between the questions of the studies.

Figure 1. Repeated Evaluation Technique Phases Overview

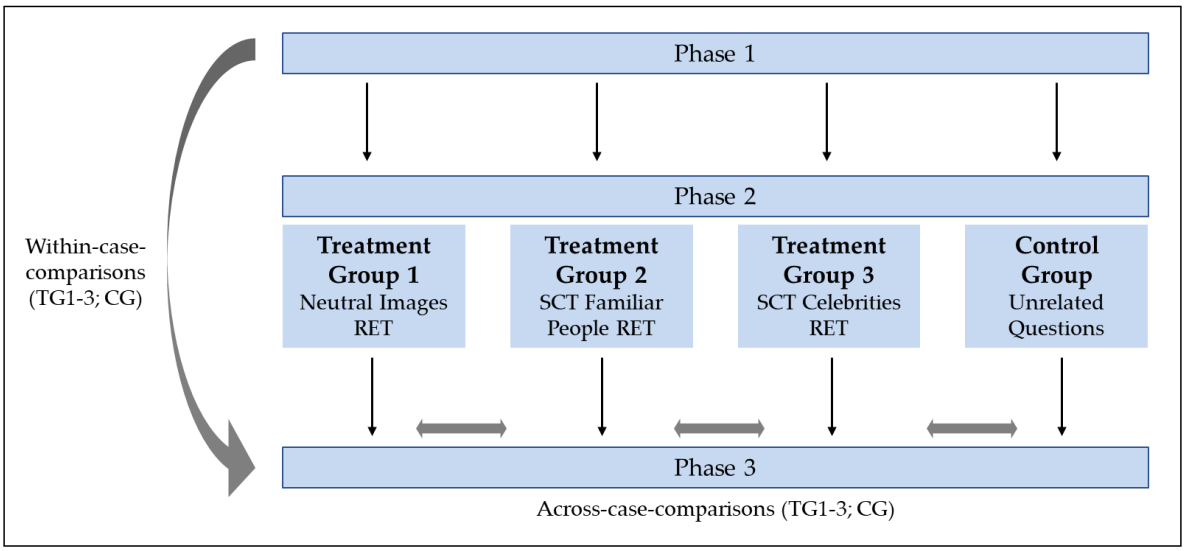

Figure 1 depicts the design of study 2. In phase 1, respondents answered questions regarding their attitude towards various modes of transport (train, bus, carpooling, cycling, walking) which were shown in pictures. Four dimensions were explored with 5-point-Likert scale answer options: willingness to experience (*How likely are you to experience this situation yourself, i.e., how willing would you be to enter into the depicted scenario?*); comfort (*How comfortable would you feel in this situation?*); stress (*How stressed would you feel in*

this situation?) and safety (*How safe would you feel in this situation?*). Together, these dimensions reflect the level of perceived attractiveness towards the modes. For reliability analysis, Cronbach's alpha was calculated to assess the internal consistency of the scale which resulted in $\alpha = .87$ for the German and $\alpha = .88$ for the English survey.

After phase 1, respondents were randomly assigned to one of four treatment groups (phase 2). In treatment group 1, respondents were shown further pictures similar to the ones in phase 1 with the task to rate them in terms of how pleasant, overwhelming, convenient, entertaining and annoying they perceive the depicted travel scenario on a 5-point-Likert scale (from strongly disagree to strongly agree). Treatment group 1 therefore served to increase the perceived attractiveness of different modes of transport by increasing familiarisation with them via repeated engagement (Carbon & Leder, 2005; Zajonc, 2001).

In treatment group 2 and 3, people were shown pictures of either celebrities or a person familiar to them with an accompanying text indicating the person on the picture is your brother, sister, father, neighbour, boss, friend or colleague, varying by pictures. In every displayed scenario in which a celebrity or familiar person drove a car, a negative consequence was shown on a second picture. A text indicated the consequence for driving the car, e.g. *Your father/Robert de Niro was driving home, tired after his nightshift. He fell asleep momentarily and caused an accident*. The opposite was depicted for alternative modes: *Your brother/Eddie Redmayne started taking the train home from work, avoiding the city traffic. He arrives home early and enjoys spending more time with his child*. Thus, seeing someone using an alternative mode was followed by a positive consequence. After every scenario, respondents were asked how this made them feel with answer options being positive, negative or neutral[8]. By showing positive or negative consequences after a certain behaviour, treatment groups 2 and 3 made use of SCT. The aim of treatment groups 2 and 3 thus were to test if SCT also applies to mobility behaviours and whether the effect is stronger for observing familiar people or celebrities.

Treatment group 4 served as a control group, in which respondents were engaged in mobility-unrelated content, as endorsed by Carbon and Leder (2005). Respondents in this group were instructed to answer questions concerning European geography. Regardless of which treatment group respondents were in, they all had to answer the same questions in phase 3 after their treatments. These questions were identical to the ones in phase 1, bar minimal

[8] In the celebrity condition, respondents had to initially indicate – after every scenario - whether they knew who the celebrity was.

differences in the pictures, without changing their overall message. This was intended to provide variation for the respondents and avoid potential confusion.

Study 2: results

For study 2, paired-sample t-tests were conducted to reveal changes in the level of attractiveness assessed via the four criteria (*willingness to experience*, *comfort*, *safety* and *stress*) between phase 1 and phase 3. The data was normally distributed which was revealed by Shapiro-Wilk tests. The paired-sample t-tests were applied for all three treatment groups and the control group. Results are shown in tables 12a-d. In GL, in the first treatment group (neutral images), results for train revealed a significant decrease in the perception of *comfort* and *safety* and an increase in the perception of *stress* between phase 1 and 3. For the mode bus, the level of all evaluation criteria showed a significant negative change from phase 1 to phase 3. For carpooling, the perception of *willingness to experience, comfort* and *safety* significantly increased from phase 1 to phase 3. For cycling, all but one criterion*, stress,* showed a significant positive change. For walking, no significant changes occurred. In uGS, results for train revealed significant negative changes for *comfort* and *stress*. The same applied for bus transportation with, again, *comfort* and *stress* showing significant changes. For carpooling, all criteria had a positive change from phase 1 to phase 3 with results for *willingness to experience* and *comfort* being significant. For cycling, all criteria showed a significant positive change with increased levels of *willingness to experience*, *comfort* and *safety* and decreased levels of *stress*. Results for walking had a slightly different pattern where the only significant result was an increase in the level of *safety*, while the other criteria did not show significant changes.

For the second treatment group (familiar people based on SCT), significant results in GL for the mode train conveyed a decrease in the perception of *comfort* and *safety* and an increase in the perception of *stress* between phase 1 and 3. Regarding the mode bus, results revealed a negative change from phase 1 to 3 for the criteria *comfort* and *safety*. For carpooling, the level of *willingness to experience* and *comfort* showed a positive change. Results for cycling showed a significant positive change for all criteria. Results for walking revealed a positive change from phase 1 to phase 3 for the criteria *willingness to experience*, *comfort* and *safety* and a decreased level of *stress*. Results for uGS mostly follow the same pattern.

In treatment group 3 (celebrities based on SCT), results in GL for train showed a significant negative change for all criteria but for the level of *willingness to experience*. For the mode bus the same pattern of results emerged. In contrast, only three criteria for carpooling showed a positive change from phase 1 to phase 3, with a significant increase of the level of *willingness to experience* and *safety* and a significant decrease in the level of *stress*. In regard to cycling and walking, all criteria showed a significant positive change from phase 1 to 3. Again, in uGS, results mostly follow the same pattern.

The results of the control group in both GL and uGS both reflected the overarching results of all treatment groups in the respective location: a negative change of the criteria for train and bus and a positive change of the criteria for carpool, cycling and walking. This effect was unexpected and is further analysed in the discussion.

Study 2: discussion

Study 2 examined different strategies for promotional campaigns for increasing the level of attractiveness regarding the modes train, bus, bike, walking and carpooling via the criteria *willingness to experience*, *comfort*, *safety* and *stress*. By means of the repeated evaluation technique, three different promotional treatments were tested to increase familiarity and, eventually, enhance attractiveness of the modes. Overall, results of study 2 disclosed a clear pattern across both regions GL and uGS. For the treatment groups, there was a negative change in the level of attractiveness from pre-treatment in phase 1 to post-treatment in phase 3 for the modes train and bus. In contrast, for cycling, walking and carpooling there was a positive change in the level of attractiveness from phase 1 to phase 3 across all treatment groups. Hence, train and bus were perceived more negatively after all promotional treatments while cycling, walking and carpooling were perceived more positively after all treatments. Although not all changes were significant, this pattern of changes was clearly evident across cases. Therefore, it may be assumed that encouraging the modes train and bus with the applied promotional strategies should be avoided while an encouragement of the modes cycling, walking and carpooling should be increased. Yet, notably, the control group showed the same pattern of results as the treatment groups. This could be due to the fact that simple engagement with the modes, i.e., assessing them according to several criteria as happened in phase 1 and 3, was sufficient to stimulate respondents' repeated evaluation process. Therefore, familiarisation with the modes occurred and resulted in an increase in the level of attractiveness for some of them.

In relation to public transport, however, the repeated evaluation technique did not lead to an increase in the level of attractiveness towards bus travel and train travel. Rather, the engagement resulted in a more negative assessment of these modes. However, the level of significance in the results of the control group was not particularly lower than for the treatment groups. This implies that the change in the level of attractiveness may be due to the variance in pictures shown in phase 3 in relation to phase 1. Thus, regardless of any treatment in phase 2 (or non-treatment as for respondents in control group) the depicted pictures in phase 1 and 3 resulted in an increase or decrease in the perceived level of attractiveness towards various modes. This finding stresses the importance of choosing suitable images for all types of promotions in the context of mobility.

Table 12a. Treatment Group 1 Neutral Images paired sample t-test results.

		GL			uGS		
Mode	Criteria	M_{Phase1}	M_{Phase2}	Delta M_{Phase1}-M_{Phase2}	M_{Phase1}	M_{Phase2}	Delta M_{Phase1}-M_{Phase2}
Train	Willingness to Experience	3.58	3.59	0.01	3.73	3.61	-0.12
	Comfort	3.18	2.87	-0.31***	2.79	2.53	-0.25*
	Stress	3.18	2.88	-0.30***	3.05	2.80	-0.25*
	Safety	3.46	3.27	-0.20***	3.11	2.97	-0.14
Bus	Willingness to Experience	3.67	3.51	-0.15**	3.70	3.69	-0.01
	Comfort	3.03	2.48	-0.56***	2.97	2.60	-0.37***
	Stress	2.98	2.58	-0.40***	3.07	2.76	-0.31**
	Safety	3.27	3.04	-0.24***	3.14	2.96	-0.17
Carpool	Willingness to Experience	3.44	3.61	0.17**	3.59	3.85	0.26**
	Comfort	3.64	3.83	0.18**	3.49	3.67	0.18*
	Stress	3.47	3.58	0.11	3.46	3.54	0.09
	Safety	3.66	3.83	0.17**	3.53	3.70	0.17
Cycling	Willingness to Experience	2.27	2.25	-0.01	2.95	3.30	0.35**
	Comfort	2.31	2.65	0.35***	2.73	3.33	0.60***
	Stress	2.26	2.55	0.29***	2.82	3.52	0.71***
	Safety	2.15	2.67	0.52***	2.73	3.41	0.68***
Walking	Willingness to Experience	4.14	4.13	-0.01	4.07	4.04	-0.03
	Comfort	3.92	3.97	0.05	3.50	3.66	0.16
	Stress	3.79	3.82	0.03	3.61	3.67	0.06
	Safety	3.78	3.81	0.02	3.56	3.79	0.22**

Note: *$p < .05$ **$p < .01$ ***$p < .001$.

Table 12b. Treatment Group 2 Familiar People paired sample t-test results.

		GL			uGS		
Mode	Criteria	M_{Phase1}	M_{Phase2}	Delta M_{Phase1}-M_{Phase2}	M_{Phase1}	M_{Phase2}	Delta M_{Phase1}-M_{Phase2}
Train	Willingness to Experience	3.66	3.59	-0.07	3.55	3.23	-0.33**
	Comfort	3.39	3.03	-0.36***	2.82	2.63	-0.19*
	Stress	3.30	3.00	-0.30***	3.03	2.85	-0.18*
	Safety	3.52	3.36	-0.16***	3.31	3.06	-0.25**
Bus	Willingness to Experience	3.64	3.59	-0.06	3.49	3.39	-0.10
	Comfort	3.08	2.58	-0.50***	2.86	2.57	-0.29**
	Stress	3.12	2.71	-0.41***	3.17	2.70	-0.47***
	Safety	3.28	3.10	-0.18**	3.28	3.06	-0.22**
Carpool	Willingness to Experience	3.43	3.67	0.24**	3.44	3.70	0.27**
	Comfort	3.70	3.81	0.11*	3.40	3.50	0.11
	Stress	3.53	3.54	0.01	3.39	3.61	0.23*
	Safety	3.67	3.76	0.09	3.44	3.56	0.13
Cycling	Willingness to Experience	2.10	2.24	0.14*	2.81	3.02	0.21
	Comfort	2.33	2.68	0.35***	2.64	3.41	0.76***
	Stress	2.20	2.64	0.44***	2.74	3.59	0.85***
	Safety	2.13	2.67	0.54***	2.68	3.54	0.86***
Walking	Willingness to Experience	4.07	4.15	0.09	4.03	4.10	0.07
	Comfort	3.99	4.07	0.08	3.63	3.90	0.27**
	Stress	3.80	3.96	0.16**	3.82	4.02	0.20*
	Safety	3.85	3.96	0.11**	3.69	3.95	0.26**

Note: *$p < .05$ **$p < .01$ ***$p < .001$.

Table 12c. Treatment Group 3 Celebrities paired sample t-test results.

		GL			uGS		
Mode	Criteria	M_{Phase1}	M_{Phase2}	Delta M_{Phase1}-M_{Phase2}	M_{Phase1}	M_{Phase2}	Delta M_{Phase1}-M_{Phase2}
Train	Willingness to Experience	3.69	3.64	-0.05	3.64	3.50	-0.14
	Comfort	3.24	3.05	-0.19**	2.81	2.66	-0.14
	Stress	3.30	3.01	-0.29***	3.14	2.84	-0.31**
	Safety	3.52	3.34	-0.17***	3.20	2.95	-0.26*
Bus	Willingness to Experience	3.74	3.73	-0.01	3.65	3.59	-0.06
	Comfort	3.01	2.65	-0.36***	2.83	2.70	-0.12
	Stress	3.14	2.81	-0.33***	3.11	2.85	-0.27*
	Safety	3.40	3.22	-0.18**	3.15	2.89	-0.27**
Carpool	Willingness to Experience	3.41	3.71	0.30***	3.59	3.84	0.24*
	Comfort	3.71	3.80	0.09	3.54	3.63	0.09
	Stress	3.51	3.64	0.14*	3.53	3.56	0.03
	Safety	3.79	3.91	0.12*	3.56	3.66	0.10
Cycling	Willingness to Experience	2.30	2.46	0.16*	2.70	3.14	0.44**
	Comfort	2.28	2.76	0.47***	2.53	3.36	0.83***
	Stress	2.32	2.68	0.37***	2.72	3.49	0.77***
	Safety	2.20	2.77	0.56***	2.58	3.46	0.88***
Walking	Willingness to Experience	4.22	4.34	0.11*	4.03	4.00	-0.03
	Comfort	3.96	4.12	0.16***	3.66	3.74	0.08
	Stress	3.85	4.01	0.16*	3.70	3.79	0.08
	Safety	3.86	4.05	0.19**	3.64	3.82	0.17

Note: *$p < .05$ **$p < .01$ ***$p < .001$.

Table 12d. Control Group paired sample t-test results.

		GL			uGS		
Mode	Criteria	M_{Phase1}	M_{Phase2}	Delta M_{Phase1}-M_{Phase2}	M_{Phase1}	M_{Phase2}	Delta M_{Phase1}-M_{Phase2}
Train	Willingness to Experience	3.62	3.61	-0.01	3.57	3.38	-0.19*
	Comfort	3.27	2.96	-0.31***	2.86	2.72	-0.15***
	Stress	3.17	2.96	-0.21***	3.14	2.82	-0.32**
	Safety	3.43	3.27	-0.16***	3.23	3.06	-0.17*
Bus	Willingness to Experience	3.73	3.57	-0.16**	3.62	3.49	-0.14
	Comfort	3.16	2.62	-0.54***	2.85	2.73	-0.13
	Stress	3.14	2.76	-0.38***	3.15	2.73	-0.42***
	Safety	3.35	3.06	-0.29***	3.21	3.03	-0.18
Carpool	Willingness to Experience	3.33	3.67	0.34***	3.52	3.77	0.24*
	Comfort	3.72	3.87	0.15*	3.45	3.68	0.23*
	Stress	3.50	3.66	0.16**	3.41	3.68	0.27*
	Safety	3.70	3.90	0.20***	3.47	3.72	0.25**
Cycling	Willingness to Experience	2.27	2.38	0.11*	2.76	3.11	0.35**
	Comfort	2.43	2.79	0.36***	2.64	3.39	0.75***
	Stress	2.34	2.66	0.32***	2.61	3.59	0.98***
	Safety	2.31	2.84	0.53***	2.70	3.58	0.88***
Walking	Willingness to Experience	4.12	4.14	0.02	3.95	4.07	0.12
	Comfort	3.91	4.01	0.10*	3.50	3.82	0.32***
	Stress	3.83	3.88	0.06	3.64	3.83	0.19*
	Safety	3.74	3.84	0.10*	3.62	3.78	0.16*

Note: *$p < .05$ **$p < .01$ ***$p < .001$.

General discussion

In the present research, we explored underlying motives influencing people's mode choice and the perceived attractiveness of alternative modes to provide a basis for policy measures to reduce car use. Understanding the motives underpinning people's transport choices is an important first step to devising policy interventions to promote the use of sustainable modes of transport, and ultimately disrupt the car purchase intention. Through study 1, we sought to provide answers for the first two sub-research questions. We ascertained motives for main mode choice and for switching from one mode to another while considering people's sociodemographic backgrounds by means of psychological projection onto personas. Through study 2, answering the third sub-research question, we then tested promotional instruments to ascertain their ability to raise the level of perceived attractiveness of alternative modes via a repeated evaluation technique.

While the main motives for car use identified via study 1 support existing findings (e.g., De Groot & Steg, 2007; Gardner & Abraham, 2006; Hiscock et al., 2002; Steg 2003; 2005), the study results provided an analysis of motives underpinning transport choices, segmented by sociodemographic groups. Intersecting the various groups, it becomes clear that changing the preference for private cars for middle-aged to elderly people with high income levels and low levels of concern for the environment will be extremely difficult. With regards to alternative, active modes such as cycling and walking as well as public transport, they are mainly driven by economic and environmental motives. These findings echo existing literature (e.g., Cavill & Watkins, 2007; Frank et al., 2006; Garrard et al., 2006) and provide further details about transport preferences among different groups. The findings show that individuals who do not travel by car as their main mode of transport are mostly relatively young with low to middle incomes and those who are health- and environmentally-conscious. While these findings may seem intuitive, they were lacking empirical confirmation. Our findings confirmed that this phenomenon applies. Moreover, the results of study 1 showed that the motives for each main mode were not necessarily the motives that people selected for switching to these modes.

Results for study 2 showed that promotional strategies based on a familiarisation process led to an increase in the level of perceived attractiveness for walking, cycling and carpooling, regardless of the actual promotional treatment applied. In contrast, the familiarisation process actually led to a more negative assessment of train and bus travel across all treatment groups. Thus, results of study 2 suggest that the use of public transport,

particularly train and bus, may be more difficult to promote. Similar results of the control group must be considered in this context, as discussed above. Although study 2 did not explore why the applied repeated evaluation technique differed in its ability to increase the perceived level of attractiveness across modes, there are two potential explanations for this finding. Firstly, there is the issue of Covid-19 and the related increase in the acceptance of cycling and walking. Even though respondents were instructed at the beginning of the survey to imagine a post-Covid-19 era, it is possible that the current pandemic still biased their results against public transport. As the chances of infection are lower when cycling or walking compared to being on a train or bus, people may currently prefer these active modes. However, this does not explain the positive shift in carpooling. Secondly, busses and trains are very established modes in the areas GL and uGS, but in recent years there has been a revival of interest in more active travel modes due to their environmental and health benefits (e.g., Cavill & Watkins, 2007; Haines et al., 2009). Carpooling, in particular, is an emerging mode gaining in popularity. It appears that becoming more aware of the benefits associated with cycling, walking and carpooling via promotional messages increases the likelihood that someone might choose these modes in the future. In contrast, buses and trains are more established modes of transport in both GL and uGS and promotions for these modes seem to have a mostly negative effect.

By combining the findings from both studies, implications for policy makers to reduce car use and, eventually, ownership in cities can be identified. First, the high level of 'stickiness' towards cars is clear. Not all groups in society are equally responsive to promotions of other modes. Identifying the more responsive groups of people in society can help more targeted policy-making efforts. In the case of both GL and uGS, the group most likely to consider changing mode choice were relatively young people with low to medium incomes who are health- and environmentally-conscious. Our research suggests that it may be particularly effective to specifically target this segment of society as these are the ones who are already using alternative means of transport and are open to switch to these modes as their main mode. Effective targeting can be achieved by highlighting the advantages of these modes and aligning them with the preferences of this particular segment. The fact that younger people appear to be more open to mode switching is also relevant given that the survey respondents were selected for their existing intention to purchase a car in the coming three years, which could potentially lock them into car use for a lifetime. Ensuring that the advantages of the use of alternative modes are effectively promoted to younger urban residents before they purchase a car could therefore have a strong impact on their longer-term

travel behaviour. It could also shape other policies that may target this particular segment of the population, such as offering free or subsidised public transport passes for people under 30 to continue to incentivise the use of this mode. For the groups of people who are not responsive to these soft nudges, policy makers may need to use other mechanisms to restrict car use in cities, including economic and regulatory instruments to limit car use.

Second, policy makers may want to note that encouraging the use of alternative modes via familiarisation is particularly suitable for cycling, walking and carpooling. The more these sustainable modes are promoted successfully, the less cars will be impacting the environment, health and space consumption in cities. In contrast, the familiarisation process turned out to have a negative impact on individual's evaluation of public transport. Alternative approaches, such as improved service frequency, modernisation of the vehicle fleet and lower fares may need to be used in conjunction with promotional campaigns to increase the attractiveness of public transport. More research will also be needed to understand the push and pull factors that may explain public transport use. In addition, findings reveal that careful picture selection is critical to the success of repeated evaluation experiments as any slight change in the pictures between phase 1 and phase 3 could be reflected in the results. Thus, future research may further explore this finding to add to the process of selecting suitable pictures which may be valuable for policy makers.

Third, policy makers should differentiate between motives for main mode choice, and motives for switching to other modes. For instance, the choice to travel by public transport as a main mode is often justified by the fact that it is the fastest and cheapest way. However, our research suggests that actively switching from any mode to public transport would most commonly be motivated by helping to reduce CO_2. Carsharing, as another example, is often chosen as a main mode to conform with others and for privacy. In contrast, actively switching to carsharing is likely to be motivated by enhanced flexibility and cost savings. These differences should be noted by policy makers as they may require differentiated promotional strategies.

Finally, it should be noted that there are some limitations to the studies and findings within this research. To start with, only two cases were explored: Greater London and the urban German-speaking parts of Switzerland. While these areas have been chosen with care, we do not generalise our findings to all regions; these methods applied in other contexts may result in different findings. Future research could explore whether the current findings hold true in other contexts. Moreover, the studies did not test whether the lack of adequate

infrastructure, for instance the unpredictability of train services, might be making some groups less willing to switch. This is another factor which could be considered in future research. Lastly, although we took care to account for the impact of the Covid-19 pandemic in the design of the study, it may still have influenced attitudes towards different transportation modes. Regarding study 2, another limitation is the choice of pictures in phases 1 and 3. Our aim was to display neutral, non-influential images. However, as the impression of these images is inevitably subjective, a different selection of images might have led to different results, especially in the case of the control group.

Despite these limitations, there are various aspects revealed by the current research that provide a greater understanding of motives for using or switching to different modes and suitable strategies to further increase their perceived attractiveness. The application of consumer and marketing methodologies in a sustainable mobility behaviour context generated new and valuable insights. These insights may serve policy makers in their efforts to successfully implement additional measures that can help to reduce car use in cities and increase the uptake of alternative travel modes.

Conclusion

In this article, we sought to explore underlying motives influencing people's mode choice and the perceived attractiveness of alternative modes via an online survey employing two methodological approaches that are novel to this research context. Firstly, we demonstrated that motives for different mode choices vary significantly across sociodemographic lines. Secondly, we showed that the motives for choosing a specific main mode are not necessarily the motives to switch to this particular mode. Thirdly, we showed that promotional measures based on increasing familiarisation were only successful for walking, cycling and carsharing. These findings expand existing knowledge by adding further insights about individual behaviours and preferences. The results should be of high value for policy makers to consider in future car-reducing initiatives.

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Article III

An exploration of levels of emotions towards different modes of transport and when switching between them

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Abstract

Urban car use remains high despite various policies attempting to reduce it. A factor that may have been overlooked by such initiatives is people's emotions towards cars, which may currently be changing due to increasing issues such as congestion and pollution. This study explores people's current emotions towards both cars and alternative modes of transport to provide a basis for targeting emotions in promoting alternative modes and reducing car use. Results show that emotional perceptions towards modes strongly depend on people's sociodemographic background. The younger, the more health-conscious and environmentally concerned people are, the more positive their emotions towards alternative modes. Further, results reveal that some groups in society generally have no positive emotions towards modes of transport other than cars. Such findings are relevant for developing emotion-based promotional measures by mobility providers and policymakers.

Keywords: urban car use, sustainable mobility, transport psychology, self-assessment manikin

Introduction

Humans have reached a point at which urban car use must be significantly reduced in order to overcome current transport and environmental challenges (Kang et al., 2019; Schneider, 2013). These challenges include increasing congestion and accidents resulting from too many cars on the roads; air, noise and other pollution; concomitant long-term sustainability and health issues (Rabl & Nazelle, 2012; Woodcock et al., 2009), among others. Moreover, it is expected that approximately 68% of people will live in cities by 2050 (United Nations, 2018), further increasing already high traffic densities and urban space taken up with roads. The need to reduce urban car use and to promote the use of alternative modes of transport instead is thus becoming increasingly crucial. Several cities have tried to reduce the number of cars on the roads by improving existing public transport networks or by imposing higher costs on parking spaces (Gössling & Cohen, 2014; Hiselius & Rosqvist, 2015). Although such policy initiatives may succeed in convincing some people not to use cars, they do not convince sufficiently large numbers of people on a lasting basis. Cars remain the first mode of choice for many (Chakrabarti, 2017; Grimal, 2020).

A fact that may have received too little attention by these policy initiatives are people's emotions towards different forms of transport and towards switching between them. Over decades, car advertisements have targeted these emotions such as senses of power, freedom and status, creating a strong desire in people to experience them and presenting the car as a way to fulfil them (Steg, 2005). This desire seems to be stronger than any regulatory hurdle for many people. Emotions towards cars have been explored in various studies throughout the last decades and could therefore be considered as having been investigated thoroughly (e.g., Gardner & Abraham, 2007; Sheller, 2004; Steg, 2003; 2005; Van Vugt et al., 1995). However, due to the currently changing mobility environment and its concomitant challenges, people's emotions towards cars may have changed. Therefore, an updated exploration of these emotions may be required, which is the first aim of the study. New modes of transport are entering the market and both social and environmental consequences of car use are much more significant today than decades ago (Nieuwenhuijsen et al., 2016). Further, as city roads are becoming more congested, the emotions experienced, for instance, while being stuck in a traffic jam, could frame an updated version of emotional associations with cars: a negative and willingly avoidable condition. Confronting people with the negative emotions felt while driving a car could enable a change in people's overall attitude towards car use. Reducing urban car use thus requires a greater understanding of the current emotions felt during actual car journeys rather than while seeing glamorous car adverts.

The second aim includes exploring people's emotions towards modes of transport *other* than cars. These modes will be referred to as alternative modes in this study, including public transport (in this case bus and tram), carsharing, cycling and walking. The study of emotions towards such alternative modes is far less developed. However, this does not necessarily imply that people are unemotional towards those. This research therefore explores the level of emotions experienced towards these alternative modes which may eventually serve as satisfactory alternatives to cars. In a final step, the results of the first and second aim are put into a dynamic context for the third aim of the study. The third aim seeks to assess the level of emotions felt during an imagined switch from a car to an alternative mode of transport and vice versa. This imagined switching process may allow us to approximate a real decision between using a car or an alternative mode – even if it is in a fictive survey environment.

Overall, this study explores people's level of emotions towards cars, alternative transport modes as well as towards switching between modes. This exploration will enable a better understanding of people's emotions towards different modes of transport – one that can

eventually serve as a basis for policy measures to reduce overall car use in cities. The ascertainment of emotions is conducted in the context of the changing mobility environment. Emotions are assessed by means of a Self-Assessment Manikin (SAM) technique via an online survey with 1,400 participants from Greater London and German-speaking urban areas in Switzerland during a timeframe of three weeks. The findings of the survey provide a foundation for future traffic initiatives, enabling policy makers and mobility providers to reduce urban car use by more effective, emotionally focussed communications. Thereby, the study contributes to the pleasure-arousal theory of emotions. Firstly, an overview of existing literature covering the emotionalisation of transport modes will be discussed, ending in a presentation of the research gap. Secondly, the applied methods and results will be outlined. Lastly, results are analysed, discussed and evaluated.

Theoretical background

Emotions in advertising

According to Vriens and Hofstede (2000), advertisements for highly complex products that focus on functional aspects would be challenging for many consumers. Therefore, marketing strategies for such products should rather address more emotional aspects such as excitement and enjoyment. Other scholars note that it is almost a universal practice in advertising to appeal to emotions and is seen as effective for all kinds of products, simple or complex (Holbrook & O'Shaughnessy, 1984). As stated by Zajonc (1980), addressing emotions may help change attitudes towards various goods and may impact many aspects of people's lives. Thus, as claimed by the author, understanding emotions may help to explain the variability in people's purchasing behaviours.

An emotional process is a combination of cognitive and physiological interactions. The process begins when a message triggers a cognitive appraisal that leads to an evaluation mediated by personal values (Holbrook & O'Shaughnessy, 1984; Lazarus, 1982; Zajonc, 1980). This evaluation against personal values produces an overall judgement of the message's favourability or unfavourability (Lyons, 1980). In addition, the onset of the emotional process involves a physiological change in the level of hormones. Several scholars refer to this change as arousal (Berlyne, 1960; Bradley & Lang, 1994; Osgood, 1952; Russel & Mehrabian, 1977; Schlosberg, 1954). The stronger the emotional process, the greater the

level of arousal. Arousal thus measures how excited or sleepy a person feels towards a presented object.

Arousal should not be confused with the intensity of the feeling as, for instance, a depression can involve low arousal but intense feelings. In addition to arousal, emotions are described by levels of pleasure, i.e., positive/pleasant or negative/unpleasant emotions (Mehrabian, 1996). Pleasure as an instrument in advertising can be designed in such a way that a good is associated with the direct experience of sensual fulfilment (Hirschmann & Holbrook, 1982; Holbrook & O'Shaughnessy, 1984). According to the pleasure-arousal theory, arousal reinforces the experience of pleasure. Hence, the hedonic value of an emotional reaction is maximised when pleasure encounters arousal (Reisenzein, 1994).

Emotions towards cars

There is general recognition that cars can evoke strong emotions and are associated with them. However, this linkage has not always been there. Early car advertisements before 1920 strongly focused on the car's mechanical and technical features (Laird, 1996; Schorman, 2010). The car was initially perceived as an advancement of a horse-drawn carriage and promoted as such to consumers, without either depicting passengers or evoking feelings of speed and enjoyment (Laird, 1996). This functional and static approach began to change in the mid-1920s. Car advertisements were no longer content with encouraging initial car purchases but wanted to convince people to buy a new car even if they owned a car already (Laird, 1996). This ushered in a new era of car advertising. Promotional themes based on psychological appeals such as power, fun, youthfulness, adventure, social status, as well as being free initiated a focus on targeting people's emotions. Via this emotionalisation, the so-called atmosphere marketing was created appealing to people's social ideals rather than to rationality (Schorman, 2010). As a result, cars were turned into "dream machines and components of our personalities" (Laird, 1996, p.811). Not only advertising, but the media in general, including films and books, created a fascinating image of cars (Greenberg & Atkin, 1983; Van Gorp & Adams, 2012). The emotionalisation of cars has been so successful that today, nearly a century later, many people still define themselves through, and base their self-esteem upon cars (Gardner & Abraham, 2007; Sheller, 2004; Steg, 2005; Van Vugt et al., 1995). Although the primary value of a car has always been its functional ability to reach places, it has an equally important value in creating positive emotions (Sandqvist & Kristroöm,

2001; Steg, 2005). Unsurprisingly, the more positive emotions are experienced while driving a car, the more it will be used (Steg, 2005).

However, a new mobility environment may be altering the traditional emotions associated with cars. Car advertisements used to be people's main source for (affective) information about cars (Douglas et al., 2011). With an increasing awareness of social and ecological challenges of car use through non-advert media and politics, a new channel for critical communication has emerged. Moreover, increased urbanisation, improved access to alternative modes (Raimond & Milthorpe, 2010; Thigpen & Handy, 2018) and changing status symbols among younger generations (Delbosc & Currie, 2013; Van der Waard et al., 2013) are factors influencing people's attitude towards cars. While for older generations owning a car has been the ultimate status symbol, this has started to loose its importance, at least in western societies (Delbosc & Currie, 2013; Kuhnimhof et al., 2012; Sivak & Schoettle, 2012).

Due to these changes, our understanding of emotions towards cars which may have been valid just a few years ago may need to be reappraised. More recent research shows that the use of sustainable modes of transport such as walking, cycling or public transport is linked to personal environmental awareness, which is currently increasing worldwide (Kachaner et al., 2020; Li et al., 2021). It was also found that people use cars less often when car use is perceived as stressful (Steg, 2003), which increasingly happens while being stuck in traffic (Emo et al., 2016).

Emotions towards alternative modes and during switching scenarios

In addition to understanding current emotions towards cars, the level of emotions towards alternative modes must be considered, too. According to Gaterlseben and Uzzel (2006), the level of affect while commuting in public transport is related to high levels of stress and boredom. On a similar vein describes Bissell (2010) how using public transport may elicit feelings of anger and annoyance. The author explains this phenomenon as being due to the presence of strangers, delays and low levels of personal control over the journey. Morris and Guerra (2015) detect a generally weak relationship of individual's mood and mode of transport – although cycling has the most positive effect on one's mood. Gaterlseben and Uzzel (2006) also provide evidence for this assumption by stating that walking and cycling are the most relaxing and exciting modes due to high levels of personal control. According to Kaplan and Prato (2016), this only applies to those who are not too stressed while walking

and cycling due to, for instance, other road users. As regards walking, Mondal et al. (2020) find that *recreational* walking is associated with more positive emotions as the route is usually freely selected. Therefore, according to the authors, a more enjoyable atmosphere is chosen than *utilitarian* walking, in which a person undertakes a journey only with the objective of reaching a specific location. Generally, the level of emotions is strongly dependent on journey times, regardless of the mode: the longer the journey, the more negative the emotions (Gaterlseben & Uzzel, 2006; Wener et al., 2003).

Although there are studies examining people's attitude towards alternative modes of transport, they mostly target commuters' perceptions or focus on only a small number of modes. Further, many studies concerned with attitudes towards transport modes focus on people's rational beliefs about those modes, for instance towards costs, flexibility and safety. In this regard, Beirão and Cabral (2007) investigate car users' opinions towards public transport and conclude that service quality and reliability are key factors for its usage. Moreover, Steg (2003) assesses the level of general attractiveness of public transport versus cars. Her findings reveal that the level of perceived attractiveness increases with decreasing car use. Regarding walking and cycling, several studies show that travel satisfaction is stronger towards walking and cycling than towards using public transport (e.g., De Vos et al., 2013; Ye & Titheridge, 2017). Reasons for this preference include health-related aspects of walking and cycling (Frank, 2006). Yet, as stated by Xia et al. (2017), people concerned about safety issues consider cycling as an unsafe option and are thus less likely to cycle at all.

Emotions towards switching scenarios

The level of emotions experienced while switching from one mode of transport (car) to another (alternative modes) and vice versa has, to the author's knowledge, not yet been examined. Kang et al. (2019) investigated rational drivers of switching from cars to public transport such as convenience and flexibility. However, their study neither explored a switch to any other alternative mode than public transport nor the switch *to* a car. Further, the authors did not consider the level of emotions perceived during a switch. Yet, people's emotional perception of a switching process from one mode to another may perhaps be the most crucial aspect to understand: assessing the experienced level of emotions during a switch from one mode to another reveals differences in the switching direction[9] and thus mode preferences.

[9] Switching direction refers to the switch from a car to an alternative mode versus from an alternative mode to a car.

Further, comprehending potentially negative emotions may enable rectifying them with appropriate promotional strategies. Therefore, insights of this study may be used in publicity campaigns aiming to reduce car use and promote the use of alternative modes.

Research focus

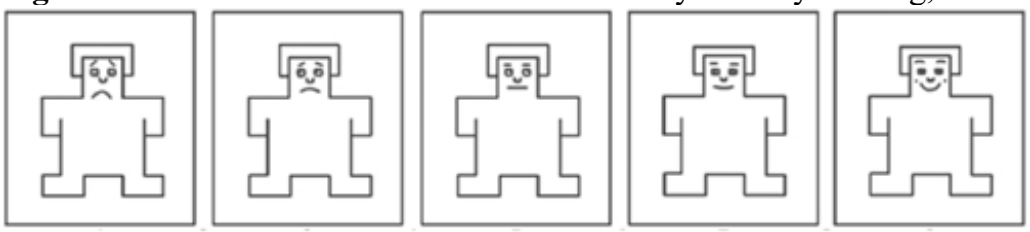
The aforementioned research findings confirm that although emotions towards cars have been widely studied, they do not take into account the current, changing mobility environment. Further, they reveal that there is only limited scientific research exploring emotions towards alternative modes of transport or as regards a switch from one mode to another. Understanding these aspects, however, is important to fully determine the level of emotion towards different modes, ultimately supporting initiatives to reduce overall car use in cities. To gain detailed and distinct insights, this study takes into account several sociodemographic factors while assessing people's level of emotion towards modes of transport. This has not been done by previous scholars in this specific research context and generates an overview of emotions according to sociodemographic patterns.

Methodology

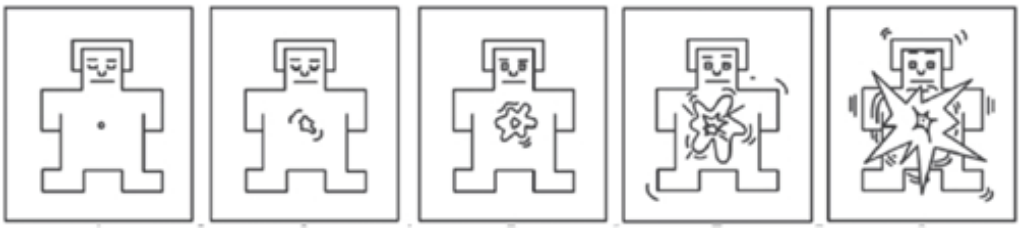
Method overview and data collection

For assessing emotional responses, a Self-Assessment Manikin (SAM) scale was used. The SAM scale is a non-verbal measure of emotions recording three affective dimensions: pleasure, arousal and dominance (Lang, 1985; Mehrabian & Russell, 1974). As ratings of dominance, concerning the question how dominant a respondent feels towards presented scenarios, were irrelevant for the aim of the study, they were not collected.

Figure 1: The Self-Assessment Manikin Scale by Bradley & Lang, 1994



Above: manikins for determining the 'pleasure' dimension



Above: manikins for determining the 'arousal' (or 'stimulation') dimension

SAM uses images of figures, ranging in their expressions from unhappy and frowning to happy and smiling to represent different degrees of pleasure (Figure 1 top row). For the arousal dimension, the figures range from sleepy and relaxed to wide-eyed and excited (Figure 1 bottom row) (Bradley & Lang, 1994). The SAM scale was used in this study due to its simplicity of interpretation and its cultural independence resulting from the graphic depictions (ibid.). Moreover, due to the latter, SAM addresses an emotional perception before it is cognitively processed and communicated to the linguistic part of the brain. Thus, results are very intuitive (Isbister et al., 2006). Previous research has validated desirable psychometric properties of the scale (Bradley & Lang 1994; Landwehr et al., 2011), and it therefore seems appropriate for the current research context which involves sample populations in different countries.

Study participants were informed that they would be presented with several pictures of mobility scenarios, involving images of modes of transport, and were instructed to rate their emotions towards the picture(s) displayed via the SAM scale. For reasons of simplicity, the term 'arousal' was referred to as 'stimulation' in the survey. It was indicated that stimulation itself is neutral and can be equally applied to positive and negative situations. The subjects were then firstly shown six static scenarios in succession with one image for each mode: an image of a traffic jam on a large road, a car (passenger view) in a traffic jam, the interior of a public transport mode[10], a person cycling and a person walking as well as a carsharing

[10] For public transport it was decided to show an image of a bus for participants from GL and a tram for participants in uGS. This is due to the more common usage of the respective mode in the locations.

situation. Secondly, respondents were shown four switching scenarios in which they were to imagine switching from a car to another mode of transport. In these scenarios, two pictures (picture 1 = car; picture 2 = alternative mode) were displayed in addition to a short text describing the switching scenario[11]. Pictures of alternative transport modes included a full public transport vehicle, an empty public transport vehicle, a bike and a person walking. Thirdly, respondents were shown four reverse switching scenarios, which displayed the same pictures as in the switching scenarios but in a reversed order[12].

For the sake of clarity, switching scenarios from car to alternative mode will be referred to as switching-from-car scenarios and reverse switching from an alternative mode to a car will be referred to as switching-to-car scenarios in the remainder of this study. All pictures could be viewed for an unlimited time. Every scenario was presented in combination with the SAM scale on which respondents indicated their felt emotions while viewing the scenarios for both pleasure from 1 (very displeased) to 5 (very pleased) and arousal from 1 (no stimulation) to 5 (extremely stimulated). A back-button allowed respondents to go back and forth between the questions. In addition to the emotion-related questions, all respondents were asked sociodemographic questions concerning their background, lifestyle and current transportation behaviour[13]. This information was required to find sociodemographic patterns within the results of the emotional questions.

Overall, 1,400 population-representative respondents aged 18-69 from Greater London (GL) (1,000 participants; 50.5% females) and the German-speaking urban area of Switzerland (uGS) (400 participants; 51.7% females) participated in the online survey. The two locations were chosen as they have a relatively high share of car use despite also having a well-developed public transport network. The survey was provided in both English and German but was otherwise identical for both locations. As data collection took place during three weeks in June 2020, the Covid-19 was an issue to be considered. To avoid potential biases in

[11] Examples of text describing a switching scenario from car to alternative mode: *Up until now, you were often stuck in your car in traffic jams. Now you travel more often by bus instead. / So far, you were driving to work early in the morning alone in your car. Now that you have your own bike, you are cycling on a regular basis. / Usually you drive to work. Now that your car is in the service garage, you walk instead.*

[12] Examples of text describing a switching scenario from alternative mode to car: *Up to now you often had to stand on a full bus to get from A to B. Now you travel by car more often and find yourself stuck in traffic jams regularly.* Or *Previously, you were cycling to work. Now that you own a car, you are driving to get there.* Or *So far you were taking the underground train to your football practice together with your teammates. Starting this week, you will drive in a carpool together.*

[13] These questions assessed respondents' age, gender, ethnicity, occupation, income, place and type of residency, level of education, level of health-consciousness, physical restrictions, level of environmental concern, main mode of transport, and whether they owned a car.

peoples' responses, all participants were instructed to imagine a post-Covid-19 situation in which chances of an infection are down to zero per cent. Additionally, participants gave their consent to take part in the study and could withdraw from the survey at any time. No personal information by which participants could be identified with was collected and all data was treated anonymously. The survey was created and run on Unipark, a software tool for online surveys.

Data analysis

All data was analysed using IBM SPSS 27. The normal distribution of the data was confirmed by a Shapiro Wilk test for both GL and uGS. Therefore, all following statistical tests could be conducted for both locations respectively. To assess the level of emotions towards cars and alternative modes both in general and in switching scenarios, the mean values of the levels of pleasure and arousal for all scenarios were calculated. T-tests, or Welch tests if required, were run to test for significant differences in the level of pleasure and arousal in the two locations GL versus uGS for all scenarios. Multiple linear regression analyses were conducted to reveal influential sociodemographic factors for the level of experienced emotions for all three scenarios. All regression models included the variables *age, gender* (male vs. female; default reference category = male), *income, level of health-consciousness* (decreasing values), *distance from where people live to city centre, main mode* (main mode is car vs. main mode is other than car; default reference category = main mode is car), *car ownership* and *the level of environmental concern*[14]. Lastly, paired sample t-test were performed to determine significant differences in the emotional level of switching-from-car scenarios versus reverse switching-to-car scenarios.

Results

The level of pleasure and arousal for static and switching scenarios

The results of all levels of pleasure and arousal for all static and switching scenarios in GL and uGS are presented in table 1. The table further indicates the significant differences in levels of pleasure and arousal across the two locations. Overall, the mean level of emotions based on pleasure and arousal towards all scenarios was higher in GL than in uGS. If results

[14] All other sociodemographic variables are not further discussed in this study as they did not show any statistically significant relation with any static or switching scenario.

of those emotional levels are broken down, a pattern emerges across the locations: In both locations, *cycling*, *walking* and *carsharing* were associated with the highest level of pleasure among the static scenarios. Moreover, the switching-from-car scenarios *car to cycling* and *car to walking* as well as the reverse switching-to-car scenarios *cycling to car* and *walking to car* showed the highest levels of pleasure. In GL, all those levels except the latter were significantly higher than in uGS. In terms of arousal, *public transport, traffic jam* and *car in a jam* resulted in the highest levels of arousal for the static scenarios in both locations. In uGS, those levels were all significantly higher than in uGS. Further, the switching-to-car scenarios resulting in relatively high levels of arousal in GL already yielded high in pleasure: *car to cycling* and *car to walking*. The latter did not result in high levels of arousal in uGS. Lastly, regarding switching-to-car scenarios, *full PT to car in a jam* had the highest level of arousal in both GL and uGS and *empty PT to car in a jam* also resulted in high levels of arousal in uGS. Again, those levels were significantly higher in uGS than in GL.

Table 1. Mean values for levels of pleasure and arousal for all scenarios in Greater London and the urban German-speaking area of Switzerland.

		GL		uGS	
	Displayed Scenarios	$M_{Pleasure}$	$M_{Arousal}$	$M_{Pleasure}$	$M_{Arousal}$
Static Scenarios	Public Transport (PT)	1.99	2.30*	2.10	2.55*
	Traffic Jam	1.51	2.66**	1.54	3.20**
	Cycling	3.37	2.21	3.28	2.01
	Car in a Jam	2.07	2.38	2.16	2.47
	Walking	3.63**	1.98	3.27**	1.91
	Carsharing	3.49*	2.03	3.26*	1.85
Switch from car to alternative mode	Car in a Jam to Full PT	2.46	2.33	2.48	2.44
	Car in a Jam to Empty PT	3.14	2.24	3.17	2.11
	Car to Cycling	3.41	2.76**	3.39	1.95**
	Car to Walking	3.36*	2.55**	3.08*	2.23**
Switch from alternative mode to car	Full PT to Car in a Jam	2.53	2.51*	2.56	2.80*
	Empty PT to Car in a Jam	2.49	2.45**	2.43	2.78**
	Cycling to Car	3.40	2.45**	3.50	2.08**
	Walking to Car	3.27*	2.47**	3.54*	2.01**
M_{Mean}		2.93	2.37	2.89	2.28

Note: Pleasure: 1 = very displeased; 2 = slightly displeased; 3 = neutral; 4 = slightly displeased; 5 = very pleased. Arousal: 1 = no stimulation; 2 = slightly stimulated; 3 = stimulated; 4 = very stimulated; 5 = extremely stimulated. * = $p < .05$; ** = $p < .01$, *p*-values indicate significant differences in the level of pleasure and/or arousal between the two locations for respective scenarios.

Differences in the level of pleasure and arousal in switching vs. switching back scenarios

Having reported the results of the levels of pleasure and arousal for static and switching scenarios, differences in the emotional perception between switching-from-car and switching-to-car scenarios were tested. The results of the paired-sample t-tests are presented in table 2. For the level of pleasure, only the scenario *car in a jam to empty PT* was significantly different from the reverse scenario *empty PT to car in a jam* in both locations. In uGS, also the scenario *car to walking* was significantly different in terms of the level of pleasure from its reverse switching scenario. Regarding the level of arousal, all switching-from-car scenarios were significantly different from switching-to-car scenarios in both locations besides *car to cycling* versus *cycling to car* in uGS.

Table 2: Differences in the level of pleasure and arousal for switching back and forth between modes: Paired sample T-test results**.**

	Switching Scenarios	Mean in GL	Mean in uGS
PLEASURE	Car in a Jam to Full PT vs. Full PT to Car in a Jam	-0.028	-0.072
	Car in a Jam to Empty PT vs. Empty PT to Car in a Jam	0.667***	0.795***
	Car to Cycling vs. Cycling to Car	0.086	-0.064
	Car to Walking vs. Walking to Car	0.170	-0.461**
AROUSAL	Car in a Jam to Full PT vs. Full PT to Car in a Jam	-0.070**	-0.507***
	Car in a Jam to Empty PT vs. Empty PT to Car in a Jam	-0.192***	-0.623***
	Car to Cycling vs. Cycling to Car	0.432***	0.026
	Car to Walking vs. Walking to Car	0.260***	0.374***

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$

Influencing factors of the experienced level of pleasure and arousal

Multiple linear regression analysis was used to develop models for predicting the level of pleasure and arousal for all scenarios. All requirements for running the tests were given in both locations. Tables 3 to 5 show the results of the multiple linear regressions with the influential sociodemographic factors for all three scenarios: static, switching-from-car and switching-to-car.

Significant results for Static Scenarios

For all but one static scenario significant regression equations were found in GL: *traffic jam* $F(8,530) = 7.91$, $p < .001$; *public transport* $F(8, 546) = 4.56$, $p < .001$; *car in a jam* F(8,

541) = 3.05, p = .002; *cycling* F(8, 507) = 10.28, p < .001; *carsharing* F(8, 499) = 2.79, p = .005. *Walking* was the only non-significant model with F(8, 549) = 1.55, p = .139. In uGS, *traffic jam* was the only scenario with a significant regression equation F(8,189) = 2.34, p = .020. All other models were non-significant; *public transport* F(8, 192) = .77, p = .634; *car in a jam* F(8, 178) = 3.40, p = .001; *cycling* F(8, 192) = 1.44, p = .184; *walking* F(8, 218) = .71, p = .680; *carsharing* F(8, 220) = 1.69, p = .103.

In GL, for the static scenarios *traffic jam*, *public transport*, *walking* and *cycling age* negatively influenced respondents' level of emotions. Thus, the older the respondent, the lower was their level of pleasure and/or arousal in these scenarios. The same effect could be seen in uGS, however, only for the scenarios *traffic jam* and *car in a jam*. Further, men experienced higher levels of pleasure for the scenarios *traffic jam* and *public transport* in GL and for *walking* in uGS. Women, in turn, experienced only higher levels of arousal in the scenario *traffic jam*. In addition, higher levels of *health-consciousness* were positively related with higher levels of pleasure and/or arousal in the scenarios *traffic jam, car in a jam, cycling* and *carsharing* in GL. For the case of uGS, this factor was less remarkable and only significant for the scenarios *traffic jam, public transport* and *car in a jam.* For the latter, the higher the level of *health-consciousness*, the lower were respondents' levels of emotions. The factor *main mode* showed significant results for the scenarios *traffic jam* and *walking* in GL. Here, those whose main mode was car had higher levels of pleasure and arousal, respectively. On the contrary, respondents from GL with a car as their main mode experienced lower levels of pleasure for the scenario *cycling*. In uGS, respondents whose main mode was a car showed lower levels of pleasure for *walking* and lower levels of arousal for *carsharing.*

Another noticeable influencing factor, but only in uGS, was *car ownership*. Here, car owners showed higher levels of pleasure and arousal for the scenarios *traffic jam* and *public transport* in comparison to non-car owners. In contrast, for the scenarios *car in a jam* and *carsharing*, *car ownership* was a negatively moderating factor for pleasure and arousal, respectively. A further factor which only had a significant influence in uGS was the level of *income*: the higher the income, the more pleasure was experienced in the scenario *car in a jam* and the more arousal in the scenario *public transport*. Factors only significant in GL were the *distance from where people live to the city centre* and the level of *environmental concern*. The further respondents live from the city centre, the lower the level of arousal they experienced for the scenarios *walking* and *carsharing*. For the latter, as well as for *cycling*, a greater concern about the environment was correlated with higher levels of pleasure.

Significant results for Switching-from-car Scenarios – from car to alternative mode

Significant regression equations were found for all switching-from-car scenarios in GL: *car in a jam to empty PT* $F(8, 575) = 2.95$, $p = .003$; *car in a jam to full PT* $F(8, 571) = 3.86$, $p < .001$; *car to cycling* $F(8, 575) = 7.65$, $p < .001$; *car to walking* $F(8, 533) = 7.77$, $p < .001$. In uGS, only two significant regression equations were found: *car to cycling* $F(8, 208) = 3.25$, $p = .002$; *car to walking* $F(8, 224) = 2.48$, $p = .014$. The scenario *car in a jam to empty PT* $F(8, 215) = .79$, $p = .607$ and *car in a jam to full PT* $F(8, 210) = 1.20$, $p = .299$ were non-significant.

Results revealed that younger and male respondents indicated higher levels of pleasure and/or arousal while switching from *car in a jam to full PT* and from *car to cycling* in GL. For all switching-from-car scenarios, respondents from GL with higher levels of *health-consciousness* experienced more pleasure and arousal. This result also applied for the switching scenario *car to cycling.* In addition, those who are more concerned about the environment felt higher levels of pleasure and arousal in all four switching-from-car scenarios in GL and for *car to walking* in uGS. For *car in a jam to full PT*, the further away respondents lived from the city centre, the more pleasure they experienced in this scenario in both locations. In GL, those who lived further away from the centre experienced higher levels of arousal while switching from *car in a jam to empty PT* than those who lived closer to the centre. The factor *main mode* showed a significant relation for respondents with the main mode car while switching from *car to walking* as they indicated lower levels of pleasure in both locations. This finding also obtained in the case of switching from *car to cycling* for respondents from uGS. Here, car owners also experienced less arousal than non-car owners. Lastly, only respondents from GL with a car as main mode felt higher levels of pleasure for the switching scenario *car in a jam to full PT.*

Significant results for Switching-to-car Scenarios – from alternative mode to car

Significant regression equations were found for all switching-to-car scenarios in GL: *empty PT to car in a jam* $F(8, 543) = 5.30$, $p < .001$; *full PT to car in a jam* $F(8, 561) = 2.40$, $p = .015$; *cycling to car* $F(8, 589) = 4.67$, $p < .001$; *walking to car* $F(8, 552) = 4.28$, $p < .001$. In uGS, only the scenarios *empty PT to car in a jam* $F(8, 205) = 2.54$, $p = .012$ and *walking to car* $F(8, 233) = 2.31$, $p = .021$ had significant regression equations. *Full PT to car in a jam* $F(8, 205) = 1.61$, $p = .123$ and *cycling to car* $F(8, 199) = 1.81$, $p = .076$ were non-significant.

As for the first two scenarios, *age* also had a significant moderating effect in the switching-to-car scenarios: here, for all scenarios but *cycling to car,* the older the respondent, the less pleasure and/or arousal they experienced in these scenarios. In regard to *gender*, men indicated higher levels of pleasure while switching from *empty PT to car in a jam* and women while switching from *full PT to car in a jam*. Moreover, respondents from GL with high levels of *income* experienced higher levels of pleasure and arousal, respectively, while switching from *cycling* and *walking to car.* In contrast, the higher the income of respondents from uGS, the less pleasure they felt during the switch from *empty PT to car in a jam*. Further, all *switching-to-car* scenarios in GL showed a relation between increasing levels of *health-consciousness* and stronger pleasure and/or arousal. Another factor only significant in GL was the *concern about the environment*: an increasing concern was related with less pleasure for the switching scenarios *empty PT to car in a jam* and *cycling to car.* In the latter scenario, those who lived further away from the city centre experienced lower levels of pleasure and arousal compared to those living closer to the centre. Lastly, those whose main mode was car experienced higher levels of pleasure while switching from *full PT to car in a jam, cycling to car*, and *walking to car* in GL. The latter also held true in uGS.

Table 3. Influencing factors for the level of emotions for Static Scenarios.

Traffic Jam	GL						uGS					
	Pleasure			Arousal			Pleasure			Arousal		
	$R^2 = .104$			$R^2 = .066$			$R^2 = .091$			$R^2 = .036$		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	-0.006***	0.001	-4.689	-0.002	0.003	-0.637	-0.005*	0.003	-2.093	0.001	0.003	0.224
Gender	0.226**	0.075	3.030	-0.304*	0.146	-2.088	0.181	0.156	1.161	-0.035	0.205	-0.169
Income	0.042	0.036	1.191	0.077	0.070	1.101	-0.006	0.085	-0.065	-0.055	0.109	-0.502
Health-consciousness	-0.137**	0.048	-2.848	-0.199*	0.096	-2.079	-0.288**	0.105	-2.746	-0.032	0.131	-0.244
Distance to city centre	-0.068	0.042	-1.607	0.079	0.082	0.965	-0.081	0.092	-0.876	-0.012	0.118	-0.099
Main mode	0.057**	0.017	3.265	0.040	0.034	1.159	0.008	0.032	0.239	-0.050	0.038	-1.307
Car ownership	0.051	0.087	0.594	0.288	0.172	1.669	-0.412*	0.207	-1.993	0.234	0.289	0.810
Environmental concern	-0.018	0.041	-0.428	0.088	0.081	1.097	0.047	0.090	0.518	0.119	0.128	0.933
Public Transport	GL						uGS					
	Pleasure			Arousal			Pleasure			Arousal		
	$R^2 = .055$			$R^2 = .115$			$R^2 = .031$			$R^2 = .131$		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	-0.005***	0.001	-3.648	-0.005**	0.002	-2.457	-0.001	0.003	-0.459	-0.001	0.003	-0.284
Gender	0.329***	0.083	3.949	-0.436**	0.130	-3.347	0.300	0.160	1.872	-0.099	0.198	-0.501
Income	0.035	0.040	0.874	0.029	0.064	0.456	0.023	0.083	0.275	0.221*	0.104	2.126
Health-consciousness	-0.027	0.054	-0.497	-0.069	0.085	-0.807	-0.128	0.100	-1.276	-0.333**	0.121	-2.761
Distance to city centre	0.005	0.046	0.117	-0.105	0.073	-1.430	-0.031	0.093	-0.335	0.183	0.120	1.523
Main mode	0.036	0.019	1.943	0.025	0.030	0.833	0.010	0.032	0.308	0.017	0.042	0.416
Car ownership	-0.111	0.099	-1.120	0.115	0.155	0.745	0.246	0.220	1.119	0.789**	0.272	2.899
Environmental concern	0.043	0.045	0.948	0.114	0.069	1.638	0.016	0.093	0.173	-0.002	0.112	-0.015

Car in Jam	GL						uGS					
	Pleasure			Arousal			Pleasure			Arousal		
	$R^2 = .046$			$R^2 = .073$			$R^2 = .132$			$R^2 = .136$		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	-0.003	0.002	-1.454	-0.003	0.002	-1.333	-0.008**	0.003	-2.763	0.001	0.003	0.324
Gender	0.100	0.099	1.012	-0.131	0.135	-0.970	-0.152	0.177	-0.856	-0.116	0.225	-0.514
Income	0.069	0.047	1.460	-0.023	0.064	-0.353	-0.314**	0.096	-3.290	0.064	0.116	0.552
Health-consciousness	-0.203**	0.066	-3.096	-0.263**	0.086	-3.067	0.257*	0.105	2.446	-0.476**	0.137	-3.469
Distance to city centre	-0.100	0.056	-1.786	-0.010	0.075	-0.134	-0.081	0.108	-0.755	0.206	0.125	1.645
Main mode	0.020	0.023	0.880	0.021	0.031	0.694	0.011	0.035	0.319	-0.009	0.048	-0.194
Car ownership	0.148	0.118	1.259	-0.038	0.160	-0.240	-0.693**	0.237	-2.919	0.397	0.307	1.291
Environmental concern	-0.057	0.051	-1.119	0.078	0.070	1.112	-0.127	0.095	-1.335	-0.092	0.118	-0.784

Cycling	GL						uGS					
	Pleasure			Arousal			Pleasure			Arousal		
	$R^2 = .142$			$R^2 = .066$			$R^2 = .053$			$R^2 = .063$		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	-0.005**	0.002	-3.471	-0.005*	0.002	-1.971	0.004	0.003	1.714	-0.003	0.004	-0.670
Gender	0.140	0.089	1.586	0.017	0.133	0.127	-0.131	0.159	-0.825	0.421	0.233	1.807
Income	-0.049	0.041	-1.196	0.131*	0.062	2.119	0.122	0.083	1.474	-0.117	0.118	-0.989
Health-consciousness	-0.176**	0.057	-3.088	-0.109	0.090	-1.221	-0.097	0.100	-0.971	-0.121	0.144	-0.841
Distance to city centre	0.007	0.050	0.141	-0.138	0.077	-1.800	-0.024	0.099	-0.246	-0.099	0.148	-0.669
Main mode	-0.043*	0.020	-2.155	-0.045	0.030	-1.504	-0.044	0.033	-1.323	0.071	0.048	1.471
Car ownership	0.037	0.102	0.361	-0.290	0.155	-1.873	0.333	0.218	1.531	0.147	0.327	0.448
Environmental concern	0.254***	0.046	5.475	0.088	0.068	1.289	-0.039	0.098	-0.400	0.089	0.136	0.652

Walking	GL						uGS					
	Pleasure			Arousal			Pleasure			Arousal		
	$R^2 = .023$			$R^2 = .092$			$R^2 = .035$			$R^2 = .069$		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	0.000	0.001	-0.202	-0.006**	0.002	-2.946	-0.002	0.002	-0.865	0.000	0.003	0.124
Gender	-0.081	0.075	-1.077	-0.029	0.111	-0.259	-0.110	0.130	-0.846	0.452*	0.203	2.231
Income	0.025	0.037	0.674	0.033	0.054	0.610	0.106	0.067	1.577	-0.035	0.105	-0.334
Health-consciousness	-0.057	0.048	-1.185	-0.129	0.074	-1.754	-0.046	0.084	-0.554	-0.033	0.126	-0.261
Distance to city centre	-0.064	0.044	-1.463	-0.143*	0.065	-2.206	-0.073	0.077	-0.944	-0.137	0.121	-1.127
Main mode	-0.006	0.017	-0.334	0.057*	0.027	2.140	-0.002	0.026	-0.096	-0.094*	0.042	-2.219
Car ownership	0.041	0.090	0.451	-0.235	0.134	-1.752	-0.014	0.168	-0.081	-0.395	0.282	-1.403
Environmental concern	0.068	0.040	1.700	0.093	0.058	1.613	-0.054	0.073	-0.731	0.184	0.110	1.676

Carsharing	GL						uGS					
	Pleasure			Arousal			Pleasure			Arousal		
	$R^2 = .051$			$R^2 = .126$			$R^2 = .059$			$R^2 = .081$		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	0.000	0.001	0.076	-0.001	0.002	-0.606	-0.002	0.002	-0.785	-0.003	0.003	-0.888
Gender	0.010	0.077	0.130	0.219	0.120	1.816	0.154	0.148	1.046	0.117	0.216	0.541
Income	0.032	0.037	0.872	-0.015	0.060	-0.250	-0.037	0.074	-0.496	-0.210	0.110	-1.910
Health-consciousness	-0.053	0.050	-1.049	-0.342***	0.081	-4.229	-0.188*	0.093	-2.028	0.051	0.126	0.404
Distance to city centre	-0.097*	0.045	-2.173	-0.111	0.073	-1.535	0.041	0.088	0.471	0.117	0.132	0.883
Main mode	0.024	0.017	1.379	0.036	0.028	1.291	-0.027	0.030	-0.905	-0.108*	0.043	-2.532
Car ownership	0.076	0.089	0.857	-0.131	0.142	-0.922	0.269	0.189	1.426	-0.663*	0.291	-2.278
Environmental concern	0.127**	0.040	3.191	0.146*	0.064	2.284	-0.146	0.084	-1.736	0.057	0.126	0.453

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$

Table 4. Influencing factors for the level of emotions for the Switching-from-car Scenarios.

Car in Jam to Empty Public Transport	GL						uGS					
	Pleasure			Arousal			Pleasure			Arousal		
	R^2 = .043			R^2 = .147			R^2 = .038			R^2 = .081		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	-0.001	0.002	-0.782	-0.003	0.002	-1.602	-0.001	0.003	-0.487	-0.003	0.003	-0.919
Gender	0.130	0.101	1.289	-0.114	0.109	-1.042	0.125	0.171	0.731	0.259	0.222	1.167
Income	0.036	0.050	0.724	-0.027	0.053	-0.514	-0.001	0.092	-0.006	-0.050	0.123	-0.408
Health-consciousness	0.052	0.064	0.800	-0.216**	0.071	-3.066	-0.071	0.105	-0.679	-0.265	0.129	-2.055
Distance to city centre	-0.043	0.058	-0.739	-0.219**	0.063	-3.500	-0.044	0.106	-0.411	-0.031	0.139	-0.223
Main mode	-0.006	0.023	-0.238	0.040	0.025	1.597	-0.015	0.035	-0.428	-0.070	0.044	-1.600
Car ownership	0.146	0.121	1.210	-0.030	0.129	-0.230	0.358	0.230	1.556	-0.327	0.314	-1.040
Environmental concern	0.217***	0.054	4.024	0.233***	0.057	4.069	-0.075	0.099	-0.761	0.117	0.128	0.915
Car in Jam to Full Public Transport	GL						uGS					
	Pleasure			Arousal			Pleasure			Arousal		
	R^2 = .052			R^2 = .100			R^2 = .036			R^2 = .116		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	-0.005**	0.002	-2.735	-0.006**	0.002	-2.684	0.003	0.003	0.980	-0.005	0.003	-1.551
Gender	0.244*	0.099	2.465	-0.234	0.122	-1.918	0.248	0.156	1.589	-0.042	0.198	-0.213
Income	0.032	0.046	0.699	0.009	0.057	0.167	0.079	0.082	0.966	0.013	0.107	0.122
Health-consciousness	-0.103	0.062	-1.648	-0.156*	0.078	-2.006	-0.151	0.103	-1.455	-0.141	0.135	-1.038
Distance to city centre	0.133**	0.056	2.372	-0.016	0.068	-0.231	-0.091	0.096	-0.953	0.433**	0.125	3.479
Main mode	-0.028	0.022	-1.263	0.078**	0.028	2.831	-0.049	0.033	-1.497	-0.016	0.041	-0.382
Car ownership	-0.034	0.118	-0.288	0.221	0.148	1.496	0.076	0.211	0.360	-0.277	0.284	-0.975
Environmental concern	0.106*	0.052	2.056	0.142*	0.064	2.218	0.049	0.091	0.537	0.165	0.114	1.451
Car to Cycling	GL						uGS					
	Pleasure			Arousal			Pleasure			Arousal		
	R^2 = .101			R^2 = .081			R^2 = .071			R^2 = .066		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	-0.005**	0.002	-2.952	0.000	0.002	0.122	0.001	0.003	0.427	-0.007	0.004	-1.656
Gender	0.308**	0.104	2.945	-0.152	0.118	-1.283	0.216	0.154	1.404	-0.229	0.228	-1.003
Income	-0.012	0.050	-0.242	0.061	0.056	1.099	0.097	0.080	1.224	-0.062	0.123	-0.508
Health-consciousness	-0.270***	0.069	-3.902	-0.242**	0.079	-3.078	-0.288**	0.098	-2.935	0.039	0.145	0.267
Distance to city centre	-0.050	0.060	-0.845	-0.108	0.067	-1.606	0.062	0.093	0.663	-0.200	0.148	-1.353
Main mode	-0.031	0.024	-1.305	-0.050	0.027	-1.860	-0.108***	0.030	-3.540	0.001	0.044	0.034
Car ownership	0.104	0.123	0.846	-0.171	0.135	-1.265	-0.165	0.196	-0.841	-0.692*	0.308	-2.251
Environmental concern	0.202***	0.056	3.596	0.165**	0.062	2.648	-0.107	0.087	-1.227	0.005	0.140	0.039
Car to Walking	GL						uGS					
	Pleasure			Arousal			Pleasure			Arousal		
	R^2 = .102			R^2 = .043			R^2 = .068			R^2 = .048		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	-0.003	0.002	-1.783	-0.003	0.002	-1.341	-0.002	0.003	-0.568	0.001	0.004	0.375
Gender	-0.172	0.108	-1.592	-0.149	0.119	-1.252	0.324	0.166	1.951	0.022	0.219	0.102
Income	0.013	0.053	0.247	0.044	0.058	0.769	0.083	0.083	1.000	-0.187	0.111	-1.692
Health-consciousness	-0.192**	0.073	-2.623	-0.077	0.082	-0.949	-0.045	0.105	-0.430	0.039	0.136	0.283
Distance to city centre	-0.057	0.062	-0.912	0.010	0.068	0.142	0.024	0.096	0.244	-0.124	0.130	-0.956
Main mode	-0.049*	0.024	-2.018	-0.020	0.027	-0.737	-0.100*	0.034	-2.969	0.002	0.045	0.047
Car ownership	-0.049	0.128	-0.385	-0.248	0.140	-1.769	-0.091	0.213	-0.428	-0.538	0.310	-1.735
Environmental concern	0.271***	0.056	4.804	0.117	0.064	1.824	0.198*	0.092	2.159	0.093	0.115	0.808

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$

Table 5. Influencing factors for the level of emotions for the Switching-to-car Scenarios.

Empty Public Transport to Car in Jam	GL						uGS					
	Pleasure			Arousal			Pleasure			Arousal		
	R^2 = .074			R^2 = .081			R^2 = .092			R^2 = .042		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	-0.006**	0.002	-3.146	-0.006**	0.002	-2.704	-0.008**	0.003	-2.609	0.001	0.004	0.310
Gender	0.039	0.103	0.377	-0.205	0.120	-1.703	0.434**	0.181	2.390	-0.024	0.242	-0.099
Income	0.059	0.050	1.185	-0.011	0.059	-0.184	-0.234**	0.088	-2.649	-0.035	0.121	-0.289
Health-consciousness	-0.181*	0.070	-2.584	-0.254**	0.084	-3.017	0.011	0.114	0.098	-0.178	0.144	-1.233
Distance to city centre	-0.057	0.060	-0.941	-0.008	0.071	-0.107	-0.070	0.106	-0.659	0.068	0.132	0.513
Main mode	0.038	0.024	1.600	0.018	0.028	0.652	-0.024	0.036	-0.670	-0.028	0.046	-0.602
Car ownership	-0.237	0.124	-1.903	-0.121	0.147	-0.827	-0.441	0.225	-1.961	0.083	0.296	0.280
Environmental concern	-0.198***	0.056	-3.521	0.067	0.067	1.002	0.162	0.103	1.567	0.242	0.133	1.825
Full Public Transport to Car in Jam	**GL**						**uGS**					
	Pleasure			Arousal			Pleasure			Arousal		
	R^2 = .031			R^2 = .112			R^2 = .059			R^2 = .012		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	-0.006**	0.002	-3.350	-0.007**	0.002	-3.410	-0.007**	0.003	-2.378	0.003	0.003	0.773
Gender	0.162	0.105	1.542	-0.400**	0.122	-3.280	0.069	0.172	0.400	0.028	0.212	0.132
Income	0.030	0.049	0.616	0.061	0.057	1.077	0.137	0.093	1.464	-0.025	0.110	-0.224
Health-consciousness	0.012	0.067	0.178	-0.204**	0.076	-2.699	0.051	0.108	0.471	-0.083	0.134	-0.620
Distance to city centre	0.005	0.059	0.086	-0.001	0.067	-0.015	0.043	0.101	0.426	0.086	0.126	0.684
Main mode	0.049*	0.023	2.126	0.015	0.026	0.567	0.039	0.035	1.112	-0.001	0.042	-0.029
Car ownership	0.008	0.121	0.062	-0.159	0.139	-1.137	-0.183	0.235	-0.778	0.094	0.280	0.337
Environmental concern	-0.029	0.055	-0.538	0.110	0.063	1.759	-0.004	0.096	-0.046	0.028	0.126	0.222
Cycling to Car	**GL**						**uGS**					
	Pleasure			Arousal			Pleasure			Arousal		
	R^2 = .049			R^2 = .113			R^2 = .053			R^2 = .019		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	0.001	0.002	0.577	-0.002	0.002	-0.923	-0.004	0.002	-1.786	-0.004	0.004	-0.968
Gender	-0.086	0.098	-0.881	0.181	0.117	1.555	0.007	0.144	0.048	0.018	0.237	0.076
Income	0.099*	0.048	2.073	0.071	0.056	1.261	-0.147	0.076	-1.940	-0.076	0.122	-0.628
Health-consciousness	-0.016	0.063	-0.259	-0.373***	0.076	-4.927	0.098	0.091	1.078	-0.059	0.143	-0.408
Distance to city centre	-0.115*	0.055	-2.068	-0.143*	0.067	-2.150	-0.023	0.092	-0.251	0.085	0.154	0.549
Main mode	0.108***	0.023	4.722	0.051	0.027	1.854	0.079**	0.029	2.730	-0.007	0.048	-0.141
Car ownership	0.129	0.115	1.121	-0.021	0.138	-0.150	-0.011	0.195	-0.059	-0.142	0.314	-0.450
Environmental concern	-0.116*	0.052	-2.247	0.078	0.063	1.248	0.033	0.088	0.377	0.052	0.141	0.372
Walking to Car	**GL**						**uGS**					
	Pleasure			Arousal			Pleasure			Arousal		
	R^2 = .066			R^2 = .053			R^2 = .047			R^2 = .019		
Variable	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t	B	Std. Err.	t
Age	-0.004*	0.002	-2.192	-0.001	0.002	-0.701	-0.005*	0.002	-2.314	0.001	0.003	0.192
Gender	0.020	0.106	0.191	-0.014	0.118	-0.119	0.187	0.143	1.313	0.088	0.204	0.432
Income	-0.018	0.051	-0.344	0.133*	0.056	2.382	0.006	0.073	0.076	-0.023	0.105	-0.221
Health-consciousness	0.044	0.067	0.653	-0.255**	0.075	-3.414	0.010	0.091	0.108	-0.157	0.128	-1.225
Distance to city centre	-0.113	0.059	-1.901	-0.043	0.067	-0.640	-0.057	0.087	-0.658	-0.069	0.127	-0.544
Main mode	0.101***	0.024	4.209	0.023	0.027	0.833	0.088**	0.030	2.950	-0.048	0.042	-1.129
Car ownership	-0.164	0.120	-1.363	0.007	0.136	0.054	0.221	0.198	1.117	-0.037	0.303	-0.123
Environmental concern	-0.010	0.055	-0.190	-0.011	0.062	-0.183	0.104	0.080	1.308	-0.050	0.109	-0.458

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$

Discussion

Differences in the two location GL and uGS

The aim of the study was to explore people's emotions towards various modes of transport to provide a basis for emotion-based marketing communication intended to reduce car use and increase the use of alternative modes in cities in the long-term. The results revealed that the mean levels of emotions based on pleasure and arousal towards most of the scenarios were quite similar in the two locations GL and uGS. Yet, some distinct differences emerged: according to the data, people from GL enjoyed *walking, cycling* and *carsharing* more than people from uGS, while people from uGS enjoyed *public transport* more and were more aroused by *traffic jams* than people from GL.

An explanation for *walking* and *cycling* as well as *car to walking* and *car to cycling* (and the respective reverse switches) could stem from the fact that the two locations are very distinct in terms of topography. While GL is flat, people from uGS are confronted with steep hills in cities due to the surrounding Alps. Thus, both *walking* and especially *cycling* are more exhausting and involve more effort in terms of personal endurance. In addition, results for uGS showed that switching from *car to walking* was less pleasurable and more arousing than the reverse switch. In contrast, the reverse switches from *cycling to car* and from *walking to car* were associated with higher levels of pleasure in uGS. *Walking* and *cycling* could therefore be regarded as more stressful by people in uGS compared to other modes and hence less enjoyable than in GL, which is characterised by flat land. This assertion is consistent with the assumption of Kaplan and Prato (2016), who state that if the use of active modes is related to levels of stress they are enjoyed less.

Findings for the higher level of pleasure in GL regarding *carsharing* could be ascribed to people's openness towards new forms of mobility. *Carsharing* is the latest type of the examined modes and has existed in GL for a longer time, where it has also been used more frequently than in uGS (Statista, 2014; 2021). Therefore, people from uGS may be less familiar with the mode in comparison to people from GL, who were already able to create emotional associations with it. Moreover, the higher levels of arousal towards *traffic jams* in uGS could be traced back to the fact that people from GL are more used to traffic jams and thus experience less emotions while being confronted with them. According to Wood et al. (2002) people feel less emotional while performing habitual behaviours. Thus, according to the authors, as people from GL perceive traffic jams as more ordinary than people from uGS,

they are less aroused by them. Yet, it should be noticed that the general level of pleasure towards *traffic jams* was low in both regions.

Further, the higher level of arousal towards *public transport* in uGS is accompanied by higher levels of pleasure. It could be concluded that people from uGS are generally more positively emotionalised by *public transport* than people from GL. This finding is evident as Switzerland is known for its excellent public transport services, besides high car ownership rates (Buehler et al., 2017; Petersen, 2016). In contrast, public transport services from GL are usually known for being expensive and frequently delayed (Petersen, 2016), which may be an explanation for the locally lower levels of pleasure. Although public transport issues in GL have started to improve over recent years (Currie & Fournier, 2021; De Oña, 2021), people in this location may still associate public transport with low quality.

These explanations also substantiate the higher levels of arousal in uGS for switching from both *empty* and *full PT to car in a jam*. This finding infers that people from uGS are more aroused while switching from *PT to car in a jam* – regardless of its user density – compared to people from GL. Yet, in both locations, the reverse switch from a *car in a jam to empty or full PT* was perceived as more pleasurable and less arousing. This finding provides evidence that in both locations, being stuck in a car in a jam is associated with more negative emotions if compared to sitting in public transport. Overall, a pattern of greater enjoyment of *cycling*, *walking* and *carsharing* in GL and a greater enjoyment of using *public transport* and driving a *car* in uGS emerged.

Influential factors for the level of pleasure and arousal towards modes

Findings for GL

In terms of influential factors regarding emotions towards various modes, results for GL indicated a prominent insight: across all modes and locations, *age* was a clearly determining factor for people's levels of pleasure and/or arousal. The younger the respondents, the more pleasurable they perceived alternative modes. Further, results revealed that levels of pleasure towards alternative modes are higher for people who are both concerned about the environment and have a health-conscious lifestyle. This insight supports existing findings by Wang (2017), who states that people with higher environmental concerns are more prone to purchase sustainable products.

With regard to emotions towards cars stuck in traffic jams, another pattern emerged, showing that respondents whose main mode of transport is a car or who own a car themselves are less irritated by traffic jams. Those people have significantly higher levels of pleasure in both static and switching scenarios resulting in being stuck in a car in traffic jams compared to non-car owners or users. This insight provides new understanding of car owner's stickiness towards cars and shows how resistant drivers may be even when exposed to negative aspects of cars. Therefore, confronting frequent car users with negative emotional aspects of cars, i.e., via being stuck in traffic jams, might not result in a desired reduction in car use.

Yet, on the other hand, results indicated that all *non*-car owners and drivers perceived negative aspects of cars such as traffic jams as particularly unpleasant and arousing. For this group of people, a confrontation with further negative situations triggering negative emotions could be more successful in reducing car use. Moreover, car owners and users experienced switching from any mode to a car as more pleasurable than all non-car owners and users. In contrast, health-conscious respondents who have concerns about the environment were much more aroused and experienced lower levels of pleasure in those scenarios.

Interestingly, the influence of the distance from where people lived to the city centre was very diverse in its effect. On the one hand, the greater that distance, the more pleasure and the less arousal they experienced during a switch from *car in a jam to full public transport* compared to people living closer to the centre. An explanation could be that the desire to reach home quickly is stronger than the need for the privacy a car could provide. This supports the assumption of Gaterlseben and Uzzel (2006) as well as Wener et al. (2003), stating that, in general, longer journey times are associated with more negative emotions. On the other hand, results revealed that the further away respondents live from the city centre, the less arousal they experience while walking. In terms of speed, this is counterintuitive and contradicts the aforementioned assumption. Yet, the further away people live from the centre, the more they may be used to walking due to the lower number of transport options outside the city centre (Pateman, 2011). Therefore, they may be less emotional towards the behaviour they are habituated to, supporting the findings of Wood et al. (2002).

Findings for uGS

In terms of uGS, fewer sociodemographic factors significantly influenced the level of pleasure and/or arousal towards the explored scenarios. Unlike in GL, where *age* was an influential factor across all scenarios, in uGS it was only a determining factor for scenarios

involving being stuck in traffic jams or switching to a car. Here, the older a person, the less pleasure was experienced. This finding shows that, in contrast to GL, in uGS older people are less emotionally irritated by alternative modes of transport. Further, *health-consciousness* and *environmental concern* were factors for high levels of pleasure towards alternative modes. However, for the scenarios *cycling, car in a jam to empty PT* and *car in a jam to full PT* none of the sociodemographic factors – except the *distance from where people live to the city centre* in the case of the latter scenario – significantly moderated emotions. This finding does not imply that there are no influential factors for the level of emotions towards the scenarios for people from uGS. Therefore, further influential factors should be assessed in future studies.

The emotional levels of car owners and frequent users was also similar to that in GL. Here, however, an exception was the switch from *public transport* – regardless of user density – *to car in a jam.* This switch was not more pleasurable or arousing for car users and owners than for non-owners and -users as was the case for GL. It could therefore be concluded that emotional stickiness towards cars in uGS is lower compared to in GL. Hence, in contrast to GL, confronting car users and owners with negative car situations may be more effective. Overall, some of the insights of the study may not be surprising. Yet the study's findings provide significant statistical evidence to what might have been considered as common sense. Moreover, the study not only reveals new knowledge as regards current emotions towards various modes and towards switching from one mode to another but does so on a detailed sociodemographic basis.

Implications

The theoretical implications of the study contribute to the study of emotions, particularly via the use of a Self-Assessment Manikin scale, in a transportation context. By applying the psychological method in this new context, novel insights could be generated which may influence and inspire future studies in this field. Furthermore, the findings of the study add to the research into individuals' mode choice with a focus on sociodemographic differences. On this basis, this study further contributes to the discussion of appropriately targeting publicity messages based on people's different emotional perceptions in a mobility context. In this respect, results show that targeting the young and environmentally concerned with individualised messages can trigger negative emotions towards cars and may lead to a reduction in their use. At the same time, results show that for other people in society, i.e., car

owners and frequent users, efforts put into reducing car use and increasing the use of alternative modes of transport is less likely to significantly affect them on an emotional level. This finding is relevant for advertising research in a transportation context to build on and explore further influential factors.

The latter finding is also relevant in terms of managerial implications. Understanding sociodemographic differences in the level of emotions towards various modes allows mobility providers to adapt their promotional messages accordingly. Hereby, currently neutral or even negative emotions towards alternative transport modes could be rectified and replaced by positive emotional connotations. In addition, policy makers aiming to increase the use of alternative modes may use location-specific, sociodemographic findings to motivate people via a deliberate reference to their emotions. Potentially, this could result in a reduction in car use. Policy makers could even use findings to go one step further and use people's negatively associated emotions with cars to send emotionally provoking messages reducing car use. Generally, it needs to be borne in mind that some people will always associate cars with positive emotions, especially in the case of those who own a car or use it frequently. Thus, for those people, messages promoting alternative modes based on positive emotions may fall on deaf ears. Here, policy makers might need to consider other measures to influence those people's mobility behaviours. Yet, others are more receptive to these messages. This group of receptive people, i.e., the young, health-conscious, and environmentally concerned, should, ideally, be enlarged by increasing awareness of environmental issues. A greater awareness could then coincide with a more positive emotional attitude towards alternative modes of transport, increasing their use in the long-term. Lastly, findings are also relevant for the car industry. Understanding how some people's emotions towards cars are currently changing for the worse is crucial for adapting product and marketing strategies to meet consumers' long-term needs.

Conclusion and limitations

The aim of the study was to explore people's emotions towards various transport modes and also towards switches between modes. For this purpose, the level of people's perceived pleasure and arousal was measured in sample populations in GL and uGS. Further, the study sought to assess sociodemographic factors influencing the level of emotions in the two locations. The data revealed differences in emotional attitudes towards modes in GL

versus in uGS. Moreover, the data indicated that – cutting across the two geographic locations – different groups in society perceive alternative modes as more pleasurable than others, particularly young, health-conscious, and environmentally concerned people. This group of people dislikes the use of cars if it means arriving late at a destination. In contrast, findings provided evidence for car owners and frequent users perceiving cars as pleasurable even when confronted with a negative situation, i.e., being stuck in a traffic jam. Overall, the study confirmed that emotions are of significance for transport-related issues. Car advertisements have successfully planted a certain image of cars in peoples' heads, which, according to the study's findings, can – at least for the younger generations – be changed. It will be crucial for policy makers wanting to reduce car use in cities to enlarge this receptive group of people and to gradually increase positive emotional associations with alternative modes of transport.

This study is not without its limitations. For one, data was restricted to sample populations in Greater London and in German-speaking urban areas of Switzerland. Hence, this study does not seek to generalise findings to other parts of the world. Nevertheless, it may serve as a basis for future research by drawing on its findings and exploring their applicability to other regions. Secondly, it should be noted that data was collected during a time when Covid-19 was an issue. Although respondents were instructed to imagine a post-Covid-19 era, this may still have influenced their answers. It remains to be seen whether future pandemics will need to be taken into account when considering transport issues. Thirdly, this study focuses on a list of sociodemographic factors which is by no means exhaustive, and results of multiple regression analyses could have been different by including further factors. Future research could investigate the effect of such additional factors, thereby building on this study.

Lastly, subjective bias and distortions of other kinds are inevitable when assessing people's emotions via online surveys. As this study sought to explore emotions of a relatively large sample to generate representative and wide-scale findings, the use of laboratory facilities to assess electroencephalography (EEG) data was not practicable. Future research could validate the study's findings by applying EEG software for a smaller sample, generating fully unbiased results. Besides such limitations, this study was able to provide new evidence in a transport research context for people's current emotions towards various transport modes. These insights are relevant for future researchers, policy makers as well as mobility providers seeking to reduce car use in cities in the long-term.

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