Attitudes and Attitude Change in Personal Travel

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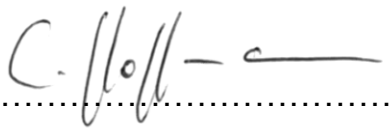
I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature: 

Abstract

High levels of personal car use have negative effects on the environment and on human health. This thesis presents four empirical studies that aimed to develop our knowledge of personal travel choices, focussing on the malleability of attitudes and their sensitivity in relation to specific contexts and goals.

The first study (Chapter 2) presents a systematic review and meta-analysis of mechanisms of travel mode choice. The study provides a comprehensive overview of antecedents of car use and non-car use, including sub-group analyses of different contextual factors. Results also highlight the need for standardised measures and consideration of implicit thought processes.

The second study (Chapter 3) employs a repertory grid technique to elicit perceptions of seven different transport modes from high mileage car users and non-car users. Comparisons between car users and non-car users highlight potentially effective and ineffective intervention targets. Findings show how sustainable transport might be promoted amongst a portfolio of travel choices.

The third study (Chapter 4) utilises qualitative methods to explore the extent to which individuals' attitude expressions are changeable. The study demonstrates that all participants hold ambivalent and conflicting attitudes, highlighting specific situations in which those attitudes are more likely to be unstable.

Two related priming experiments are presented in the final empirical chapter (Chapter 5). Both use survey methodology to investigate whether manipulating the salience of car-use-incongruent goals can lead to more positive attitudes towards and increased willingness to use non-car travel modes. The study confirms that people who are motivated to make changes are a potentially optimal target group for interventions based on subliminal messages.

Overall, the research presented in this thesis introduces context sensitivity into the transport literature and offers novel insights into perceptions of a range of travel modes. Recommendations include relevant avenues for future research, findings are discussed in light of implications for transport policy and practice.

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Author's Declaration

I declare that the work presented in this thesis was designed, undertaken and written by me.

Four separate studies reported here have been written as manuscripts for publication. At the time of submission, one study was published (Chapter 2), one paper was under review after resubmission (Chapter 3), one was submitted (Chapter 4) and one has been prepared for submission (Chapter 5). All papers are co-authored but are primarily the result of my own work with the supervisory team providing feedback on drafts. Throughout the doctoral programme, my lead supervisor Prof. Charles Abraham (CA) has worked closely with me on preparing all chapters for publication. Where required, my secondary supervisor Dr. Stephen Skippon (SS) provided advice and comments at various stages. Dr. Mathew White (MW), my third supervisor, provided guidance and comments across all of my doctoral work.

For the systematic review and meta-analysis (Chapter 2), I developed the protocol and search strategy, performed subsequent systematic searching, screening, data extraction, quality assessment and carried out qualitative and quantitative data analysis. Rebecca Whear advised on systematic review processes. Samuel Chng performed inter-rater screening. Susan Ball provided guidance on statistical procedures and commented on the manuscript. CA, SS and MW commented on the study protocol and helped define the inclusion criteria.

For the Repertory Grid (Chapter 3) and qualitative study (Chapter 4), I developed the interview protocol and all participant and interview materials. CA, MW and SS provided advice and commented on these materials. I prepared the application for ethical approval and Jillian Anable and Mark Tarrant provided reviewer comments. I conducted the Repertory Grid and in-depth interviews, transcribed audio recordings. Analyses were undertaken with guidance from CA and MW.

For the experimental goal priming study (Chapter 5), I developed the protocol and survey materials. CA and MW helped refine the study design and Paschal Sheeran also provided advice on methodology. I collected data for Study 1. Paschal Sheeran and Aya Avishai-YitshakI collected participant data for Study 2. I performed statistical analyses and interpretation under supervision of MW.

List of Publications

The thesis contains four papers for publication. A version of each paper is presented in Chapters 2 to 5.

Chapter 2 has been published as:

Hoffmann, C., Abraham, C., White, M. P., Ball, S., & Skippon, S. (2017) What cognitive mechanisms predict travel mode choice? A systematic review with meta-analysis. *Transport Reviews*, 37(5), 631-352. doi:10.1080/01441647.2017.1285819

Chapter 3 has completed its first peer review stage in March 2018:

Hoffmann, C., Abraham, C., White, M. P., & Skippon, S. (*under review*) Cognitive Construction of Travel Modes among Car Users and Non-car Users - A Repertory Grid Analysis. *Transportation Research Part A: Policy and Practice.*

Chapter 4 has been submitted in March 2018:

Hoffmann, C., Abraham, C., White, M. P., & Skippon, S. (*submitted*) Ambivalent about travel mode choice? A qualitative investigation of car user and non-car user attitudes. *Transportation Research Part A: Policy and Practice.*

Chapter 5 has been prepared for submission as:

Hoffmann, C., Abraham, C., White, M. P., & Skippon, S. (*in preparation*) Can different goals change willingness to use and attitudes towards non-car use? An implicit priming experiment.

List of Abbreviations

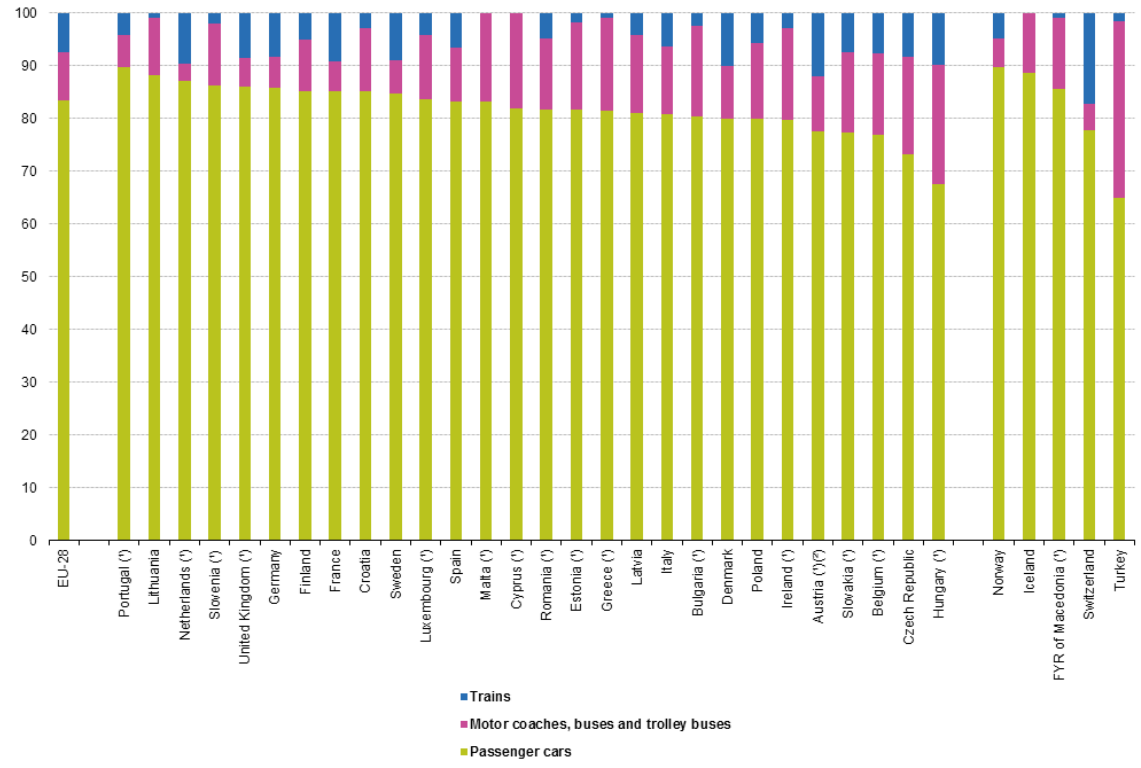
ANCOVA	Analysis of covariance
CI	Confidence intervals
CO_2	Carbon dioxide
DfT	Department for Transport
IEA	International Environment Agency
NAM	Norm Activation Model
PBC	Perceived Behavioural Control
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PA	Physical activity
PT	Public transport
RepGrid	Repertory Grid
TMC	Travel mode choice
TPB	Theory of Planned Behaviour
WHO	World Health Organisation

Chapter 1 Introduction

The 20th century has seen the development of Western cities and towns designed for car use including urban freeways, parking lots and extensive road networks. Stimulated by mass production and globalisation, personal vehicles have become a common consumer good, offering convenient, comfortable and fast travel (Giuliano & Hanson, 2017). These developments have unfortunate consequences (Geels, 2005; Sumantran, Fine, & Gonsalvez, 2017). Developed and developing countries alike face problems caused by over-reliance on car use: climate change, congested cities, air pollution and obesity can all be attributed to high levels of car use (Davis, Valsecchi, & Fergusson, 2007; Karanasiou, Viana, Querol, Moreno, & de Leeuw, 2014; WHO, 2016). Air pollution in UK urban areas has exceeded what is considered safe levels of nitrogen dioxide and is responsible for an estimated 50,000 premature deaths annually. Convenience, comfort and speed are compromised by high volumes of traffic, causing mental distress, early deaths and threats to biodiversity. Decarbonising urban spaces by reducing car use has become a major concern to mitigate environmental and public health crises (Blair, 2009; WHO, 2016).

Consequently, transport governance increasingly focuses on alternative solutions. Promoting non-motorised or active transport, such as walking and cycling, features in current policy plans and transport strategies, e.g. London's 25-year Transport Strategy (Greater London Authority, 2017) or the Walking and Cycling Investment Strategy (DfT, 2017c). Increasing levels of walking and cycling incorporates physical activity into daily travel so promoting wholesome environments and healthy populations (Humphreys, Goodman, & Ogilvie, 2013; Martin, Goryakin, & Suhrcke, 2014; Norwood, Eberth, Farrar, Anable, & Ludbrook, 2014). Integrating these strategies into long-term local transport planning, local authorities across the UK have devised schemes and interventions to reduce reliance on cars (e.g. Birmingham Connected, Leicestershire's Choose How You Move, West of England's Travelwest). As a result, awareness of the negative consequences of personal car

use is generally high (Whitmarsh, Seyfang, & O'Neill, 2011). Yet, in Western Europe for example, 79% of total passenger mileage is travelled by car (Jeekel, 2016). EU member states report over 80% of all passenger kilometres are driven (see Figure 1.1 below). In the UK, personal car use still accounts for 62% trips overall (DfT, 2017b) and private road transport accounts for 10% of the UK's greenhouse gas emissions, jeopardising government targets set under the Climate Change Act 2008. UK car sales have peaked in 2017 (Kollewe & Carrington, 2017), increasing the pressure on transport policy to address issues more effectively. Unless rapid changes through travel demand management are realised, environmental and human health problems are expected to intensify.



Note: excluding powered two-wheelers. Cyprus, Malta and Iceland: railways not applicable.
(¹) Includes estimates or provisional data.
(²) The railway in Liechtenstein is owned and operated by the Austrian ÖBB and included in their statistics.

Figure 1.1 Modal split of inland passenger transport (Eurostat, 2014)

The four studies presented in this thesis contribute to our knowledge of travel mode choice decisions. In particular, the work addresses how improved understanding of transport-relevant attitudes may enhance car use reduction interventions and future research in this area. This chapter presents the background to this research, outlines overall thesis aims and presents an overview of the four studies.

1.1 The problem of personal car use

Damaging effects of urban pollution (WHO, 2016) caused by high levels of car use have lately been receiving greater policy priority (OLEV, 2017). Air quality concerns have surged to the top of EU policy agenda, imposing sanctions on member states not reducing “life-threating” pollution levels (European Commission, 2013). Commitments to reduce emissions in cities have been announced in the form of stricter congestion charges and emission-free city centres e.g. Oxford by 2020 and Paris by 2040. Automotive manufacturers are now required to deliver solutions that mitigate the impact on environmental and human health. Significant technological advancements and government initiatives are propelling the registration of low and zero emission vehicles, capable of mitigating toxic pollutants in the long-term (Davies, 2017). However, introduction of pollution standards and adequate charging infrastructure for electric vehicle use are subject to political agendas, lobbying, and take time to implement (Anable & Boardman, 2005; Anable & Shaw, 2007; B. Walker, Adger, & Russel, 2015). Current trends suggest that the UK Government is unlikely to deliver emission reduction targets required to avoid exceeding the critical threshold of 2°C global warming above pre-industrial levels (Committee on Climate Change, 2018; United Nations, 2015). Alternative-fuelled cars may reduce emissions in the long run, but also fail to address physical inactivity associated with car use (Lindström, 2008; McCormack & Virk, 2014). Globally, 23% of adults and 80% of adolescents are being insufficiently active which is responsible for a range of non-

communicable diseases leading to early death (Ekelund et al., 2015; WHO, 2018). Further, low and zero emission vehicles are unlikely to alleviate problems in relation to land use, wellbeing and mental health caused by transport (Humphreys et al., 2013; Martin et al., 2014; Mitchell, Hargreaves, Namdeo, & Echenique, 2011). Ultimately, current challenges necessitate behaviour change in the form of decreasing levels of single-occupancy driving.

1.2 Influencing car use behaviour through hard or soft measures

To reduce motorised transport, transport policy utilises a range of measures ranging from, for instance, increased taxes on parking and fossil fuel, subsidising renewal fuels, and improving facilities for public transport and cycling. These influences are referred to as travel demand management. While several attempts have been made to classify these measures (Litman, 2003; Loukopoulos, 2007; Stradling, Meadows, & Beatty, 2000), the literature broadly distinguishes between “hard” and “soft” measures (Fujii, Gärling, & Kitamura, 2001; Taniguchi, Hara, Takano, Kagaya, & Fujii, 2003).

“Hard” (structural or push) measures aim to alter the context or consequences of driving. Such structural interventions can be further divided into “stick” and “carrot” measures which aim to motivate change through disincentives or incentives, respectively (Meyer, 1999). “Stick” measures typically reduce the attractiveness of driving using financial deterrents (e.g. increased road pricing) or access restrictions (e.g. in city centres). Often, such changes are being met with criticisms and disapproval (Schade & Schlag, 2003). Low levels of public acceptability can be a major barrier to implementation and effectiveness of “stick” measures (Gärling & Schuitema, 2007; Gärling, 2007). To enhance popularity of such structural interventions, research has suggested taking into account psychological determinants of acceptability, e.g. perceived effectiveness, perceived fairness

(Eriksson, Garvill, & Nordlund, 2008) and environmental problem awareness (Kim, Schmöcker, Fujii, & Noland, 2013).

“Carrot” measures seek to reward the desired behaviour and offer benefits of non-car travel (e.g. improved frequency of public transport). As such, many capital investments rely on psychology to inform service improvements. For instance, real-time information screens at bus stops were introduced to address perceived long waiting times and uncertainty (Dziekan & Kottenhoff, 2007). UK Government responded to the need to increase perceived travel time value by rolling out Wi-Fi on public transport (Connolly, Caulfield, & O’Mahony, 2009). Psychological research can also affirm infrastructural improvements. For example, perceived safety and willingness to cycle increased as a result of building segregated cycle paths (Chataway, Kaplan, Nielsen, & Prato, 2014). Despite sizeable financial investments by local authorities, “carrot” measures alone may not deliver desired modal shifts (e.g. Stopher, 2004). Potential reasons for such failure may be found in social-psychological research. For instance, travel mode choice is subject to biased perceptions, for example, about public transport travel time (Fujii et al., 2001; Fujii & Kitamura, 2003) or trip experience (Guiver, 2007). “Carrot” measures also fail to address underlying motivations to drive and neglect the complexity of travel-relevant beliefs and attitudes, including affective and symbolic motivations underpinning travel mode choice (Anable & Gatersleben, 2005; Mann & Abraham, 2012; Steg, Vlek, & Slotegraaf, 2001).

“Soft” (psychological, smart or pull) strategies aim to modify antecedents of travel mode choice in order to achieve voluntary behaviour change. Initiatives range from travel plans, personalised travel planning and car sharing schemes, to travel awareness and information campaigns (c.f. Cairns et al., 2004). These measures are more publicly acceptable and have potential to achieve quick, notable car use reductions at good cost-benefit ratios (Cairns et al., 2008; Scally, Ginger, &

O'Driscoll, 2011). Following an influential report commissioned by the Department for Transport (Cairns et al., 2004), "soft" measures are now an important part of local transport strategy.

Joint application of "hard" and "soft" strategies is believed to yield optimal results (Möser & Bamberg, 2008). To date, driving reduction programmes implemented through UK Government funding rely on both traditional strategies to inform transport planning and travel demand management (Hiblin, Taylor, & Sloman, 2016). An early review of "soft" measures provide support for psychological interventions, stating an average increase of non-car use by 7% across 141 studies (Möser & Bamberg, 2008). By contrast, growing (review and meta-analytic) evidence suggests that effectiveness of travel behaviour change intervention is generally low (Graham-Rowe, Skippon, Gardner, & Abraham, 2011; Ogilvie, Egan, Hamilton, & Petticrew, 2004; Swait, 2015; Yang, Sahlqvist, McMinn, Griffin, & Ogilvie, 2010) and not informed by theory (Arnott et al., 2014). Syntheses consistently conclude that heterogeneous evidence, lack of scientific rigour and non-standardised reporting lead to inconclusive results about efficacy of current interventions based on "soft" measures. This suggests that our knowledge about travel mode choice is still incomplete and alternative approaches are needed to inform interventions to reduce car use.

Importantly, the (local) transport environment is changing rapidly (Lyons & Davidson, 2016). Smart technologies and digital connectivity provide on-demand access to travel information, hence have the potential to simplify access to public transport, for example (Hensher, 2017). This transition to "Mobility as a Service" (Hietanen, 2014; Jittrapirom et al., 2017; Pippuri, Hietanen, & Pyyhti, n.d.) has seen a rise in novel, cost-effective and person-oriented transport systems. For instance, (dockless) bicycle sharing schemes (e.g. YoBikes), personalised route mapping (e.g. Google Maps) and ridesharing services (e.g. Uber) remove barriers to multi-modal and multi-

trip travel (Hensher, 2017; Kuhnimhof, Buehler, Wirtz, & Kalinowska, 2012) and reduce the need for car ownership, at least in urban environments (Hietanen, 2014; Kamargianni, Li, Matyas, & Schäfer, 2016). These trends change the focus of modern transport planning and policy (Docherty, Marsden, & Anable, 2017) and necessitate perspectives beyond analysis of daily travel patterns in order to manage and direct complexities of mobility (Swait, 2015).

1.3 Psychology of travel mode choice

Travel demand management strategies direct drivers towards reduced single-occupancy driving. Adequately explaining and predicting who will respond, in what way, to interventions is critical to enhancing the effectiveness of such schemes.

Travel mode choice is determined by a range of factors. Interactions between socio-demographic, socio-psychological factors and spatial and journey characteristics all influence modal choice (De Witte, Hollevoet, Dobruszkes, Hubert, & Macharis, 2013). Consequently, explaining and predicting travel mode choice has been of interest to psychologists, economists, behavioural mathematicians, engineers and geographers, amongst others, and integration of cross-discipline insights is likely to enhance intervention effectiveness. Objective attributes of travel modes (e.g. cost, travel times) and individual characteristics (e.g. age, gender, ethnicity, income, household composition) have all been used to model transport mode use (Curtis & Headicar, 1997; L. Frank, Bradley, Kavage, Chapman, & Lawton, 2008; Handy, 1996). Social and environmental psychology assumes that these socio-demographic and socio-economic influences are mediated by cognitive antecedents (Ajzen, 1991; Schwartz, 1977; Triandis, 1977). In the past two decades, psychological studies of travel mode choice have been largely theoretically-driven. A multitude of frameworks, dominated by attitude models, have been proposed and tested in attempts to understand and predict a single travel behaviour, for instance, car use

(Barff, Mackay, & Olshavsky, 1982; Gardner & Abraham, 2008). Much attention has been devoted to identifying modifiable determinants of driving and non-car mode use, thus emphasising a wide range of regulatory mechanisms that might be targeted in interventions (Chng, Abraham, White, Hoffmann, & Skippon, 2017). A comprehensive review of these models and its components is beyond the scope of this chapter, only the most relevant concepts will be outlined below.

Frameworks proposed by Fishbein and Ajzen (TPB; Theory of Reasoned Action, 1975), Ajzen (Theory of Planned Behaviour, 1991) and Schwarz (NAM; Norm Activation Model, 1977) are the most frequently applied theories in travel behaviour research (Gardner & Abraham, 2008; Klöckner & Blöbaum, 2010). The dominating assumptions behind this line of research is that travel mode choice is conscious, rational and deliberated. Correlational evidence suggests that modifying central components of these models, such as norms, control beliefs and attitudes, can bring about behaviour change (Bamberg, Ajzen, & Schmidt, 2003). Yet, the predictive validity of these models varies considerably. For instance, studies applying TPB to travel mode choice behaviour reported model fits between 22% and 58% (e.g. Forward, 2004; Harland, Staats, & Wilke, 1999). A meta-analysis of pro-environmental behaviours integrated TPB and NAM and observed an explained variance of 27% (Bamberg & Möser, 2007). A common criticism of these models is their parsimony and static, one-directional representation of decision making processes (Conner & Armitage, 1998; Sniehotta, Presseau, & Araújo-Soares, 2014). Commonly applied rational choice models also do not adequately represent real-world decisions because travel decisions may be automatic, bypassing conscious deliberation. Verplanken and colleagues (Verplanken & Aarts, 1999; Verplanken, Aarts, & Van Knippenberg, 1997; Verplanken, Aarts, Van Knippenberg, & Moonen, 1998; Verplanken, Aarts, van Knippenberg, & van Knippenberg, 1994) were among the first to study habitual travel choices. Strong car use habits were found to attenuate other predictors such as intention and attitudes (Verplanken et al., 1997),

particularly in stable contexts like commuting mode choice where driving choices are less deliberated (Gardner, 2009; Thøgersen, 2006). These studies demonstrated that mode choice can occur outside of conscious awareness and be partially guided by implicit processes.

Unconscious and automatic processes are represented in models of goal pursuit (Latham & Locke, 1991), Control Theory of self-regulation (Carver & Scheier, 1982) or dual-process model (Strack & Deutsch, 2004). Dual and goal system perspectives account for impulsive (automatic) responses alongside the reflective (deliberated) route of reasoning. These theories integrate a feedback loop which are proposed to regulate behaviour. A common analogy used for goal pursuit is a thermostat (Bamberg, 2013c), whereby goals act as reference points (target temperature). Behaviour is regulated by a comparator which evaluates difference between the goal (target temperature) and the environment (ambient temperature) and adjusts behaviour (the radiator) accordingly to attain the goal (target temperature). Put differently, goal pursuit hypothesises that actions are taken to reduce the discrepancy between a salient goal and current state to remove tension. Consequently, triggering or activating a particular goal is presumed to influence how a person behaves (Austin & Vancouver, 1996). Thus, the past three decades have seen wide application of goal-setting, contributing to our understanding of motivation from a cognitive perspective (Gollwitzer, 1999; see Gollwitzer & Sheeran, 2006 for a meta-analysis). Significant work has been conducted in, for example, health research (Bandura, 2005; see Covington, 2000 for a review), task performance (Campion & Lord, 1982; e.g. Latham & Locke, 1991; Locke & Latham, 1990, 2002), or wellbeing (e.g. Elliot, Sheldon, & Church, 1997; Sheldon & Elliot, 1999). Models of self-regulation and goal pursuit have also underpinned psychological interventions to promote, e.g. dietary change (e.g. Schnoll & Zimmerman, 2001), smoking cessation (e.g. Obermayer, Riley, Asif, & Jean-Mary, 2004), physical activity (e.g. King et al., 2008) or energy conservation (Grønhøj & Thøgersen, 2011). Researchers in the field

of environmental psychology have now also expanded the theoretical scope beyond predictive models (Nielsen, 2017). Recently, goal-based models specific to pro-environmental behaviour have been proposed (Goal-Framing Theory, Lindenberg & Steg, 2007, 2013) and tested (e.g. Chakraborty, Singh, & Roy, 2017). Most relevant, Bamberg (2013c) introduced a stage model of self-regulated behaviour change as an alternative to established theories of pro-environmental behaviours (i.e. TPB, NAM, VBN). Integrating rational choice theories, Control Theory (Carver & Scheier, 1982) and the Transtheoretical Model (Prochaska & Velicer, 1997), Bamberg provides a comprehensive framework for systematic intervention development, applicable to a range of pro-environmental behaviours. Bamberg (2013a) has applied this model in the domain of travel behaviour and demonstrated a significant reduction in car use (d = 0.51) in a randomised control trial of drivers. This novel approach to driving reduction interventions integrates the time-ordered sequences of the Stages of Change (Prochaska & Velicer, 1997) with the notion of goal-directed behaviour. A second study has recently demonstrated the utility of this framework in modelling intentions to reduce car use (Olsson, Huck, & Friman, 2018). An assumption inherent to all these studies, is the need for conscious goal activation through explicit and deliberate goal setting (Locke & Latham, 2002). Conscious goal activation and pursuit can be hard to realise outside of research settings, in particular in relation to driving behaviour. It is also assumed that unconscious goals have a substantial influence on the content of consciousness, with the latter playing a merely supportive role in guiding behaviour (Baumeister & Bargh, 2014). Thus, unconscious goal activation may be desired from an economic and intervention effectiveness point of view.

Apart from Bamberg's work, implicit goal pursuit has rarely been applied to transport research. It is acknowledged that personal travel is generally a "derived demand" (Handy, Boarnet, Ewing, & Killingsworth, 2002). Individuals travel because they want to fulfil a certain task or need rather than for travelling *per se*. Thus, mode choice

decisions may be regarded as goal-directed behaviour: person A may choose to take the car because it provides the fastest form of travel (time efficiency goal) and enables a prompt start in business attire (professional goals). Similarly, person B might prefer to cycle because it allows him to exercise (physical activity goal) while commuting (time efficiency goal) and because consistent journey times ensure reliable working hours (professional goal). Similarly, changes in goal priorities can occur unconsciously and as a result of changes in context. For example, the need to undertake a school run (parenting goal) may only be relevant for a certain number of days during the week, if this responsibility is shared between partners. Context is represented in rational choice models as the individual's perception towards situational factors (Ajzen, 1985) but assumes awareness of the change in their environment. Likewise, traditional theories do not take into account context changes that occur throughout the day, month or year. (Implicitly) activating goals which are congruent with non-car use may induce goal consistent behaviour. Thus, understanding underlying goal structures can elucidate new opportunities for interventions to reduce car use.

1.4 Goals and attitudes

1.4.1 Goals

A century of research into the concept of goals within the study of motivation has resulted in a myriad of conceptualisations and definitions (see Elliot & Niesta, 2009). There is disagreement with regards to, for example, the future orientation of goals (Austin & Vancouver, 1996; cf. Kruglanski, 1996), the level of commitment involved (e.g. Decker & Curry, 2000; cf. Green, 1995), or references to affective processes (e.g. Ford, 1992; cf. M. Lewis, 1990). Nevertheless, a common theme across the majority of definitions is that goals can be seen as internal representations of desired end states (Austin & Vancouver, 1996; Carver & Scheier, 1982; Elliot & Niesta, 2009;

Fishbach & Ferguson, 2007; Gollwitzer & Moskowitz, 1996; Kruglanski, 1996; Locke & Latham, 1990). Needs and desires drive our choices with goals indicating success in meeting these, and barriers preventing the attainment of goals. Goals do not exist in isolation. In reality, we pursue multiple goals at a given time (Kruglanski, 1996), which may be congruent, competing, related or unrelated (Kruglanski et al., 2002). Goals also vary in their specificity, their importance to self and their conscious consideration (Moskowitz & Grant, 2009). Intentions often emerge from the desire to attain certain goals, thus pursuing goals implies guiding and directing choice behaviour. In other words, goals provide reasons for individuals' choices between alternatives.

Transport decisions often entail selecting between different competing options (where alternatives are available) to satisfy journey needs (Mokhtarian, 2005). For instance, a journey from Birmingham to London could entail several goals such as a) cost-effectiveness, b) time-efficiency, c) comfort, d) ease and/or e) security. Of course, such goals may also be dependent on context and circumstances of the journey. As such, journey needs may change in view of a) number of people travelling, b) journey purpose, c) the length of the overall trip or c) journey chaining. Travel mode choice may therefore be seen as goal-directed behaviour. Other research has noted the theoretical importance of goal attainment as a moderator between daily travel patterns and, e.g. subjective wellbeing (Ettema, Gärling, Olsson, & Friman, 2010). Applications of the rational models described above have not adequately represented this decision-making complexity.

1.4.2 Attitudes

Attitudes have been a mainstay of socio-psychological research and an equally central concept in transport literature: "The concept of attitudes is probably the most distinctive and indispensable concept in […] social psychology" (Allport, 1935 p. 798). Despite their long and important history, understandings of the concept vary. A

commonly referred to, general, definition of attitudes has been proposed by Eagly and Chaiken (1993) who describe attitudes as “tendencies to evaluate an entity with some degree of favour or disfavour, ordinarily expressed in cognitive, affective and behavioural responses”. Traditional views have conceptualised attitudes as learned representations, deeply rooted in memory and stable across time and situation (Fazio, 1995; Fazio & Towles-Schwen, 1999). On this basis, transport-relevant attitudes are typically measured using unidimensional scales, most prominently Likert or semantic differential scales (Matsumoto, 2009). Because such measures simply ask the individual to report their attitude, these can be considered explicit. Such measurement may, however, be inaccurate. For example, people do not always report their true opinions but rather give socially desirable responses (Paulhus, 1984). Likewise, because attitude and behaviour are typically measured together, responses may be subject to consistency biases (Gawronski & Strack, 2012). By contrast, attitudes have been conceptualised as unstable and context-dependent, being constructed as requested rather existing as stable context-independent entities.

Attitudes are hypothesised to influence perceptions, thoughts and behaviour (Eagly & Chaiken, 1993, 1998). In psychological transport research, many transport-relevant beliefs and attitudes have been identified and categorised. Often, evaluations are related to perceptions of travel and journey features such as price, speed, comfort, convenience, reliability or safety (Mann & Abraham, 2012). These, in turn, can be underpinned by multiple beliefs. Perceived convenience of driving, for example, can imply practical and psycho-social consequences (Buys & Miller, 2011). Perceived security may be based on perceived protection, autonomy and prestige (Hiscock, Macintyre, Kearns, & Ellaway, 2002). A common categorisation of a range of beliefs and attitudes is the distinction between instrumental and affective motives for driving (e.g. Anable & Gatersleben, 2005; Steg et al., 2001). It has been acknowledged, however, that some beliefs may be more important or more salient

than others. Conner and Armitage (2008) report a study which found that five salient beliefs towards smoking achieved a stronger attitude-behaviour relationship (r = .62) than did 18 less salient belief items (r = .07). Such variations in salience or importance of beliefs and evaluations has not been studied in detail in the transport literature. Evaluations should also be viewed in conjunction with societal, social and individual factors (Gärling, Ettema, & Friman, 2014). Rational choice models account for some degree of contextual factors. As Ajzen and Fishbein note, specific attitudes predict specific behaviour and broad attitudes predict general behaviour. Thus, attitude-relationships in transport were improved by increasing the relevance of the attitude to behaviour, e.g. “For me, to use public transport versus the car for daily trips from my residence would be…” (Bamberg, 2006), “Driving to work allows me to have a flexible schedule” (Abrahamse, Steg, Gifford, & Vlek, 2009).

Whilst the concept of attitudes and its relationship with (travel mode choice) behaviour is well-documented, meta-analytic reviews report, at best, moderate effect sizes (Armitage & Christian, 2003). This led pro-environmental psychologist Blake (1999) to label the weak attitude-behaviour relationship as the “Value-Action Gap” so highlighting that values (or attitudes) are “negotiated, transitory, and sometimes contradictory” (p. 265).

Social context influences attitudes and behaviour patterns, including pro-environmental behaviour (see Schwarz, 2007 for a review). Individuals respond differently to the same message, depending on who delivers the message and whether this is in presence of other people (Appleyard, 1979; Gifford & Nilsson, 2014). So stronger contextual influences result in weaker attitude-behaviour relationships (Stern, 2000). For instance, natural experiments have shown that contextual influences moderate the relationship between attitudes and recycling behaviour (Guagnano, Stern, & Dietz, 1995). Literature has documented changes in transport patterns and cognitions in relation to context changes, i.e. different life

stages. For instance, research has investigated turning points in cycling (Chatterjee, Sherwin, & Jain, 2013) or driving (Taubman - Ben-Ari & Noy, 2011), following changes of individual life circumstances. Similarly, Jones and Ogilvie (2012) have investigated experiences of a change in travel behaviour before and after relocation. These studies form part of a pool of evidence which supports the so-called habit discontinuity hypothesis (Bamberg, 2006; Verplanken, Walker, Davis, & Jurasek, 2008). In transport research, this is commonly referred to as “mobility biographies” (Lanzendorf, 2003; Scheiner, 2007). This line of research suggests that key events in individuals’ lives disrupt habitual travel patterns and form a “window of opportunity”, beneficial for driving reduction interventions (see Müggenburg, Busch-Geertsema, & Lanzendorf, 2015 for a review). However, only a limited number of such key events occur in a person’s lifetime, research tends to involve complex network of partners and requires long-term planning (Scheiner, 2014). It is plausible, however, that changes in contexts occur more often and in more regular intervals, e.g. during the day, week or months with associated changes in cognitions. Marsden et al. (2016), for instance, report that travelllers face disruptions to normal travel patters on a weekly basis which includes roadworks but also extends to bad weather, caring responsibilities or public transport strikes. The focus of investigation lies on external factors. Some transport attitudes are likely to be shaped by in-the-moment constructions. For example, witnessing a cyclist passing a queue of cars while oneself is sitting in traffic could trigger positive evaluations about speed and reliability of cycling. Current measurements of transport-relevant attitudes do not reflect this variability. Identifying specific evaluations that change in context is a first step to exploring how such variability can be captured and modelled.

A second explanation for weak attitude-behaviour correlations may also be variability of attitude strength - a central concept to attitude research. Some attitudes may be stable and highly important to self-value, while others may be malleable and inconsequential. Social-psychological research has explored attitude strength in

great detail (Fazio, 1995; see Petty & Krosnick, 1995) and we know that the strength of an attitude can depend on its 1) perceived importance , 2) accessibility, 3) evaluative extremity, 4) conflict with other attitudes or 5) knowledge about the attitude object.

The belief that attitudes are a product of situated construal (as opposed to representations stored in memory) gave rise to attitudinal ambivalence (Conner & Sparks, 2002). Similar to the attitude concept itself, a range of definitions have been offered to describe attitudinal ambivalence. A common feature is that a person holds "mixed feelings (positive and negative) towards some psychological object" (P. Gardner, 1987, p. 241). Ambivalence accounts for those instances in which attitudes are not polarised, but instead, seemingly contrasting evaluations towards an object are expressed simultaneously. There is mixed evidence as to whether high ambivalence implies 1) lower likelihood to guide behaviour, 2) increased susceptibility to persuasion, 3) lower temporal stability or 4) negative impacts on information processing. To date, the variability of attitude importance, valence and ambivalence has not yet received much attention in transport research. It is likely that people have positive and negative evaluations of travel modes, e.g. cycling offers physical exercise but also results in exposure to adverse weather conditions. Yet, for some individuals, the former may be more important, hence they prefer cycyling over other modes. Current studies of transport-relevant attitudes do not reflect these processes. Exploring which attitudes may be durable and significant and which malleable and weak would be an important contribution to fruitful and cost-effective interventions.

1.4.3 How goals influence attitudes

Fergusons and Porter (2009, p. 447) assert that attitudes and goals are "two of the most central constructs within social psychology" but observe that the relationship between these constructs is less well understood. Fishbach and Ferguson (2007)

propose that evaluative and attentional processes are dynamically and automatically influenced by goal pursuit. Specifically, salient goals are believed to temporarily change the accessibility of stimuli-related (positive) memories and knowledge structures such that goal activation generates more positive evaluations of goal-relevant attitude, if this is perceived to aid goal attainment. Mere perception of a goal-relevant stimulus can activate a goal and thereby alter evaluations (and attitudes) of goal-related objects. Goals can be activated through explicit and implicit priming (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001; see Förster & Liberman, 2007 for a review). Likewise, a range of experiments have demonstrated malleability of cognitions in response to experimentally activated goals (see Dijksterhuis & Bargh, 2001 for a review; e.g. Schwarz & Bohner, 2001). I will return to this evidence in Chapter 5.

1.5 Aims and overview of the doctoral programme

This thesis aims to contribute to our understanding of travel mode choice to optimise interventions. Applying a mixed method approach, the current research seeks to investigate changeability of attitudes and to explore automatic processes in decisions (not) to drive. Four studies aim to broadly establish:

1. What transport-relevant cognitive mechanisms, in particular attitudes, are currently used to explain travel mode choice? How are these conceptualised and how do these vary in different contexts?
2. How do individuals evaluate multiple modes at the same time?
3. Are transport-relevant attitudes variable and if so, under which circumstances?
4. Can transport-relevant cognitions be manipulated through priming methods?

This chapter is followed by four studies (Chapters 2 – 5) using different methodologies. Each stand-alone study addresses separate study research questions. Chapters 3 – 5 present empirical work applying inductive and deductive approaches. Each study is written as a manuscript for publication which may lead to some repetition of introductory sections in the individual chapters. The final chapter (Chapter 6) provides a general discussion of overall findings, facilitating reflections on limitations and general implications for practice and research.

1.6 The studies

The first study (Chapter 2) presents a (now published) systematic review and meta-analysis of determinants of car use and non-car use and addresses research aim 1. The review focuses on quantitative measures used to predict car use and non-car use. Meta-analysis of effect sizes summarised the strength of relationships of most common predictors and confirmed dominance of rational choice models and predictive validity of variables derived from the Theory of Planned Behaviour. The review was designed to allow sub-group analyses of varying relationships across contexts but heterogeneity of primary studies limited this work. Nonetheless, extending previous research, the review concluded that heterogeneous measures and inconsistent conceptualisations, in particular, in relation to attitudes, may limit or distort our understanding of decisions (not) to drive.

The second study (Chapter 3) is a mixed-method study of representations of a range of transport modes and addresses research aim 2. Applying Repertory Grid methods facilitated elicitation of a comprehensive list of transport-relevant dimensions of evaluation in relation to seven different transport options. Non-car users' and car users' conceptual maps were compared and inferences about potentially effective and ineffective intervention targets were drawn. For example, car users may not be susceptible to messages containing environmental and health benefits of transport.

The research highlighted evaluations that are more or less important to transport users. For example, time and route flexibility were more important for drivers, whereas environmental and health concerns were more important for non-car users. Taking into account a range of travel modes, the study provides insights into how sustainable transport modes can be best promoted amongst a portfolio of travel choices. Participants' discussions during the Repertory Grid exercise began to elucidate how competing options are evaluated in light of differing journey needs and travel purposes. The following study explored this in more detail.

The third study (Chapter 4) reports a qualitative investigation using semi-structured interviews to elicit participants' experiences of attitude change towards travel modes and addresses research aim 3. Results from in-depth interviews with car users and non-car users demonstrated that all participants hold ambivalent attitudes. Specifically, beliefs about speed, cost, responsibility of driving, flexibility and safety were all presented in positive and negative terms in relation to various modes. Interestingly, the most important attitudes identified in the second study were also found to be most ambivalent in this research. The study also found that evaluations regarding cost, time, speed, comfort, convenience and eco-friendliness were most often conflicted and that complex relationships between these and specific travel needs and journey types determined travel mode choice. This study demonstrated a clear link between the changeability of travel mode perceptions as a result of changing priorities as contexts of travel decisions changes.

Collectively these three studies demonstrated that attitudes 1) display different relationship strengths with behaviour, depending on study context and attitude category, 2) are multi-dimensional and vary in priority, and 3) are ambivalent and subject to context change.

The fourth study (Chapter 5) used two related experimental studies to test whether implicit goal priming can enhance evaluations of non-car use and addresses

research aim 4. Goals congruent with non-car use, physical activity and pro-environment, were primed in questionnaires to test whether 1) priming two goals at the same time, or 2) priming two goals separately, positively affect attitudes and willingness towards non-car use. Results only partially supported the assumption that attitudes change as a result of implicit goal priming. Several study limitations outlined in the chapter may explain this. Nonetheless, the research supports recent theoretical developments. In particular, the study confirmed that people who had already formed intentions and those who had already initiated change (those in the contemplation, preparation and action stages of the Transtheoretical Model) were most susceptible to goal primes, identifying a potentially optimal target group for interventions based on subliminal messages.

Chapter 2 What cognitive mechanisms predict travel mode choice? A systematic review with meta-analysis[1]

2.1 Abstract

Reduced private car use can limit greenhouse gas emissions and improve public health. It is unclear, however, how promotion of alternative transport choices can be optimised. A systematic review and meta-analysis was conducted to identify potentially-modifiable cognitive mechanisms that have been related to car use and use of alternative transport modes. A qualitative synthesis of measures of potentially-modifiable mechanisms based on 43 studies yielded 26 conceptually-distinct mechanism categories. Meta-analyses of associations between these mechanisms and car use/non-use generated 205 effects sizes (Pearson's *r*) from 35 studies. The strongest correlates of car use were intentions, perceived behavioural control, attitudes and habit. The strongest correlates of alternative transportation choices were intentions, perceived behavioural control, and attitudes. Implications for researchers and policy implementation are discussed.

2.2 Background

Increasing reliance on car use is associated with substantial negative impacts on human health and the environment, especially in cities (Gärling & Friman, 2015). For instance, non-car commuting, such as walking and cycling and using public transport (PT) can contribute to daily recommended levels of physical activity (Sahlqvist, Song, & Ogilvie, 2012; Wener & Evans, 2007). Active transport and use of PT also reduces pollution. For instance, use of PT can result in 45% less CO2 and 48% less nitrogen oxide emissions compared to private vehicle use (Shapiro, Hassett, &

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Arnold, 2002). Unfortunately, however, the use of cars for school runs (Ulfarsson & Shankar, 2008), leisure purposes (Van Acker, Mokhtarian, & Witlox, 2011) tourism mobility (Ram, Nawijn, & Peeters, 2013) and most notably for commuting to work (Panter, Desousa, & Ogilvie, 2013), is increasing and current trends suggest a doubling of global car ownership by 2040 (IEA, 2015).

To understand how interventions could effectively promote alternative travel mode choices, researchers have investigated several predictors of car use and alternative travel modes including, geographic (e.g. Park, Kang, & Choi, 2014), economic (e.g. L. Frank, 2004) and psychological factors (see Gardner & Abraham, 2008 for a review). Narrative reviews, have synthesised determinants of car use across disciplines, concluding that travel time and cost, socio-demographic and spatial characteristics and car availability are key antecedents of travel mode choice (De Witte et al., 2013; L. Frank et al., 2008). Identifying psychological changes that could increase use of alternatives to car travel (henceforth abbreviated as 'non-car-use') provides a theoretical basis for so-called 'soft' interventions to promote voluntary behaviour change (Fujii et al., 2001). Such interventions, can be cost-efficient and quickly implemented compared to, for instance, engineering solutions (Cairns et al., 2008; Friman, Richter, & Gärling, 2010). In reality, policy strikes a balance between the two.

Social-psychological theory has identified a range of potentially-modifiable cognitive mechanisms that can be targeted in travel mode choice interventions (Bamberg, Fujii, Friman, & Gärling, 2011). Most commonly, the Theory of Reasoned Action (Fishbein & Ajzen, 1975) and its successor, including perceived behavioural control (PBC), the Theory of Planned Behaviour (TPB) (Ajzen, 1991) have both been tested. Attitudes, subjective norms and PBC are products of underpinning beliefs and many beliefs related to safety, convenience, time flexibility, practicality, health, accident risk and comfort have been investigated as antecedents of travel mode attitudes

(e.g. Gärling, Gillholm, & Gärling, 1998; Heath & Gifford, 2002; Mann & Abraham, 2012; Şimşekoğlu, Nordfj\a ern, & Rundmo, 2015).

Understanding of the role of normative beliefs, in particular, has been furthered by development of the Norm Activation Model (NAM) (Schwartz, 1977). This model's core construct is personal norms or the "individual's internalised moral rules" (Parker, Manstead, & Stradling, 1995, p. 129). Dunlap and Van Liere (1978) propose, that "to the extent that concern for the well-being of other humans is aroused, we would expect traditional moral norms which regulate interpersonal behavior to influence environmental behaviors" (p.175). Schwartz (1977) argues for a direct influence of personal norms on behaviour, as opposed to the mediating role for intentions proposed by the TPB. According to the NAM, personal norms influence behaviour when ascription of responsibilities and awareness of consequences are activated. The former refers to a person's self-ascribed responsibility to, for instance, refrain from using the car. The latter describes the level of awareness of environmental damage caused by human influences.

The Value-Belief-Norm (VBN) model (Stern, Dietz, Abel, Guagnano, & Kalof, 1999), clarifies how values are related to behaviour in the NAM. Stern et al. (1999) propose that biospheric, altruistic and egoistic values may all be related to environmentally-relevant behaviour.

It has been argued that these models and other rational choice theories do not adequately represent behaviour patterns that may be regulated by less conscious processes (Sniehotta et al., 2014; Triandis, 1977). For instance, when behaviours are practiced in stable environments over time, they can be automatically initiated by environmental prompts with little or no conscious deliberation (Strack & Deutsch, 2004). Thus, since daily travel tends to occur in stable contexts, transport mode choice may, over time, become less of a "choice" and more of a habitual response executed with little reflection (Gardner, 2009; Gärling & Axhausen, 2003). Habit was first introduced in Triandis' (1977) Theory of Interpersonal Behaviour and it has been

shown that the formation of habits may change the cognitive mechanisms underpinning travel (Verplanken et al., 1994).

A limited number of systematic reviews have evaluated interventions that implemented evidence on the importance of a range of cognitive mechanisms to change transport mode choices, but evidence of effectiveness of such interventions is sparse (Arnott et al., 2014; Graham-Rowe et al., 2011; Macmillan, Hosking, Connor, Bullen, & Ameratunga, 2013). This implies that our understanding of travel mode choice is incomplete. Reviews of effectiveness may not elucidate which interventions work best under varying circumstances. For instance, as Bamberg (2006) notes, “summarizing and comparing average intervention effects per se provides little insight into the conditions and mechanisms mediating these effects” (p. 821). More integrative systematic reviews are needed so that intervention designers can identify relevant cognitive mechanisms linked to driving decisions and circumstances in which those mechanisms might be more susceptible to modification.

So which potentially-modifiable psychological/ cognitive mechanisms should be targeted by interventionists attempting to change travel mode choice? Gardner and Abraham (2008) provide a useful review of the associations between psychological constructs and car use but were limited to reviewing 23 available studies. We sought to provide a comprehensive review examining associations between modifiable cognitions and both car use and non-car-use. We will use the term “cognitive mechanisms” to refer to a set of psychological measures that have been related to car use and non-car-use across this literature. This includes implicit and explicit measures of beliefs (including normative beliefs), attitudes (including feelings), motives and self-reported habitual action.

2.2.1 The present study

We updated and extended the work of Gardner and Abraham (2008) by taking account of a wider range of potentially-modifiable cognitive mechanisms (henceforth abbreviated to “cognitive mechanisms”) based on a larger sample of studies. The present review distinguished between correlates of car use and non-car-use (e.g., use of public transport instead of driving) and examined potential moderators. Five questions were addressed: (1) which cognitive mechanisms have been used to explain car use and non-car travel, (2) how methodologically rigorous are available studies, (3) which theories do identified cognitive mechanisms represent, (4) how strong are bivariate associations between specific cognitive mechanisms and car use/ non-car-use, and (5) is strength of these associations moderated by contextual factors such as study location, journey type and travel measure (e.g., ’typical car use’ versus ‘actual car use’).

2.3 Methods

Many narrative reviews usefully summarise existing literature but only in relation to specific review questions. In this study we conducted a systematic review to ensure a more comprehensive and transparent summary of the literature (Tranfield, Denyer, & Smart, 2003; Young, Ashby, Boaz, & Grayson, 2002). In addition, we conducted a narrative synthesis of identified cognitive mechanisms and, based on this, a meta-analytic synthesis of (zero order) bivariate correlations between categories of cognitive mechanisms and car use. The review was conducted in accordance with the guidance provided by the University of York, Centre for Reviews and Dissemination for undertaking systematic reviews (Khan, Ter Riet, Glanville, Sowden, & Kleijnen, 2001).

2.3.1 Inclusion criteria

We included papers that (1) provided at least one quantitative measure of an association between a cognitive mechanism and a measure of car use or non-car-use, (2) were published in English in a peer-reviewed journal, (3) sampled a range of the adult driving population (>18 years), (i.e. excluding studies that investigated only e.g. older adults (>60 years), particular households, people with impaired mental and physical abilities or non-license holders), and (4) focused on any journey type (i.e. excluding studies that focused exclusively on e.g. school runs or holiday travel). No limitations were set on publication date, study design or other socio-demographic population characteristics. When multiple papers reporting results based on a unique data set were identified, the paper with the most comprehensive methodological description was retained for analyses. Where necessary, secondary articles reporting on the same data set were used to complete data extraction. Appendix A, Section A.1 provides further explanation of our inclusion criteria.

2.3.2 Search strategy

The systematic search was closed in September 2015. Ten databases were searched for keywords, abstracts and titles including the meta-databases EBSCO, Web of Knowledge, Transport Research Board and ProQuest. The search used 77 keywords related to travel mode choice (e.g. “modal choice”), transport (e.g. “car”) and social-psychological categories (e.g. “antecedent”). Search terms and Boolean combinations were customised to accommodate differences across databases. An illustration of one systematic search can be found in Appendix A, Section A.1, Table A.1. Ancestry and descendency searches were performed by hand-searching reference lists of included key papers and systematic/narrative review articles as well as citation searches using Google Scholar until no new records could be identified.

2.3.3 Study selection and data collection

The systematic search strategy identified 4,156 records which were initially screened for title as well as abstracts. A second reviewer independently screened a random selection of 306 (of 3005, 10%) excluded records and agreed, in all cases, that none of those papers should have been included in the review. Full text screening of 388 articles was completed based on the pre-defined inclusion criteria. A final number of 43 studies were deemed eligible for inclusion. Eighty-six studies (43 included and 43 excluded) were independently screened by a second coder. The AC1 statistic (Gwet, 2002) was used to calculate the degree of agreement between two coders and a score of 0.93 indicated good inter-rater reliability. Disagreements were resolved by consensus or in consultations with a third researcher.

Extracted information included measures of cognitive mechanisms, detail of study characteristics, statistical analysis, dependent car use and non-car use measures and methodological quality criteria. Longitudinal data were extracted from the most recent set of measures. Only baseline measures or control group data were extracted from studies with an experimental design. Wherever possible, Pearson's correlation coefficients were extracted; otherwise Spearman's correlation coefficients or point-biserial correlations were used. Authors were contacted if relevant information could not be extracted and studies were excluded from meta-analyses if effect sizes were unobtainable. Of 43 eligible studies, 35 could be included in quantitative synthesis.

Included papers are marked with one asterisk in the reference list and with two asterisks if data was included in meta-analyses. Figure 2.1 illustrates the steps of the study selection process in more detail.

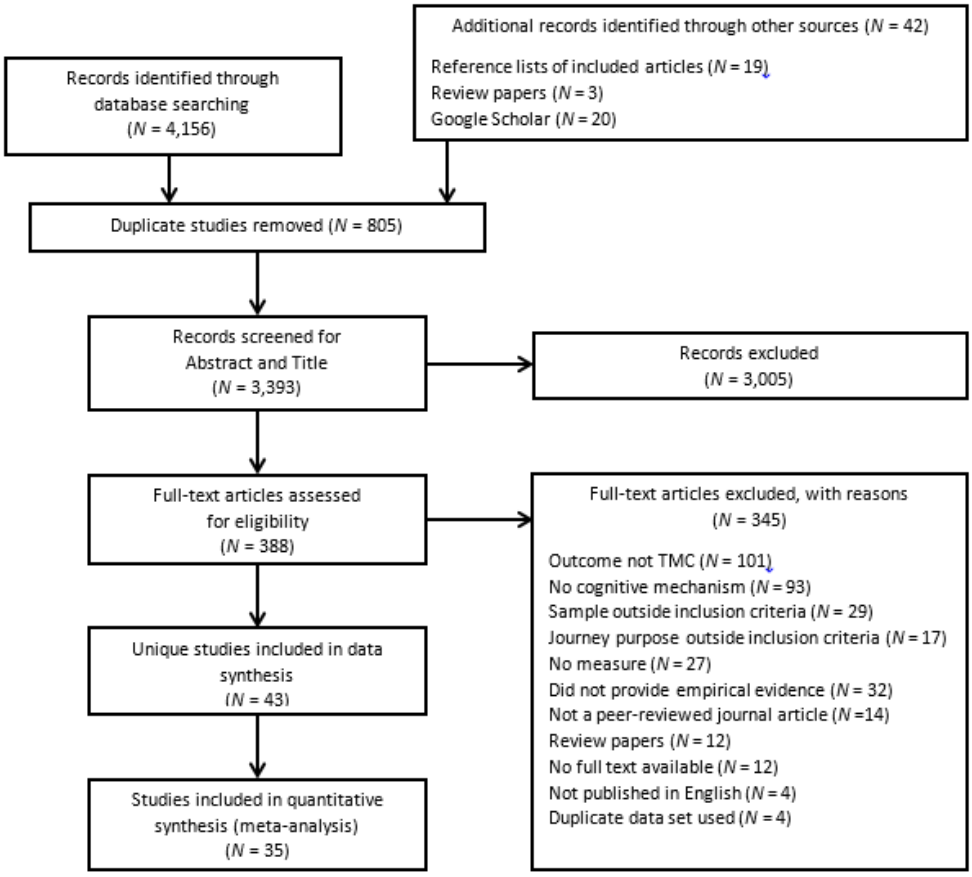

Figure 2.1 PRISMA flowchart

2.3.4 Methodological quality assessment

The majority of included studies were cross-sectional surveys. No suitable quality assessment tool was found to assess such survey studies. We therefore applied three criteria that were highlighted across six previous studies recommending bias assessment in correlational studies (EPHPP, 1998; Gauthier, 2003; NHLBI, 2014; Pace et al., 2012; Von Elm et al., 2014; Wong, Cheung, & Hart, 2008). We have adopted the most common criteria across these validated quality assessment tools. First, was the sample size sufficiently large to find the hypothesized effects? Two

criteria were used: (1) use of power analyses to guide sample size selection or; (2) a sample size greater than 200 if path analysis or structural equation modelling (SEM) were employed (Garver & Mentzer, 1999; Hoelter, 1983; Kline, 2011). Second, was the sample representative of the target population? Third, did the study use reliable and valid measures as assessed by use of previously-validated/tested/used measures and reporting of internal scale reliability ($\alpha > 0.6$) (Gliem & Gliem, 2003). Studies could score 1 point for the first and second criteria. In assessing question 3, each measure of a cognitive mechanism was assessed separately and contributed to a single ratio of valid//reliable measures for each study. Hence, studies that included multiple measures could score between 0 and 1 point. Single-item measures were deemed not applicable for reliability assessment, hence not included in the score. A score of 0 was assigned if the criteria were inadequately reported, unclear or absent. Studies that achieved an overall score >2, 1-2, <1 were rated as high, medium or low quality, respectively. We did not exclude studies on the basis of low quality scores but used the criteria to highlight areas of potential bias. A detailed definition of assessment criteria can be found in Appendix A, Section A.3, Table A.4.

2.3.5 Data synthesis

A narrative synthesis was conducted (Popay et al., 2006) by qualitatively summarising extracted data to identify categories of cognitive mechanisms. In addition, a meta-analysis of correlation coefficients was undertaken to summarise effect sizes for each identified cognitive mechanism. Random-effects analyses were undertaken, assuming that not all study effects are homogenous (J. E. Hunter & Schmidt, 2000).

2.3.5.1 Effect size analysis and multiple measures

Pearson's correlation coefficient r ($N = 30$), the point-biserial correlation r_{pb} ($N = 4$) and Spearman's rank correlation coefficient ρ ($N = 1$) could be obtained from a total of 35 studies. In order to assign more weight to studies that carry more information,

i.e. had larger sample sizes, the meta-analysis produced a weighted average effect size (*r*+). A 95% confidence interval was used to infer statistical significance. Pooled effect sizes are interpreted in accordance with thresholds proposed by Cohen (1988) where *r*+ ≥ .10, *r*+ ≥ .30, *r*+ ≥ .50 and *r*+ ≥ .70 qualify as small, medium, large or very large effects, respectively.

Our meta-analytic procedure frequently included more than one effect size per cognitive mechanism that was extracted from the same study (Myrtek, 1995; Pole, 2007; Wolf, 1986). For example, van Vugt et al.'s (1995) study measured the association between subjective importance of the environment and of public health using two different scales. Although the scales produced two different effect sizes, they are not independent of each other. Therefore, we combined those study effects a priori to obtain an average effect (Borenstein, Hedges, Higgins, & Rothstein, 2009). Consequently, we only used one (average) effect size for meta-analysis for which we extracted two associations at first. Hence, *k* refers to the number of unique associations tested. Meta-analysis was performed where *k* ≥ 3. While conclusions cannot be drawn from *k* = 2 analyses (Ryan, 2016), all these analyses are presented for comparative purposes.

2.3.5.2 Test of homogeneity and bias

Chi-squared was used to test for heterogeneity. We expected X^2 to have a value at least as high as its degrees of freedom and $p > .05$ for studies to be considered homogeneous. For ease of interpretation, we also calculated the heterogeneity index I^2 to summarise inconsistencies across studies (Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013). This statistic describes the variation across studies as a result of heterogeneity rather than chance (Higgins & Thompson, 2002) with higher percentage values demonstrating greater heterogeneity of effect sizes. I^2 values were interpreted in accordance with Higgins and Green (2009), whereby values

between 0-40%, 30-60%, 50-90% and 75-100% represent no, moderate, substantial and considerable heterogeneity, respectively.

Egger's regression test (Egger, Smith, Schneider, & Minder, 1997) and interpretation of funnel plots was used, wherever possible, to detect evidence of publication bias (Begg & Mazumdar, 1994; Rosenthal, 1979). Bias was considered to be present if the intercept significantly ($p < 0.1$) differed from 0. Some analyses had insufficient numbers of studies for the test to be carried out so that results cannot be reported consistently.

2.4 Results

2.4.1 Study characteristics

Included studies ($N = 43$) were predominantly cross-sectional surveys ($N = 26$, 60.5%) that recruited, on average, 584 participants, with a slight over-representation of female participants (54%). Across all studies, a minority ($N = 7$, 16.3%) used student-only samples. The majority of studies were conducted in Europe ($N = 36$, 83.7%) with contributions primarily from Germany ($N = 13$), the Netherlands ($N = 8$) and the UK ($N = 7$). Other studies were conducted in USA ($N = 3$), Australia ($N = 3$) and Canada ($N = 1$). Approximately one quarter of the studies ($N = 10$, 23.3%) were conducted before the year 2000. Detailed information on individual study characteristics can be found in Appendix A, Section A.2, Tables A.2 and A.3.

2.4.2 Setting, journey characteristics and dependent measures

Thirty-eight studies (88.4%) reported geographic settings ($N = 38$), of which 27 (71%) were conducted in urban areas, three used rural samples and eight mixed rural, suburban and urban samples. Studies that included rural, suburban or a mix were aggregated and entered as non-urban studies in meta-analyses.

Various journey types were considered. A large number of studies focused on commuting trips only (*N* = 19, 44.2%). The remaining 24 studies were aggregated as non-commuting journeys, of which shopping (*N* = 7, 30.4%) and leisure trips (*N* = 6, 26.1%) were the most frequent.

A variety of simple self-report car use and non-car-use measures were considered. A continuous measure of "typical car use" was employed by 30 studies (69.8%), e.g. "how many times during the last week have you used the car?" (5-point scale *seldom – always*) or "In the last week, how many of your journeys were made using a car?" (5-point scale *all journeys – no journeys*). Thirteen studies (30.2%) used self-administered travel diaries (over several days or weeks) to log multiple trips and modes and were summarised as "actual car use" studies. Continuous measures were derived by calculating a ratio, e.g. the sum of reported journeys made by car divided by the total number of reported journeys. Dichotomous measures (*N* = 7, 16.3%) were used where, e.g. a value of 1 was given if a participant used PT and zero for car use.

2.4.3 Measures of potentially-modifiable cognitive mechanisms (study 1 research question 1)

Overall, 333 associations were found between (1) a cognitive mechanism measure and (2) a measure of car use/ non–car-use frequency or intensity. The number of associations reported per study ranged from one (Davidov, 2007; Tischer & Phillips, 1979; Verplanken et al., 2008) to 20 (Mann & Abraham, 2012) per dependent variable with an average of seven. One study tested 36 associations across three different car use measures (Van Acker et al., 2011). Later studies tended to measure more cognitive mechanisms per dependent measure (see in Appendix A, Section A.4, Figure A.1).

Operationalisations of non-car-use cognitive mechanisms varied considerably. For example, considering attitudes towards non-car-use travel, some studies

concentrated only on one mode such as train travel (Verplanken et al., 1994) or PT in general (Nilsson & Küller, 2000), while others measured attitudes towards using PT instead of the car (Bamberg, 2006; Matthies, Klöckner, & Preissner, 2006). Studies also concentrated on attitudes towards reducing the number of journeys (Abrahamse et al., 2009), not using the car (Gardner & Abraham, 2010), or using other forms of transport instead of the car (Harland et al., 1999). Two studies measured attitudes towards the use of active modes, e.g. cycling (Haustein & Hunecke, 2007) and walking/ cycling (Van Acker et al., 2011) as separate variables in addition to PT use.

This range of conceptually and psychometrically different measures of cognitive mechanisms was aggregated into meaningful categories. We applied a similar coding scheme as used in previous meta-analyses (e.g. Hagger, Chatzisarantis, & Biddle, 2002) in order to maintain continuity and transparency of categorisation. A second independent researcher categorised 65% of all measures and coders agreed on 88% of classified measures. Disagreements were resolved through discussion. The number of studies and reported associations per cognitive mechanism can be found in Appendix A, Section A.4, Table A.6. In addition, Table A.7 (Section A.4 in Appendix A) shows an overview of the emerged categories including a more detailed definition and examples.

2.4.4 Methodological quality assessment (study 1 research question 2)

Study quality was assessed for 43 studies and a mean score of 1 (range: 0 to 3) indicated a low to medium overall study quality. Seven studies (16.3%) could be classified as high quality, 18 studies (41.9%) as medium and the remaining 18 (41.9%) as low quality. Detailed scores for individual studies can be found in Appendix A, Section A.3, Table A.5.

2.4.4.1 Sample size

Only 9 of 12 studies which performed SEM or path analysis used a sufficient sample of 200 or more. Of those that did not perform SEM or path analysis, only three of 31 (9.7%) reported undertaking a power calculation prior to data collection of which two achieved the required sample size.

2.4.4.2 Sample representativeness

Seven studies (16.3%) used a representative sample of the target population. One third of included studies (*N* = 14, 32.5%) acknowledged having used samples that could not be described as representative and 22 (51.2%) did not discuss sample representativeness.

2.4.4.3 Validity/reliability

The most frequent previously-validated measure used was the Response Frequency Measure (RFM) of habit (Verplanken et al., 1994) used in ten (23.3%) studies. Overall 32 (74.4%) studies used at least one previously-validated/tested/used measure. Of 214 measures eligible for reliability evaluation, 87 (40.6%) achieved acceptable internal reliability (Cronbach's alpha >0.6). We were unable to determine scale reliability for half of these measures (*N* = 108, 50.47%) due not reported data.

2.4.5 Use of theoretical frameworks (study 1 research question 3)

Twenty four studies (55.8%) were explicitly based on an underlying theoretical framework and eight multi-component theories were applied. Studies used measures derived from Ajzen's (1991) TPB (*N* = 16, 66.7%), the habit-extended Theory of Interpersonal Behaviour by Triandis (1977) (*N* = 1, 4.2%), Schwartz' (1977) NAM (*N* = 6, 2%), Stern et al.'s (1999) modified VBN model (*N* = 1), Stryker's (1980) Identity Theory (*N* = 1), Kelley and Thibaut's (1978) Interdependence Theory (*N* = 1),

Dittmar's (1992) Model on the Meaning of Material Possessions (*N* = 1), and Frey's (1988) Ipsative Theory of Behaviour (*N* = 2, 8.3%). Authors rarely used theories in combination (*N* = 3, 12.5%), but more frequently extended the TPB (*N* = 8, 33.3%) and NAM (*N* = 2) by measuring additional cognitive mechanisms, predominantly habit (*N* = 4, 16.7%) and personal norms (*N* = 2).

2.4.6 Meta-analytic results (study 1 research questions 4 and 5)

Data were available from 35 studies for inclusion in the meta-analyses (see Appendix A, Section A.5 for further explanations and more detailed results). We performed meta-analysis separately for: (1) cognitive mechanisms associated with car use (i.e. frequency or intensity of car use), and (2) cognitive mechanisms associated with non-car-use (i.e., how much car use had been replaced by an alternative mode). Moderator analyses (study 1 research question 5) were conducted when there were at least two studies and three associations in the smallest of the comparison groups. Results of these analyses are included in Tables 1 and 2. Below we only highlight significant dissimilarities between moderator groups, based on comparisons of confidence interval overlap.

A low number of studies testing each cognitive mechanism only allowed to perform bias assessment for 22 (out of 53) meta-analyses, of which seven were significant. We could not find any evidence suggestive of publication bias for most of the TPB measures and habit measures. However, results of Egger's tests suggested that for Car Use Attitude there may be "missing studies".

2.4.6.1 Cognitive mechanisms associated with car use

Table 2.1 presents meta-analytic results for associations with car use (*N* = 27, *k* = 87) for a total sample of 35,645. Car use was mainly operationalised as driving or using a private motorised vehicle but occasionally included taxi journeys (Gardner & Abraham, 2010), taxi and motorcycle use (Verplanken et al., 2008), or car share and

rental cars (Hunecke, Haustein, Grischkat, & Böhler, 2007). One study specified car use as single occupancy driving (Golob & Hensher, 1998).

Cognitive mechanism (sub-groups)	*n*	*k*	*r+*	95% CI	I^2 (%)	*Egger's test*
Car Use Attitudes	**4647**	**38**	**0.22*** **	**0.13, 0.30**	**91.6**	**6.8 (*p*=.01)**
non-urban	3186	29	0.14***	0.06, 0.23	87.2	8.8 (*p*=.07)
urban	1461	9	0.31***	0.21, 0.41	83.2	3.6 (*p*=.17)
non-commuting journeys	3019	24	0.15**	0.05, 0.25	92.4	9.4 (*p*=.12)
commuting journeys	1628	14	0.34***	0.26, 0.42	78	4.2 (*p*=.11)
non-European	927	3	0.37***	0.26, 0.48	83.9	7.8 (*p*=.10)
European	3720	35	0.18***	0.09, 0.27	90.8	6.3 (*p*=.04)
typical car use	4218	28	0.21***	0.12, 0.30	92.3	6.5 (*p*=.01)
actual car use	429	10	0.28*	0.06, 0.50	92	-
TPB measures	1290	6	0.33***	0.20, 0.46	89.3	2.8 (*p*=.62)
Beliefs	3586	32	0.19***	0.09, 0.29	92.2	9.2 (*p*=.01)
Non-car-use Attitudes	**812**	**3**	**-0.23****	**-0.40, -0.06**	**90.7**	**-**
Attitudes - Travel in General	**1486**	**10**	**0.05**	**-0.05, 0.15**	**84.6**	**-**
Attitudes - Environment & Health	**4097**	**9**	**-0.10****	**-0.17, -0.03**	**86.2**	**-**
non-urban	2804	3	-0.09	-0.18, 0.00	89	-
urban	1293	6	-0.13*	-0.25, 0.00	87.4	-
Attitudes - Transport Environment	**4811**	**12**	**-0.28*****	**-0.41, -0.15**	**97.5**	**-**
non-urban	1759	8	-0.17***	-0.23, -0.11	70.5	-
urban	3052	4	-0.35***	-0.52, -0.17	98.6	-
Car Use Subjective Norms	**1455**	**6**	**0.20****	**0.05, 0.35**	**91.3**	**12.2 (*p*=.20)**
Non-car-use Subjective Norms	**944**	**3**	**-0.15*****	**-0.20, -0.11**	**0**	**-**
Car Use Descriptive Norms	**532**	**3**	**-0.07**	**-0.35, 0.21**	**94.2**	**-**
Car Use PBC	**1605**	**9**	**0.39*****	**0.18, 0.60**	**97.1**	**-6.3 (*p*=.75)**
Non-car-use PBC	**1200**	**5**	**-0.42*****	**-0.57, -0.28**	**93**	**-**
PBC - Environment	**324**	**4**	**-0.08****	**-0.17, -0.05**	**52.8**	**-**
Car Use Intentions	**2375**	**7**	**0.50*****	**0.31, 0.68**	**98.3**	**8.3 (*p*=.33)**
non-urban	844	3	0.34	-0.04, 0.71	99.2	-
urban	1531	4	0.59***	0.47, 0.70	95.6	9.1 (*p*=.01)
non-commuting journeys	1438	3	0.50***	0.33, 0.67	96.7	-
commuting journeys	937	4	0.50**	0.15, 0.85	98.9	26.4 (*p*=.24)
typical car use	1839	4	0.47***	0.26, 0.67	97.9	6.2 (*p*=.62)
actual car use	536	3	0.62***	0.25, 0.98	98.7	-
Non-car-use Intentions	**943**	**3**	**-0.38***	**-0.68, -0.09**	**98.1**	**-**
Non-car-use Personal Norms	**793**	**5**	**-0.35*****	**-0.42, -0.28**	**69.3**	**-**
Ascription of Responsibilities	**642**	**3**	**-0.14**	**-0.31, 0.03**	**87.7**	**-**

Awareness of Consequences	**2139**	**6**	**-0.22*** **	**-0.29, -0.16**	**69.1**	**-**
Altruistic Value Orientation	**184**	**3**	**-0.32*** **	**-0.34, -0.29**	**0**	**-**
Identity Anti-Car	**1609**	**11**	**-0.08** **	**-0.11, -0.02**	**39.1**	**-**
Identity Pro-Car	**4229**	**11**	**0.05*** **	**0.04, 0.07**	**0**	**-**
Social Comparison	**1247**	**6**	**0.16** **	**0.06, 0.26**	**84.5**	**-**
Car Use Habit - RFM	**2058**	**6**	**0.47*** **	**0.39, 0.56**	**89**	**2.7 (*p*=.42)**
typical car use	445	3	0.53***	0.39, 0.66	87.9	-
actual car use	1613	3	0.46***	0.35, 0.57	92.1	-
Car Use Habit - Other Measures	**2160**	**7**	**0.38*** **	**0.20, 0.56**	**97.8**	**7 (*p*=.48)**
past behaviour	1248	2	0.58***	0.37, 0.78	97.7	-
SRHI	523	2	0.28	-0.08, 0.64	98.6	-
latent variable	1437	2	0.49***	0.29, 0.69	98.6	-
*p<.05, **p<.01, ***p<.001						

Table 2.1 Results of the meta-analysis of car use

Car use Attitudes were the most studied cognitive mechanism with 38 associations tested. The meta-analysis suggested that the relationship between (positive) attitudes and car use was positive, and of a small to medium size (r_+ = .22, CI: 0.13;0.30). There was considerable heterogeneity across studies (I^2 = 91.6%).

Moderator analysis, to explore this heterogeneity further, showed that the link between attitudes and car use was stronger for commuting journeys (r_+ = .34, CI: 0.26;0.42, k = 14, I^2 = 78%) than for non-commuting journeys (r_+ = .15, CI: 0.05;0.25, k = 24, I^2 = 92.4%). Attitudinal scales using TPB measures were relatively stronger predictors (r_+ = .33, CI: 0.20;0.46, k = 6, I^2 = 89.3%) while those employing car use beliefs showed smaller effects (r_+ = .19, CI :0.09;0.29, k = 32, I^2 = 92.2%).

Non-car-use Attitudes. Favourable attitudes towards alternative transport modes were negatively associated with car use (r_+ = -.23, CI: -0.40;-0.06, k = 3, I^2 = 90.7%). Despite continued heterogeneity, moderator analysis was not performed due to a limited number of associations.

Attitudes - Travel in General. The relationship general evaluations about travel and car use was not significant (r_+ = .05, CI: -0.05;0.15, k = 10, I^2 = 84.6%). The result was underpinned by only three studies of varying effect sizes. Attitudinal measures

varied, assessing the subjective importance of flexibility or time (Joireman, Van Lange, Kuhlman, Van Vugt, & Shelley, 1997; Van Vugt, Meertens, & Van Lange, 1995), stress (Cao & Mokhtarian, 2005) or comfort (Joireman et al., 1997). Inconsistent operationalisations may have created this variability.

Attitudes - Environment & Health. Drivers' concern about environmental protection and public health showed small negative associations with car use (r_+ = -.10, CI: -0.17;-0.03, k = 9, I^2 = 86.2).

Attitudes - Transport Environment. Positive perceptions of the built environment such as proximity to shops (Scheiner & Holz-Rau, 2007), walkability or cyclability (Panter et al., 2013) or concerns about traffic congestion (Golob & Hensher, 1998) were also negatively associated with car use (r_+ = -.28, CI: -0.41;-0.15, k = 12, I^2 = 97.5%).

Car Use Subjective Norms. A small to medium-sized positive association was observed between driving and drivers' perceptions of others' approval of driving (r_+ = .20, CI: 0.05;0.35, k = 6). Effect sizes varied considerably across studies (range from r = .03 to r = .52, I^2 = 91.3%) with half of the studies including subjective norm measures (N = 3) reported non-significant associations with car use.

Non-car-use Subjective Norms. Combining effect sizes from three studies generated a small negative, homogeneous average association (r_+ = -.15, CI: -0.20;-0.11, I^2 = 0%).

Car Use Descriptive Norms. Although there was a small negative relationship between self-reported car use and perceptions about other people's car use behaviour, this was not significant (r_+ = -.07, CI: -0.35;0.21, I^2 = 94.2%).

Car use PBC. Control beliefs (e.g. freedom or confidence) were positively associated with car use (r_+ = .30, p = .021, k = 10) and this was increased (r_+ = .39, CI: 0.18;0.60, k = 9) when an anomalous negative association (Gardner & Abraham, 2010, r_+ = -.33) was removed from further analysis. Heterogeneity was again high (I^2

= 97.1%) reflecting the combination of measures of feasibility, (Verplanken et al., 1998), confidence, (Panter et al., 2013) and perceptions of parking problems and accident risks (Mann & Abraham, 2012).

Non-car-use PBC. A negative heterogeneous association was observed between perceived difficulty of driving and car use (r_+ = -.42, CI: -0.57;-0.28, k = 5, I^2 = 93%).

PBC - Environment. People's beliefs about the capability of reducing environmental damage showed a very small negative, though relatively homogenous, negative association with car use (r_+ = -.08, CI: -0.17;-0.05, k = 4, I^2 = 52.8%).

Car Use Intentions showed a large, positive, heterogeneous association with car use (r_+ = .50, CI: 0.31;0.68, k = 7, I^2 = 98.3%). See Appendix A, Section A.5A.5.1 for further details about effect size variability.

Non-car-use Intentions produced a weaker, negative, heterogeneous association with car use (r_+ = -.38, CI: -0.68;-0.09, k = 3, I^2 = 98.1%).

Non-car-use Personal Norms. Feeling a moral obligation not to drive had a negative medium association with car use (r_+ = -.35, CI: -0.42;-0.28). This result was underpinned by five studies with substantial heterogeneity (I^2 = 69.3%).

Awareness of Consequences. Combining effect sizes generated a small to medium negative effect (r_+ = -.22, CI: -0.22;-0.16, k = 6, I^2 = 69.1%), such that people who were more aware of the environmental consequences of car use, also reported driving less frequently. See Appendix A, Section A.5.2 for for further details about effect size variability.

Ascription of Responsibilities. The relationship between car use and the perceived responsibility to reduce environmental impacts was negative but not significant (r_+ = -.14, CI: -0.31;0.03, k = 3, I^2 = 87.7%).

Altruistic Value Orientation. Consistent with theory, there was a negative, moderate association between altruistic values and car use (r_+ = -.32, CI: -0.34;-0.29, k = 3). Meta-analysis was performed on two homogeneous studies (I^2 = 0%).

Identity. A very small, negative association was observed between car use and anti-car identity measures (r_+ = -.08, CI: -0.11;-0.02, k = 11), while a very small positive association was observed between car use and pro-car identities (r_+ = .05, CI: 0.04;0.07, k = 11). Both effects were homogeneous (I^2 = 39.1% and I^2 = 0%, respectively).

Social Comparison. A small positive effect of r_+ = .16 (CI: 0.06;0.26, k = 6, I^2 = 84.5%) showed that people who consider driving as a means of self-evaluation and self-enhancement are also more likely to use the car.

Car Use Habit – RFM. Verplanken et al.'s (1994) Response Frequency Measure of habit was employed by six studies (a tool to assess habit strength of travel mode choices across different travel situations, drawing on automaticity component of habit). Meta-analysis suggested that car use was positively, associated with strong car use habits, though the effect was considerably heterogeneous (r_+ = .47, CI: 0.39;0.56, k = 6, I^2 = 89%).

Car Use Habit – Other Measures. Five studies reported a total of seven associations that used other measures of car use habit based on different conceptualisations of habit (see Appendix A, Section A.5.3). Meta-analysis produced a medium to large, positive heterogeneous, effect of r_+ = .38 (CI: 0.20;0.56, k = 7, I^2 = 97.8%). Moderator analyses for the different conceptualisations of habit identified the largest effect for "past behaviour" (r_+ = .58, CI: 0.37;0.78, k = 2, I^2 = 97.7%). Whilst generating the largest effect size, this result was based on only two studies.

2.4.6.2 Cognitive mechanisms of non-car-use

Table 2.2 presents results for the meta-analysis of non-car-use studies with an overall sample size of *n* = 12,335. Only nine studies were available for inclusion, so few moderator analyses could be undertaken. Moreover, these studies used varying operationalisations of alternatives to car use. Specifically, (1) use of other forms of transport in general (Harland et al., 1999), (2) use of PT (Bamberg, 2006; Yang-Wallentin, Schmidt, Davidov, & Bamberg, 2004), (3) use of environmentally friendly transport modes (incl. walking, cycling, bus, tram/subway, regional train, long-distance train) (Haustein & Hunecke, 2007) and (4) use of the subway instead of the car (Hunecke, Blöbaum, Matthies, & Höger, 2001). Aggregating these operationalisations is not ideal and high levels of heterogeneity suggests caution in interpretation.

Cognitive mechanism (sub-groups)	***n***	***k***	***r+***	**95% CI**	***I²* (%)**	***Egger's test***
Non-car-use Attitudes	**2597**	**7**	**0.36*** **	**0.21, 0.51**	**97.1**	**11.3 (*p*=.19)**
Non-car-use Subjective Norms	**2745**	**6**	**0.28*** **	**0.14, 0.41**	**95.6**	**5.1 (*p*=.41)**
Non-car-use PBC	**3500**	**9**	**0.49*** **	**0.41, 0.57**	**93.9**	**8.3 (*p*=.14)**
typical non-car-use	2347	4	0.49***	0.39, 0.59	93.3	-
actual non-car-use	1153	3	0.50***	0.34, 0.66	97.2	-
Non-car-use Intentions	**3493**	**8**	**0.48*** **	**0.35, 0.61**	**97.3**	**11.8 (*p*=.18)**
* $p < .05$, ** $p < .01$, ***$p < .001$						

Table 2.2 Results of the meta-analysis of non-car use

Non-car-use Attitudes. Positive attitudes towards alternative travel modes was associated with a medium-level, though heterogeneous, positive relationship with non-car-use ($r_+ = .36$, CI: 0.21;0.51, $k = 7$, $I^2 = 97.1\%$).

Non-car-use Subjective Norms. Non-car-use was positively associated with stronger subjective norms towards *not* driving, though the effect was small to medium and heterogeneous ($r_+ = .28$, CI: 0.14;0.41, $k = 6$, $I^2 = 95.6\%$).

Non-car-use PBC. A large, positive effect between the perceived ease of using alternative travel modes and the reported use of alternatives to the car (r_+ = .49, CI: 0.41;0.57, k = 9) was considerably heterogeneous (I^2 = 93.9%).

Non-car-use Intentions. A large, positive association between non-car-use and the intention *not* to drive was observed, though yielded a heterogeneous effect (r_+ = .48, CI: 0.35;0.61, k = 8, I^2 = 97.3%).

2.5 Discussion

This systematic review of 36 years of research into measures of potentially-modifiable cognitive mechanisms associated with transport mode choice identified 43 relevant studies of which 35 generated data that could be included in meta-analyses. The mechanisms assessed in these studies could be grouped into 22 conceptually-coherent categories of cognitive mechanisms related to car use and 4 categories of cognitive mechanisms related to non-car-use. Our results support and extend those of previous reviews, in particular Gardner and Abraham (2008), who summarised results from 23 studies identifying 18 unique potentially-modifiable correlates of car use and car use intentions.

Included studies were assessed to be of low to moderate methodological quality. Few studies conducted an *a priori* power analyses (Cohen, 1988) and few samples could be regarded as representative of particular populations of drivers. In many instances study quality indicators received low scores because important information for assessing quality was not reported. In part, this reflects the multi-disciplinary roots of the field, where reporting standards may vary. We also acknowledge that many studies were conducted before it was common practice to include supplementary materials in digital format. We would therefore urge future researchers in this field to provide comprehensive methodological details in supplementary materials, to aid future reviews. Further work could also validate a

quality assessment tool, suitable for cross-sectional studies or systematic reviews with mixed study design. In addition, the range of cognitive mechanisms assessed strongly suggests that use of standardised measures would facilitate data syntheses in this field. In particular, development of validated self-report measures of the extent of car use and use of alternative transportation modes to replace car use could accelerate progress in identifying intervention targets. In achieving coherence of measurements we suggest adopting items recommended by Ajzen or Francis et al. (2004) and encourage the use of already published measures that were identified in this review.

Our findings identify a clear pattern. Two theories, the Theory of Planned Behaviour (TPB) and the Norm Activation Model (NAM) were widely applied and results support continued use of the TPB but offer less support for NAM because, measures of PBC, intentions and habit generated consistently higher average effect sizes than measures of norms. This does not mean that normative beliefs are inconsequential but that unless higher activation levels can be reached, they may not be the most effective change targets for interventions seeking to reduce car use. Interestingly too, TPB-derived attitude measures generated somewhat higher average effect sizes than other attitudinal measures. Attitudinal measures incorporating affective components showed the weakest individual effect sizes in both categories of non-car-use attitudes (Armitage, Reid, & Spencer, 2013; Haustein & Hunecke, 2007).

The range of attitude and car use/ non-car-use-measures emphasises that the importance of attitudes critically depends on what type of car use/ car use reduction is being predicted. For example, attitudes may be better predictors of urban and commuting journeys than of other journey types. Thus targeting reductions in particular types of car journey may be more effective than planning reductions in driving *per se* (Graham-Rowe et al., 2011). While our results generally support the important role often assigned to attitudes (e.g. Fujii & Gärling, 2003; Gärling et al., 1998; Sunkanapalli, Pendyala, & Kuppam, 2000), they also advocate greater specificity of cognition measures.

People can evaluate transport mode choices as both positive and negative depending on the journey type and the transport environment. For example, cycling may be viewed as good exercise (attitudes – environment and health) but also impractical when faced with high volumes of traffic (attitudes – transport environment). It is notable too, that drivers' environmental and health-related attitudes did not have strong associations with car use. Hence, clarification of the complex structure of attitudes in measurement methods could clarify intervention targets.

It is unsurprising to note that people's perceived feasibility of alternatives and confidence in being able to use these alternatives is important to driving reduction (see non-car-use PBC) (Klöckner & Friedrichsmeier, 2011). Constraints may be imposed by job or family responsibilities or by infrastructure limitations. Acknowledging this, Haustein and Hunecke (2007) have defined a measure of perceived mobility necessities. Klöckner and Blöbaum (2010) included perceived mobility necessities items in their perceived behavioural control measure and this study yielded the largest individual effect size (r = .72) between a measure of a potentially-modifiable cognition and reported car use, suggesting that perceived mobility necessities may well be an important adjunct to controllability measures.

Meta-analyses of intentions and habits supported previous findings (Gardner & Abraham, 2008) emphasizing both the importance of intentions not to drive and the challenges of translating such motivation into action by those who habitually and perhaps unthinkingly drive to travel (Gardner, 2009). Identifying interventions capable of breaking habits may, therefore, be as important as employing persuasive interventions targeting motivation. For instance, a series of studies by Verplanken and colleagues (Verplanken & Roy, 2016; Verplanken et al., 2008; Walker, Thomas, & Verplanken, 2015) into the habit discontinuity hypothesis have demonstrated how contextual changes, e.g. moving home or offices, can weaken habits. Likewise, the formation of if-then plans or implementation intentions to change travel mode

amongst a sample with strong car use habits has proven to be effective in a driving reduction experiment (Eriksson et al., 2008).

We were disappointed that so few moderator analyses could be conducted. Insufficient reporting and aggregation of journey types and location limited our ability to draw conclusions about possible change targets in different contexts. Hence, moderator analysis remains exploratory in this review. Variations between study findings may be explained by factors not investigated in this review (e.g. other confounders or the use of different measurement scales for cognitive mechanisms). Journeys may also be helpfully categorised by length (Harland et al., 1999) as mode choice behaviour changes with varying travel distance (Sustrans, 2014). Both purpose and length may moderate changeability and possible key change mechanisms. The review also highlighted that geographical journey location categories need careful specification. For example, rural as opposed to urban journeys may – or may not – indicate poorer PT accessibility (Mann & Abraham, 2012). PT accessibility as well as walkability and cyclability may be critical to behaviour change and indexes such as the Transport for London's Public Transport Accessibility measures may be helpful in this regard (Chng, White, Abraham, & Skippon, 2016).

2.5.1 Study limitations

Due to the inconsistent methodological quality and heterogeneity of the primary studies, the current review was unable to provide clear and unambiguous findings. Variations in individual effect sizes are considerable due, no doubt, in part to the wide range of different measures used across studies. Thus, we acknowledge that interpretation of our findings should be cautious because we include similar but not identical measures of cognitive mechanisms across samples. Also, as with other meta-analytic reviews of this literature (Gardner & Abraham, 2008; Neoh, Chipulu, & Marshall, 2015), the number of included studies for moderator analyses was

sometimes very small. This limits our ability to draw meaningful conclusions and generalise across populations.

The data we have summarised is correlational, more detailed analyses of carefully designed controlled intervention studies would provide a more definitive and causal guide to which cognitive mechanisms can and cannot be easily changed in which populations and what impact this has on which journey types in specified contexts. Unfortunately, current intervention evaluations do not permit such analyses (Arnott et al., 2014; Graham-Rowe et al., 2011). Likewise, the analyses of bivariate relationships as investigated in this review do not identify inverse associations, e.g. a person's attitudes or PBC might be a result of that person's choice of transport rather than a determinant thereof.

The quality assessment sought to detect potential confounders by applying core criteria common across all studies in this review. However, this does not exclude the possibility of other confounding variables (e.g. walkability, access to a car or accessibility of PT) which vary across studies and time.

2.6 Conclusion

The current systematic review summarises the evidence of associations between specific cognitive mechanisms and both, car use and non-car-use. The review highlights the wide range of such mechanisms and the limited number of theories used to conceptualise these. In particular, the use of theories other than rational choice models could advance our understanding of the motivation (not) to drive. Our meta-analyses show that the strongest correlates of car use and non-car-use were intentions, perceived behavioural control and attitudes with habit also being a strong predictor of car use. Development of standardised measures, both of change mechanisms and of driving and use of alternative transport modes could help accelerate identification of optimal change targets. Most importantly, heterogeneity of

attitudinal measurement needs urgent attention and we propose greater specificity and consensus of measures. Careful categorisation of journey type and length as well as descriptions of the geographical setting could also facilitate intervention design. We recommend that a consensual, validated quality assessment tool is developed for cross-sectional studies, to be used by both primary researchers and reviewers. We considered methodological criteria identified across six such tools and found that study quality was moderate to weak. Finally, we suggest that researchers make extensive use of supplementary materials to clarify study methodology.

Chapter 3 Cognitive Construction of Travel Modes among high mileage car users and non-car users - A repertory grid analysis[1]

3.1 Abstract

Human and environmental health are important globally. Reduced car use could improve human health by promoting physical activity and consequent decreases in carbon dioxide emissions would help achieve greenhouse gas emissions targets. The aim of this study was to explore how travellers evaluate seven transport choices. We compared the evaluative spaces of two distinct groups of transport users: predominantly non-car users and above-average car users. The Repertory Grid technique was used to elicit 448 constructs from 15 non-car users and 15 high-mileage car users. Thematic analysis, content analysis, cluster analysis, analysis of means and principal component analysis were used to identify similarities and differences between the construct systems. Results revealed that non-car users and high-mileage car users apply broadly similar constructs to evaluate transport modes. They differ, however, in the structure of their construct systems. Both groups share constructs related to time and route flexibility. Effects on the environment and benefits of physical activity were important for non-car users but not for high-mileage car users. Non-car users view travel modes with greater differentiation, while high-mileage car users use a looser construal of travel modes. We discuss implications for future intervention design and ramifications for policy and practice.

[1] A version of this chapter has been published as Hoffmann, C., Abraham, C., White, M. P., & Skippon, S. (2018) Cognitive Construction of Travel Modes among high mileage car users and non-car users - A repertory grid analysis. *Transportation Research Part A: Policy and Practice,* 118, 216-233. doi: 10.1016/j.tra.2018.08.031.

3.2 Background

In the UK, for example, car use accounts for 23% of overall greenhouse gas emissions (IEA, 2009). Despite rising concerns about air quality, lack of physical activity and fossil fuel consumption, 64% of journeys in the UK are by car (DfT, 2016). The number of driven kilometres is rising (Stradling, Meadows, & Beatty, 2000; Van Exel, De Graaf, & Rietveld, 2011) and 2017 also saw a record sale of new cars in the UK (Kollewe & Carrington, 2017). Moreover, the poorest 10% of car-owning household devote more than 25% of their disposable income to purchasing and running a car (Gomm & Wengraf, 2013). This pattern can be observed across Europe. Car is the dominant mode of transport, accounting for an average of 83.4% of trips across the European Union (EEA, 2015; Eurostat, 2017). Thus, a decrease in individual car use to tackle CO_2 emissions remains a primary climate change target (European Commission, 2013; IPCC, 2013). Despite availability of new technologies involving electric mobility, forecasts show that adoption rates remain low and are not sufficient to meet desired carbon reduction targets (Wietschel, Plötz, Kühn, & Gnann, 2013).

Applied psychological research has investigated determinants of driving to inform population-based interventions designed to reduce car use. Quantitative, survey-based research, applying models such as the Theory of Planned Behaviour (Ajzen, 1991), Theory of Interpersonal Behaviour (Triandis, 1977) or The Norm Activation Model (Schwartz, 1977) to predict driving has sought to identify modifiable antecedents of car use (Bamberg & Schmidt, 2003; Forward, 2004; Galdames, Tudela, & Carrasco, 2011; Klöckner & Matthies, 2004; Wall, Devine-Wright, & Mill, 2008). This work has highlighted the role of instrumental or utilitarian reasons for driving such as importance of travel costs (e.g. Steg, Geurs, & Ras, 2001), time efficiency (e.g. Joireman, Van Lange, Kuhlman, Van Vugt, & Shelley, 1997)) and concerns about convenience and practicality (e.g. Steg, 2005). Rational-choice models provide useful guides to modifiable psychological antecedents of travel mode choice (see Hoffmann, Abraham, White, Ball, & Skippon, 2017 for a review), but may oversimplify the psychological processes generating action (Sniehotta, Presseau, & Araújo-Soares, 2014). For example, attitude questionnaires might not fully elucidate how these perceptions are interrelated or whether some perceptions are more

important than others. Qualitative research into antecedents of travel mode choice has also explored the complexities of driving decisions and has identified a range of car use motivations. Consequently, we now recognise the importance of affective (e.g. Anable & Gatersleben, 2005; Domarchi, Tudela, & González, 2008; Gatersleben & Uzzell, 2007; Stradling et al., 2000) and symbolic (e.g. Haustein, Klöckner, & Blöbaum, 2009; Hong Tan & Fujii, 2008; Steg, 2005) motivations for car use. The importance of status, identification, enjoyment, feelings of autonomy or independence and valuing personal space all feature in driving preferences (Jensen, 1999; Mann & Abraham, 2006).

Quantitative and qualitative work has primarily focussed on a single travel mode and mode user group (Gardner & Abraham, 2007; Hoffmann et al., 2017). For example, drivers' reasons for car use (e.g. Bean, Kearns, & Collins, 2008; Handy, Weston, & Mokhtarian, 2005), the experiences of bus users (Carreira, Patrício, Jorge, Magee, & Hommes, 2013) or cyclists' motivation for active commuting (Guell, Panter, & Ogilvie, 2013) were explored. Motivations towards alternatives to car use remain less well understood and the question arises whether similar motivations emerge for other modes. Moreover, direct comparisons of modes and mode users are surprisingly rare. Some studies have compared users' and non-users' perceptions of travel modes. For example, cycling motivations of regular and irregular cyclists (e. g. Fishman, Washington, & Haworth, 2012) or car versus bus users (Beirão & Cabral, 2007; Carreira et al., 2013; Guiver, 2007; Hiscock, Macintyre, Kearns, & Ellaway, 2002) were investigated. For example, Beirão and Cabral (2007) confirmed general dissatisfaction with public transport use but also highlighted the social aspects of bus use. Research has also shown that driving vs. using public transport can have different psychological consequences, highlighting increased psychosocial benefits gained by being the driver (Ellaway, Macintyre, Hiscock, & Kearns, 2003). Most relevant, Anable and Gatersleben (2005) compared different mode users' survey ratings of a variety of travel options for two different journey purposes. The authors found that evaluations can differ in their importance, depending on journey type, and identified several 'gaps' in how car users and non-car users evaluate a range of modes. However, their results

were drawn from two different studies, conducted at different time points with different participants. To our knowledge, a study by Thomas, Walker, and Musselwhite (2014) is the only qualitative research that explored knowledge and perceptions of carbon reduction and asked a range of mode users to evaluate different modes at the same time. This focus group study highlighted differences and similarities in perceptions of carbon emissions across five groups of mode users. Overall, however, a comprehensive view of perceptions of, and motivations to use a range of transport modes is yet to be developed. Identifying further similarities and differences between underlying perceptions of different travel modes by means of a novel methodology may elucidate new intervention targets and avenues for future research.

3.2.1 The Repertory Grid

The Repertory Grid (RepGrid) method was designed to investigate complex systems of perception and understanding through semi-structured interviews (Fransella, Bell, & Bannister, 2004). It is an operationalisation of Kelly's (1955) Personal Construct Theory. Kelly proposed that people use finite, bipolar constructs to understand the world around them. Although some have challenged the bipolarity of constructs (Goodrich, 1993), evidence supports this structure (B. M. Walker & Winter, 2007 for reviews; see Riemann, 1990). A construct describes a dimension in which two things are alike but different from a third (Stewart, Stewart, & Fonda, 1981). By presenting participants with evaluative stimuli - "elements", the RepGrid process maps out individuals' evaluative spaces (Easterby-Smith, Thorpe, & Holman, 1996; Fransella et al., 2004; Stewart et al., 1981). These elements are presented in groups of three, so this is known as the triadic elicitation procedure. Through contrasting and comparing elements, bipolar constructs can be elicited. Collectively, these create a two-dimensional grid, as opposed to in-depth uni-dimensional answers in a conventional qualitative interview. To complete the grid and reveal relationships between elements and constructs, participants rate the elements against elicited constructs which are being treated as semantic endpoints of a scale. For example, in deciding to travel, a person might apply the construct "cost effective" to transport mode A whereas the opposite "too expensive" may be applied to travel mode B. It is also assumed that constructs are organised hierarchically in subordinate and

superordinate relationships of importance (G. Kelly, 1955; R. G. Lewis & Klein, 1985; D. Marsden & Littler, 2000; Neimeyer, 1993). Since its introduction in 1955, the RepGrid has been adapted (Bannister & Mair, 1968) to include, for example, the use of pictures to represent elements and ranking of constructs to reveal the structure of importance (Skippon, 2014). While RepGrid methods have been widely used in market research (e.g. Goffin, 1994; Jankowicz, 1990; Lemke, Clark, & Wilson, 2011; McEwan & Thomson, 1989) including vacation destination choice (e.g. Coshall, 2000; Pike, 2003) or perceptions of food (e.g. Embacher & Buttle, 1989; Gains, 1994; Russell & Cox, 2004; Thomson & McEwan, 1988), it found little application in transportation research to date (see Gkouskos, Jörgen Normark, & Lundgren, 2014; Skippon, 2014 for examples). Recently, Clauss and Döppe (2016) compared a wide range of travel alternatives (elements) including innovative options, e.g. sharing schemes, multi-modal travel apps and an 'ideal' mode. The study elicited 28 perceptual determinants (constructs) from 60 participants that were either car users or public transport users, living in an urban German city. Based on the elicited determinants, they explored how these new modes can be best promoted amongst a portfolio of existing alternatives.

3.2.2 The present study

We increasingly rely on multiple travel modes and, therefore, policies designed to reduce reliance on car use should take account of multi-modal travel planning. Contemporary transport research has begun to focus on this complexity (Anable & Gatersleben, 2005; Buehler & Hamre, 2014; Clauss & Döppe, 2016; Diana & Pirra, 2016; Kuhnimhof et al., 2012). The present study sought to extend such work by exploring perceptions of a range of travel modes among different mode user groups. Thereby, the study addresses several shortcomings in the current transport literature such as 1) the simultaneous investigation of perceptions of a range of travel modes by users and non-users, 2) the direct comparison of these, and 3) the use of alternative methodologies to explore potential behaviour-change intervention targets.

The Repertory Grid (RepGrid) technique was used to compare perceptions of seven travel modes (car, bus, walking, cycling, train, coach and tram) among participants who primarily use alternative transport (non-car users) with those who drive frequently (car users). Specifically, we explored how non-car users and high-mileage[2] car users differ in relation to;

1. elicited constructs (content of the construct system),
2. priority of some constructs over others,
3. relationships (a) among travel modes (elements) and (b) among constructs,
4. and relationships between elements and constructs.

3.3 Methods

3.3.1 Recruitment and participants

The recruitment strategy covered three different geographical areas in the UK (Bristol, Exeter, Wokingham) to warrant a wide range of views. This also avoided recruitment of participants who lived in the same immediate location with a similar geographically-determined transport infrastructure. Access to public transport and cycling infrastructure of the three geographical areas can be broadly described as ‘good’, ‘moderate’ and ‘poor’, respectively. Participants were approached through face-to-face or e-mail invitation, digital newsletter advertisements or social media posts at different institutions: two UK Universities, a local UK Green Party and staff members working at a UK Transport Research Laboratory.

Inclusion criteria were (1) being a “non-car user”, i.e. participants who mainly used non-car transport modes, or (2) an above-average mileage “car user”. Those criteria were specified in the recruitment adverts and participants had to meet the following criteria corresponding to the two distinct groups: (1) “a regular public transport/active mode user over the last three years for private journeys who purposely does not use a car”, or (2) “a frequent car driver with an annual mileage of approx. 9,000 miles

[2] At the time of research, the average annual mileage of a UK driver was estimated to be 7,000 miles (DfT, 2013). We defined above-average car users as those driving 30% more than the average.

over the last three years for private journeys". Participants were entered into a prize draw to win a £100 shopping voucher.

In total, 15 non-car users and 15 high-mileage car users were recruited. The sample size of minimum of 15 per group was based on those used in previous RepGrid studies (e.g. Embacher & Buttle, 1989; Gupta, Fischer, & Frewer, 2015; Home, Bauer, & Hunziker, 2010; Michel, Punter, & Wismer, 2011; Wan & Shen, 2015) because it is assumed that 15 participants allow elicitation of a full range of constructs (van de Kerkhof, Cuppen, & Hisschemöller, 2009). Theoretical saturation was reached after six and nine interviews (Appendix B, Section B.1 and Figures B.3 and B.4), thus recruitment was closed after the minimum total of 30 participants was achieved. Participants were aged 22 – 64 years (M = 39.73, SD = 12.23) and all had a driver's license and access to a car. The sample was a relatively well-educated one with the majority of participants having a postgraduate degree (N = 21, 70%) of which twelve (40%) had a PhD. All participants were in employment, working in managerial (N = 5, 16.67%), professional (N = 10, 33.33%) or scientific/academic (N = 13, 43.33%) occupations or in education (N = 2, 6.67%). One third of the participants (N = 9, 30%) reported an income between £20,000 and £29,999 with five (17%) earning less than £20,000. The sampling frame did not achieve equal mode user group characteristics and there were differences in relation to gender distribution and area of residence. As expected, there were more car drivers in areas of low levels of public transport services (e.g. Wokingham) and more cyclists from locations with high cycling provision (e.g. Bristol). Overall, the sample was not representative of the wider population but was acceptably representative in relation to UK gender distribution (46.7% female) and residence location (73.3% urban) (Office for National Statistics, 2011). Participant details can be found in Table 3.1, separated for non-car users and high-mileage car users (henceforth abbreviated as "car users").

		NON-CAR		CAR	
		Range	Mean (SD)	Range	Mean (SD)
Age		22 - 59	37.9 (10.8)	22 - 64	41.5 (13.6)
Annual driven mileage		0 - 5000	1,020 (1722.5)	9000 - 20000	13,866.7 (3997.6)
		Frequency	**%**	**Frequency**	**%**
Gender	male	5	33.3	11	73.3
	female	10	66.7	4	26.7
Area of residence	rural	1	6.7	7	46.7
	urban	14	93.3	8	53.3
Educational level	HND	1	6.7	0	0
	Bachelor	4	26.7	4	26.7
	Masters	4	26.7	4	26.7
	MBA	0	0	1	6.7
	PHD	6	40	6	40
Occupational category	professional	6	40	4	26.67
	scientific/academic	6	40	7	46.67
	managerial	2	13.3	3	20
	full time education	1	6.7	1	6.7
Income category	< 10,000	1	6.7	0	0
	10,000 - 19,999	2	13.3	2	13.3
	20,000 - 29,999	5	33.3	4	26.7
	30,000 - 39,999	4	26.7	3	20
	40,000 - 49,999	2	13.3	3	20
	50,000 - 74,999	1	6.7	2	13.3
	75,000 - 99,999	0	0	1	6.7
No. of children	0	13	86.7	9	60
	1	1	6.7	1	6.7
	2	1	6.7	5	33.3

Table 3.1 Demographic details of non-car user and car user participants

3.3.2 Interview procedure

To elicit RepGrids, semi-structured face-to-face interviews were conducted, each lasting approximately 60 minutes. Black-and-white pictures that portrayed either car, bus, walking, bicycle, tram, train or coach were presented in triads. Saturation of individual-level constructs was ensured by asking respondents to add additional constructs (Fransella et al., 2004). Participants completed the grid by rating each travel mode on each construct and by ranking each construct according to the

importance given when making travel decisions. A detailed description of the elicitation procedure, an example of a completed RepGrid and pictures used can be found in Appendix B, Section B.1, Figure B.1. Theoretical saturation of group-level constructs implied that no new constructs were elicited amongst either non-car user or car user participants. Theoretical saturation plots for both groups can be found in the Appendix B, Section B.1 and Figures B.3 and B.4. Sessions were audio recorded to facilitate subsequent analyses in case meanings of certain constructs were ambiguous. The RepGrid along with the interview guide was piloted with four independent researchers. All methods were approved by the institutional review board of the University of Exeter.

3.3.3 Analysis

The analysis of RepGrid data was completed in four different stages to address the three study research questions: (1) a thematic analysis, (2) a content analysis, (3) a cluster analysis, and (4) an analysis of means and principal component analysis. Responses were analysed separately for non-car users and car users because these two groups were expected to generate different construct systems.

3.3.3.1 Thematic Analysis

Qualitative thematic analysis was undertaken to determine whether non-car users and car users differ with regards to type of constructs elicited (study 2 research question 1).

We used techniques of thematic analysis proposed by Braun and Clarke (2006) to create a set of summary constructs within each group. This analysis was a semantic, data-driven categorisation procedure used to reduce individual constructs. For example, each respondent generated between 13 and 19 individual-level bipolar constructs. The first author coded constructs with identical meaning to create overarching categories of constructs across non-car users and then across car users. For example, one car user generated the construct ‘I can get almost anywhere’ vs. ‘I am bound by a designated route’ while another generated the

construct ‘You can go right where you want to go’ vs. ‘You are constrained by where you can go’. The analyses categorised both of these as examples of the overarching construct of ‘go where you want’ vs. ‘fixed route’. To assess validity, the list of constructs derived for each group were reviewed and assessed by a second, independent researcher. Overall, agreement reached 98%. A summary of descriptions across the two participant groups can be found in Appendix B, Section B.2, Table B2.

3.3.3.2 Quantitative content analysis

Content analysis (M. G. Hunter, 1997; Joffe & Yardley, 2004) was performed to identify the priority of some constructs over others (study 2 research question 2). The analysis summarised and compared the frequency of elicited constructs, importance ranking and a combined measure of non-car users’ and car users’ responses. This resulted in the following measures:

(i) Frequency

The higher the *Frequency* score, the more participants used that particular construct within the group. The *Frequency* score was determined by counting the number of participants who used the construct within each group and dividing this by the total number of constructs generated by each group, multiplied by 100. So for example, among the 15 car user participants, 15 generated a construct categorised as ‘go where you want’ vs. ‘fixed route’ and there were 222 total constructs generated by the car user group. Consequently, the percentage *Frequency* score for this summary construct was 6.76.

(ii) Importance

Each participant rank ordered their individual constructs starting with the most important (rank 1) to their travel choices. For example, two car user participants may use the overarching ‘go where you want’ vs. ‘fixed route’ construct but rank its importance differently e.g., second most important and fifth most important. Therefore, for every construct generated by each participant, a proportional rank was calculated by dividing their ranking by the total number of constructs that participant

had generated. These proportional ranks were then averaged across each overarching construct to generate a per-construct Importance score within each of the two groups.

(iii) Relevance

The *Relevance* index for each construct was obtained by multiplying *Frequency* scores with the corresponding *Importance* rankings.

3.3.3.3 Cluster analysis

Hierarchical cluster analyses identified similarities among both constructs and travel modes. This method was used to determine whether non-car users and car users differed in their rating of constructs and rating of travel modes, or elements (study 2 research question 3). Analysis was conducted for each individual RepGrid using the web-based analysis tool WebGrid 5 (Gaines & Shaw, 2010). The rating matrices resulting from each individual interview provided the basis for the cluster analysis, i.e. the allocated ratings for each individual-level construct on the seven travel modes bus, walking, bicycle, car, coach, train and tram (see Appendix B, Figure B.2 for a completed RepGrid matrix).

The WebGrid 5 software utilises the FOCUS algorithm (Jankowicz & Thomas, 1982; Shaw & Thomas, 1978) to group similar constructs and similar travel modes into clusters. FOCUS analysis sorts the grid for proximity between clusters and between travel modes using the nearest-neighbour distance metric. This method calculates the summed difference between pairs of ratings in each RepGrid, by column and by row. Constructs and travel modes are then reordered to position the most similar ones side-to-side. The results are graphically represented as hierarchical tree diagrams, referred to as dendrograms (see Figures 2 and 3 in the results section for an example). Thereby, the level of similarity is expressed as a percentage value where a higher percentage value represents a higher degree of similarity. Similar constructs and similar elements means that these have been evaluated in a similar way and are closely linked to each other.

The seven travel modes (elements) were provided to participants and identical across the sample. Consequently, inferences with regards to clustered travel modes were assessed using *all* participants; both non-car users and car users.

Clusters of constructs were expected to be more heterogeneous amongst the participants as no two RepGrids are alike. Dendrograms generated for constructs were compared subjectively within each group of participants. We then selected a "typical" non-car user and a "typical" car user to serve as an illustration of how constructs can be clustered by an individual. The selection was based on the coherence with findings from the content analysis. We selected these two individuals because (i) their elicited set of constructs contained the most frequently mentioned constructs identified for their group and (ii) their *Importance* rankings for the individual constructs matched average *Importance* scores for their group. We chose this approach as opposed to combining results from all RepGrids into a composite grid because a RepGrid is a personal interpretation of the world (Kelly, 1955). Consolidating multiple RepGrids could distort this personal structure and basic principles of personal construct psychology would be violated (Fransella et al., 2004; Jankowicz, 2005). Moreover, constructs were not supplied resulting in varying *N*'s and unsuitable for aggregation.

3.3.3.4 Analysis of means and principal component analysis

Finally, we aimed to explore the relationship between constructs and elements (study 2 research question 4) for which we compared mean construct ratings of non-car users and car users. We also conducted principal component analyses (PCA) for each individual RepGrid which spatially clusters elements and constructs. PCA helped to interpret individual RepGrid data in two ways: (1) a two-dimensional map was created for every RepGrid to illustrate the relationships between elements and constructs and (2) PCA identified components that explain the greatest variance within the RepGrid. The component scores were used to determine the cognitive complexity of a participant's construct map (Bell, 2004; Winter, 1992), i.e. a high percentage value of the first component indicated a more one-dimensional (looser) cognitive construal, whereas lower percentage of variance spread across two or

more components designated greater complexity (Winter, 1992). Thus general conclusions can be drawn about the complexity of construct systems across all participants' and between groups, however, mapping of construct spaces within each group will be illustrative, using results from our typical non-car user and our typical car user respondent.

3.4 Results

3.4.1 Thematic analysis and content analysis

A total of 448 individual bipolar constructs were elicited from 30 participants. Non-car users produced a slightly higher number (n = 226) than car users (n = 222). The number of elicited individual bipolar constructs in each individual RepGrid ranged from 13 to 19 among non-car users (M = 15) and 13 to 18 among car users (M = 14.8). Thematic analysis identified 28 ($n_{\text{non-car}}$ = 27, n_{car} = 26) unique summary constructs or overarching constructs (henceforth simplified to "constructs"). These are shown in Table 2. Twenty-five of these were common across non-car users and car users. Only constructs relating to level of maintenance, status and type of power supply were elicited from one group but not the other. Section B.2 in Appendix B presents detailed content of the summary constructs that emerged from thematic analyses.

Constructs in Table 3.2 were arranged in terms of average *Relevance* scores across both groups, listing the most relevant construct first. A detailed table of all elicited constructs including *Importance* and *Frequency* scores can be found in Appendix B, Section B.3, Table B.5.

		NON-CAR		CAR	
All elicited bi-polar constructs[1]	N	n	Relevance	n	Relevance
go where you want ; fixed route	29	14	3.74	15	5.68
go when you want ; stick to set times	26	13	4.06	13	5.05
cheaper ; expensive	23	11	3.30	12	4.00
fast ; slow	24	11	2.94	13	4.23
reliable ; unreliable	22	11	3.07	11	3.62
physically active ; sedentary	26	13	4.35	13	2.22
environmentally friendly ; unsustainable	21	11	3.84	10	1.78
just yourself ; lots of people	25	12	2.18	13	3.24
predictable ; unexpected factors	18	10	2.64	8	2.66
own space ; crowded	19	7	1.84	12	2.76
suitable for short distance ; suitable for long distance	21	8	1.41	13	2.45
ability to transport lots of items ; not able to carry much	16	5	1.19	11	2.62
no planning needed ; requires planning	14	6	1.65	8	1.98
protected from elements ; exposed to elements	14	6	1.47	8	2.07
safe ; unsafe	16	8	1.76	8	1.50
relaxed travelling ; stressful journey	10	5	1.76	5	1.48
can do something else ; can't do anything else	14	6	1.31	8	1.78
shared road space ; dedicated space	20	11	1.68	9	1.31
enjoyable ; means to end	12	5	0.99	7	1.50
private transport ; public transport	22	13	1.71	9	0.78
minimal responsibility ; individual's responsibility	10	8	1.98	2	0.48
sociable ; isolated	10	8	1.71	2	0.09
being driven ; have to drive yourself	12	8	1.30	4	0.47
more accessible ; less accessible	8	5	0.36	3	0.36
interesting ; boring	3	1	0.32	2	0.29
no maintenance needed ; requires high maintenance	4	4	0.51	0	0.00
conveys status ; no status attached	6	6	0.42	0	0.00
external power supply ; internal fuel supply	3	0	0.00	3	0.18

[1] Constructs ordered in descending average *Relevance* score across both groups

Table 3.2 Elicited summary constructs from non-car users and car users

Overall, the (overarching) construct relating to route flexibility (‘go where you want’ vs. ‘fixed route’) was the most frequently elicited and also most relevant across both groups. This was closely followed by the construct representing time flexibility (‘go when you want’ vs. ‘stick to set times’). Constructs relating to cost (‘cheaper’ vs. ‘expensive’), speed (‘fast’ vs. ‘slow’) and reliability (‘reliable’ vs. ‘unreliable’) were also relevant for both groups. Scores for constructs concerning physical activity (‘physically active’ vs ‘sedentary’) and the environment (‘environmentally friendly’ vs. ‘unsustainable’) were significantly higher for non-car users.

In order to better compare results between the two groups, we divided Importance and Frequency scores for all constructs into tertiles and mapped those to a two-dimensional matrix of low, medium and high constructs in Tables 3.3 and 3.4. Constructs were considered considerably differed if they were not located in adjacent

matrix tiles. The similarities and differences in constructs between non-car users and car users can be grouped into four categories:

(i) Equal Importance, equal Frequency (6)

Overall, six constructs were elicited with similar frequency and assigned importance rankings.

Among constructs with high *Importance* / high *Frequency* scores, ‘go where you want’ vs. ‘fixed route’ and ‘go when you want’ vs. ‘stick to set times’ were consistent across non-car users and car users.

‘More accessible’ vs. ‘less accessible’ was the only construct that was classified as low *Importance* / low *Frequency* for both groups.

(ii) Equal *Importance*, varying *Frequency* (8)

Both groups considered instrumental constructs related to cost (‘cheaper’ vs. ‘expensive’), speed (‘fast’ vs. ‘slow’) and reliability (‘reliable’ vs. ‘unreliable’) highly important, however, they were elicited less frequently from non-car users. Similarly, concerns about comfort ‘own space’ vs. ‘crowded’ was elicited from more car users but of moderate importance to both groups. ‘Ability to transport lots of items’ vs. ‘not able to carry much’ was also perceived equally important by both groups. Frequency of this construct differed considerably with fewer non-car users mentioning this construct than car users.

By contrast, more non-car users than car users used two constructs related to feelings of independence (‘minimal responsibility’ vs. ‘individual’s responsibility’ and ‘being driven’ vs. ‘have to drive yourself’, both medium importance) and ‘private transport’ vs. ‘public transport’ (low importance).

(iii) Varying *Importance*, equal *Frequency* (8)

Three constructs were ranked considerably different in *Importance* but were elicited from a similar number of non-car users and car users. A high number of participants distinguished between ‘physically active’ vs. ‘sedentary’ transport modes.

Nevertheless, *Importance* of that construct was considerably lower for car users and higher for non-car users. Conversely, concerns about privacy (‘just yourself’ vs. ‘lots of ‘people’) were considerably more important to car users. Constructs linked to planning efforts (‘no planning needed’ vs. ‘requires planning’) and environmental concerns (‘environmentally friendly’ vs. ‘unsustainable’) were ranked more important by non-car users, whereas car users ranked ‘predictable’ vs. ‘unexpected factors’ and ‘protected from elements’ vs. ‘exposed to elements’ as more important constructs.

Very few participants mentioned ‘interesting’ vs. ‘boring’ but it was ranked as highly important by one non-car user and of less importance by two car users. By contrast, ‘enjoyable’ vs. ‘means to end’ was elicited by only a few participants but ranked more important by car users.

(iv) Varying *Importance*, varying *Frequency* (2)

Two constructs were identified as considerably different from each other in terms of *Importance* and *Frequency.* ‘Sociable’ vs. ‘isolated’ was elicited from very few car users who did not consider it important. By contrast, a higher number of non-car users valued the social aspects of transport. The construct ‘suitable for short distance’ vs. ‘suitable for long distance’ was more important for car users than for non-car users.

Thus the results of the thematic analyses showed that, in general, non-car users and car users applied the same constructs to understand transport choices (research aim 1). Content analysis revealed that while constructs relating to time flexibility and freedom of route choice are important to both groups, non-car users and car users also differed with regards to priorities attached to some constructs (research aim 2).

NON-CAR		Frequency		
		Low	Medium	High
Importance	Low	enjoyable ; means to end more accessible ; less accessible no maintenance needed ; requires high maintenance	suitable for short distance ; suitable for long distance shared road space ; dedicated space being driven ; have to drive yourself conveys status ; no status attached	just yourself ; lots of people private transport ; public transport
	Medium	ability to transport lots of items ; not able to carry much	predictable ; unexpected factors own space ; crowded protected from elements ; exposed to elements safe ; unsafe can do something else ; can't do anything else minimal responsibility ; individual's responsibility sociable ; isolated	N/A
	High	relaxed travelling ; stressful journey interesting ; boring	cheaper ; expensive fast ; slow reliable ; unreliable environmentally friendly ; unsustainable no planning needed ; requires planning	go where you want ; fixed route go when you want ; stick to set times physically active ; sedentary

Table 3.3 *Importance* / *Frequency* matrix of constructs for non-car users

CAR		Frequency		
		Low	**Medium**	**High**
Importance	**Low**	sociable ; isolated being driven ; have to drive yourself more accessible ; less accessible interesting ; boring external power supply ; internal fuel supply	shared road space ; dedicated space private transport ; public transport	physically active ; sedentary
	Medium	enjoyable ; means to end minimal responsibility ; individual's responsibility	environmentally friendly ; unsustainable no planning needed ; requires planning safe ; unsafe can do something else ; can't do anything else	own space ; crowded suitable for short distance ; suitable for long distance ability to transport lots of items ; not able to carry much
	High	relaxed travelling ; stressful journey	predictable ; unexpected factors protected from elements ; exposed to elements	go where you want ; fixed route go when you want ; stick to set times cheaper ; expensive fast ; slow reliable ; unreliable just yourself ; lots of people

Table 3.4 Importance / Frequency matrix of constructs for non-car users

3.4.2 Cluster analyses

Cluster analyses were conducted for 30 individual RepGrids to give some indication of how similar constructs and how similar travel modes (elements) are across individuals. The patterns of relationships amongst elements and amongst constructs represented a personal theory or world view used by each respondent to understand and select travel modes. Figures 1 and 2 illustrate the results of the cluster analyses in form of dendrograms for two participants, a typical non-car user and a typical car user. As described in the Methods section, both participants' individual RepGrids overlapped in terms of average *Frequency* and *Importance* scores identified in the content analysis for the relevant group. Individual dendrograms of all participants can be found in Appendix B, Section B.4.

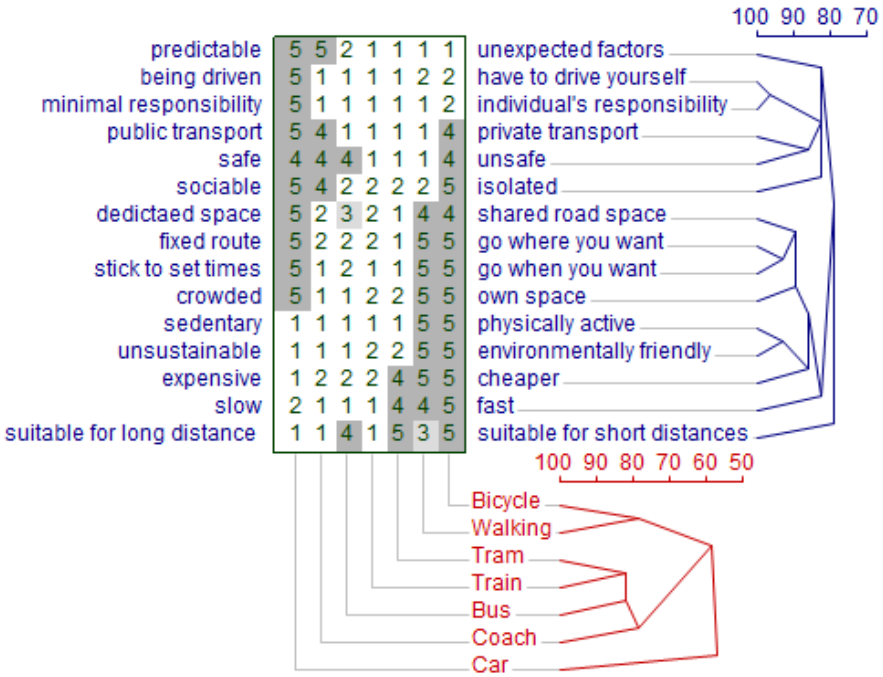

Figure 3.1 FOCUS cluster grid of a typical non-car user (example: Participant 21)

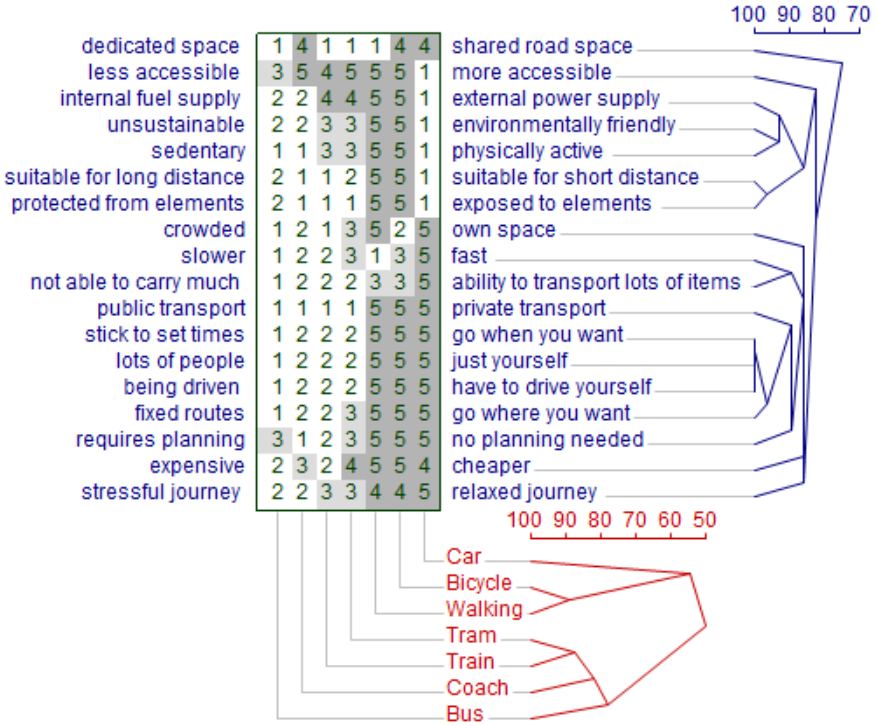

Figure 3.2 FOCUS cluster grid of a typical car user (example: Participant 11)

3.4.2.1 Cluster analysis of travel modes

The number and type of travel modes (elements) used in the RepGrid elicitation were identical across all participants. This allowed us to include all participants into the analysis and to compare the level of similarity between travel modes across both groups.

Average similarity levels revealed somewhat homogenous clusters of elements across non-car users and car users (see Table 3.5). As expected, the active transport modes walking and cycling were perceived as similar and formed one cluster. Likewise, public transport modes (tram, train, coach and bus) were also construed in a similar way and formed another cluster. As illustrated in our example in Figure 3.2, the car was sometimes associated with active modes but displayed a lower similarity level (non-car user = 61%; car user = 64.1%). All but one car user

were consistent with regards to the latter structure. Non-car users revealed a more varied structure where some participants construed active modes more similar to public transport (60.5%), as did our typical non-car user in Figure 3.1. Alternatively, public transport was construed closer to the car but with a lower average level of similarity (56.7%).

Also of interest, the active modes cluster displayed considerably higher average similarity levels for car users (90.1%) compared to non-car users (83.7%) suggesting that non-car use participants construed walking and cycling as more differentiated than car users.

	NON-CAR					CAR			
	Walking, Bicycle (*N* = 15)	Coach, Tram, Bus, Train (*N* = 15)	Walking, Bicycle, Car (*N* = 6)	Walking, Bicycle, Coach, Tram, Bus, Train (*N* = 6)	Coach, Tram, Bus, Train, Car (*N* = 3)	Walking , Bicycle (*N* = 15)	Coach, Tram, Bus, Train (*N* = 15)	Walking, Bicycle, Car (*N* = 14)	Walking, Bicycle, Coach, Tram, Bus, Train (*N* = 1)
Average	**83.7**	82.3	61	60.5	56.7	**90.1**	83.6	64.1	54
Min	70	70	52	56	54	81	78	54	54
Max	98	92	76	75	58	100	95	78	54

Table 3.5 Similarity levels (%) between the clustered elements

Cluster analyses revealed that both groups elicit the same clusters of transport modes. However, the relationship between elements within a cluster differed between the two group (study 2 research question 3a): the active modes cluster was construed as more differentiated by non-car users. Car users also consistently see active modes more similar to the car whereas only six non-car users showed this pattern.

3.4.2.2 Cluster analysis of constructs

As elicited set of constructs were unique for each participant, results for clustered constructs are illustrative in that they are based on a selected typical participant from each group.

Non-car user

The typical non-car user, (Participant 21) displayed in Figure 3.1 showed three clusters.

We observed highest similarity levels (98%) between ‘minimal responsibility’ vs. ‘individual’s responsibility’ and ‘being driven’ vs. ‘have to drive yourself’. This implies that this participant attributes a low level of personal responsibility to travel modes where he or she is a passenger. These affective constructs formed a cluster (83%) with ‘safe’ vs. ‘unsafe’, ‘predictable’ vs. ‘unexpected factors’, ‘sociable’ vs. ‘isolated’ and ‘public transport’ vs. ‘private transport’. Consequently, further affective concerns were related to the type of transport. We can infer that one dimension of the construal of this participant is characterised by a collective vs. individualistic group of constructs. This participant saw public transport as a safe mode of transport because of its predictability and low responsibility which is characterised by a social environment.

These perceptions were distinct from a second cluster which combined the important instrumental constructs ‘go when you want to’ vs. ‘stick to set times’, ‘go where you want’ vs. ‘fixed routes’ with affective concerns of privacy (‘own space’ vs. ‘crowded’) and space (‘shared road space’ vs. ‘dedicated space’).

The closely related constructs ‘physically active’ vs. ‘sedentary’ and ‘environmentally friendly’ vs. ‘unsustainable’ (94%) together with ‘expensive’ vs. ‘cheap’ formed a third cluster but were also somewhat associated with the second cluster. The latter three

constructs also displayed high similarity (86%) which implied that environmentally friendly and active modes are also considered cheaper. Additionally, ‘slow’ vs. ‘fast’ was somewhat related to the second and third cluster. ‘Suitable for long distance’ vs. ‘suitable for short distance’ was not strongly associated with both clusters, suggesting that perceptions of trip length were construed distinct from those clusters.

Car user

The typical car user, (Participant 11) displayed in Figure 3.2, showed two distinct clusters of constructs.

The first cluster displayed high similarities between the constructs ‘physically active’ vs. ‘sedentary’, ‘environmentally friendly’ vs. ‘unsustainable’, ‘external power supply’ vs. ‘internal fuel supply’ (94%). This structure resembled the clustered constructs that was also identified for the typical non-car user: Physically active modes were seen as environmentally friendly and not reliant on fossil fuels. Contrary to the non-car user example, this participant construed these attributes as similar to ‘protected from the elements’ vs. ‘exposed to the elements’ and ‘suitable for short distances’ vs. ‘suitable for long distances’. Thus, an active, environmentally friendly travel mode was also typically associated with shorter distances and exposure to the weather conditions. Finally, ‘more accessible’ vs. ‘less accessible’ was loosely related to that cluster, indicating that such transport modes are freely available to the general public.

While the first cluster comprised of primarily instrumental constructs, the second cluster encompassed a range of constructs, both instrumental and affective in nature. For example, we observed highest similarity (100%) between the important instrumental constructs related to time flexibility (‘go when you want to’ vs. ‘stick to set times’), comfort (‘just yourself’ vs. ‘lots of people’) and levels of control (‘being

driven' vs. 'have to drive yourself'). 'Go where you want to go' vs. 'fixed route' was also strongly linked to these constructs (97%). 'Private transport' vs. 'public transport' and 'no planning required' vs. 'requires planning' joined the cluster at a 90% similarity level. Thus, the typical car user perceives single occupancy travel modes where he/she is the driver to offer high time and route flexibility, greater levels of comfort, closely associated with the fact that trips don't need to be planned. This varied significantly from the typical non-car user who viewed driving yourself as a responsibility. Further instrumental constructs relating to speed, ability to transport items that are typically positively associated with car use, were viewed as similar (90%) and joined the second cluster, together with 'expensive' vs. 'cheap', 'crowded' vs. 'own space' and 'stressful journey' vs. 'relaxed journey' with a similarity level of 87%. By contrast, the typical non-car user construed perceptions of costs and speed in a different cluster, closely associated with environmentally friendly.

Cluster analysis confirmed that the relationship between constructs differed between the typical car user and a typical non-car user (study 2 research question 3b). The car user showed clear clusters that could be regarded as car attributes versus non-car attributes. By contrast, the typical non-car user showed a less tight cluster structure in which clusters could be characterized as representing collective vs. individualistic, flexibility, privacy and sustainability of transport mode.

3.4.3 Analysis of means and principal component analysis

In a last step, we compared mean construct ratings of individual elements between both groups to identify differences in the relationship between elements and constructs. All constructs that ranked highest in *Importance* and *Frequency* were included in these analyses. The absolute difference ($|x|$) between the mean was calculated for each such construct. We considered constructs as meaningfully different if the absolute difference was ≥ 0.5, which is equal to 10% change (Hacke et al., 1998; Thorlund et al., 2008). We did not use statistical tests as sample sizes

were too small and also differed within each construct. Means are displayed in Table 3.6 and the absolute differences between pairwise ratings can be seen in Table 3.7. Section B.4 in Appendix B provides a detailed table of mean ratings and comparisons of constructs ranged lowest in *Importance* and *Frequency.*

Across both groups, seven unique constructs were identified as high in Importance and high in Relevance. Overall, 16 (32.65%) ratings showed an absolute difference of ≥ 0.5. The average absolute difference of ratings was 0.42.

The construct ‘cheaper’ vs ‘expensive’ showed the highest number of different mean ratings (total $|x| = 7.15$). In particular, ratings with regards to the car differed considerably ($|x| = 2.25$) whereby car-users see car as a somewhat cheaper form of transport (Mcar = -0.25) and non-car users entirely agree that it’s the most expensive (Mnon-car = 2.00). ‘Go where you want’ vs. ‘fixed route’ displayed the fewest differences between groups (total = 0.80)

Across the seven constructs, the travel mode car displayed the highest total absolute difference ($|x| = 5.35$), followed, with a big difference, by the tram ($|x| = 3.26$). Walking was the most consistently rated across both groups (total $|x| = 1.90$). Notably, there were no differences between ratings of walking and the construct ‘physically active’ vs. ‘sedentary’.

‘Physically active’ vs. ‘sedentary’ and ‘just yourself’ vs. ‘lots of people’ and were the most consistent constructs with no mean differences above ≥ 0.5 and also the second and third lowest total score, respectively.

	NON-CAR							CAR						
Constructs	**Walking**	**Tram**	**Bicycle**	**Car**	**Train**	**Coach**	**Bus**	**Walking**	**Tram**	**Bicycle**	**Car**	**Train**	**Coach**	**Bus**
go where you want ; fixed route (*N* = 14, 15)	-1.64	1.43	-1.43	-1.07	1.57	1.50	1.36	-1.67	0.93	-1.53	-1.13	1.53	1.53	1.40
go when you want ; stick to set times (*N* = 13, 13)	-1.85	1.62	-1.85	-1.92	1.69	1.69	1.62	-1.31	1.00	-1.31	-1.38	1.23	1.46	1.46
cheaper ; expensive (*N* = 13 , 12)	-1.92	1.23	-2.00	2.00	1.08	1.46	1.46	-1.50	0.25	-1.08	-0.25	0.83	0.17	0.42
fast ; slow (*N* = 11, 13)	1.18	-0.27	-0.36	-0.82	-0.55	-0.09	0.55	1.00	0.31	-0.08	-1.54	0.31	0.69	0.77
reliable ; unreliable (*N* = 11, 11)	-1.64	0.27	-1.45	-0.09	0.55	0.91	1.18	-2.00	0.36	-1.55	-1.36	1.36	1.09	1.36
physically active ; sedentary (*N* = 13, 13)	-1.92	1.23	-2.00	2.00	1.08	1.46	1.46	-1.92	0.92	-1.92	1.77	1.00	1.15	1.15
just yourself ; lots of people (*N* = 12, 13)	-1.17	1.50	-1.00	-1.42	1.42	1.67	1.83	-1.54	1.69	-1.46	-1.69	1.77	1.69	1.85

Table 3.6 Mean ratings for constructs with high *Importance* and high *Frequency* scores on all seven elements

Constructs	**Walking**	**Tram**	**Bicycle**	**Car**	**Train**	**Coach**	**Bus**	**Total**
go where you want ; fixed route (*N* = 14, 15)	0.02	**0.50**	0.10	0.06	0.04	0.03	0.04	**0.80**
go when you want ; stick to set times (*N* = 13, 13)	**0.54**	**0.62**	**0.54**	**0.54**	0.46	0.23	0.15	**3.08**
cheaper ; expensive (*N* = 13 , 12)	0.42	**0.98**	**0.92**	**2.25**	0.24	**1.29**	**1.04**	**7.15**
fast ; slow (*N* = 11, 13)	0.18	**0.58**	0.29	**0.72**	**0.85**	**0.78**	0.22	**3.63**
reliable ; unreliable (*N* = 11, 11)	0.36	0.09	0.09	**1.27**	**0.82**	0.18	0.18	**3.00**
physically active ; sedentary (*N* = 13, 13)	0.00	0.31	0.08	0.23	0.08	0.31	0.31	**1.31**
just yourself ; lots of people (*N* = 12, 13)	0.37	0.19	0.46	0.28	0.35	0.03	0.01	**1.69**
Total	**1.90**	**3.26**	**2.48**	**5.35**	**2.84**	**2.86**	**1.97**	

Table 3.7 Absolute difference between mean ratings of high *Importance* / high *Relevance* constructs for all elements. Red-rimmed indicates $|x|$ >0.5.

Across the seven travel modes, the car was rated most inconsistently applying the most important and most frequent constructs. Figure 3.3 offers a visual juxtaposition of non-car user and car user construct ratings for the travel mode car. The graphs show major disagreements with regards to costs of car use but also demonstrate heterogeneous ratings for speed and reliability. Notably, each travel mode user group consistently rated their own travel mode more positively suggesting higher satisfaction levels with the personally familiar transport mode. Figures B.5, B.6 and B.7 in Appendix B, Section B.4 contrast all constructs, grouped by travel mode clusters.

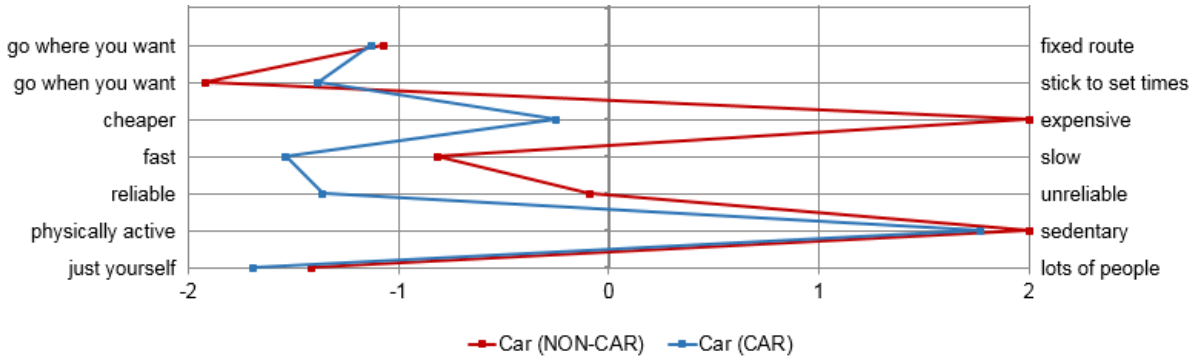

Figure 3.3 Non-car user and car user mean ratings of high *Importance*, high *Frequency* construct ratings for car

Principal component analysis (PCA) maps further illustrated how constructs (represented as lines) and elements (points) are connected in a construct system. Figures 3.5 and 3.6 show the corresponding examples of a typical non-car user and typical car user, respectively. Individual PCA maps of all participants can be found in Appendix B, Section B.4.

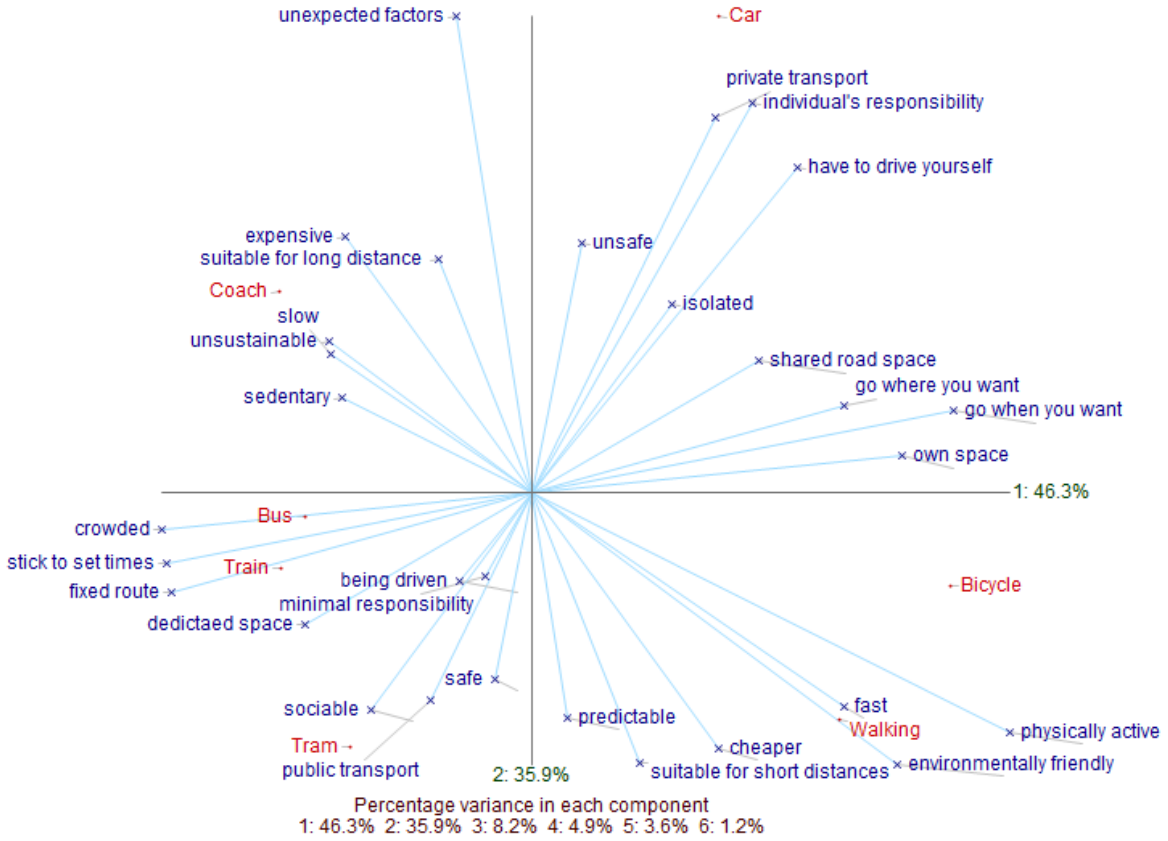

Figure 3.4 Principal components map of a typical non-car user (example: Participant 21)

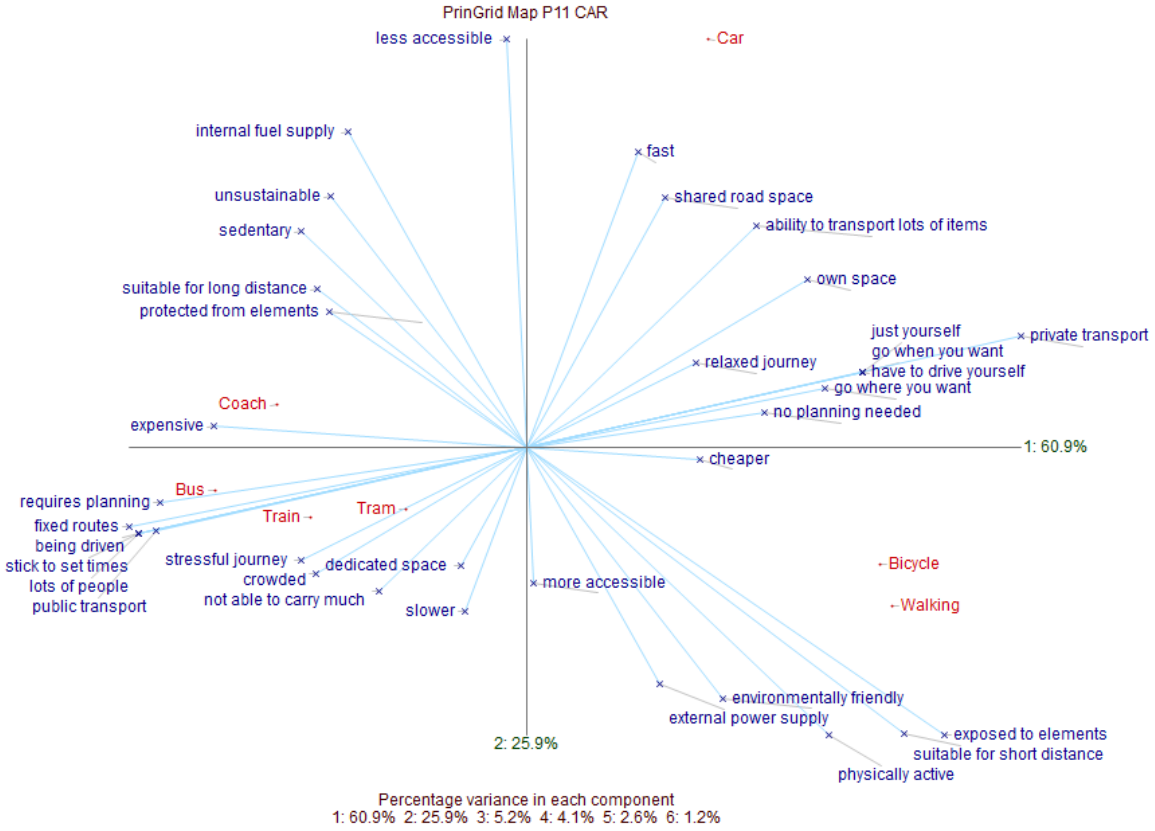

Figure 3.5 Principal components map of a typical car user (example: Participant 1)

Relationship between constructs and travel modes

PCA maps for our two typical participants confirmed the clusters of travel modes identified across all participants in the cluster analyses. For both groups, the first component separated car from public transport and the second component separated public transport from car and active transport. The maps highlight that tram, train and bus were most dissimilar to the car and are located in opposite quadrants (Grice, 2006; Watson & Winter, 2000). Nevertheless, non-car users construed public transport and active transport clusters in a more differentiated way with individual elements located further apart. In particular, for non-car users, coach displayed the greatest distance from the other three means of public transport.

The typical non-car user and typical car user differ with regards to construct dimensions assigned to the transport modes. The non-car user linked positive construct dimensions such as ‘sociable’, ‘being driven’, ‘minimal responsibility’ and ‘being driven’ to bus, train and tram. By contrast, the typical car user identified negative attributes of public transport. The typical car user’s negative attributes appeared to be solely present on the left-hand side of the map, located close to public transport modes. This is less distinct for the typical non-car user: negative attributes tend to surround coach and car, solely positive attributes were located with active modes, train and tram.

Notably, the important construct dimensions ‘go where you want’, ‘go when you want’ and ‘own space’ were all located between active transport and the car in both PCA maps suggesting that all three modes were attributed those characteristics. Interesting too, the typical car user participant associated ‘fast’ with car whereas the non-car user construed ‘fast’ closer to the cluster of active transport modes.

Cognitive Complexity

For both groups, constructs were reduced to two components (x-axes and y-axes) that accounted for most of the variances. Table 3.8 shows details of variances explained across both participant groups from which the level of cognitive complexity can be inferred.

	NON-CAR			CAR		
	Component 1	Component 2	Total	Component 1	Component 2	Total
Average	**57.0**	**27.1**	**84.1**	**69.8**	**19.1**	**88.8**
Min	44.9	19.2	76.6	53.0	10.0	82.7
Max	69.3	39.8	91.6	85.0	31.0	95.0

Table 3.8 Minimum, maximum and average variance explained (%) by participants in the two groups

On average, components 1 and 2 explained 69.8% and 19.1%, respectively of the variance in car users' principal component maps. The maps produced by the non-car users were also dominated by two components, however, components 1 and 2 accounted for 57.0% and 27.1% on average. The higher percentage of variance accounted for by the first component indicated a tight construct system (Winter, 1992). Therefore, car users' construct system can be considered less complex than those of non-car users whose construal showed greater differentiation.

In summary then, analyses of means and PCA revealed differences in the relationship between constructs and travel modes for non-car users and car users (study 2 research question 4). Examples of two typical participants demonstrated what kind of constructs may be attributed to the different travel modes. Results showed that perceptions related to car differed greatly. In particular, costs were perceived differently between non-car users and car users. Ratings for constructs relating to reliability, speed and time flexibility also varied between the two groups. The findings also suggest that non-car users generally have more complex cognitive constructions of travel modes than car users.

3.5 Discussion

It is important to understand how individuals evaluate transport choices in order to effectively promote switching from car use to sustainable travel modes. We compared the evaluative spaces of two distinct user groups to identify psychological change targets for intervention planning. Analyses of 30 responses elicited by means of the Repertory Grid technique (RepGrid) explored the construction of seven travel modes for (1) non-car users (participants who primarily use non-car modes) and (2) car users (high mileage car drivers). We identified similarities and differences between how non-car users' and high-mileage car users' construe travel modes. Our

findings also suggest that non-car users have more complex cognitive constructions of travel modes compared to high-mileage car users.

3.5.1 General discussion

Our results revealed that non-car users and car users share perceptions of travel modes, i.e. both groups apply broadly similar constructs to evaluate transport modes. The RepGrid elicited a similar overall number of constructs across both groups and thematic analysis identified 25 common summary constructs (out of 28 in total). Unsurprisingly, the content of these constructs corresponded closely to transport-related beliefs and attitudes explored in previous studies (e.g. Bamberg & Schmidt, 2003; Mann & Abraham, 2006; Steg, 2005; Anable & Gatersleben, 2005) and to previous RepGrid travel mode research (e.g. Clauss & Döppe, 2016). Thus the categories of constructs identified provide a good representation of the construal space within which travellers perceive and judge transport modes. The idiographic RepGrid elicitation procedure, however, also revealed some constructs rarely identified in previous research, specifically, perceived responsibility for the journey and the level of maintenance required by the transport mode, with the former being central to perceptions of non-car users. Low responsibility and low maintenance requirements can be seen as aspects of the independence that non-car travel can provide and could be promoted in interventions designed to reduce car use.

Our results highlighted importance of trip length and suitability of travel modes to accommodate specific journey distances. This was particularly important for car users. This emphasises the need for a clear distinction between lengths of trip in future research to elucidate journey-specific change mechanisms (Hoffmann et al., 2017). Therefore, future research should differentiate more precisely between travel mode choice and journey type, particularly in relation to active travel modes. To date, many studies have failed to differentiate between walking and cycling (Ogilvie, Egan, Hamilton, & Petticrew, 2004; Saelens, Sallis, & Frank, 2003; Saelens et al., 2003).

Similarly, studies investigating motivations to use public transport have favoured combining several modes (Johansson, Heldt, & Johansson, 2006; Tyrinopoulos & Antoniou, 2013). Yet our typical non-car user and typical car user illustrated how distinct perceptions for different modes can be. This included, for example, positive connotations for train but negative perceptions of coach. Our examples support earlier findings that future studies would benefit from a more differentiated outcome measures (Hoffmann et al., 2017). Interventions that focus efforts on short trips that are walkable and cycleable have potential to increase use of active modes for car users. These are subjective and depend on the context. Intervention design adopting user engagement approaches could increase effectiveness of efforts aimed to promote walking and cycling for short journeys (Arnott et al., 2014).

To our surprise, no car user generated the construct ‘conveys status’ vs. ‘no status attached’ because previous research has identified status as an important intrinsic motive for car use (Jensen, 1999; Mann & Abraham, 2006). This could be explained in several ways. First, our sample reported a higher than average annual income and Beirão and Cabral (2007) suggest that people with *lower* income are more likely to attribute status to car ownership. Second, the need for status can be considered a “higher-order” or intrinsic motive (Reynolds & Gutman, 1988; Schaefers, 2013) that might not have been explored during our study. Finally, recent research suggests a change in perceptions of cars as status symbols, especially among young people (Bratzel, 2014; Delbosc & Currie, 2014; TNS, 2013) as traditional status symbols are being replaced by other representations of the self, especially using digital technology and social media (Barba, 2013). Non-car users attributed the lowest average *Importance* rating to “conveys status” construct so this may be a “lower-order” motive for this group. This may mean that car ownership is less important to identity and/or that it is less socially acceptable to identify in this way. This low need for status in relation to transport mode choice may be a key characteristic of those

willing to reduce or eschew car use. Moreover, the importance of social media to identity may make such media an ideal platform for interventions to reduce car use among young people to complement transport infrastructure developments. Further examination of these identity issues could optimise interventions to reduce car use.

The matrices produced from content analyses can indicate potentially effective intervention targets, but also which perceptions may *not* prompt behaviour change. For example, our analyses suggested high levels of awareness of environmental friendliness and benefits of physical activity across both groups. Both constructs were important for non-car users but not for car users. Consequently, attempts to reduce car use among high-mileage drives may *not* work well if they focus on raising awareness of environmental impacts or the benefits of physical activity. In contrast, time and route flexibility were central aspects in all participants' construct system. Analyses confirmed that those constructs are associated with both car and active transport modes by both groups. Thus, walking and cycling have potential to replace some car journeys that are subject to time uncertainty, particularly in highly-congested areas.

Our findings suggest that high-mileage drivers aggregate and generalise across non-car travel modes. This was evident by a generally looser cognitive construction of travel mode choices. However, the oversimplified cognitive construction is sensitive to individual experiences (Kelly, 1991). Interventions could aim to increase the complexity with which drivers view other modes hence foster greater awareness of distinct characteristics of non-car modes. Communicative strategies could draw upon constructs elicited from our non-car user participants. For instance, cycling may be fast, cheaper and more reliable than a car and provides easy access to traffic restricted areas. Likewise, using a train may be a less stressful journey that removes all responsibility of driving and paying attention. Interventions could, for example, promote free try-outs for public transport (Fujii & Kitamura, 2003) and take

advantage of opportunities to promote transport mode change when traffic is congested or disrupted (Brown, Werner, & Kim, 2003; Fujii, Gärling, & Kitamura, 2001).

Evaluating car use vis-à-vis non-car modes provided interesting insights. Both groups evaluated their own mode more favourable, suggesting that satisfaction of the personal travel experience is high and that important travel needs are satisfied for both groups. Car use was perceived inferior with regards to speed, cost and reliability by non-car users. This signifies considerable differences between the perceived performance of car on these attributes. Decreasing these discrepancies through interventions can offer opportunities to influence intentions to use alternative modes. Identifying underlying reasons for non-car users' negatively-valanced responses may help devising targeted strategies for influencing car users' perceptions.

Promoting non-car modes' unique features and advantages may also clarify their distinct utility in a portfolio of transport modes, rather than being a substitute for another travel mode. This can encourage multimodality, particularly in urban areas. Localised or personalised travel planning may also help to plan journeys more effectively by taking into account a wider range of accessible transport alternatives. Use of contemporary technology, e.g. travel smartphone apps, may be able to provide such personalised services (Shaheen, Cohen, & Martin, 2017; Wang & Fesenmaier, 2013). Transport service providers may also make use of traditional marketing tools to increase perceived benefits of using the relevant travel mode.

Promoting contact with non-car users and even occasional use of alternative modes may also challenge unhelpful stereotypes held by drivers. Drivers may see non-divers as more similar than they are, the so-called "outgroup homogeneity effect" (Judd, Ryan, & Park, 1991; Linville, Salovey, & Fischer, 1986; Park & Rothbart,

1982). Increasing familiarity and knowledge of non-car users may be important to promoting more unbiased perceptions and thereby prompt change processes (Pettigrew & Tropp, 2008). Community-based interventions could facilitate a dialogue through co-operative projects that work towards a common goal, important moderators of improving contact (Allport, 1954; Pettigrew & Tropp, 2008). For example, interventions involving community and local authorities empowering citizens to promote sustainable travel within the community have reported successful change (e.g. Exeter City Futures, Smart Oxford). Workplace-based interventions such as the TravelWise programme have succeeded in uptake of sustainable travel among employees through an increase in access to non-car users (Cairns et al., 2004). Similarly, cycle challenges (e.g. Love to Ride) have established themselves as a popular nation-wide virtual challenge to log bicycle journeys. Those programmes could be an important motivator to increased cycling but exact underlying mechanisms of this new tool remain to be explored.

The more monolithic perspective of car users may generate misconceptions concerning distinct attributes of different travel modes. For example, despite no considerable income differences between non-car users and car users, they greatly differed in how costs were rated. This confirms previous findings that car users often underestimate the total costs of car ownership and use (e.g. Gardner & Abraham, 2007) while our non-car users unanimously perceived car ownership as expensive. As suggested by Gardner and Abraham (2007) car costs could be made more transparent by being broken down to monthly-level or per-trip costs. Calculations taking into account depreciation, fuel and other running costs could facilitate more realistic evaluations. Again, smart technologies could fairly accurately predict journey costs based on personalised data and present such personalised data that could help drivers identify the real costs. Current financial discouragement for monthly payments of road tax (e.g. 5% surcharge in the UK) and car insurance may also be a hindrance to more accurate appraisals of motoring costs.

Finally, our typical car user demonstrated close relationships among constructs such as comfort, feelings of being in control and time and route flexibility, thus representing close links between instrumental and affective constructs. This echoes findings from Mann & Abraham (2006) who also suggested that affective constructs may be consequences of instrumental motives and vice versa. Our results may suggest, for instance, that the lack of route and time flexibility typical for public transport may be offset by increased comfort. This addresses often documented recommendations by research to increase comfort of public transport and in particular buses (e.g. Thomas et al., 2014).

3.5.2 Methodology

To our knowledge, this is the first study to compare non-car users' and car users' perceptions, taking into account a range of travel modes. Our study endorses the application of the RepGrid technique to the transport research (e.g. Clauss & Döppe, 2016; Skippon, 2014) as a useful method to elicit perceptions of distinct transport user groups in a structured manner. While the RepGrid is frequently analysed at an individual level, our study has demonstrated its usefulness in analysing group-level data and using this data to compare groups using both qualitative and quantitative analyses.

RepGrids may also be useful as a self-administered monitoring tool in personalised travel planning. Several web-based versions offer convenient and user-friendly interfaces (e.g. Webgrid). Similarly, RepGrids can be used in process evaluations of car use reduction interventions to explore changes in construct systems at individual and group levels (Fromm, 2004).

3.5.3 Limitations

Limitations of the RepGrid should also be noted. These include general limitations of qualitative research such as small sample sizes, which limit our ability to generalise across populations (Ritchie, Lewis, Elam, Tennant, & Rahim, 2013).

We sought to achieve both depth and variety in discussions. Participants were recruited from organisations which may lead participants to hold strong views about education, environmental protection and general transport choices (e.g. Universities, Green Party and Transport Research Laboratory). This may have resulted in increased motivation to participate in the study (self-selection bias) and some participants may be considered ‘outliers’, likely to skew results (Stewart et al., 1981). It can be argued that integration of outliers are an advantage in developing richness of evidence, demonstrating diversity of perceptions (Barbour, 2001). Similarly, travel mode user groups were not equal in relation to socio-demographic characteristics. This lack of cohesion amongst mode user groups meant that RepGrid interviews did not generate generalisable results but yielded broader data. Overall, however, our findings overlap with previous research, so we do not have reasons to believe that our participants differ significantly from other UK transport users. Further research that favours a more quantitative approach may elaborate on our findings using standardised RepGrids and bigger sample sizes. Heckmann & Bell (2016) propose a method of testing the statistical significance of constructs in cluster analysis within RepGrids.

The typical non-car user and typical car user provided a useful insight into the variability within general perceptions of travel modes. These examples cannot be said to provide a representative population-relevant model but their typicality does provide an indication of likely ways in which transport modes are viewed. Again, a more standardised approach to RepGrid elicitation with a bigger sample size may produce more generalisable and conclusive findings.

The sampling strategy was used to capture a wide range of views, not determined by geographically homogenous groups. However, this also implies that no inferences can be made about how views might be shaped by the respective transport environment. The sampling frame did not include accessibility to or previous knowledge of the transport modes discussed during the interview. Participants may have not or infrequently used particular modes, which may impact the extent of their perceptions about these. Indeed, investigating perceptions of a more homogeneous set of participants might remove some of the variability that geography, built environment and location can account for. Future research may recruit a sample with a shared destination, placing greater emphasis on underlying mode choice motivations for specific journeys.

Lastly, it should be acknowledged that perceptions alone may not sufficiently influence behaviour to achieve sustained travel behaviour change. Other determinants of mode choice such as habits, intentions, normative influences and self-efficacy, have been shown to predict car use behaviour (Hoffmann et al., 2017). Moreover, the conversational nature of RepGrid elicitation encouraged participant to reflect on their choices. It is also unclear if the same level of deliberation is applied in real choice scenarios. Nevertheless, we suggest findings presented here can be used to underpin fragments of wider applications of behaviour change principles in car use reduction interventions.

3.6 Conclusion

The study shows that non-car users and high-mileage car users apply broadly similar constructs to evaluate transport choices. The groups differ, however, in relation to the structure of construct systems. The research also found that car users have less complex perceptual representations of travel modes.

Recommendations for future research include the use of more disaggregated outcome measures for public transport modes and separation of walking and cycling as well as greater specificity of the length and purpose of journey. Continued investigation of different mode user groups, taking into account a range of travel modes, can highlight potentially effective and ineffective intervention targets. The study suggests further application of the Repertory Grid methodology, suitable for specific localised research aims, or for a wider population. Opportunities for self-administration of RepGrids also offers opportunities for the evaluation of interventions.

Implications for policy include, noting that interventions targeting environmental concern and concerns about health and physical activity may not be successful in changing behaviour of high mileage drivers. Creative approaches to promote distinct benefits of non-car modes, in particular walking and cycling, are necessary. Promotional campaigns highlighting key perceptions of time and route flexibility have the potential to shift short journeys from car use to use of active modes. Communicative strategies might also draw upon perceptions identified amongst non-car users, such as removal of responsibility and cost-effectiveness. Community-based and workplace-based interventions can enhance contact between car users and non-car users to overcome misconceptions particularly related to costs, speed, reliability and responsibilities in relation to driving. Change of road tax and car insurance pricing policies may also highlight true costs of cars.

Chapter 4 Ambivalent about travel mode choice? A qualitative investigation of car user and non-car user attitudes[4]

4.1 Abstract

Attitudes towards travel mode choice have been regarded as bi-polar evaluations of travel options that remain stable across time and context. Intra-personal attitudes can be variable, becoming more or less salient and changing in strength or valence across decisional contexts. This study draws on theoretical underpinnings of attitudinal ambivalence, which proposes that a person can hold two-dimensional (negative and positive) evaluations about one attitude object simultaneously. The present research aimed to explore attitudinal ambivalence in relation to travel modes and examine the variability of attitudes in different contexts. Thirty semi-structured interviews explored above-average mileage car users' (*n*=15) and non-car users' (*n*=15) experiences of attitudinal ambivalence in relation to various transport modes and under which circumstances. Thematic analysis found support for attitudinal ambivalence and context-dependent attitude variability in relation to travel mode evaluations. Analyses also identified 47 independent dimensions of convenience evident in above-average mileage car users' and non-car users' responses. Discussions of an a priori questionnaire confirmed the malleability of transport-relevant attitudes. Transport-relevant attitudes are complex and ambivalent. Attitudinal ambivalence and context-dependent attitude variability has implications

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for transport research design, interventions targeting travel-related attitudes and policies aimed to reduce single-occupancy driving.

4.2 Background

Overreliance on automobiles is a global concern, negatively affecting human and environmental health. Personal car use is a major contributor to overall greenhouse gasses emitted by transport and thereby aggravating negative impacts of car use on respiratory and cardiovascular health and on global climate. A substantial reduction in pollution levels is essential to avoid several million premature deaths (WHO, 2014) and to slow global warming (Apte, Marshall, Cohen, & Brauer, 2015). Reducing car journeys by providing sustainable transportation has the potential to bring about positive change for both environment and populations. Consequently, car use reduction interventions are central to local and national policy. Often, such interventions draw on findings from social-psychological research to inform behaviour change strategies. A substantial body of literature has investigated motivations (not) to drive and attitudes have been assigned an important role in influencing behaviour through intentions (Gardner & Abraham, 2010; Gaymer, 2005). Nonetheless, discrepancies between stated beliefs and actions have been noted (Mairesse, Macharis, Lebeau & Turcksin, 2012). Meta-analytic evidence indicates moderate effect sizes between attitudes and car use, attributing the weak link to several moderators (Armitage & Christian, 2003). This lack of correspondence is often labelled “Value-Action Gap” (Blake, 1999), and highlights that attitudes can be are “negotiated, transitory, and sometimes contradictory” (p. 265). More research is needed to better understand this complexity because dependence on personal vehicles persists and cars remain the dominant mode of transport worldwide, highlighting that our understanding of travel choices and attitudes is incomplete.

Attempts to improve the attitude-behaviour relationship have been made. Psychological transport research has investigated attitudinal variability *between* individuals (inter-personal variability) employing quantitative cluster techniques based on, lifestyle (Van Acker, 2015), attitudinal factors (Anable, 2005) or

preferences (Anable & Wright, 2013). This approach has been useful in recommending tailoring of car use reduction interventions to the population segments most likely to be susceptible to particular messages. A few qualitative studies have focused on inter-personal variability of attitudes in relation to contextual changes. Lo et al. (2016), for example, investigated the variability of mode choice evaluations among employees in different geographical settings (high vs. less populated areas) and different sectors (public vs. private organisations). Attitude changes in relation to life changes have also been found. For example, small shifts in driving patterns have been observed during the transition to parenthood (Taubman - Ben-Ari & Noy, 2011) and changes in perceptions of driving noted in transition to old age (Mollenkopf, Hieber, & Wahl, 2011) and from teenage to adulthood (Underwood, Handy, Paterniti, & Lee, 2014). However, many of these qualitative studies focus on only one travel mode such as cycling and walking (e.g. Chatterjee, Sherwin, & Jain, 2013; Jones & Ogilvie, 2012; Underwood et al., 2014), or just driving (e.g. Taubman - Ben-Ari & Noy, 2011) or bus use (e.g. Beirão & Cabral, 2007; Guiver, 2007). It would be informative to study variability in transportation attitudes in relation to a range of transport modes to obtain a holistic picture of evaluations underpinning travel mode choice, not least due to the widespread potential for substitutability across options.

Less emphasis has been placed on the variability of transport mode use attitudes *within* individuals (intra-personal variability). Economic methods addressed this shortcoming by investigating personal multi-modality (e.g Heinen & Chatterjee, 2015; Nobis, 2007), destination variability (e.g. Buliung, Roorda, & Remmel, 2008) and perhaps more importantly time and activity pattern variation (e.g. Van, Choocharukul, & Fujii, 2014). Intra-personal attitude variability may also be explained by psychological processes, e.g. evaluative inconsistencies, commonly referred to as attitudinal ambivalence (Cacioppo & Berntson, 1994). Researchers generally agree

in the definition of attitudinal ambivalence in that it is a “state in which a person holds mixed feelings (positive and negative) towards some psychological object” (P. Gardner, 1987, p. 241). Attitudinal ambivalence supports a proposed two-dimesional structure of attitudes (M. M. Thompson, Zanna & Griffin, 1995) that re-conceptualises attitudes as unstable, implying that attitudes may be weaker and less robust over time and context (Armitage & Conner, 2000; Petty & Krosnik, 1995). Guiver (2007), for instance, found that people simultaneouly hold negative and positive attitudes towards bus use. Similarly, research by Hagman (2003) focused on how drivers present arguments for and against car use. Attitudinal ambivalence may also occur between cognitions (e.g. Eagly & Chaiken, 1998; Holbrook & Krosnick, 2005) and has been described as “conflicting attitudes towards multiple attributes of an object” (Baek, 2010, p. 614). To revisit Baek’s example, voters may feel ambivalent about presidential performance if they regard domestic economy and security as very important, however, hold positive attitudes towards one (presidential candidate’s economic policies are good) but negative towards the other (candidate is bad at handling national security). Final evaluations are subject to external influences, such as media messages (Baek, 2010).

Intra-personal attitudinal variability in travel mode choices may also be prompted by changes over time and context (henceforth referred to as “context-depent attitude variability”). While research has acknowledged the contextual sensitivity of transport choice (Gray, Farrington, Shaw, Martin, & Roberts, 2001; Jones & Ogilvie, 2012; Lejoux & Raux, 2012; Lo, van Breukelen, Peters, & Kok, 2013), less is known about how various circumstances during a day, month or year, may influence individuals’ travel attitudes and choices. For example, a person may perceive driving as favourable option because a car can provide a comfortable and relaxed journey, but might change her/his evaluation in view of congestion resulting in stressful journeys. It has recently been argued that individual context changes should inform studies of mobility (Chatterjee, Clark, & Bartle, 2016; Hanson, 2010; Wang, 2015).

To date, transport research has traditionally conceptualised attitudes as stable structures across time and situation. This is seen in assessments of attitudes towards travel modes as being either positive or negative evaluations measured on bi-polar scales. Uni-dimensional scales of attitude measurement may be insufficient to identify such important mixed opinions and may therefore falsely portray ambivalent attitudes as neutral (Schneider & Schwarz, 2017). Perhaps it is more realistic, however, to view transport evaluations as multi-faceted and changeable as opposed to static evaluations.

4.2.1 The present study

We hypothesised that intra-personal attitudes underpinning transport mode choices are ambivalent and variable, incorporating many, and potentially conflicting, evaluations of the same attitude action, both positive and negative. It is further proposed that shifts in evaluations are context-dependent, according to both psychological and physical changes in situational and elicitation context. If a train is delayed, for instance, the person's attitude about public transport reliability may be more salient than when the train is on time. No current framework or theory explains a) which transport-relevant attitudes are ambivalent and b) under which circumstances evaluations are most likely to be variable. The current study threfore attempted to explore these issues by addressing the following aims:

1. Investigate participant's awareness and experiences of attitudinal ambivalence in relation to travel mode choice
2. Explore and explain context-dependent attitudinal variability and identify specific evaluation contexts
3. Identify potential differences between individuals in such attitudinal ambivalence and context-dependent attitudinal variability

4.3 Methods

4.3.1 Recruitment and participants

This study was an extension of the previous RepGrid study and used the same participants recruited for Study 2 (Chapter 3). Participants were recruited in three different geographical areas of the UK to facilitate collection of variable views and avoid sampling those with similar attitudes based on a specific transport infrastructure. Individuals were approached face-to-face, through e-mail invitation, digital newsletter advertisements or social media posts at two UK Universities, a local UK Green Party and at the UK Transport Research Laboratory.

Inclusion criteria specified in the recruitment adverts were (1) being a "non-car user", *or* (2) being an "above-average mileage car user"[5] (henceforth abbreviated to "car-user"). Participants were then selected to create two distinct groups: (1) "a regular public transport/active mode user over the last three years who purposely does not use a car", or (2) "a frequent car driver with an annual mileage of approximately 9,000 miles over the last three years.

Participants were offered entry into a prize draw for one £100 shopping voucher. All participant consented to recording the interview. Audio recordings were transcribed verbatim. Transcripts were edited to replace names with participant IDs (e.g. P3) and to replace any information that might allow personal identification, so ensuring anonymity.

In total, 15 non-car users and 15 car users were recruited. Participants were aged 22 – 64 years (M = 39.73, SD = 12.23) and all had a driver's license and access to a car. The sample was well-educated with the majority of participants holding a

[5] The average annual mileage of a UK driver was estimated to be 7,000 miles (DfT, 2013). We defined above-average car users as those driving 30% more than the average UK driver.

postgraduate degree (*n*=21, 70%) of which twelve (40%) had a PhD. All participants were in employment, working in managerial (*n*=5, 17%), professional (*n*=10, 33%) or scientific/academic (*n*=13, 43%) occupations or in education (*n*=2, 7%). One third (*n*=9, 30%) reported an income between £20,000 and £29,999 with five (17%) earning less than £20,000. The sample was acceptably representative in relation to UK gender distribution (47% female) and residence location (73% urban) (Office for National Statistics, 2011). Participants' socio-demographic details can be found in Appendix C, Section C.1, Table C.2.

4.3.2 Data collection

This study employed two forms of data collection. A short, 30-item pre-interview questionnaire was administered to participants two weeks before they were interviewed. Questions assessed beliefs, attitudes and motivations in relation to car use, public transport use and environmental protection. Items were based on previously validated questionnaires (Anable, 2005; Skippon & Garwood, 2011). All questions employed 5-point Likert response scales with "Strongly Disagree" and "Strongly Agree" as anchor points and an additional "Don't know" option. The questionnaire also included demographic items that allowed characterisation of the sample. The complete participant questionnaire can be found in Appendix C, Section C.1, Table C.1. After the interview, participants were invited to reflect on the reasons for their responses to the survey and consider the variability of their evaluations.

Following the Repertory Grid task which provided data for Study 2 (Chapter 3), semi-structured, open-ended interviews were lasting approximately 45 minutes were conducted. Interviews commenced by participants describing their most frequent journey, listing aspects they like and dislike about it. During the interviews, participants were also invited to talk about their experiences of different transport modes, thereby reflecting on negative as well as positive evaluations. For instance,

P28 noted: “I like that it [commute by car] is usually fairly smooth, […] there is hardly any traffic […] but it can be stressful sometimes.”. The interviewer then prompted individuals to think about situations in which those evaluations occurred, e.g. “when is a car journey stressful?” and also asked, e.g. “when is it important to have relaxed journeys?”. A laddering technique (Reynolds and Gutman, 1988), using follow up questions such as “Why…?”, was used in order to elicit more reflective explanations of transport decisions. This allowed exploration of the relationship between expressed attitudes and core values or key goal that may underpin people’s choices (Gutman, 1981). An additional question was added to the interview guide to capture participants’ views on convenience/inconvenience of transport modes. Specifically, differing interpretations of convenience evident in the first five interviews led us to ask all other interviewees, “What does convenience mean to you?” This allowed us to explore the multifacetedness of “convenience/inconvenience”. Lastly, pre-interview questionnaires were discussed, lasting approximately 15 minutes. Thereby, the interviewer selected responses (a) which conflicted with statements made during the interview or (b) to which participants have expressed ambivalent attitudes.

4.3.3 Thematic analysis

Inductive qualitative thematic analysis was conducted as described by Braun and Clarke (2006). Analysis was conducted separately for non-car users and car users. First, the lead author read and re-read all transcripts to familiarise with their content. During this process, initial ideas were noted down to support subsequent coding. Second, transcripts were coded in a systematic way. Thus, the lead author employed a data-driven approach where interesting relevant segments of the data were assigned to the initial codes. This stage helped to broadly organise the responses. Third, repeated patterns in the data were identified and summarised into broader themes. Thematic maps were produced and discussed with the second author to ensure clarity of definition and coherence of overall thematic organisation. Mind

maps were used to identify relationships and hierarchies between the initial codes. Fourth, the themes were reviewed several times until satisfactory match of themes to the initial codes was achieved.

4.4 Results

Thematic analysis revealed three overarching themes demonstrating intra-personal variability and general complexity of travel mode choice perceptions. Analysis identified attitudinal ambivalence (Study 3 reseach question 1) and context-dependent attitude variability (Study 3 reseach question 2) in relation to several transport modes. “Multi-facetedness of convenience” evolved as additional theme, independent from the research questions. Each theme consists of sub-themes highlighting specific beliefs and illustrating contexts in which attitude variability occurred and whether there were differences between non-car users and car users (Study 3 research question 3). All quotes to support our findings can be found in Appendix C, Sections C.2 – C.3. Below we use quotes from 27 participants which best represented the evidence, but the complete dataset reveals that quotes from all 30 participants were used to derive the final thematic map.

4.4.1 Attitudinal ambivalence

Attitudinal ambivalence was common in both participant groups and referred to cases where attributes of the same travel mode are evaluated differently, thus both positive and negative evaluations occurred simultaneously. Analysis revealed six sub-themes of transport-relevant attitudes for which participants showed inconsistent evaluations. Positive and negative evaluations of particular transport modes were frequently discussed in relation to different contexts.

Cost

Non-car user and car user participants expressed uncertainty about running costs of a car and discussed situations in which car travel can be the cheapest and the more expensive option.

> "For certain things it [the car] is more expensive. For certain things it isn't."
> (P18, non-car user)

Car users described situations in which they become more aware of related expenses, such as refilling of petrol or yearly MOT costs, as illustrated in the following quotes.

"I don't actually know how much it compares to the cost of travelling by train but I think [the car] is definitely cheaper"
(P1, car user)

"Cars are expensive things to run. […] I am trying to save up for a house […] and I feel quite guilty about having to fill up my car all the time and taking the money out of our savings for that. […] When it hurts the most is generally when I have to take my car off to MOT. I can't actually remember an MOT it's passed […] that's always quite expensive."
(P1, car user)

Non-car users viewed cars as generally expensive but also agreed that car travel as was cheaper when travelling in a group.

Many participants discussed cost of the car in relation to costs of other modes, most frequently train travel. Respondents tried to determine cost-per-mile and cost-per-journey. Unclear and varying train journey prices proved difficult for interviewees to make comparisons to car costs, leading to inconsistent evaluations.

> "When I was saying more expensive, I was talking more about the keeping of a car as opposed to the price per mile. I'm sure that if you work it out, trains and buses are probably not that far different in terms of price of a ticket, especially the peak hour ticket to the price per mile if you drove. But you add onto that your insurance, your road tax, all of that and the maintenance and things, it makes it more expensive"
> (P3, car user)

Safety

Non-car user and car user participants also discussed negative and positive aspects of safety in relation to cars and bicycles. Deliberations of safety revealed that the personal vehicle was seen as both safe and dangerous.

> "I can see that the safety [issues] are there but there is always that thought as well: 'Well, I am a good driver so it's less likely to happen to me'."
> (P3, car user)

> "I suppose when you look at the figures, pretty much any form of transport is safer than the car. […] I feel as safe on buses and trains as I do in my own car."
> (P3, car user)

Concerns about safety increased when discussing long journeys which involved high-speed motorway routes. Driving was also seen as unsafe at night and in severe weather conditions.

> "Potentially tiredness, being distracted, not focussing, not paying attention to what's going on around you. […] It's important because if you're distracted and you don't pay attention, certainly on the motorway."
> (P1, car user)

Overall, cycling was considered dangerous by both groups who felt that cyclists are more vulnerable road users. Participants acknowledged that this is due to collisions with other road users. Nonetheless, cycling can be safe in certain environments, e.g. off-road and on segregated cycle paths.

> "I've always felt more secure on a bike than in a car. Because, essentially, I think it's like an extension of my own body rather than something that is just a shell where I press buttons."
> (P14, non-car user)

> "But on the other hand, there is the vulnerability aspect. Because in the car, you are so cushioned and protected from weather, from other drivers, from pedestrians, cyclists, noise."
> (P14, non-car user)

> "When you are riding a bike or [are] walking and you are just going across one of the parks in London, it's perfectly safe. But if you needed to commute from one side of

> London to the other on a bike, it's probably quite risky."
> (P6, car user)

Less frequently, interviewees compared safety levels of the car and the bike to public transport and viewed the latter as generally safest.

> "Public transport especially trains, aeroplanes that sort of thing remove a lot of the variables so intrinsically they're safer."
> (P11, car user)

> "The train feels safer as a mode of transport."
> (P12, non-car user)

Being the driver

Participants presented arguments for and against being the driver or passenger in a car. Car users and non-car users liked driving *per se*. References were made to well-documented concepts of enjoyment of driving on an open road and being in control of a vehicle. At the same time, participants expressed positive emotions towards being driven. Being able to see "what's going on around you" (P29, car user) and to enjoy the countryside were aspects mentioned by participants in both groups. Fewer car users also mentioned removed responsibility as a driver in form of "not having to concentrate" and concerns about safety when driving other passengers.

> "I don't like being driven. If I go anywhere, I like to be the person that's doing the driving."
> (P1, car user)

> "I suppose there is an aspect of being driven that where you get to look around and you get to see what's going on. When you are driving you don't because you are concentrating on the road in front of you"
> (P1, car user)

For non-car users, not driving and the ability to perform other tasks, e.g. reading a book or enjoying the landscape, was important while this aspect was mentioned by

car users only in connection with business travel, i.e. being able to work on the train. However, participants' accounts of enjoyment of public transport journeys were highly dependent on the nature of the journey. A train journey for leisure, for example, was seen as a relaxing and enjoyable form of transport for long distances. Commuting train journeys were seen as a means to an end and evaluated negatively, highlighting the unpleasantness of monotonous and over-crowded journeys. Respondents also preferred being driven after alcohol use and mentioned particular social situations such as "Friday after work drinks" and Christmas parties.

New and unknown journeys, when responsibility for navigation increases, also led to negative evaluations of driving.

> "I suppose equally with that is that you have the pressure of having to navigate in the car when it's somewhere you don't know. I think the car is good when it's sort of in your local area. When you are having to go somewhere else then it's up to you to kind of find your way whereas the bus and tram will go where you expect them to go." (P8, car-user)

Comfort

Closely linked to responsibility for driving, (dis)comfort was most often discussed in relation to public transport, especially bus travel. The majority of participants mentioned common perceptions of lack of control over temperature and personal space. Discussions revealed that these were mostly experiences during peak hours and commuting times. Participants frequently revealed comfort of train travel for longer journeys and trips during off-peak times.

> "When it's absolutely packed to the gunnels and you can't sit down, it's not very comfortable and pleasant. […] There's usually not a seat because I'm usually

> "The train is much more relaxing. So, there are a lot of other things I can do on a train I couldn't do in a car." (P12, non-car user)

doing it in commuting times”
(P12, non-car user)

“[It is unpleasant] when you are on the bus and it’s chucking down with rain and it’s soaking wet and you’ve got people sitting wet and it’s steaming wet.
(P10, car user)

“I mean the bus is quite nice, occasionally. If it’s like a nice sunny day and you are not in a rush. If you don’t have to get anywhere at a certain time and it’s not rush hour. If you are just out for a nice pleasant journey its quite nice sitting on the bus or the train.”
(P10, car user)

A common perception was that car travel offers the highest levels of control of the personal environment and personal space. Some of these aspects were also assessed negatively by car user participants.

“The car is about comfort and having your radio on and that sort of thing”
(P5, car user)

“Generally, [when commuting by motorcycle] I usually get here a lot happier. Mainly because I haven’t listened to the news and got depressed by that. Because […] on a [motor]bike, I don’t have any form of radio or music or anything like that because I want to hear what’s going on around me.”
(P5, car user)

“[…] you can turn the radio up as loud as you want, and you control the temperature. […] you are just more aware of other people around you when you’re in a public space and you know can’t really talk to yourself”
(P4, non-car user)

“Especially when you’ve been in the car on your own or whatever it’s nice to be around other people and rant about your day.”
(P4, non-car user)

High levels of comfort were closely linked to a relaxed journey. Respondents evaluated car travel as generally relaxing. Further discussions revealed that this feeling of being relaxed was often compromised by traffic situations and heavy congestion. Participants frequently described situations in which “being stuck” in

traffic or being “at the mercy of other people doing silly things” (P13, non-car user) resulted in stressful and frustrating journeys.

“I enjoy listening to the radio in the car, that’s quite relaxing. So, I generally don’t get too stressed, sometimes a little”
(P30, car user)

“it can end up not quite so relaxed when you get there, because if you’ve had people sort of cutting you up on the way.”
(P30, car user)

“I can see situations where public transport would make people stressed out. Not that I’m saying that cars are any different. They make people stressed out as well, if not more so on occasion.”
(P3, car user)

“Really frustrating. Being stuck on a national express bus and missing my flight home. That was the biggest frustration ever. I mean that is true for getting stuck in traffic in a car as well so maybe it’s not fair to use that. Whether I’m in a car or bus or train, that is the most frustrating moment.
(P17, non-car user)

Speed

Speed was evaluated inconsistently for all travel modes. Participants described several situations in which different modes were described as faster depending on context.

“Walking and cycling are, depending on where you are going and how long your journey is, slower”
(P19, car user)

“Getting around the city, walking and cycling are a lot quicker.”
(P19, car user)

“[The train] is obviously a lot faster getting into [the city]”
(P24, car user)

“To get [to work] using the train it would take about an hour and three quarters […]. So it’s considerably longer.”
(P24, car user)

> "Bikes and walking are pretty efficient, they are not fast necessarily, or well… bikes can be quite fast. […] It's [bike] the quickest mode of transport. […] the bus is actually the very slowest option. […] Walking is always slow, but it depends what I am trying to do. I mean, I do long-distance walks and I really like it."
> (P12, non-car mode)

Congestion and traffic situations determined evaluations of journey speed and predictability. Participants often referred to specific times of the day, week or year when disruptions were predictably likely.

> "Generally, bikes are quicker in Central London. And perhaps even walking […] In rush hour a bike is probably quicker than a car."
> (P18, non-car user)

> "On the weekend, the traffic into [UK city] is an absolute nightmare. So, although it might seem like a long journey, it takes me 20 minutes on the bus. It takes me 27 minutes on the train. To drive would be about the same if I had a clear run and invariably, you won't get a clear run into Bath in the car. So actually, public transport in that instance is a lot more sensible because it is quicker."
> (P6, car user)

Preference and importance of a quick journey was variable and depending on the time sensitivity of activities. Whereas time efficiency mattered for journeys relating to the commute and for work, speed was less important for leisure trips and visits to see family or friends.

> "If I'm travelling on holiday or if I'm on my way to, let's say, […] to see my sister in [*city*], I know it's going to take me the whole day to get there. So, it doesn't matter if it takes a couple of hours if I get a very simple journey at a cheaper cost."
> (P7, car user)

> "I don't need to go everywhere fast. But if I'm trying to achieve something and I've got a time limit, then I do.
> (P16, non-car user)

> "[Quick journeys are important] when I've got an appointment or when I need to get to work. I would always imagine the train to be quickest. But it also depends on the journey obviously."
> (P13, non-car user)

Not all leisure journeys were time insensitive. Five participants also highlighted situations in which travel time efficiency matters.

> "If I've got loads of stuff to do and I can't afford spending too much time on travel. And strangely enough it's whenever I'm not working that it bothers me to spend too much time on transport because I can't see my friends."
> (P2, non-car user)

> "If I'm travelling at weekends, it's usually to go and do some form of scuba diving or something where I need to be able to control the times. I get there because of tides and that sort of thing, or when the boats are going to go."
> (P5, car user)

Flexibility

Flexibility was important for all participants and entailed concepts of being able to go wherever and whenever. This also implied certain predictability and independence of travel modes. Car users valued the door-to-door capacity of a personal vehicle and their perceived independence. Both groups, however, noted situations in which flexibility of cars was restricted, e.g. traffic conditions and the need to plan ahead for unknown and long journeys.

> "[I like the] convenience and flexibility of being able to come and go as I need or want by having the car"
> (P6, car user)

> "I wouldn't necessarily find it easy taking a car and travelling [a long way] because of the time it takes to drive and try to plan all the different road conditions."
> (P6, car user)

Car users and non-car users felt constrained by having to fit into timetables and routes of public transport. However, some respondents noted that "good" public transport system offers flexibility through frequent services and highlighted general satisfaction with tram systems.

> "The car gives more freedom. Unless it's very, very heavily congested through traffic jams. […] I don't have to stick to schedules, I don't have to make changes to get somewhere. I don't need to wait half an hour, an hour, changing from one bus to the other, from one train to the other. If you want to go to one place, you might not have the option to go there by train or bus. Or you might have an option where it would take 3 h while the car would take only half an hour."
> (P15, non-car user)

> "Having a dense public transport network so you don't have to care about timings [gives you more freedom]. So, if you have a bus every 5 minutes then you don't have to have car. You go down and you have to wait maximum 5 minutes."
> (P15, non-car user)

Sometimes, the flexibility of cycling was limited by lack of cycle paths and the dominance of cars on roads. Some respondents also saw requirements of route planning as restrictive since "you need to know where you are going, you need to choose the routes and make sure it's not full of traffic, it's not full of hills, you are not going to run into someone, block someone's way." (P14, non-car user). Participants who primarily cycled complained about urban design mainly considering car users which restricts access by bike.

> "Just trying to get out of my front door with the bicycle can be really difficult because the cars are parked that much apart [indicating very small spaces] from each other. It's just really crowded […]."
> (P16, non-car user)

Participants agreed that walking offers the highest level of flexibility and control through the ease of "put[ting] on your coat and shoes and […] just walk out the door" (P13, non-car user).

4.4.2 Context-dependent attitude variability

Context-dependent attitude variability was identified for non-car users and car-user and highlights instances when the overall evaluation of the transport mode changes depending on the context. Differences between the groups were found within the

three sub-themes which highlight how preferences for a particular travel mode varied across decision contexts. Psychological and physical changes were found to prompt changes in priorities, showing that transport choices were often the result of "trade-offs" of various advantages and disadvantages.

Cost & Time

All participants considered cost and time efficiency to be important in their mode decisions. Participants often found themselves in discussion about cost outweighing time and vice versa.

> "There is a certain amount of my own convenience. But the primary considerations are time and cost and it depends on what I'm doing as to which is the more important."
> (P7, car user)

Cost and time implications were rarely considered in isolation. Interviews revealed a range of other influencing factors. The most common were comfort or aspects of perceived convenience, ease of the journey and, for non-car users, levels of exercise.

> "If I take the bus, compared to walking, it's a 10-minute difference and that is worth the fun. It's much cheaper as actually it's very expensive for a single ticket. So, I am willing to pay 10 minutes of my time for exercise, not paying for the bus."
> (P15, non-car user)

> "It's a combination of the convenience and the cost. I don't think the costs are excessive using a car. Its putting multiple factors together rather than just one factor outweighs the other."
> (P6, car user)

Evaluations were also dependent on purpose of travel: "the pay-off between cost and time changes depending on what it is I am doing" (P24, car user). Travel for work was mentioned repeatedly by car users who judged value of time differently in a business context.

> "To a certain extent, depends if it's private or work. If I can save money when I am travelling myself, I am willing to spend more time. If it's for work, I would reduce reasonable amount of time for reasonable amount of cost. Only saving £10 for an extra half an hour is not worth is. I think the primary thing is time and convenience to a certain extent. If I was travelling [a long way] on my own in my own time, I would have probably take the train, because of the less hassle and quite probably cheaper even though it took physically more time but just the idea of getting on at one end and getting off at the other…"
> (P30, car user)

> "I'm going to a conference in [a UK city] and work is going to pay for the train for me, so I'll probably go by train, because I'm by myself and can get a taxi from the train station rather than navigate myself to [the city] on my own by car. Whereas, if I was having to pay for myself to go to [the same city], then I'd drive. Because it would cost me more on the train fares than it will on petrol."
> (P19, car user)

Physical activity & Pro-environment

Two themes emerged separately for non-car users. Fitness and environmental reasons were strong motivators for this group to use non-car modes, the former being the more stable incentive. However, three non-car participants mentioned situations in which perceptions of comfort conflicted with the perceived benefits of exercise.

> "If I was visiting my friend who just moved [a good distance away], it's whether I cycle to the station, catch the train and cycle at the other end or get in the car and drive there, I know what I'd rather do. But I'd feel better at the end of the day if I'd done the cycle and the train ride because I've done some exercise and managed to do it without the car. But if someone said it doesn't matter which mode, then I would take the car because its comfortable, it's easy".
> (P17, non-car user)

A range of competing influences made participants reconsider the importance of environmentally friendliness. Non-car users' intention to use pro-environmental modes of transport was most often influenced when there was a large difference in journey costs.

> "For example, the meeting we have got in [a city a long way away] next week, we have to go by plane which is obviously not the most environmentally friendly, but it costs £60 to go by plane and it takes an hour each way. The other option is a train that would cost £160 (if not £200) and we would have to pay an extra one or two nights in the hotel because of how much that would add on to the journey. So, you… know when you are getting a plane up to the other side of the country that it's not great for the environment, but when it's the easiest and the most affordable, it seems like it takes the decision out of it."
> (P4, non-car user)

Less often, enjoyment of driving was also mentioned by non-car users, conflicting with pro-environmental evaluations.

> "Believe it or not for someone who's just said all those green things, I genuinely like cars. I think they're fun. […] I actually like being a single person in my car. I love driving. I didn't learn to drive until my mid-20ies and it felt like a very liberating experience. However, I am very conscious when I'm alone in my car that that's the least efficient way to travel for the environment."
> (P12, non-car user)

Walking and cycling were seen as the "greenest" way to travel. Whilst participants acknowledged general efficiency of public transport, low levels of comfort and unreliability often overruled perceptions of green travel.

> "I suppose sometimes that it can be annoying, and you're not always guaranteed a seat and if you've got quite a lot of stuff with you… Either you are annoying people or… you know, it's difficult to sometimes. But obviously it makes it more environmentally friendly because you are saving energy and things like that by using public transport. I think you just never really know who you sit next to and whether that's going to be a pleasant experience or not."
> (P4, non-car user)

> "There are so many buses it's just almost impossible [to work out timetables and routes]. And they are always late. And the train is always delayed … As good as it [public transport] is, you kind of can't help but see the drawbacks as well at the same time."
> (P2, non-car user)

The interviews also revealed unique personal situations, as P18 described the reasons for accepting a longer school run by car following a separation from his partner:

> My daughter came to live with me that was quite disruptive. School was stable, we wanted to keep that stable. Removing her from school would, I think, would have been a bad idea. So, all I've said about how important environment is, actually it came second for her stability in school and everything."
> (P18, non-car user)

Freedom

Car users' perceived freedom offered by a private vehicle was in conflict with unpredictability of traffic situations and restrictions. Car users and non-car users discussed the benefits of being in control of the journey, "you can go whenever, wherever" (P23, car user) whilst highlighting restrictions through traffic. For example, anticipating congestion led participants to leave home earlier for work. Uncertainty of parking availability was also a common factor compromising the door-to-door ability.

> "With the car, I guess, it's just that sort of freedom, you go the routes that you have selected. Obviously with the number of roads there are, you can go … directly and… exactly your destination. Although, it then depends on things like parking and whether you can actually park there. And obviously, on the road you have to deal with other cars, traffic, roundabouts. Lots of other different things like roadworks and that kind of influence."
> (P9, car user)

Public transport was typically seen as restrictive by both groups, stating that times and routes are prescribed and sometimes unpredictable. However, some non-car users valued the removed responsibility when *not* being in control of the journey.

> "Like with public transport, it can be completely frequent or infrequent… They only take you to certain places, so you don't have as much freedom as using a car… A car is ultimately freedom but then there is lot of responsibility with that. Owning it and paying for it. Making sure it doesn't get stolen. You have to maintain it, you have to park it somewhere and have to pay for it. With public transport you just get on and off and you don't have to worry about it after that. But then, sort of contrary to what I said, there is also freedom in travelling by public transport in the way that… you are not the one driving and you can relax and like enjoy the commute more than you might if you were driving."
> (P21, non-car user)

Interestingly, non-car users felt that freedom of walking and cycling was a primary benefit of choosing their mode: “I personally feel much more freedom on the bike than in a car” (P15, non-car user).

4.4.3 Multi-facetedness of convenience

Analysis revealed convenience to be an ambiguous and multi-faceted concept for all participants. This emerged as an additional theme, independent from the research questions.

Quotes explicitly describing (in)convenience in general and in relation to specific travel modes were elicited from 27 participants (15 car users and 12 non-car users). Overall, analyses revealed 42 unique dimensions of (in)convenience across seven different travel modes. Table 4.1 shows a summary of the wide range of aspects of (in)convenience, separately for different mode types. Inconvenient aspects of cycling and walking (active modes) were seldom elicited. Buses and trains (public transport) demonstrate the highest number of aspects of inconvenience and convenience. A comprehensive list and quotes by participants referring to aspects of convenience can be found in Appendix C, Section C.4.

	Car	Public transport	Active modes
Convenience	• Time flexibility • Route flexibility • Time efficient • Door-to-door • Transport capacity • Easy journey chaining • Travel in big groups • Safety • Relaxing journey • For longer journeys	• Frequent services • For longer journeys • In close proximity • Time efficient (on time) • Being driven • No or limited number of changes • No multi-modal travel • Cost-effective • WIFI availability • Able to do something else • Relaxing journey • Travel in big groups • No responsibility	• Time flexibility • Route flexibility • Reliability • No planning needed • Predictability • Door-to-door • Quick • High level of control
Inconvenience	• Parking difficulties • Safety • Break downs • Congestion • Concerns about fuel range • High costs • Responsibility	• Time inefficiency (delays, waiting times) • Long distance to stops and stations • Low flexibility of routes • Stick to timetable • Planning needed • Infrequent services • Unable to work • Crowded • Lack of control over comfort • High costs • Low transport capacity • Exposed to weather • Unreliable	• Exposed to weather

Table 4.1 Overview of multiple aspects of (in)convenience

Each participant applied several different aspects of convenience to different modes. Responses further suggested that the same aspect of convenience was applied to several travel modes. In particular, route and time flexibility and time efficiency were often applied to car and active modes.

> "So, the bike and the car are the most convenient because I can just get on them, in them and go. […] The car is convenient because I can get a lot of things into it." (P12, non-car user)

> "You've got convenience in all three, cycling, walking and driving. It's your own transport in three. You have more control with the bike and walking. You can start and stop EXACTLY where you need to go." (P11, car user)

Participants changed their perceptions of what is more convenient, depending on the context. For example, the car was described as convenient when there was a need

to transport a lot of items. At the same time, public transport is convenient for social occasions and when stops are in close proximity.

> "I think particularly if I am going to see my daughter, it is the convenience [of the car]. Usually when I'm going down, I am taking something with me for her or bringing something back."
> (P6, car user)

> "Then [after watching a Rugby game] I take the bus to come home, because it's really convenient, because the stop is two houses away."
> (P6, car user)

> "[…] because it is just so much more convenient not to take the car into a big place like London. Because then you have to think 'Where am I going to park it?', and then the security of the car, 'Is it going to get broken into?'."
> (P27, car user)

Participants also revealed aspects of inconvenience in relation to different travel modes. Often, the opposite of convenience of particular transport modes did not automatically translate into inconvenience. For example, a non-car user (P12) described convenience as something that is in his/her control and offers route and time flexibility. The same participant also described exposure to weather conditions, not finding a seat and compromises on comfort as inconvenient aspects of public transport.

> "The bike is very convenient in terms of being able to stop almost anywhere. So, I can just get off the bike, put it on the pavement, lock it up. It's convenient from the perspective of it always takes me exactly the same amount of time to get to work and get home."
> (P12, non-car user)

> "Inconvenient would be standing, waiting for a mode of transport if it's raining, if it's really cold. Its inconvenient when it's absolutely packed to the gunnels and you can't sit down, it's not very comfortable and pleasant."
> (P12, non-car user)

For public transport, however, aspects of convenience and inconvenience were greatly overlapping (see Table 4.1).

Finally, convenience was also discussed in general terms, not related to a specific mode. Analysis revealed varying conceptualisations across different participants. While for some participants, convenience meant time efficiency and simple accessibility, for others, convenience was expressed as time flexibility, absence of journey planning and predictability.

> "It's convenient to me if it is, whatever that mode of transport is, if I can use it... if I can quickly access it. […] If it goes, to a destination that I want it to go to within a reasonable time to me that allows me to get to where I need to be on time. Then it becomes a convenient mode of transport to me."
> (P24, car user)

> "Well in general, convenience is to come and go as you want to."
> (P11, car user)

> "It's convenient, it means that I need less time to think about what I need to do. I can just get on with doing it. I don't need to plan for disruptions, and I don't need to phone my boss and say I'm running late because something happened, I don't know, one of the roads is blocked or whatever. It just makes my life easier."
> (P14, non-car user)

> "I think convenience for me is, 'Do I have to think about it too much?'"
> (P5, car user)

> "Convenience is, it's under my control."
> (P12, non-car user)

4.4.4 Reflection on questionnaire responses

Participants were confronted with their answers to the questionnaire completed two weeks before the interview. All survey questions and mean responses can be found in Appendix C, Section C.3, Table C.6. Overall, 17 participants (56%) acknowledged that they would have responded differently to some survey questions if they were being asked about particular situations or contexts, or after reflecting on the topic. Results generally supported ambivalence of some questionnaire items and demonstrated responses were context-dependent.

> "Oh, I'm sure I feel very ambivalent about bus travel. Satisfied in some moments, frustrated in others."
> (P20, non-car user)

> "Ah, yeah I think it depends a little bit on the context."
> (P17, non-car user)

In particular, eight survey questions (see Table 4.2) were most frequently identified as inconsistent with narratives from the preceding interview. All quotes supporting the results below can be found in Appendix C, Section C.5, Table C.7.

Question	Item	Mean rating*	
		NON-CAR	CAR
Q4	Car driving is affordable and good value for money	2.5	3.3
Q6	I like travelling in a car	3.2	4.1
Q8	Using public transport is convenient	3.0	1.7
Q9	Using a car is the safest way to travel	1.8	2.7
Q13	Using public transport is a satisfying experience	3.1	1.8
Q17	Being environmentally responsible is important to me as a person	4.6	3.9
Q21	I like travelling by bus	2.8	1.9

*5-point Likert scale (1=strongly disagree, 5=strongly agree)

Table 4.2 Survey questions presenting discrepancies between responses and narratives most frequently and corresponding Mean ratings of non-car users (*n*=15) and car users (*n*=15)

Responses in relation to car use confirmed participants' dissonance with previous narratives relating to car use (e.g. Q4, Q6). As a result, participants generally justified and re-evaluated their answers. Thereby, respondents clarified the context in which the question was answered and disclosed positive and negative views about car use.

> "In the moment that I'm stressed because of driving, I keep thinking 'There must be a better way of doing this'. But when the driving is OK and there is no traffic or whatever I do enjoy it and it makes up for the stress."
> (P1, car user)

> "There are always two sides to it. Not all of them, but some of them. There is no black or white answer for, for example, 'Do I enjoy driving?'. Yes, I do and I don't. 'Do I enjoy driving on an open road in a fast car?'. Yes, I do. 'Do I enjoy driving in the city

> with all that traffic?'. No! So, depending on how you see it, what angle you are looking at it, it will probably change."
> (P29, car user)

Interestingly, non-car user participants (*n*=3) who agreed with Q4 (Car driving is affordable and good value for money) justified the car's value-for-money in terms of being able to share the cost of journeys.

> "In principle yes, I mean it is good value for money if you think that you can share a car. In that sense I put that answer when I was thinking about in terms of car sharing or carpooling."
> (P25, non-car user, survey response to Q4: agree)

Analysis supported previous findings that participants relied on past experiences to form opinions (Meyers-Levy & Malaviya, 1999). In particular, questions relating to public transport (e.g. Q8, Q13 and Q21) were subject to recollection of the most memorable negative experience with a specific service. Some participants (*n*=3) also indicated they would have rated these questions differently.

> "I think that's my recent experience with getting the bus. Because I have just gone on the bus once and it's just that whole… I think it's the not knowing whether you just missed the bus or whether it's really late. […] I think I would have responded differently had I not had a recent bus journey that was a bit of a nightmare."
> (P4, non-car user)

Some participants drew on factual and statistical knowledge to justify responses. This was particularly true for questions concerning safety (Q9) and environmental concern (Q17).

> "I am trying to remember the statistics. I believe that per mile, driving is much more dangerous. Every time I get into the car I got reminded that a small move can have very serious consequences. Not only for myself but for the family or other family as well. The danger of getting involved in an accident is always there."
> (P15, non-car user, survey response to Q9: agree)

Questions relating to environmental protection (e.g. Q17) were rated generally positively by car users' and non-car users' (M = 3.6, across nine items). However, participants seldom referred to environmental concerns during the interview. When being confronted with this discrepancy, inconsistencies were frequently

acknowledged by participants. Participants in both groups admitted that environmental factors are rarely part of transport decision making.

> "Yes (laughs). It's not something I think about. At all. For me it's time and cost are more important to me than environmental friendliness. […] Yes, it's good to be but that isn't a reason why I would choose to travel in a certain way."
> (P19, car user, survey response to Q17: strongly agree)

> "That is really interesting because that does not come into my reasoning for why I chose the bike. […] It's not a big factor in my decision making."
> (P17, non-car user, survey response to Q17: strongly agree)

Whilst participants' survey scores suggest high environmental concern, narratives suggested that these rarely play a role in travel mode decisions. Participants revealed several strategies to justify this discrepancy. As such, individuals questioned the actual contribution of a single person's actions to the total cause. In particular, car users felt that there was a lack of empowerment in face of a global challenge. Participants showed low efficacy but also expressed a desire for a top-down approach to reduce environmental degradation.

> "I remember going through the questions and especially with the environmental questions I was sort of in the middle. Yes, I think it's important, but personally I don't know how much I can do."
> (P3, car user)

> "It has to be a global change rather than just one person not using the car"
> (P10, car-user)

A recurring argument by car users against sustainable travel emerged from a distorted perception of responsibility. Often, the need to change behaviour was offset by other behaviours perceived to be pro-environmental. It was felt that "doing my bit" (P3, car user) would already be enough. In particular, social comparisons were often used and, interestingly, being "about average" was seen as sufficient.

> "I don't think I drive as much as some other people, but also I'm not a saint and don't try everything to inconvenience myself by not taking a car. I do other things that are pro-environmentally friendly, that most other people probably wouldn't do. […] I think

I'm just about average when it comes to that sort of thing."
(P28, car user)

4.5 Discussion

Successful and cost-effective strategies to reduce car use and encourage uptake of non-car travel modes are vital for transport policy. Attitude change has been a key intervention target but has seen only limited success in changing the mobility behaviour. This study explored variability in attitude expressions among 15 non-car users and 15 above-average mileage car users. Thematic analysis of semi-structured interviews found evidence for attitudinal ambivalence and context-dependent attitude variability in relation to transport modes. These findings enhance our understanding of inconsistencies in attitude-behaviour relationships. They also emphasise how transport mode evaluations are dependent on decision contexts and journey requirements. Situations in which evaluations shift were identified providing insights into how contextually-situated interventions could be developed. In addition, this work revealed high ambiguity in relation to aspects of convenience of various transport modes and demonstrated variability of questionnaire responses through retrospective survey discussions.

This work generally supported accounts of attitudinal ambivalence, underpinning views of in-the-moment attitude formation (e.g. Gollwitzer & Bargh, 1996; Gollwitzer & Moskowitz, 1996). The complexity of travel decisions of both non-car users and car users was revealed and specific opportunities to foster change processes were identified.

4.5.1 Intra-personal attitude variability

First, the study demonstrated variability within transport-relevant attitudes towards one travel mode (attitudinal ambivalence). Perceptions of cost, safety, being the

driver, comfort, speed and flexibility were discussed along a continuum of negative to positive valence by all transport users. Non-car users and car users displayed broadly similar levels of attitudinal ambivalence, suggesting that changeable perceptions are not unique to specific user groups. Findings can be used to inform communicative strategies for different travel modes building on the positive perceptions of non-car modes and negative perception of car travel. For example, cycling and walking can be more cost-effective than car use, providing greater route flexibility and quicker journeys in urban areas. Likewise, train travel can offer a comfortable, relaxed journey which removes the responsibility of controlling a vehicle. Results also call for more situated non-car travel communications. For instance, less expensive non-car travel can be highlighted when perceptions about motoring costs are salient, e.g. at petrol stations, garages and on car insurance websites. Findings can also be used to inform public engagement events. Specifically, attitudinal ambivalence can be useful in situations where motivational interviewing is applied (Miller & Rollnick, 2012).

Second, the study revealed context-dependent attitude variability which led to inconsistent evaluative preferences of travel modes. Context changes prompted a change in the importance of some evaluations over others. Non-car users and car users described situations in which importance of journey time and cost varied and how competing contextual influences may change evaluations. Improving accuracy of actual and perceived travel time, increasing cost transparency and consistent public transport service quality may be crucial in facilitating accurate comparisons of various travel alternatives.

Non-car users revealed a conflict between pro-environmental motivations and evaluations of cost and comfort of travel modes, providing some insights into reasons for the variability of attitude-behaviour links in transport. Car user

participants highlighted situations in which perceived freedom of car use was compromised. Unpredictability of traffic and vehicle access restrictions can be an important factor in increasing attractiveness of non-car modes. Findings emphasise the complexity of travel mode beliefs and attitudes thus stress the potentially unsuitability of prediction models to account for such dynamics.

Third, the study highlighted that attitude variability was a result of changing situations and changing journey needs and types. So, for example, long-distance train journeys, in particular into urban areas, have the potential to substitute car journeys. Information about transport options at the destination and communicating safety and removed responsibility can encourage modal switch. These findings emphasised the importance of structural interventions in city centres such as high parking costs, pedestrianisation and access restrictions. In particular, the Congestion Charge Scheme (TfL, 2004) has been a major deterrent for car travel into London. Enforcement of further congestion charges across other city centres in the UK may be an important driver for behaviour change.

Personally unknown journeys may also provide an opportunity for promoting non-car travel. Requirements to plan and need for navigation prompted negative evaluations of car travel. The personal relevance of work journeys implies that research should not view business travel in isolation. Train travel, in particular, should be fostered through workplace travel plans, e.g. “rail-first” policy (Harris, 2018). Rail concession schemes provided by employers may support such initiatives and create spill-over effects for private journeys. The level of congruence between travel decisions for work and personal travel warrants wider research. Future work could explore opportunities for employer engagement in designing effective interventions.

Results further suggest that commuting journeys are strongly linked to the need for predictability and reliability. This unlocks opportunities for cycling and walking interventions, but also provides a challenge for non-cycleable and non-walkable

distances and where traffic disruptions are minimal. While the car offers benefits for time-critical commuting journeys along traffic-free routes, promoting the secure and relaxed travel on public transport, specifically for leisure, has potential to enhance behavioural interventions. So far, policy focused on reducing single-occupancy commuting journeys. Public transport service frequency and scheduled disruptions also often cater for commuters in peak hours. This implies reduced and disrupted service, specifically, over weekends, evenings and bank holidays might discourage public transport use amongst those who are willing to use buses and trains for non-commuting journeys. Commuting journeys account for about 40% of total journeys overall. Increased frequency of services during weekends and evenings has potential to decrease single-occupancy driving and create important spill-over effects.

Findings also showed that communicative strategies nurturing recurring situations can prompt a shift in attitudes towards non-car use. For instance, alcohol use (e.g. after work socials) and predictably high traffic constraints (peak travel times) offer incentives not to drive. Campaigns may build on advantages of using public transport in connection with social events. Likewise, emphasising time-efficient alternatives at periodic times of increased congestion (e.g. during term time) can help to increase modal shifts.

Overall, our work has demonstrated intra-personal variability of common transport-relevant attitudes and also showed dynamic importance of these in response to unstable contexts. Knowledge of attitudinal ambivalence and context-dependent attitude variability may be improved by identifying underlying changing goal priorities (Shah & Kruglanski, 2002). For instance, our participants explained how professional goals (e.g. be on time for work) led to preferences for the quickest possible journeys whereas participants sometimes preferred longer and scenic routes for leisure

journeys to satisfy relaxation goals. An explorative map of travel-relevant goals identified from the interviews can be found in Appendix C, Section C.4. Future experimental research could explore the link between individual goals and goal priorities and changeability of cognitions. Discrete choice experiments could also use our findings to quantify preferences in different scenarios.

4.5.2 Multi-facetedness of convenience

The study highlighted the complexity of perceived transport convenience and inconvenience. Our results echo findings by Buys and Miller (2011) which elucidated dimensions of convenience amongst a population in Brisbane, Australia. The authors broadly categorised concepts of convenience into time-efficiency, multi-modal trip making and distance and purpose of journey. Twenty-seven participants in our study discussed 42 aspects of convenience and inconvenience in relation to car, train, bus, cycling and walking. Findings revealed considerable inter and intra-personal variability of perceptions of (in)convenience highlighting the subjectivity of this concept. Findings showed no unique perceptions of (in)convenience of driving and aspects overlapped with those of active modes. Drawing on time and route flexibility and “door-to-door” attributes of cycling and walking may succeed in encouraging car users to replace some journeys with active modes. Targeting inconvenient aspects of driving in car-use reduction interventions could also enhance effectiveness.

Our findings also showed that public transport modes have the potential to be perceived as convenient when aspects of inconvenience are addressed. For example, public transport was perceived as convenient by car users and non-car users when services are frequent, cost-effective and do not require multiple stops and modes. Communicative strategies may also nurture aspects of removed responsibility and suitability for long journeys. Service improvements may address perceptions of inconvenience. These can include perceived unreliability, exposure to weather and lack of comfort. Provision of real-time information, installation of

sheltered stops and quality improvements have been helpful in this regard (Brakewood, Macfarlane, & Watkins, 2015; Dziekan & Kottenhoff, 2007; Hensher, Mulley, & Yahya, 2010).

Varying and subjective interpretations of (in)convenience warrants careful use of this terminology in future transport studies and mass communication campaigns. So, for example, attitudinal scales using labels such as “convenient - inconvenient” may have limited validity and should be more specific. Future research could uncover a clearer picture of when these different dimensions are most important to inform intervention development. Communicative materials may also evoke unintended ambiguous associations and should consider the multi-faceted nature of convenience.

4.5.3 Reflection on questionnaire responses

Retrospective discussions of *a priori* questionnaires revealed ambiguity of attitude items commonly used in transport research. Thus, perceptions and motivations may be overly simplified in traditional survey questions. Highest discrepancies between survey responses and interview statements were found in relation to environmental concern, safety, enjoyment and cost efficiency of driving, and perceptions of public transport. Results supported the theoretical basis of induced cognitive dissonance (Festinger, 1962) and revealed different strategies participants used to answer and justify their responses. In particular, high levels of environmental concern among car users did not feature in our participants’ transport decisions, supporting findings reported in previous research (Barr & Prillwitz, 2012; Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007). For example, the study highlighted that participants often relied on social comparisons and low levels of response efficacy, leading to a diffusion of responsibility among drivers. This raises questions about effective framing of environmental messages in the context of travel choices. Increasing felt

responsibility by normalising non-driving behaviour (Gifford & Nilsson, 2014) may initiate engagement with relevant messages. Drawing on in-group effects and demonstrating relevant others' positive achievements through not driving, might invoke feelings of reciprocity (Gupta & Ogden, 2009; Nyborg, Howarth, & Brekke, 2006). Findings also implied that travel attitude change needs to be facilitated by different strategies, depending on the type of attitude. For instance, participants' responses to safety items were guided by statistical facts whilst lived experiences were recalled in response to car use questions. This knowledge can be used to influence campaigns based on scientific information. For example, common misconceptions of cycling safety may be corrected by widely publicising casualty statistics which confirms benefits of cycling outweighing its risks (DfT, 2017). In line with previous research (e.g. Meyers-Levy & Malaviya, 1999), we also found evidence that opinions about public transport tend to be based on, primarily negative, past experiences that are more readily available in memory (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Guiver, 2007). Analyses and interpretation of survey research should consider such recollection biases. Strategies to create more memorable positive experiences could increase bus patronage. The use of real-time transit information has shown to attract bus users (Litman, 2008) and reduce perceived waiting times (Brakewood et al., 2015). The use of targeted marketing materials containing expectancy-incongruent information also has potential to correct misconceptions (Beale & Bonsall, 2007). Findings presented in literature on peripheral routes to persuasion may also help in this regard (Cacioppo, Petty, Kao, & Rodriguez, 1986; Petty, Briñol, & DeMarree, 2007; Petty, Cacioppo, & Schumann, 1983; Petty, Fazio, & Briñol, 2009). Our results have implications for the design and interpretation of questionnaires. Careful and specific wording of the context and survey items may reduce ambiguity.

Our results recommend situation-specific models of mode choice decisions that draw on day-to-day dynamics in individuals' travel mode choice. Retrospective

discussions of questionnaire responses may prove a useful method in future studies to further identify potential biases in survey responses or reveal alternative motives for travel decisions. As such, response efficacy was identified to be a potentially important additional antecedents of mode choice, not yet explored by (quantitative) transport studies.

4.5.4 Limitations

Limitations of this study should be taken into account when generalising and applying the findings. A small purposeful sample of above-average mileage car drivers and non-car users were selected to highlight differences in the perceptions of those groups. These participants may have developed habitual transport behaviour patterns. Further research could explore how attitudinal ambivalence differs amongst individuals who are already motivated to change their car use behaviour. Results were drawn from in-depth accounts of participants' past and predicted mode choice decisions, however, habitual travel patterns are known to attenuate such deliberate processes (Verplanken, Aarts, & Van Knippenberg, 1997). Real-world travel decisions may therefore be less deliberated. General limitations of qualitative research should be noted and include small sample sizes, limiting our ability to generalise findings across a wider population (Ritchie, Lewis, Elam, Tennant, & Rahim, 2013). Our sample cannot be considered representative of UK population. Our recruitment strategy may have resulted in a more educated and wealthier sample having less children compared to the average. Likewise, non-car users and car users differed with regards to gender distribution, residential location and number of children. These socio-demographic antecedents are known to influence travel behaviour, so may well affect perceptions of cost and perceived need of transportability. We acknowledge that participants may vary in their frequency and intensity with which they have experienced different travel modes, so that reports of

past decisions may be incomplete. The study was reliant on voluntary participation, so the possibility of self-selection bias should be acknowledged. Yet, the aim of this study was not to establish a definite theory of transport-relevant attitudinal ambivalence. Future quantitative methods incorporating validated ambivalence measures could clarify the extent in which attitudes identified in this research may be malleable amongst a representative sample.

4.6 Conclusion

Analysis of 30 semi-structured interviews with 15 non-car users and 15 above-average mileage car users found support for intra-personal attitude variability, highlighting the complexity of transport-relevant evaluations. The research identified individuals hold (1) simultaneous negative and positive evaluations – “attitudinal ambivalence” and (2) shifting evaluations depending on decision situations – “context-dependent attitude variability” in relation to car use, cycling or public transport use. Both groups expressed variability within perceptions of cost, safety, being the driver, comfort, speed and flexibility. Participants’ evaluations of independence as well as cost and time commitments showed highest potential for motivational conflicts with affective aspects such as perceived comfort or convenience. Context-dependent attitude variability was also evident in relation to evaluations about physical activity and pro-environment benefits, but only for non-car users. Thus, ambivalence can depend on decision contexts and journey requirements. The study elucidated specific contexts in which transport-relevant attitudes are more susceptible to ambivalence. It is recommended that long and unknown journeys and journeys into city centres may be important intervention targets. Targeting journeys for leisure and business may also foster change processes. Interventions using information as the basis for car use behaviour change, may draw on negative aspects of driving and positive facets of non-car use,

utilising findings from this study in situated campaigns. Interviews also revealed ambiguity of perceived convenience. Finally, results highlighted limitations in interpretation of traditional survey measurement and provide possible explanations to attitude-behaviour gaps, e.g. in relation to pro-environmental behaviour. Findings also have implications for the conceptualisation and operationalisation of attitudes in travel mode choice research. Developments within this literature could integrate ambivalent and context-sensitive attitudes in models of mode choice. Quantitative methods could adopt measures of ambivalence and further establish to what degree attitudinal ambivalence might moderate relationships within traditional prediction models.

Chapter 5 Can different goals change willingness to use and attitudes towards non-car use? An implicit priming experiment

5.1 Abstract

Psychological research into travel mode choice has been important in efforts to reduce car use. Research has focussed on rational choice models without investigating how goals change over time and context may influence driving decisions. Two cross-sectional experiments applied Goal Theory to test the malleability of willingness to use and attitudes towards non-car travel modes. Implicit goal priming experiments employed priming questions to activate pro-environmental and/or pro-physical activity goals. The two studies examined whether: Priming two goals at the same time (Study 1, *N* = 75) and priming two single goals (Study 2, *N* = 898), would increase willingness to use and promote non-car use attitudes towards alternative transport mode scores. Analyses of covariance were conducted to examine differences between (1) a dual goal prime condition vs. a single goal prime condition and (2) two single goal prime conditions vs. a control condition. A 3 (prime: environment, physical activity vs. control) x 3 (readiness to change: pre-contemplation, motivated stages, maintenance) between-subject design with willingness and attitudes as dependent variables was employed. Results indicated, firstly, that while respondents' attitudes towards non-car use were sensitive to the dual goal prime condition in Study 1, willingness to use non-car modes was not increased. Secondly, the implicit single goal priming questions did not exert any positive influence on non-car use attitudes or willingness-to-use non-car modes. In Study 2, strong effects for readiness to change were observed including a negative/boomerang priming effect on willingness amongst motivated participants. Theoretical implications and directions for future research are discussed.

5.2 Background

Car use accounts for a major share of greenhouse gas emissions globally (IEA, 2013) and, consequently, has substantial negative effects on the environment and human health. Combined with increasingly unmanageable urban congestion this has prioritised policies promoting use of alternative forms of travel. For example, the UK government has committed to reduce its carbon emissions by 80% by 2050 and has incorporated measures to reduce car travel demand. While emissions per mile travelled have decreased due to enhanced vehicle efficiency, demand for private road transport is growing as evidenced by increased fuel sales (Committee on Climate Change, 2015). Moreover, despite raising concerns about air quality, fossil fuel consumption and lack of physical activity, the International Energy Agency (2015) forecasts a doubling of global car ownership by 2040. Consistent with these predictions, a recent study examined travel behaviour over 11 years and concluded that car journeys were not being replaced by active travel (McDonald, 2017).

Sustainable travel requires individuals to switch from car use to non-car modes. Car use reduction interventions based on motivational theories could offer a cost-effective, easily-to–implement alternative to engineering and economic solutions (Cairns et al., 2008; Friman et al., 2010). Understanding beliefs, attitudes and motivations towards transport mode choice is essential to such intervention because greater intervention effectiveness is observed when relevant cognitions were targeted (Akar, Flynn, & Namgung, 2012; Johansson, Heldt, & Johansson, 2006; Kuppam, Pendyala, & Rahman, 1999; Namgung & Akar, 2014). However, recent reviews show only limited overall effectiveness (Chapter 2, Graham-Rowe et al., 2011; Arnott et al., 2014) suggesting that our understanding of motivations to use non-car modes is incomplete.

One challenge for such research is inconsistency between expressed attitudes and behaviour. For example, even when measured attitudes towards environmental protection are positive pro-attitudinal behaviour may not follow (Fazio, 2007; Gifford & Nilsson, 2014). This may be because cognitions themselves are unstable. In particular, attitude expression can be inconsistent across different situations (Schwarz, 2007) and when goal priorities change (Ferguson & Porter, 2009; Markman & Brendl, 2000). Individuals pursue multiple goals simultaneously that vary in salience so attitudes may change across time and context (Custers & Aarts, 2010; Fishbach, Friedman, & Kruglanski, 2003; Shah & Kruglanski, 2002). For instance, decisions involving food choice in restaurants can be influenced by health, diet or social desirability goals which can be complementary or in competition with eating goals. Thus evaluations that underpin non-car modes, may shift as the priority of particular goals changes even within relatively short time frames (e.g. Ferguson & Bargh, 2004; Gollwitzer & Oettingen, 2015; Kopetz, Kruglanski, Arens, Etkin, & Johnson, 2012; Perugini & Bagozzi, 2001; Seibt, Häfner, & Deutsch, 2007; Sherman, Rose, Koch, Presson, & Chassin, 2003).

Exploring the effects of multiple goals is challenging and research has focused on performance and achievement goals (Kristof-Brown & Stevens, 2001; Locke, Smith, Erez, Chah, & Schaffer, 1994). In the case of travel mode choice, a person may have two potentially competing goals: a) workplace productivity vs. b) enhancing fitness. Cycling to work could be consistent with the fitness goal but if driving enables the person to start work 30 minutes earlier, the workplace goal may take priority. This is especially likely if the person has a deadline that day, it’s raining, they are tired or they also need to run errands on the way home from work. This may lead to changing evaluations depending on the utility in achieving a particular goal. Thus non-car use attitudes may be influenced by competing goals that vary in salience on a moment-to-moment or day-to-day basis.

The two studies reported here investigate whether goal priming might influence responses to attitudinal statements with respect to non-car use. More specifically, it was explored whether priming individuals with pro-environmental and pro-physical activity goals, can increase willingness to use alternative modes and promote pro non-car-use attitudes.

5.2.1 Implicit activation of goals through priming

Goals are cognitive representations of what individuals want to achieve in particular contexts (Bargh, 1990; Kruglanski, 1996). Theories of goal pursuit propose that goals can be triggered outside of people's awareness and pursued automatically (Bargh et al., 2001). This has generated research demonstrating that goals can be activated and manipulated through implicit priming. According to Bargh and Chartrand (2000) priming is the non-conscious or automatic activation of mental concepts as a result of the presence of a subliminal, contextual cue – the prime – that is associated with those concepts. Experimental evidence across different domains supports the notion of automatic activation of goals. Bargh and colleagues have reported a number of studies demonstrating that implicit priming, using goal-related words, can have an effect on evaluations, motivations and behaviour. For instance, increased accessibility of social concepts such as kindness, ageing or achievement led to participants being more helpful (Bargh, Chen, & Burrows, 1996), walking more slowly (Bargh et al., 1996) or demonstrating increased performance (Bargh et al., 2001), respectively. Kawakami et al. (2003) also demonstrated that priming a specific social category, e.g. elderly people, lead to more conservative attitudes.

Crucially for the current work, priming techniques have also been used to influence pro-environmental attitudes and behaviours. For instance, Tate et al. (2014) demonstrated that pro-environmental priming increased positivity of implicit attitudes

and so prompted more pro-environmental product choices. The authors invited 80 university students and staff members to complete a lab-based experiment in which a reading comprehension task masked an environmental goal prime related to waste reduction. They then measured implicit as well as explicit attitudes towards product packaging and also general environmental attitude scales. The behavioural measure was a choice task between loose and packaged fruits and vegetables. The authors did not observe differences between the environmental and neutral goal prime for the explicitly measured attitudes. However, they demonstrated more positive implicit attitudes amongst pro-environment primed participants. Moreover, they demonstrated that the positively primed attitudes had a significant effect on behaviour.

Recently, research involving implicit priming has been criticised due to non-replicability of effects (Bower, 2002; Yong, 2012). Studies by Pashler, Coburn and Harris (2012a) and Doyen et al. (2012) conducted identical replications of studies published by Bargh and colleagues and found no priming effect. Authors have also challenged the notion of non-conscious goal activation through primes and propose that other mental representations might be made salient at the same time (Förster, Liberman, & Friedman, 2007a) (Förster, Liberman, & Friedman, 2007b). Nevertheless, there is evidence supporting the effectiveness of implicit priming techniques to activate and/or influence pro-environmental cognitions and behaviours (Fritsche, Jonas, Kayser, & Koranyi, 2010).

No study has tested effects of implicit priming on different populations stratified by readiness to change. Likewise, priming in relation to mode choice behaviour has not been investigated to date. One might hypothesise, however, that individuals whose attitudes are ambivalent (see Chapter 4) may be more susceptible to primes.

5.2.2 Pro-environmental behaviour, Physical activity and travel mode choice

Car use is an environmentally-relevant behaviour and cognitions relevant to environmental protection have been found to play a role in travel mode choice (Hoffmann, Abraham, White, Ball, & Skippon, 2017). In particular, environmental concern (Gardner & Abraham, 2010) and the subjective importance of the environment (van Vugt et al., 1995). Awareness of driving-related problems, such as air and noise pollution (Bamberg & Schmidt, 2003) and exacerbated climate change through greenhouse gas emissions (Hunecke et al., 2001) have also been linked to car use. Studies have shown that people ascribe responsibility to themselves to reduce the impact car use has on the environment (Abrahamse et al., 2009). All these antecedents are negatively correlated with car use. Importantly, sustainability was identified as a key underlying value in relation to car sharing behaviour (Schaefers, 2013).

Ample research has documented the association between physical activity (PA) and health benefits such as reduced risks of cardio-vascular diseases, diabetes, cancer or hypertension (Warburton, Nicol, & Bredin, 2006). Incorporating PA into daily travel in the form of walking (to public transport) or cycling has shown to contribute to achieving levels of recommended physical activity (Sahlqvist et al., 2012; Wener & Evans, 2007), in particular for daily commuters (Audrey, Procter, & Cooper, 2014). Surveys have demonstrated that concerns about PA and health are positively correlated with non-car travel (Joireman, Van Lange, Kuhlman, Van Vugt, & Shelley, 1997). Qualitative studies have also revealed that individuals positively evaluated cycling based on the exercise they gained (Thomas, Walker, & Musselwhite, 2014). By contrast, driving is considered a sedentary form of travel and negatively associated with concerns about PA and health (Proper, Singh, Van Mechelen, & Chinapaw, 2011).

Travel mode choice is a goal-directed behaviour (Farag & Lyons, 2008, 2010) and using alternatives to the car have been repeatedly linked to pro-environmental behaviours and PA (Hallal et al., 2012). It can thus be hypothesised that activating goals related to determinants congruent with non-car use would positively affect cognitions towards car use alternatives.

5.2.3 Readiness to change behaviour

A person's attitudinal ambivalence depends on how much (s)he is already contemplating changing the behaviour in question (Armitage, Povey, & Arden, 2003; Miller & Rollnick, 2012). Readiness to change can be considered as a continuum, ranging from no intention to change behaviour (that is, resisting change) to an establishment of a new habitual routine. Depending on where on this continuum a person falls, different cognitions and characteristics are likely to be important in readiness-targeted interventions (Dijkstra, De Vries, Roijackers, & van Breukelen, 1998; Sandman & Weinstein, 1993; Sutton, 2005). Bamberg (2007), for example, demonstrated such differences in his application of the Transtheoretical Model (Prochaska & DiClemente, 1986) to drivers' decision to use public transport. Participants in the first stage (pre-contemplation) showed lowest willingness to refrain from car use and those in the last stage (maintenance) demonstrated highest scores of willingness to use non-car modes. This corresponded with high and low intensity of current car use behaviour, respectively. Research by Forward (2014) investigated willingness to cycle and found that habits were strongest in first and last stage of the model suggesting automaticity of travel behaviour. Consequently, it seems plausible that priming would not be effective for individuals in the first and last stages of the Transtheoretical Model, that is, either the pre-contemplation or maintenance stages. Thus, priming may be most effective in relation to individuals in contemplation, preparation and action stages. Without endorsing the Transtheoretical Model itself which has been criticised, e.g. by Sutton (Sutton, 2005,

2007), it seems reasonable to assume that priming may be most effective when people are motivated to change but have not yet established a new habit. We will refer to these “middle stages” (Velicer et al., 2000) as “motivational stages”. Priming manipulations might be able to influence cognitions within an individual’s latitude of acceptance (Hovland, Harvey, & Sherif, 1957). Specifically, changes in evaluations are assumed to occur if the presented message (or stimulus) is close to the person’s own position then these messages are deemed reasonable and the individual’s perceptions are more likely to change in favour of presented stimulus, also called assimilation effect.

5.2.4 The present studies

The present studies investigated whether implicitly priming people with either pro-environmental questions or pro-physical activity questions would change people’s willingness to use and explicit attitudes towards non-car travel modes. Study 1 was designed to be a pilot study using a small sample and a simple data collection method to assess whether a larger scale study (Study 2) was warranted.

Although goal priming effects have been investigated in other domains over the past 30 years, to our knowledge, no research has investigated whether cognitions towards the use of non-car modes can be manipulated through priming. We hypothesise that the activation of goals, congruent with non-car travel, i.e. (i) the goal of being environmentally friendly and (ii) the goal of being physically active, will elicit more positive evaluations of driving and consequently, lead to higher willingness to use non-car modes.

Two surveys were conducted to investigate effects of implicit goal primes on non-car use cognitions among a UK sample of drivers and US online panel sample.

It is unclear what effect priming of two goals that are incongruent with car use may have. They could cancel one another out, so having little or no effect, or increase non-car-use cognition scores over and above the single goal prime. It seems plausible, however, that providing more reasons to perform a behaviour may promote more positive evaluations of that behaviour. Therefore, Study 1 tests the following two hypotheses:

Hypothesis 1a: A dual goal prime condition (*pro-environment* AND *pro-physical activity*) will generate higher non-car-use willingness scores compared to a single-goal prime condition (*pro-environment*).

Hypothesis 1b: A dual goal prime condition (*pro-environment* AND *pro-physical activity*) will generate higher non-car-use attitude scores compared to a single-goal prime condition (*pro-environment*).

The graphical representation of the hypotheses is displayed in Figure 5.1

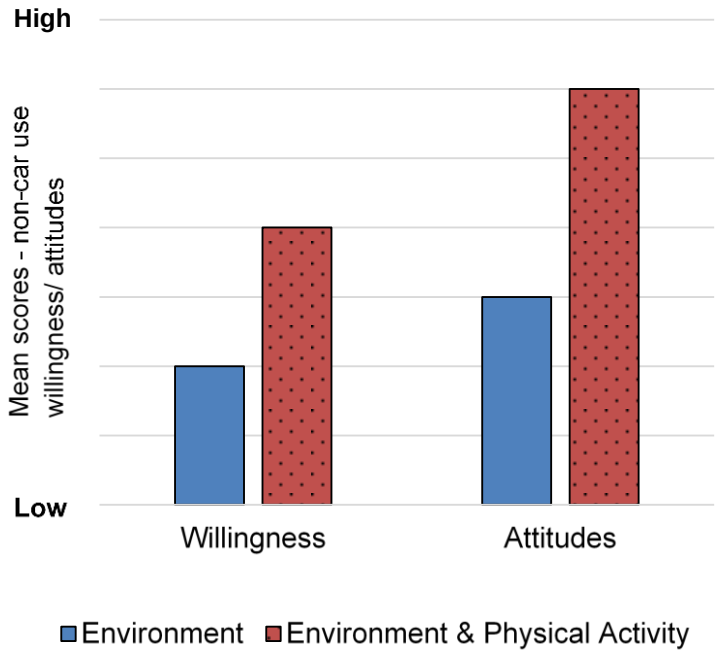

Figure 5.1 Graphical representation of Study 1 hypotheses

Study 2 examines whether the separate activation of two different goals that are incongruent with car use, has a positive effect on non-car use cognitions. Further, we examined whether influences differ for participants in the motivational stages of the Transtheoretical Model. In particular, the study will test the following:

Hypothesis 1a: Two single-goal prime conditions (pro-environment OR pro-physical activity) will increase non-car use willingness scores, compared to a no-goal prime control condition for participants in the motivational stages of readiness to change.

Hypothesis 1b: Two single-goal prime conditions (pro-environment OR pro-physical activity) will increase non-car use attitude scores, compared to a no-goal prime control condition for participants in motivational stages of readiness to change.

A simplified graphical representation of the hypotheses is displayed in Figure 5.2

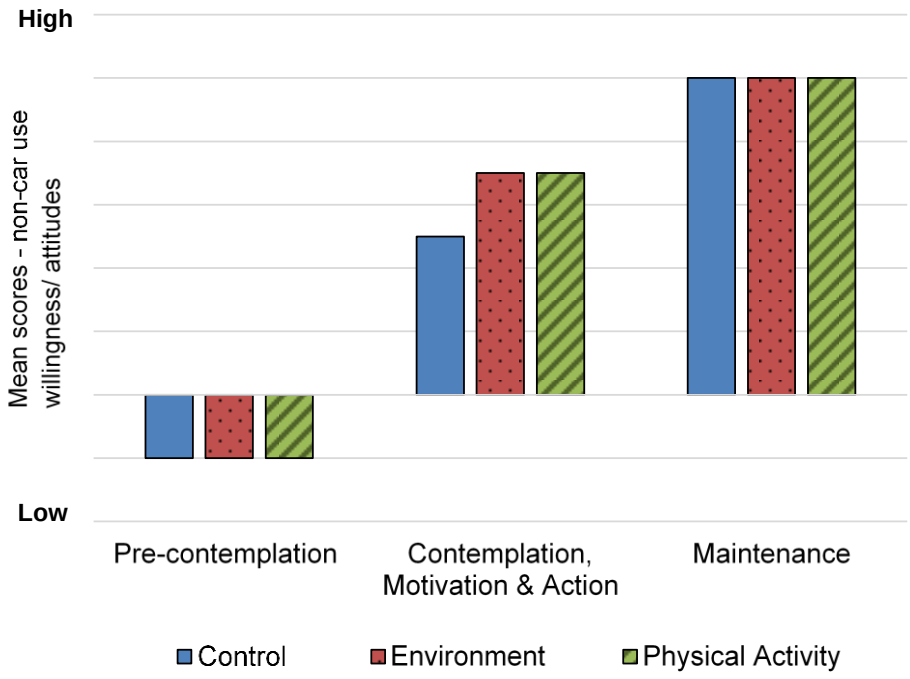

Figure 5.2 Graphical representation of Study 2 hypotheses

5.3 Study 1

The first study tested whether combining two goals would lead to higher levels of willingness and attitudes compared to priming a single goal (Hypotheses 1a, 1b).

5.3.1 Method

5.3.1.1 Participants

In 2016, face-to-face recruitment was carried out at a UK university campus car park, asking passers-by to fill in a pen and paper questionnaire. This site was chosen to guarantee that selected participants were drivers and had access to a car. This was considered a subtle alternative to screening questions asking for the participants' current driving behaviour which could have disclosed the nature of the survey and contaminated the priming effect. This also allowed exclusion of non-eligible participants. Of course, no assumptions can be made about the intensity and frequency of car use. Pen and paper questionnaires were distributed in a block-randomised procedure using an AB design. A tally was kept to warrant a fairly even gender distribution. Eighty participants were approached, of which 75 were eligible for analysis (five had missing data). The sample consisted of 41 male (54.6%) and 34 female participants. The mean age was 35.9 (*SD*=11.2) years.

5.3.1.2 Goal primes

The implicit goal prime stimuli was constructed through the use of a targeted title: either a) pro-environment: 'YOU and the Environment'; b) dual goal prime: 'YOU, the Environment and Physical Activity'; plus seven questions that related to each goal. Consequently, seven pro-environment priming questions were used for the single goal prime. For the dual goal prime, the questionnaire combined seven pro-environment priming questions AND seven pro-physical activity priming questions.

The 14 items were alternated to avoid primacy effects. Table 5.1 shows priming questions for each experimental condition. The construction of the questions was based on techniques of compliance and adopts the foot-in-the-door approach (Freedman & Fraser, 1966). It was predicted that participants would be drawn into agreeing with the goal prime but at the same time remained unaware of this manipulation. All items were presented in the same order for each participant. All items used a 7-point scale (-3 strongly disagree, 3 strongly agree). Questions were partially adapted from questionnaires developed by Anable (2005) and Abraham and Sheeran (2004).

Pro-environmental priming questions	Physical activity priming questions
I am willing to use bins and not litter the environment.	I am willing to take the stairs instead of lifts or escalators to be more physically active.
I intend to switch off lights in rooms that are not being used.	I intend to include more walking into my daily routine.
In the future, I am prepared to use my own shopping bag when shopping to preserve the environment.	In the future, I am prepared to be more active outdoors, e.g. visiting green spaces.
I will take shorter showers in order to use less water.	I will spend more time being physically active in the future.
In the future, I am willing to buy food that has been produced locally.	In future, I am willing to engage in vigorous activity, e.g. jogging or team sport.
I would volunteer to help care for the environment.	I would attend regular fitness classes, e.g. Zumba or Circuits.
I am willing to donate money to curb environmental damage.	I am willing to donate money to improve indoor physical activity facilities in my area.

Table 5.1 Goal priming questions

5.3.1.3 Dependent measures

The dependent variables were formulated following Ajzen's Theory of Planned Behaviour guidelines. Six items assessed willingness to use and attitudes towards

the use of non-car alternatives, for short, daily trips in the future. All items employed a 7-point Likert scale. Willingness questions were asked first as those items were considered most important and consequently followed the priming questions before the priming effect weakened.

Willingness was measured using 2 items, adapted from Abrahamse et al. (2009), Gardner (2009).

(1) *In future, I am willing to not use the car for short day-to-day journeys from where I live*
(2) *In future, for short regular journeys from my home, I am willing to use forms of transport other than the car*
(-3 strongly disagree, 3 strongly agree; α = .87).

Attitudes were assessed by two items, adapted from Gardner and Abraham (2010), Francis et al. (2004).

(1) *Using other forms of transport rather than the car for short daily journeys from where I live in the future would be…*
(2) *Not using the car for short regular journeys from home in the future would be…*
(-3 bad, 3 good; α = .88)

5.3.1.4 Control and demographic variables

Perceived behavioural control (PBC) over the use of non-car transport modes was also measured, using two items adapted from Gardner and Abraham (2010), Francis et al. (2004).

(1) *Using other forms of transport rather than the car for short daily journeys from where I live in the future would be…*
(2) *Not using the car for short regular journeys from home in the future would be…*
(-3 unfeasible, 3 feasible; α = .88).

The survey concluded by asking participants to record their age and gender.

5.3.1.5 Statistical procedure

All analyses were performed using SPSS version 23. Analyses of covariance was performed (ANCOVA), controlling for PBC, age and gender to determine differences of willingness and attitude scores between the two experimental conditions.

5.3.2 Results

5.3.2.1 Descriptive results

Table 5.2 and Table 5.3 below show the descriptive results for the two different experimental conditions and the correlation matrix.

	Willingness			**Attitudes**		
	N	Mean	*SD*	*N*	Mean	*SD*
Environment	38	0.21	1.78	38	1.43	1.34
Physical Activity & Environment	37	0.61	2.01	37	2.15	1.32

Table 5.2 Descriptive statistics

	1.	2.	3.	4.
1. Willingness				
2. Attitudes	.501***			
3. PBC	.768***	.376**		
4. Gender[a]	.059	.121	.171	
5. Age	-.228*	.066	-.226	-.139

Unless otherwise stated, Pearson's correlations coefficient *r* (two-tailed test) is reported (*** p< 0.001, ** p<0.01, * p<0.05)
[a] point-biserial correlation coefficient r_{pb}

Table 5.3 Bivariate correlation matrix

Mean scores suggested that willingness was higher and attitude were more positive in the dual goal prime condition compared to the single goal prime condition.

Results indicated that willingness and attitudes are positively correlated (r=.501, p<.001). Results also showed a significant positive relationship of attitudes and perceived behavioural control (PBC) with willingness. PBC was also positively correlated with attitudes. Age only showed a significant and moderate negative correlation with willingness to use non-car modes.

5.3.2.2 Analyses of covariance

Willingness

One-way ANCOVA was conducted to determine differences between the two priming conditions (single vs. dual prime) on willingness scores, controlling for PBC, age and gender. This analysis was not significant ($F(1, 75)=0.17$, $p=.685$, partial $\eta 2=.002$). There was a significant main effect of PBC ($F(1,75)=93.16$, $p<.000$, partial $\eta 2=.571$) but no significant effect of age ($p=.370$) or gender ($p=.253$). Consequently, hypothesis 1a cannot be confirmed. A summary of ANCOVA results are displayed in Table 5.4.

Source	Sum of Squares	df	Mean Square	F-ratio	*p*-value	Partial η^2
Condition	0.25	1	0.25	0.17	.685	.002
PBC	141.16	1	141.16	93.16	.000	.571
Age	1.23	1	1.23	0.81	.370	.012
Gender	2.01	1	2.01	1.33	.253	.019
Error	106.07	70	1.52			

R^2 = .60 (Adjusted R^2 = .58)

Table 5.4 ANCOVA summary for non-car use willingness

Attitudes

One-way ANCOVA was also performed for attitudes towards non-car user to test whether there were statistically significant difference between the single and the dual goal prime. There was a marginally significant main effect of condition (F(1, 74)=3.31, p=.063, partial $\eta 2$=.045). There was a significant main effect of PBC (F(1,75)=11.49, p=.001, partial $\eta 2$=.141) but no significant effect of age (p=.280) or gender (p=.998). A summary of ANCOVA can be found in Table 5.5.

Source	Sum of Squares	*df*	Mean Square	F-ratio	*p*-value	Partial η^2
Condition	5.25	1	5.25	3.31	.063	.045
PBC	18.20	1	18.20	11.49	.001	.141
Age	1.88	1	1.88	1.19	.280	.017
Gender	0.00	1	0.00	0.00	.998	.000
Error	110.85	70	1.58			

R^2 = .20 (Adjusted R^2 = .16)

Table 5.5 ANCOVA summary for attitudes towards non-car use

Table 5.6 presents the estimated marginal means for both dependent variables. A graphical representation in Figure 5.3 can be directly compared with predictions in Figure 5.1

	Willingness				Attitudes			
	M	*SD*	95% *CI* LB	95% *CI* UB	*M*	*SD*	95% *CI* LB	95% *CI* UB
Environment	.14	.30	-.46	.75	1.44	.22	1.00	1.88
Environment & Physical Activity	.68	.31	.07	1.29	2.14	.22	1.70	2.59

Table 5.6 Estimated marginal means of experimental conditions, controlled for age

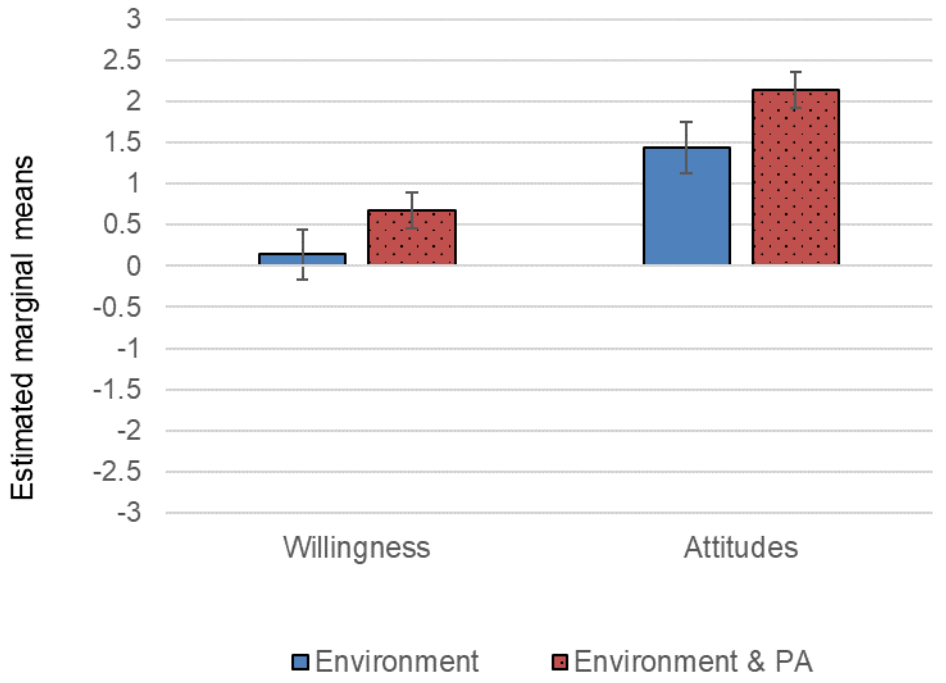

Figure 5.3 Estimated marginal means chart for willingness and attitudes

Results indicated that participants primed with two goals at the same time (pro-environment and pro-physical activity) did not show higher willingness to use non-car modes compared to participants primed with only one goal (pro-environment). Thus, hypothesis 1a cannot be supported. In contrast, priming two goals at the same time generated higher attitude scores among participants primed with two goals.

Consequently, hypothesis 1b is supported. Overall, results provide evidence that the direction of the responses in the dual priming condition are influenced in the hypothesised direction. Effects may have not been significant due to small sample sizes and potential floor effects. This warrants further investigation in a following study (Study 2), using a bigger sample size.

5.4 Study 2

In Study 1, it was demonstrated how priming participants with two goals can elicit more positive attitudes towards non-car modes compared to only one goal. It is not clear, however, whether this effect was due to the physical activity prime alone or whether both goals complement each other. Potential confounders that would cancel out the priming effect were also not taken into account. Thus, Study 2 aimed to explore priming effects by activating the two goals separately. This second study extended Study 1 by a) comparing experimental conditions to a control condition (see section 5.4.1.1); b) included various covariates to avoid possible confounding effects (see sections 5.4.1.4 and 5.4.1.5); c) an increased sample size, taking into account a wider and more diverse population; and d) including a measure to assess participants' readiness to change (see section 5.4.1.6), in order to identify potentially distinct effects among different target groups.

5.4.1 Method

5.4.1.1 Participant recruitment and procedure

In 2016, a US-based sample was recruited through the internet-based crowdsourcing tool MTurk (Paolacci & Chandler, 2014). MTurk is a third party online labour market hosted by Amazon. Respondents receive a small reimbursement for

completing quick so-called ‘human intelligence tasks’, such as surveys or product comparisons. Despite early criticisms of the platform (Birnbaum, 2004; Buchanan & Smith, 1999; Mathy, Schillace, Coleman, & Berquist, 2002), MTurk participants have been found to be more ethnically and socio-economically diverse compared to other online consumer panels (Buhrmester, Kwang, & Gosling, 2011). Research has also shown that attentiveness of MTurk participants is equal to that of traditional samples (Fleischer, Mead, & Huang, 2015; Hauser & Schwarz, 2016). MTurk has been widely used in psychological research with authors reporting reliable results (Hayes, van Stolk-Cooke, & Muench, 2015; K. Eriksson & Simpson, 2010).

Three versions of a questionnaire were administered randomly to participants. For a small remuneration, they were invited to complete an online survey about their opinions on three different subjects. All questionnaires started with priming questions that differed depending on one of the two experimental conditions: (1) pro-environment or (2) pro-physical activity. The control condition (3) travel mode choice, did not receive any priming questions as it was thought that even supposedly neutral questions can prompt implicit concepts (Vranka & Houdek, 2015). The complete questionnaire can be found in Appendix D, Section D.1.

5.4.1.2 Goal primes

The implicit goal prime stimuli consisted of the title (Pro-environment: YOU and the Environment, pro-physical activity: ‘YOU and Physical Activity’, or the control: ‘Travel Mode Choice’) and priming questions. Questions were constructed according techniques of compliance (Freedman & Fraser, 1966) and adapted to meet American English spelling and vernacular (refer to Table 5.1 in previous section).

5.4.1.3 Dependent measures

The dependent measures were identical to the ones used in Study 1. Items formed reliable scales (willingness: α = .76; attitudes: α = .76) and scores were averaged across items.

5.4.1.4 Demographic and socio-economic variables

Following the dependent measures, respondents were asked to record their gender and age. We recoded age into four categories consistent with the USA transport survey (16-20, 21-35, 36-65, >65 years). The questionnaire also asked for the respondent's primary living area with four options ranging from rural to urban location categories which were adapted from Lee et al. (2015). Residential location is an important determinant of car use with people in more urban areas consistently reporting higher levels of non-car use (Lee, Davis, & Goulias, 2017). Number of children was also recorded and categorised as "no children", "1 child" and "2 or more children". Research has shown that parenthood and in particular being first-time parents moderate relationships in relation to car use (Lee et al., 2017; S. Thompson et al., 2011). Using US census items, respondents were asked to indicate their ethnicity, educational status and household income (before tax). Ethnicity was dichotomised into "White or Caucasian" and "All other ethnicities" (due to low *N*s in specific categories). As described in Section 5.2, common socio-economic variables such as ethnicity, level of education and income have been found to correlate with car use (Buehler, 2011; Metz, 2012).

5.4.1.5 Transport and health-related variables

Participants provided their annual driven mileage. Data was highly skewed and recoded annual mileage was categorized into four groups (0, 1-500, 501-5000, 5001-

15000, >15000) enabling classification of participants as non-drivers, occasional drivers, light drivers, daily and heavy car users. Additionally, we assessed the extent to which people exercised, based on recommendations of moderate intensity physical activity (L. Frank, Saelens, Powell, & Chapman, 2007; Wener & Evans, 2007). Categories were no exercise, 1-2 times a week, 3-4 times or more than 5 times. Higher levels of exercise was frequently found to positively correlate with intentions to use non-car use, in particular walking and cycling, in earlier research (e.g. Panter, Griffin, Jones, Mackett, & Ogilvie, 2011). We also asked participants if they had any physical impairments that could limit their ability to walk, cycle or take public transport.

PBC over the use of non-car modes was also measured using items identical to Study 1 (α = .86).

5.4.1.6 Readiness to change

To assess participants' general readiness to make changes with regards to their travel mode choices, we used items adapted from Crawford et al. (2001) that represented the five stages of change theorised by the Transtheoretical Model (Prochaska & DiClemente, 1986). In line with our hypothesis that individuals in motivational stages are more likely to respond to priming, we classified respondents into three categories (0=pre-contemplation, 1=contemplation, preparation, action, 2=maintenance).

5.4.1.7 Awareness of influence

Respondents' lack of awareness of manipulations is important in implicit goal priming studies. If respondents are aware of persuasive attempts this may prompt reactance as they adjust their responses and this could contaminate the priming effect (Bargh,

1992). The last survey question asked whether participants felt they were influenced.

> *My answers were entirely my own and I was in no way influenced to give particular answers.*
> (-3 strongly disagree, 3 strongly agree)

Participants who disagreed or responded neutral on a 7-point scale were later excluded from analysis to mitigate potential contamination of the priming effect. Four participants indicated their responses were influenced (3 disagreed, 1 strongly disagreed) and eight were neutral. So only 12 were excluded from analyses and no separate sensitivity analysis was conducted.

5.4.1.8 Statistical procedure

All analyses were performed using SPSS version 23. Analyses of covariance (ANCOVA) were performed separately for both dependent variables, willingness to use and attitudes towards non-car modes. Controlling for all covariates (i.e. demographic, socio-economic, transport and health-related variables), the analyses adopted a 3x3 design (interaction between priming conditions and stages of change). Stratification by readiness to change allowed investigation of whether priming is more effective for those in motivational stages.

5.4.2 Results

5.4.2.1 Participants

The survey was completed by 909 participants (control *n*=303, environment *n*=303, physical activity *n*=303). No data on survey completion time was available, hence no exclusions could be made on that basis. We excluded respondents that failed the

awareness of influence check (*n*=12). This resulted in a final sample size of 897 (control *n*=294, environment *n*=302, physical activity *n*=295).

Several ANOVAs confirmed that randomisation of participants was successful. There were no differences between the two experimental conditions and control condition in terms of age ($F(3,609)=0.87$, $p=.455$), living area ($F(3,886)=0.30$, $p=.824$), ethnicity ($F(1,611)=0.23$, $p=.633$), income ($F(5,884)=2.04$, $p=.070$), number of children ($F(2,879)=0.31$, $p=.732$), educational status ($F(2,609)=1.95$, $p=.144$), annual mileage ($F(4,882)=1.30$, $p=.267$) and exercise levels ($F(3,886)=0.74$, $p=.528$) or gender ($F(1,612)=2.52$, $p=.081$).

5.4.2.2 Descriptive statistics

Table 5.7 depicts a summary of means (*M*) and standard deviations (*SD*) for both dependent variables across the two experimental conditions (pro-environment and pro-physical activity) and control condition. The descriptive statistics show that willingness to use and attitudes towards non-car travel modes were generally positive. However, no obvious differences were observed between the different conditions. In fact, willingness to use non-car modes seemed slightly lower for the physical activity goal prime condition compared to the control (before relevant covariates and stages of change have been controlled for).

	Willingness			**Attitudes**		
	N	*M*	*SD*	*N*	*M*	*SD*
Control	295	0.34	1.96	295	0.94	1.75
Environment	303	0.30	1.91	303	0.99	1.77
Physical Activity	299	0.14	1.62	298	1.00	1.76

Table 5.7 Sample size, means and standard deviations for non-car use willingness and attitudes

Correlation coefficients in Table 5.8 indicate that, as expected, Theory of Planned Behaviour variables a) attitudes and b) PBC are highly correlated with willingness to use non-car travel modes. Importantly, and also as expected, readiness to change showed similarly large effects on willingness and attitudes. The number of children, income and annual driven mileage all showed a significant moderate relationship with attitudes and willingness.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Willingness													
2. Attitudes	.591***												
3. PBC	.716***	.632***											
4. Age	-.108**	-.114**	-.155***										
5. Gender[a]	-.055	-.025	-.092*	.078									
6. Living area	.187***	.120***	.314***	-.097*	-.042								
7. Ethnicity[a]	-.066	-.011	-.126**	.110**	.061	-.119**							
8. Income	-.081*	-.043	-.095**	.029	.017	.011	.016						
9. Children	-.159***	-.134***	-.145***	.043	.135**	-.124***	.034	.158***					
10. Education	-.034	-.036	-.084*	.138**	-.034	.045	-.007	.310***	-.028				
11. Annual mileage	-.244***	-.114**	-.193***	.003	.008	-.145***	.066	.276***	.131***	.115**			
12. Exercise level	.189***	.148***	.170***	-.034	-.084*	.016	.003	.140***	-.031	.110**	.066*		
13. Stage of change[b]	.696***	.471***	.639***	-.091*	-.084*	.217***	-.039	-.109**	-.150***	-.055	-.249***	.194***	
14. Disability status[a]	.093**	.082*	.162***	-.223***	-.139**	.039	-.051	.161***	.063	.051	.066	.199***	.084*

Unless otherwise stated, Pearson's correlations coefficient *r* is reported
Significance levels (2-tailed) *** p< 0.001, ** p<0.01, * p<0.05)
[a] point-biserial correlation coefficient r_{pb}
[b] Spearman's rank-order coefficient r_s

Table 5.8 Bivariate correlation coefficients for dependent variables and covariates

5.4.2.3 Analyses of covariance

Analyses of covariance (ANCOVA) were performed adjusted for demographic, socio-economic and transport and health-related variables. ANCOVA also explored potential influences of the priming conditions on sub-groups. For sake of brevity, more parsimonious models are presented in this section, only displaying effects of the most immediate predictors. Complete analyses can be found in Appendix D, Section D.2.

Willingness

Willingness was explored using a 3 (conditions: control, environment, physical activity) x 3 (stages of change: pre-contemplation, motivational stages, maintenance), between-participants ANCOVA controlling for age, gender, living area, ethnicity, income, number of children, level of education, annual mileage, exercise levels and disability status. Notably, the sample size was reduced to n=601 mainly due to missing data for age (*n*=613), gender (*n*=614), ethnicity (*n*=613) and education (*n*=612). All those covariates were not significant predictors and therefore excluded in the final model. A summary of results are displayed in Table 5.9.

Source	SS_T	*df*	SS_M	*F*-ratio	*p*-value	η^2
Condition	9.69	2	4.85	3.36	.035	.008
Stages of change	259.66	2	129.83	90.02	.000	.173
Stages of change x Condition	2.69	4	0.67	0.47	.761	.002
PBC	374.45	1	374.45	259.62	.000	.231
Living Area	7.57	1	7.57	5.25	.022	.006
Mileage	11.72	1	11.72	8.13	.004	.009
R^2 = .62 (Adjusted R^2 = .61)						

Table 5.9 Summary of ANCOVA results for non-car use willingness

Results highlighted the importance of PBC (F(1,879)=259.62, p<.000, η^2=.231), living area (F(1, 879)=5.25, p=.022, η^2=.006) and annual mileage (F(1, 879)=8.13,

p=.004, η^2=.009) which were all significant independent predictors of willingness such that greater control, urban living and driving less were associated with greater willingness to use non-car-use modes. Of more direct importance was the significant main effect of condition (F(2, 879)=3.36, p=.034, η^2=.008) and a large significant main effect of readiness to change (F(2, 879)=90.02, p<.000, η^2=.173). However, there was no significant interaction between condition and readiness to change stage (F(4, 879)=0.47, p=.761, η^2=.002).

The significant main effect of condition was further explored using post hoc tests (Bonferroni adjustment and simple contrast). Contrary to predictions, results showed significantly lower willingness scores for participants in motivational stages when primed with physical activity goals compared to the control condition (p=.027). Priming participants with pro-environmental goals did not show any significant differences compared to control (p=.954).

Analysis using special contrast showed a marginal statistical significant difference between both experimental conditions and the control condition (p=.080). This confirmed that both primes together altered willingness scores in the opposite to predicted direction.

Estimated marginal means, controlling for PBC, living area, income, number of children, annual mileage, exercise levels and disability status are depicted in Table 5.10.

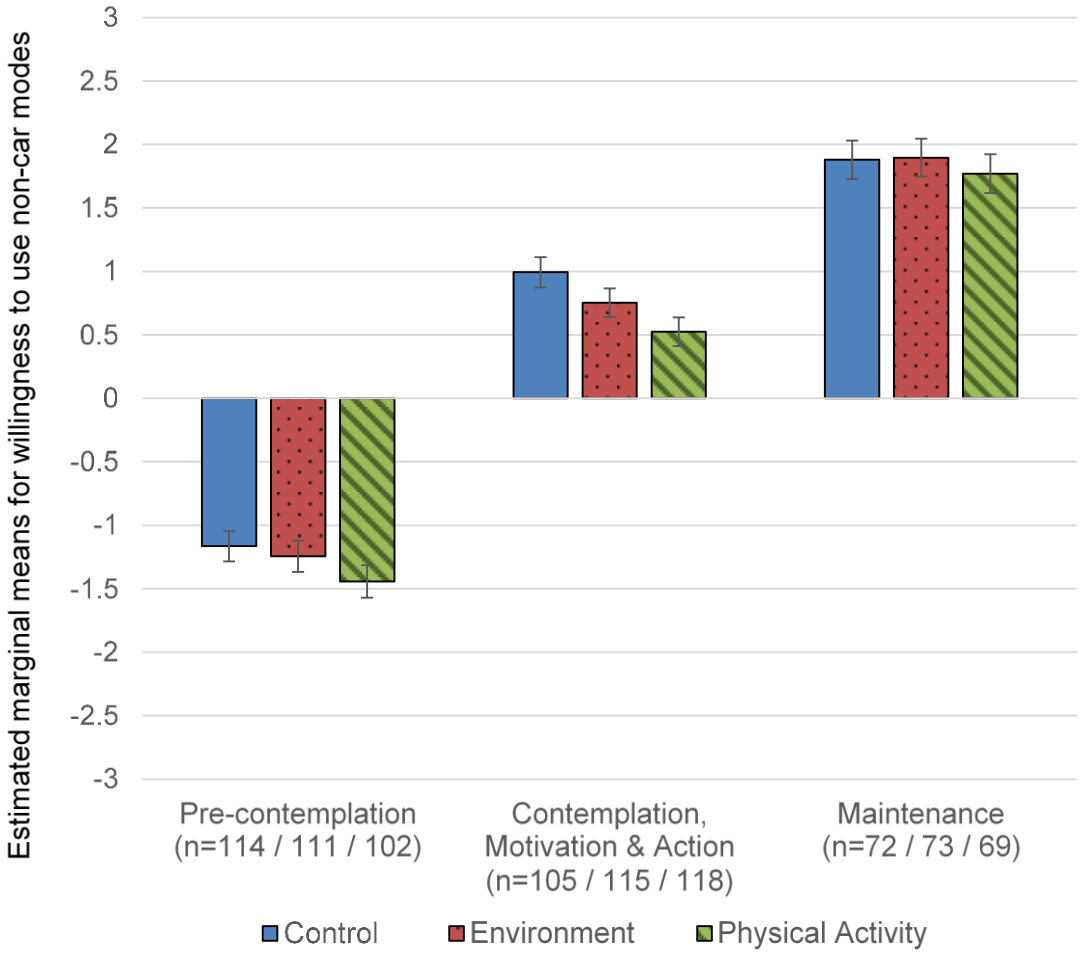

Figure **5.4** (refer to Figure 5.2 for direct comparisons with predictions) and detailed in.

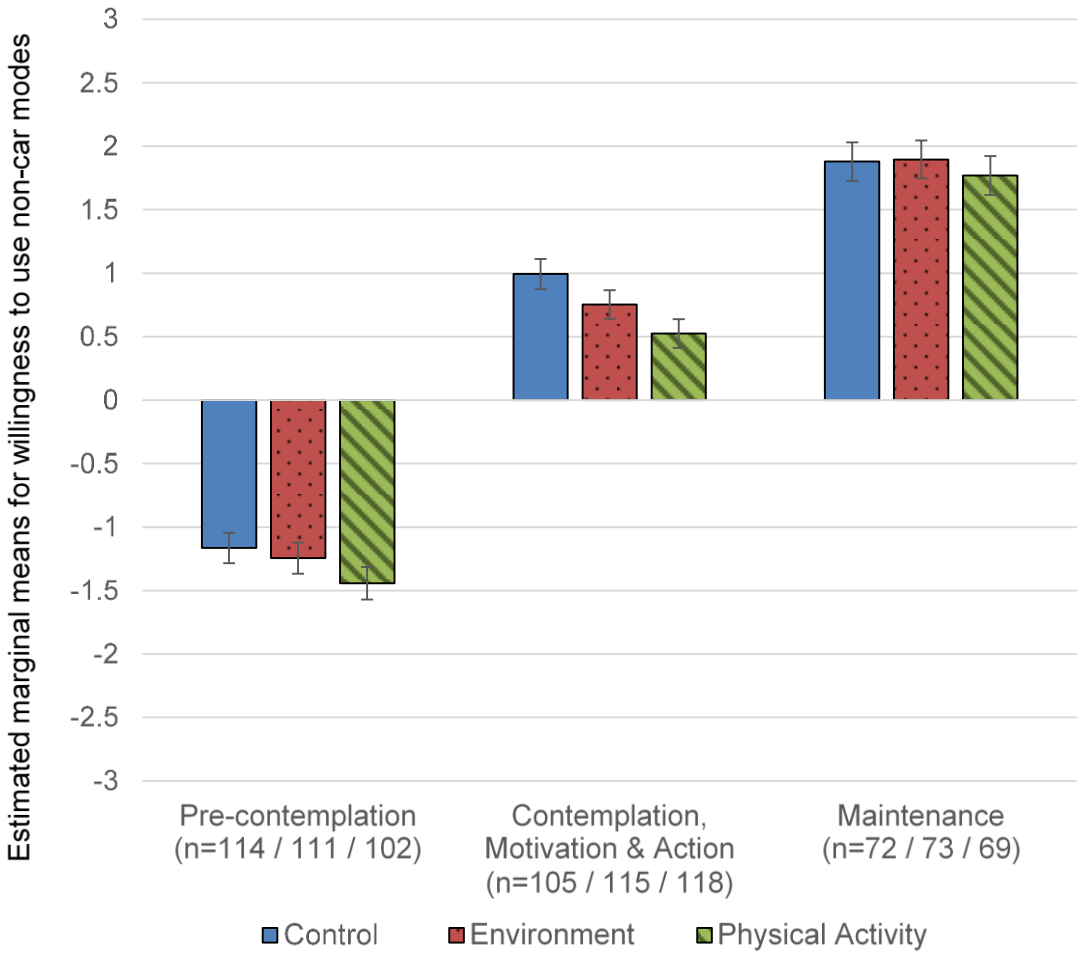

Figure 5.4 Chart for estimated marginal means for willingness

The results confirmed an overall large main effect of readiness to change on willingness to use non-car modes. As expected, the goal priming condition only affected participants in motivational stages. However, this effect was contrary to predictions such that the physical activity goal prime resulted in lower willingness to use non-car modes. No effect was observed for the pro-environmental goal prime. Consequently, neither hypotheses are supported.

	Pre-contemplation				Contemplation, Preparation & Action				Maintenance			
			95% *CI*				95% *CI*				95% *CI*	
	M	*SD*	LB	UB	*M*	*SD*	LB	UB	*M*	*SD*	LB	UB
Control	-0.55	0.12	-0.78	-0.31	0.67	0.12	0.44	0.91	1.21	0.15	0.92	1.51
Environment	-0.55	0.12	-0.79	-0.31	0.52	0.11	0.30	0.74	1.39	0.15	1.10	1.68
Physical Activity	-0.76	0.13	-1.01	-0.51	0.30	0.11	0.08	0.52	1.11	0.15	0.81	1.41

NB: Means are adjusted for living area, children, annual mileage and exercise level

Table 5.10 Estimated marginal means for willingness

Attitudes

Attitudes were explored using a 3 (conditions: control, environment, physical activity) x 3 (stages of change: pre-contemplation, motivational stages, maintenance), analysis of covariance (ANCOVA) controlling for age, gender, living area, ethnicity, income, number of children, level of education, annual mileage, exercise levels and disability status. Again, insignificant covariates age, gender ethnicity and education were removed in the final model due to a high number of missing values. Results of the parsimonious model can be found in
Table 5.11.

There was a large main effect of PBC on non-car use attitudes (F(1,879)=450.12, p<.000, $\eta 2$=.225). Living area (F(1,879)=19.88, p<.001, $\eta 2$=.013) and number of children (F(1,879)=3.58, p<.059, $\eta 2$=.004) were also predictive of non-car use attitudes with the latter only being marginally significant. This implies that increased perceived feasibility to use non-car modes, living in an urban area and having no children is associated with more positive attitudes towards non-car use. Mileage was not a significant predictor of attitudes (p=.752).

Importantly, there was no significant of condition (F(2, 879)=0.53, p=.591, $\eta 2$<.001) and the interaction between stages of change and condition was also not significant (F(4, 879)=1.22, p=.299, $\eta 2$=.006). The effect of readiness to change (F(2,879)=8.61, p<.000, $\eta 2$=.020) was significant but of lower magnitude compared to non-car user willingness.

Source	SS_T	*df*	SS_M	*F*-ratio	*p*-value	η^2
Condition	1.89	2	.95	.53	.591	.001
Stages of change	30.97	2	15.49	8.61	.000	.020
Stages of change x Condition	8.81	4	2.20	1.22	.299	.006
PBC	450.12	1	450.12	250.31	.000	.225
Living Area	19.88	1	19.88	11.05	.001	.013
Children	6.44	1	6.44	3.58	.059	.004
R^2 = .43 (Adjusted R^2 = .42)						

Table 5.11 Summary of ANCOVA results for attitudes

Consistent with analysis undertaken for willingness, results suggested that pro-environment and pro-physical activity, together, had a statistically significant influence on attitudes for participants in motivational stages (p=.006). The findings confirmed that priming participants changed attitude scores in the predicted direction. Thus, hypothesis 2b was partially supported.

Estimated marginal means, controlling for PBC, living area, income, number of children, mileage, exercise levels and disability status are summarised in Table 5.12 and graphical representation is presented in Figure 5.5.

Overall, the analyses highlighted the importance of readiness to change. The priming conditions led to mixed effects on cognition scores among participants who had already formed intentions and those who had already initiated change (those in the contemplation, preparation and action stages of the Transtheoretical Model). Findings provide some evidence that priming was successful for this target group. Surprisingly, the pro-physical activity goal prime had a significant negative effect, lowering non-car use willingness scores. Likewise, results also showed that priming with any goal, compared to no priming, affected willingness scores negatively. In contrast, both primes combined had a significant positive effect on attitude scores, supporting findings from Study 1

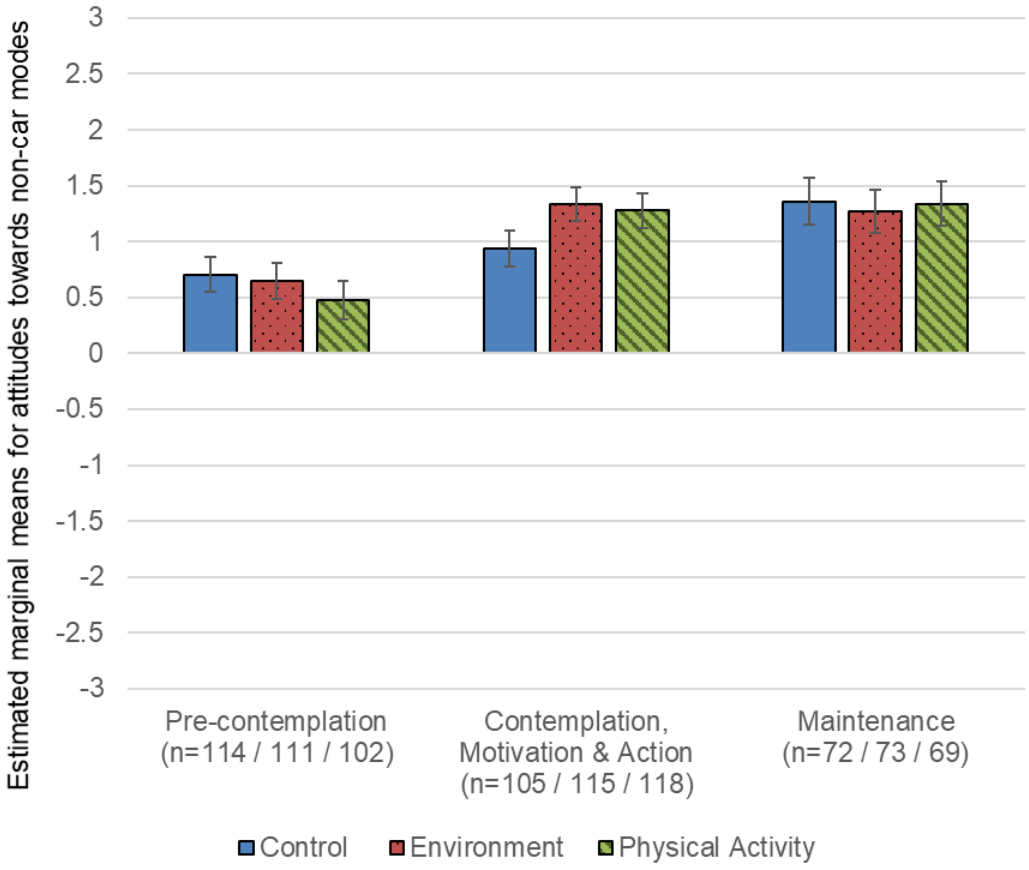

Figure 5.5 Chart for estimated marginal means for attitudes

	Pre-contemplation				Contemplation, Preparation & Action				Maintenance			
			95% *CI*				95% *CI*				95% *CI*	
	M	*SD*	LB	UB	*M*	*SD*	LB	UB	*M*	*SD*	LB	UB
Control	0.71	0.16	0.39	1.02	0.94	0.16	0.63	1.25	1.36	0.21	0.96	1.77
Environment	0.65	0.16	0.33	0.97	1.34	0.15	1.04	1.63	1.27	0.19	0.89	1.64
Physical Activity	0.48	0.17	0.13	0.82	1.28	0.16	0.97	1.58	1.34	0.20	0.95	1.73

NB: Means are adjusted for living area, children, annual mileage, exercise level and disability

Table 5.12 Estimated marginal means for attitudes

5.4.3 Investigation of reversed priming effects

The negative effect of the physical activity prime condition on willingness was further explored. The two items that measured willingness to use non-car modes were considered separately, showing that responses for both questions were fairly heterogeneous (see Table 5.13 for means across the conditions). Only for the second item, participants were less willing to use forms of transport other than the car, relative to control. ANOVA and post hoc tests (Fisher's Least Significant Difference, Bonferroni Correction) confirmed that Physical Activity condition was statistically significantly different from the control (p=.012).

	Willingness – item 1			**Willingness – item 2**		
	N	Mean	SD	*N*	Mean	SD
Control	295	.05	2.17	295	.63	2.03
Environment	302	.24	2.02	302	.36	2.01
Physical Activity	299	.07	2.01	299	.21	2.06

Table 5.13 Means for both willingness items

Mean scores for each of the seven priming questions were computed.

Table **5.14** shows a clear pattern: participants' mean responses gradually change from a positive (strongly agree) to a negative (disagree) stance towards the primed goal. Consequently, the last priming question (concerning willingness to donate money) which preceded the first willingness item was evaluated very negatively. Correlations confirmed a significant relationship between both variables (r=.278, p<.001).

Physical Activity priming question	*M*	*SD*
I am willing to take the stairs instead of elevators or escalators to be more physically active.	1.79	1.510
I intend to include more walking in my daily routine.	1.74	1.460
In the future, I am prepared to be more active outdoors, e.g. visiting green spaces.	1.62	1.420
I will spend more time being physically active in the future.	1.86	1.226
In the future, I am willing to engage in vigorous activity, e.g. jogging or team sport.	0.83	1.705
I would attend regular fitness classes, e.g. Zumba or Circuits.	-0.72	1.870
I am willing to donate money to improve indoor physical activity facilities in my area.	-0.97	1.652

N=299

Table 5.14 Mean scores for physical activity priming questions

It seemed reasonable to assume that a low income is associated with unwillingness to donate money. To exclude such effects of low income, I examined the correlation between the last priming question and the 2 lowest income categories (<$20,000, $20,000-34,999). No significant relationships were found.

Ultimately, it can be inferred that responses to the physical activity priming questions had a negative effect on willingness, priming the dependent variable in the opposite direction to the hypothesis. These findings also suggest that the order and question

content of the priming stimuli may have inadvertently undermined the aims of the current study.

5.5 Discussion

The studies reported here assessed the degree to which cognitions towards non-car use might be influenced by priming goals that are congruent with non-car use. This is, to my knowledge, the first test of implicit priming to manipulate goal salience in relation to the malleability of transport-relevant cognitions. The studies tested if priming pro-environmental and pro-physical activity goals, either together (Study 1) or separately (Study 2) is associated with greater willingness to use, and more positive attitudes, towards non-car use. The second study also explored potential effects of readiness to change. Results revealed mixed and unintended priming effects, contingent on sub-group, population, prime content and delivery.

Results did not support the hypotheses but are nonetheless interesting. Some support was observed for goal priming to affect non-car use willingness and attitudes. Study 1 revealed that respondents primed with two goals at the same time expressed more positive attitudes towards non-car use, compared to being primed with only one goal. Of course, the sample size for this study is very small, so results have to be interpreted with caution. Study 2 revealed a surprisingly negative influence of the physical activity goal prime on willingness scores amongst participants in motivational stages of readiness to change. By contrast, compared to the control, attitude scores were more positive amongst motivated participants when two single goal primes are combined. Results from both studies suggest that the pro-physical activity prime on its own may not be effective. However, in combination with a pro-environmental prime such a prime may alter cognitions towards non-car use among motivated respondents.

The study provides evidence that certain individuals' perceptions can be changed through the use of unconscious goal manipulation. In particular, people who had already formed intentions and those who had already initiated change. Importantly, it was found that both primes together had a positive effect on attitudes. This lends general support for the utility of non-conscious goal activation that does not require explicit goal setting (Bargh et al., 2001; Chartrand & Bargh, 1996; Gollwitzer, 1999). Providing subtle cues in transport-relevant environments may remind people of relevant goals. Increasing accessibility of goals can be achieved in various ways, ranging from posters (Biel, Dahlstrand, & Grankvist, 2005) or simple pro-environmental messages (Tate et al., 2014) as also used in this study. Multiple methods that activate environmental and physical activity constructs can be a useful addition to hard policy measures to enhance the adoption of sustainable alternatives when travel choices are deliberated. For example, providing information about emissions and calorie consumption incorporated into travel planning tools could activate related goals, thus result in more positive attitudes towards sustainable travel and perhaps "greener" choices.

5.5.1 Negative priming effect

An unexpected outcome was the significant effect of the physical activity prime in the opposite direction to that hypothesised. Assuming those effects were not random, two possible explanations can be considered.

First, ad hoc analyses revealed that asking participants to donate time and money – two critical resources in people's lives – may have led to negative responses towards non-car use cognitions. This suggests that communicative materials containing temporal and monetary content can lead to reduced willingness to use non-car modes. Indeed, asking participant to donate time and money could have activated other implicit concepts such as time efficiency and cost savings which are negatively

associated with non-car use (Gardner & Abraham, 2007). Previous research has revealed that, just measuring the intention to donate money can lead people to consider implications of that action in terms of a value-maximising goal (Liu & Aaker, 2008). Similarly, Whillans and Dunn's (2015) research into intentions to act in an environmentally-friendly way reminded participants of the economic value of time. Consequently, intentions to engage in environmentally-friendly behaviour were reduced among a representative sample of Americans. Results may also mean that the observed negative effect has potential to be reversed when individuals strongly agree with the prime content. This could be accelerated through awareness of desired pro-environmental behaviours being more cost-effective (Steg, Bolderdijk, Keizer, & Perlaviciute, 2014). Well-documented recommendations (see also Chapter 3 and 4) challenging misconceptions about low costs of car use compared to public transport could also help in this regard (Gardner & Abraham, 2007; Tertoolen, Van Kreveld, & Verstraten, 1998). Strategies aimed at making environmental goals constantly salient may be effective when being combined with reminders of high motoring costs vs. "free" travel modes and congestion vs. time efficiency of active travel options, i.e. walking and cycling. Travel information sources that compare and highlight such cost and time savings might also be successful in this regard. Finally, findings suggest that future priming research should consider unintended activation of implicit concepts. Perhaps, priming questionnaire items containing a coherent set of agreeable statements congruent with the goal could have led to a positive priming effect in Study 2.

Second, reversed priming effects have been observed previously and referred to as 'contrast effects' (Hovland et al., 1957) or 'boomerang effects' (see Byrne & Hart, 2009 for a review). For example, such unintended effects have been reported in relation to campaigns aimed at reducing unhealthy behaviours, e.g. smoking (Grandpre, Alvaro, Burgoon, Miller, & Hall, 2003; J. L. Harris, Pierce, & Bargh, 2014; Wolburg, 2006), alcohol consumption (Ringold, 2002) or drug abuse (Rosenbaum &

Hanson, 1998). In all these cases, messages about the desired behaviour led to more positive attitudes towards the undesired behaviour. Likewise, messages that aimed to promote health behaviours such as healthy eating have resulted in a lower willingness to perform the target behaviour (M. B. Schwartz, Thomas, Bohan, & Vartanian, 2007). Notably, pro-environmental messages targeting social norms have also resulted in boomerang effects amongst people who already perform the behaviour (Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). Similar findings have been documented in social psychological research (Glaser & Banaji, 1999). Glaser and Banaji (1999) demonstrated contrast effects caused by extreme valence of responses to their priming words. In Study 2 reported here, extremity of evaluations in relation to the priming questions may have also moderated correction bias believed to account for these contrast effects (Herr, Sherman, & Fazio, 1983; Strack, 1992).

Ultimately, results raise questions about the most effective means of conveying messages containing information about environmental protection and physical activity. Findings imply that implicit goal activation based on foot-in-the-door techniques may not be suitable approaches. Importantly, research should explore whether environmental and human health messages are perceived as persuasion tactics as this can have important implications for the success of behaviour change interventions (Ringold, 2002).

It is not clear why the physical activity prime, and not the environmental prime was negatively associated with willingness. Likewise, it is unclear why was the reversed priming effect was only detected among the US sample who were in the motivated stages of change. Wheeler and Berger (2007) have explained reversed priming effects as a result of different prime associations. The authors showed that the identical prime can lead to inconsistent effects and suggested that person-specific

characteristics play an important role in priming experiments. This warrants further research using segmentation within the priming studies. Obermiller (1995) also demonstrated the importance of distinguishing between individuals possessing high vs. low environmental concern when framing environmental messages. Further, polarised responses to environmental messages were found to be linked to political partisanship (Hart & Nisbet, 2012). In the US, in particular, the gap between Democrats and Republicans in relation to their opinions about environmental issues was responsible for a boomerang effect on pro-environmental messages in Dunlap and McCright's (2008) study. These authors proposed that views about climate mitigation have become an important part of how people identify themselves politically (Nisbet, 2009). So, while participants in the physical activity goal prime condition could have held more homogeneous perceptions of physical activity, participants in the environmental prime condition may have held ambivalent environmental dispositions. Neither general concerns about environment, physical activity nor political partisanship were measured during the study procedure. Successful goal activation may also depend on antecedents of goal setting, particularly relevant for adoption of pro-environmental goals (Nielsen, 2017). As such, people with higher levels of environmental awareness and pro-social values are more likely to pursue pro-environmental goals (Steg & de Groot, 2012). Environmental awareness and value orientation were not assessed in this study.

5.5.2 Importance of readiness to change

Findings have identified readiness to change as an important predictor for both willingness to use and attitudes towards non-car use over and above key predictors such as age, number of children and income. In line with previous research (Armitage & Arden, 2002; Forward, 2014; Gatersleben & Appleton, 2007), the study demonstrated a linear relationship between cognitive determinants and readiness to change. Results imply that different strategies may be fruitful for different groups

(Prochaska, DiClemente, & Norcross, 1992). For instance, social support and reinforcement can be an effective strategy for people contemplating cycling to work (Gatersleben & Appleton, 2007), tailored marketing materials can be successful for people willing to use the bus (Beale & Bonsall, 2007). Individuals in motivational stages also show greater attitudinal ambivalence (Clarke & Eves, 1997; Prochaska & DiClemente, 1986) and so may be persuaded by techniques that leverage those ambivalent attitudes. Communicative strategies can also build upon ambivalent attitudes identified in Chapter 4 where simple nudging techniques and motivational interviewing can facilitate a shift in car use (Miller & Rollnick, 2012). Techniques of understanding, exploring and problem solving (Kaplan, 2000), and self-persuasion (Bem, 1965) can be fruitful methods to change attitudes and lead individuals towards maintenance stage of the Transtheoretical Model. By contrast, psychological interventions targeting pre-contemplators may be resource-intensive and of limited immediate effectiveness. Future research can explore whether pre-contemplators respond differently to different goal primes.

Readiness to change proved a useful framework to identify groups that could be more susceptible to implicit messages. Results also imply that integrating readiness to change into segmentation approaches can increase effectiveness of sustainable travel campaigns. For example, households participating in the IndiMark TravelSmart project were categorised according to their willingness to change and received tailored marketing material. The intervention achieved a sustained reduction in car journeys by 14% and has since been applied in twelve countries (Brög, Erl, & Mense, 2002). This emphasises the need for localised and personalised transport interventions to drive behaviour change

5.5.3 Limitations

Several methodological factors limit interpretation of these findings.

First, the use of a crowdsourcing tool combined with an online study design could have reduced priming effects. While data collection using digital sources allows access to a wider pool of participants, it also leads to limited control over the participants' environment. Priming is sensitive to situational influences, individual context, time and place stimuli, all of which can contaminate priming effects (Xu & Wyer, 2012). Participants in experimental as well as control groups could have been influenced by other concepts in their immediate environment. Laboratory-based studies could mitigate these influences, but ultimately compromise on sample size and representativeness.

Second, while implicit attitudes have gained attention trough research into socially sensitive research areas, e.g. racial stereotypes (Cameron, Brown-Iannuzzi, & Payne, 2012), little is known about the influence of implicit attitudes on transport choices. Returning to the example described in Section 5.2.1, Tate and colleagues (2014) observed priming to influence implicit (not explicit) attitudes towards sustainable food choices. By contrast, Panzone et al. (2016) found that implicit attitudes were not predictive of sustainable consumption behaviour. More research is needed to clarify the role of implicit and explicit attitudes in travel mode choice. More specifically, the field would benefit from identifying journey-specific implicit and explicit attitudes that may drive further research into their malleability. Also, this study did not assess implicit attitudes due to the limitations associated with the Implicit Association Test (Greenwald, McGhee, & J. Schwartz, 1998) employed in a non-controlled environment and using non-standardised IT equipment.

Third, assessment of the true changeability of a person's cognitions, of course, requires the *same* participant to be primed with different goals. Future research could explore this intra-person variability using a within-group study design. A more homogeneous target population could have yielded more robust priming effects by mitigating person-specific variability in mental associations with the stimulus.

5.6 Conclusion

The current study explored to what extent two goals that are incongruent with car use may change cognitions when primed either at the same time (Study 1) or individually (Study 2). Study 1 showed that attitudes towards non-car use were more positive when both pro-environmental and pro-physical activity goals were active. Study 2 showed that priming a single physical activity goal decreased willingness to use non-car modes amongst motivated participants. However, non-car use attitudes were more positive among this group, when both primes were combined.

The research indicated that motivated (as opposed to unmotivated or those who have already changed) are susceptible to primes that aim to change cognitions, hence a crucial target group for travel behaviour change interventions. The results also suggest that using more than one prime can prompt cognition change. More research is needed to determine whether unconscious priming techniques are effective.

Chapter 6 General discussion

The doctoral research aimed to expand our knowledge about underlying motivations to choose travel modes. In particular, it sought to explore changeability of transport-relevant attitudes to better understand evaluations of travel modes. Findings of the work presented in this thesis provide contributions to future research in this area and highlighted potentially effective targets for car use reduction intervention. Travel behaviour research has been dominated by applications of rational choice models in quantitative studies, frequently focussing on one travel mode user group (e.g. drivers). Static measurement of uni-dimensional cognitions has been the primary method to predict, often only one, behavioural option (e.g. car use). To date, little is known about the variability of underlying evaluations of travel modes and unconscious motivational processes have been largely ignored in the literature. Thus, the current research aimed to explore attitude variability across contexts and to test the degree of changeability of transport-relevant cognitions. Fundamental to this thesis is the assumption that non-car use evaluations and motivations are not salient at all times, but may be in competition with other goal priorities. Four studies presented in this thesis used a range of novel methodologies to directly address these following overall research aims:

1. What transport-relevant cognitive mechanisms, in particular attitudes, are currently used to explain travel mode choice? How are these conceptualised and how do these vary in different contexts?
2. How do individuals evaluate multiple modes at the same time?
3. Are transport-relevant attitudes variable and if so, under which circumstances?
4. Can transport-relevant cognitions be manipulated through priming methods?

The remainder of this chapter provides an overview of key findings of this research, revisiting the overall research aims (Section 6.1). Overall strengths and limitations of

the research are highlighted (Section 6.2) and implications for practice (Section 6.3) and research (Section 6.4) are discussed.

6.1 Summary of findings

What Cognitive Mechanisms Predict Travel Mode Choice? A Systematic Review with Meta-Analysis (Chapter 2)

The systematic review and meta-analysis extended and updated previous work by Gardner and Abraham (2008). The study aimed to revisit available evidence and to synthesise knowledge of current conceptualisations of cognitive mechanisms, in particular attitudes. It further sought to understand contextual inconsistencies and their influence on the relationship with car use and non-car use (research aim 1). The first study investigated the following specific study research questions:

1. Which cognitive mechanisms have been used to explain car use and non-car use?
2. How methodological rigorous are available studies?
3. Which theories do identified cognitive mechanisms represent?
4. How strong are the bivariate associations between specific cognitive mechanisms and car use/non-car use?
5. Is strength of these associations moderated by contextual factors, such as study location, journey type and travel measure?

The systematic review included 43 studies from 36 years of research and revealed 333 unique associations grouped into 26 categories of mechanisms. Qualitative synthesis revealed methodological gaps in the literature. In particular, it confirmed 1) the limited use of theory to underpin research, 2) limited number of mechanisms explored, 3) few studies establishing causal relationships, and 4) heterogeneous operationalisations of predictor and behavioural variables. Attitudes were both the

most studied (125 unique associations derived from 32 studies) and the most inconsistently operationalised cognitive mechanism (47 different operationalisations). The range of different associations prompted summarising these into manageable and meaningful groups. Six conceptually different categories of attitudes were proposed.

Quantitative synthesis was performed using 205 effect sizes (Pearson's *r*) available from 35 studies. Meta-analysis of bi-variate effect sizes revealed which mechanisms targeted in interventions may yield most effective behavioural shifts. As such, intentions, perceived behavioural control and attitudes were strongest predictors of both car use and non-car use, whilst habit provided an important antecedent of car use only. Few moderator analyses were performed due to poor reporting and low number of effect sizes per category of cognitive mechanism.

Meta-analysis and sub-group analyses showed variations in attitude-behaviour strength, depending on the type of attitude and context studied. Specifically, general car use attitudes towards driving only showed a moderate relationship which significantly varied depending on geographical settings, study location, journey purpose and type of measure used. Attitudes towards transport environment were more relevant in urban areas (r_+ = -.35) and less predictive in non-urban settings (r_+ = -.17). Other categories of attitudes showed smaller pooled effect sizes (attitudes towards environment and health, r_+ = -.10) or no effect (attitudes towards travel in general, r_+ = .05). Interestingly, non-car attitudes were more predictive of non-car use (r_+ = .36, p < .001) than car use (r_+ = -.23, p < .01).

Chapter 2 directly addressed the overall research aim 1: *What transport-relevant cognitive mechanisms, in particular attitudes, are currently used to explain travel mode choice? How are these conceptualised and how do these vary in different contexts?* The research highlighted the range of determinants of car use and non-car use behaviour (26 conceptually distinct categories of mechanisms). However, our

understanding of car use and non-car use may be limited due to mechanisms being derived from a limited number of rational choice theories (eight socio-psychological theories) and varying operationalisations and conceptualisations. Specifically, heterogeneity of attitudinal measures needs urgent attention. Unfortunately, sub-group analysis to establish contextual differences in the predictive validity of mechanisms remains, to a large extent, explorative. Significant results were obtained for attitudinal measures, confirming considerable variations in effect sizes depending on which type of attitude, geographical setting, journey type and population is being studied and which measurement scale is being used. Findings highlighted the complexity of attitudinal variables with regards to their measurement, conceptualisation and context-dependent predictability of car use, providing insights into potential reasons for inconsistent attitude-behaviour link. This warrants further exploration into the underlying dynamics of perceptions of travel modes.

Cognitive Construction of Travel Modes among Car Users and Non-Car Users - A Repertory Grid Analysis (Chapter 3)

The second study used a Repertory Grid methodology to explore how travel modes are construed and evaluated amongst a range of choice options (research aim 2). In particular, the study compared perceptual spaces of two travel mode user groups, those who primarily use alternative transport (non-car users) with those who drive frequently (car users). Addressing four study research questions, the second study explored how non-car users and car users differed in relation to:

1. elicited constructs
2. priority of some constructs over others
3. relationships (a) among travel modes and (b) among constructs
4. relationships between travel modes and constructs

Repertory Grid (RepGrid) elicitation procedure was conducted with 30 participants that were either a non-car user (participants who primarily use non-car modes) or car user (high mileage car driver). The RepGrid interview technique used seven traditional travel modes (bus, coach, train, tram, car, walking, cycling) in triadic elicitation procedure which identified 448 unique bi-polar constructs ($n_{\text{non-car}}$ = 226, n_{car} = 222). Participants used between 13 and 19 (M = 15) constructs to understand travel modes. Five different types of analyses were conducted to address the specific study aims. Thematic analysis grouped individual constructs into 28 ($n_{\text{non-car}}$ = 27, n_{car} = 26) unique summary constructs, with 25 categories overlapping between the two groups. Content analysis confirmed the importance of some constructs over others and established that route and time flexibility, cost, speed and reliability are important evaluative criteria for both travel mode user groups. Interestingly, physical activity and environmental considerations were only important for non-car users, echoing findings from Chapter 2 which found a weak relationship with car use. Cluster analyses confirmed that both groups see public transport modes as similar and active modes as alike, and both significantly dissimilar from car. Notable, non-car users construed walking and cycling more differentiated than car users. This was confirmed by principal component analysis which suggested that car users' construct system can be considered less complex. Analyses of mean rating scores identified further differences between the two groups who both rated their own travel mode more favourable. Large differences were identified in how non-car users and car users evaluate cost, reliability and speed of cars and public transport which may contribute towards misconceptions and monolithic perspectives of car users that can be addressed in interventions.

Chapter 3 directly addressed the overall research aim 2: *How do individuals evaluate multiple modes at the same time?* The RepGrid elicitation procedure has provided a useful tool for deriving evaluations of multiple modes and elicited perceptions beyond those identified in Chapter 2. The results showed that car use can be placed

amongst a portfolio of different travel options and that unique bi-polar evaluations can be applied to multiple different modes. For example, respondents applied important constructs of route and time flexibility to both car and active modes, suggesting that some car journeys may be replaced with walking and cycling. The study confirmed that non-car users and car users applied broadly similar constructs to judge travel modes, however these groups differed in *how* they applied these constructs to travel mode choice. Results also demonstrated that not all perceptions are equally important. Investigating evaluations with multiple choice options pose a richer and more realistic method of investigation. Importantly, the RepGrid interview technique has revealed participants' ambivalent and changeable evaluations when multiple options were discussed. These informed the subsequent research.

Ambivalent about Travel Mode Choice? A qualitative investigation of car user and non-car user attitude change (Chapter 4)

The qualitative study used narratives from the preceding RepGrid elicitation procedure to inform semi-structured interviews conducted with the same 30 participants (15 non-car user and 15 car user). It sought to further explore how variable transport-relevant attitudes are and in which context these are most changeable (research aim 3). Study 3 had the following three research questions:

1. Investigate participant's awareness and experiences of travel mode choice attitude change
2. Explore and explain context-sensitive evaluations and assess the degree of changeability of transport mode attitudes in specific contexts
3. Identify potential differences between individuals in such attitudinal changeability

Thematic analysis revealed intra-personal attitude variability amongst transport-relevant attitudes in which a) negative and positive evaluations towards one travel

mode (attitudinal ambivalence), and 2) variability of attitudes dependent on the context, were identified. Attitudinal ambivalence contains six sub-themes which identified common beliefs of cost, safety, being the driver, comfort, speed and flexibility change along an evaluative continuum of positive and negative. This variability was most expressed in relation to car use and less often active mode, train or bus use. In addition, this study revealed high intra and intra-person variability in relation to aspects of (in)convenience of various travel options. Forty-two unique dimensions were identified across seven travel modes. The study further demonstrated variability of questionnaire responses through retrospective survey discussions and provided a list of previously used survey items subject to biases and ambiguity.

Previous chapters have explored the dynamics of transport-relevant attitudes in relation to contextual differences amongst different studies (Chapter 2) and relationship between evaluations amongst groups of travel mode users (Chapter 3). Chapter 4 directly addressed the overall research aim 3: *Are transport-relevant attitudes variable and if so, under which circumstances?* and established that attitudes can be subject to intra-personal variability. Two forms of intra-personal attitude variability were identified: attitudinal ambivalence and context-dependent attitude variability. It is important to note that many of the frequently elicited and important constructs identified in Chapter 3 also showed intra-attitudinal ambivalence in Chapter 4. Thus, evaluations regarding cost, safety, comfort, speed, being the driver and flexibility were all changeable and can be used in interventions to reduce car use. Variability of evaluations also occurred as a result of conflicts between attitudes, with respondent often discussing compromising time, cost, freedom, non-car users also discussed concerns about physical activity and environmental concerns. In both cases, variability was dependent on contextual factors and the final evaluation was conditional to individual's (goal) priorities at the time. The extent of ambivalence of identified evaluations could be further explored through quantitative

measures to establish more generalisable evidence. The study revealed several circumstances in which attitudes are more susceptible to ambivalent evaluations. These were mainly relating to traffic conditions, trip purpose, length and destination and the number of people travelling. The study also found evidence for variability in questionnaire response and reported survey items which were subject to several biases. The study confirmed that attitudes are unstable and changeable as a result of varying situations. A relevant question then for intervention design is, whether context can be manipulated to generate more positive evaluations towards non-car travel modes?

Can different goals change willingness to use and attitudes towards non-car use? An implicit priming experiment (Chapter 5)

Studies 1 - 3 established that the attitude-behaviour relationship is variable (Chapter 2 - research aim 1) which may be a result of individually different importance of some evaluations (Chapter 3 - research aim 2) and attitudinal ambivalence caused by varying context changes (Chapter 4 - research aim 3). These results raised the question whether transport-relevant evaluations, and theoretically associated cognitions, can be manipulated (research aim 4). The fourth piece of work addresses this question in two priming experiments that used findings from the previous studies. Chapter 5 presents two separate studies investigating the following specific study research questions that asked whether:

1. the activation of two goals simultaneously that are incongruent with car use has a positive effect on non-car use (1) attitudes and (2) willingness (Study 1)
2. the separate activation of two different goals that are incongruent with car use has a positive effect on non-car use (1) attitudes and (2) willingness (Study 2)
3. influences differ between individuals belonging to different stages of change (Study2)

Analyses of covariance (ANCOVA) were conducted to examine differences between a dual goal prime condition vs. a single goal prime condition (Study 1, *N* = 75) and two single goal prime conditions vs. a control condition (Study 2, *N* = 898). One-way ANCOVA of responses from a smaller sample in Study 1 controlled for PBC, age and gender and showed a small positive effect of the dual goal prime on non-car use attitude scores. Further investigation in a larger scale study (Study 2) used a 3 (prime: environment, physical activity vs. control) x 3 (readiness to change: pre-contemplation, motivated stages, maintenance) between-subject design with willingness and attitudes as dependent variables. However, no goal activation effects were observed. Surprisingly, the physical activity goal prime generated a negative effect on willingness to use non-car modes amongst respondents in the middle stages of the Transtheoretical Model. This effect be explained explained by several study limitations or insufficient goal-means association.

Chapter 5 directly addressed the overall research aim 4: *Can transport-relevant cognitions be manipulated through priming methods?* Evidence for changing cognitions as a result of automatically primed goals is inconclusive and warrants further research. Across both studies, priming effects were either absent, very small or reversed. A small reversed effect of the physical activity prime on willingness to use non-car modes among already motivated individuals identified a potential optimal target group for intervention to promote non-car use. Investigations of this effect suggest careful wording of questions in surveys to avoid similar unintended effects. Goal activation through the mere use of priming questions may also not be the most effective way to test malleability of travel-relevant cognitions and results suggest the use of alternative implicit goal primes in future research.

6.2 Strengths and limitations

The four research studies presented in this thesis have a number of strengths and limitations that warrant attention, some of which were already discussed in respective chapters. The following section revisits and addresses key strengths and limitations of this work.

The systematic review and meta-analysis (Chapter 2) is, to my knowledge, the most up-to-date and comprehensive synthesis of quantitative studies investigating travel mode choice in socio-psychological research. Study design, syntheses and reporting were conducted in accordance with standard PRISM guidelines (Higgins & Green, 2009; Moher, Liberati, Tetzlaff, Altman, & Group, 2009), ensuring methodological rigour. It contributes to the scarce evidence-based research in this field and complements other recent work that focussed on effectiveness of car use reduction interventions (Arnott et al., 2014) or theoretical applications (Chng et al., 2017). The review provides a comprehensive list of previously used and/or validated measures along with quality assessment scores for each study. Thus, it is a valuable resource for future research to address identified issues of heterogeneous conceptualisation and operationalisation of cognitive mechanisms in transport research. Meta-analytic results form a guide for targeted intervention development summarising cognitive mechanisms that may yield most effective behavioural shifts. The review uncovered methodological and conceptual gaps and weaknesses within the current literature, providing recommendations and priorities for future research. Again, to the best of my knowledge, this was the first study to perform sub-group analysis, investigating contextual moderators. Moderator analysis was both strength and limitation of this study because low number of effect sizes meant that some results remained explorative. For instance, sub-group analysis could reliably be performed for general attitude measures but were less conclusive for environmental and health-related attitudes.

The Repertory Grid study (Chapter 3) applied personal construct theory to transport research and offered an alternative exploratory approach to commonly used methodologies. Whilst more widely used in other fields (e.g., consumer behaviour, education), Repertory Grid analyses in transport are rare. To my knowledge, this is the third study using this mixed method approach and the first to compare perceptual maps between different groups of transport users. The mixed method approach has several advantages over conventional interview or projective methods, hence the study offered 1) a structured elicitation procedure which did not impose the researchers own views on participants nor did questions limit the extent of elicited constructs, 2) insights into the relationship between individuals' perceptions of travel modes and which attitudes may be more important than others, 3) improved understanding of how travellers may evaluate modes when faced with a range of choice alternatives, 4) comparisons of evaluations between two distinct groups and 5) analyses of responses beyond what traditional qualitative studies allow. Categories identified through the RepGrid elicitation procedure corresponded with findings reported in a recent RepGrid study (Clauss & Döppe, 2016) and previous studies of transport-relevant beliefs (e.g. Anable & Gatersleben, 2005; Mann & Abraham, 2012). The study therefore provided a good representation of evaluative spaces which travel mode users apply to judge transport modes. During the elicitation of bi-polar perceptions participants exhibited attitudinal ambivalence within modal decisions which informed subsequent qualitative research.

The qualitative study (Chapter 4) contributes to less common inductive travel behaviour research (Clifton & Handy, 2003). It is the first to explore alternative meanings of attitude neutrality in the context of travel mode choice. The study compared different transport users and investigated perceptions towards multiple travel modes, as opposed to attitudes of homogenous user groups towards a single choice option. The study identified specific situations in which attitudinal ambivalence was expressed, suggesting a range of practical implications for intervention design.

The study offers an improved understanding of the value-action gap in travel mode choice by revealing underlying complexities of daily mode choices largely ignored by quantitative methods. For example, attitudes can be conflicting and final evaluations depending on context-specific individual priorities. The study was the first to apply *a posteriori* survey discussions and uncovered a set of biases and sources of ambiguity important for questionnaire design and data collection.

The experimental research (Chapter 5) is, to the best of my knowledge, the first study to experimentally test changeability of cognitions as a result of implicit goal priming. The majority of implicit priming experiments in social psychological research are conducted in laboratory-based setting and predominantly rely on student samples. This can lead to low experimental power, limited generalisability and gaps between experimental research and practical relevance. This study addressed limitations of sample size, representativeness and limited applicability of methods in non-academic settings. Utilising widely used data collection methods, i.e. survey, the study benefitted from recruitment through MTurk which provided access to a large pool of participants broadly representative of the US population.

Overall, the thesis draws on various theoretical frameworks from different disciplines, e.g. personal construct theory, attitudinal ambivalence and goal pursuit, and, as yet, is unique in its application of chosen methodologies (e.g. Chapter 3, 4 and 5). As outlined in Chapter 1, the current literature lacks applications of alternative theoretical approach and applications of primarily prediction models has limited our understanding of underlying motives of travel mode choice. The doctoral research aimed to create a more realistic account of underlying evaluations of travel modes and offers novel insights into the extent of changeability of transport-relevant attitudes and the relationship between those.

The studies reported in this thesis, however, also have limitations which have to be considered when interpreting the results.

The results of the systematic review and meta-analysis (Chapter 2) are limited by poor reporting by some of the studies and general heterogeneity of measures within the transport literature. The review found inconsistent measurement for both measures of cognitive mechanisms and travel behaviour, providing unfavourable prerequisites for meta-analyses that assumes studies have been carried out under comparable conditions (Hunter & Schmidt, 2000). Varying study settings and samples have implications for the validity of study results across different environments and populations and comparison between pooled sub-group effect sizes may be imprecise. Nevertheless, the proposed categorisation was considered the best possible solution to aggregate data available from current evidence and may be adopted or developed by future studies. Some pooled effect sizes were generated by a small number of studies and thus warrant caution when interpreting the results. Quality assessment did not follow a validated framework because no tool exists which accounts for different study designs. Instead, the most common study quality criteria across a range of such assessment guidelines were used. Because of time and resources limitations, quality assessment scoring was only undertaken by the first author. Similarly, a second researcher did not extract data from included full texts but only performed double-screening of a random selection of excluded and included studies against the inclusion criteria. Despite a comprehensive search strategy, there may well be missing studies which used different terminology or did not report methods in the abstract. Likewise, a number of studies may have been published in grey literature or foreign language journals not identified by the search strategy.

Studies investigating alternatives to car use employed a wide range of outcome measures. These ranged from “environmentally friendly modes of travel” to “public transport” or “active modes” with low number of studies for each unique behaviour. Aggregation of these as “non-car use” in the meta-analyses, therefore, created a mixed category that could not reveal the multifacetedness of different non-car use

behaviours. For example, public transport use vs. car use and walking vs. driving might be influenced by different cognitive mechanisms or indeed, as shown in Study 2 (Chapter 3), might share perceptions and evaluations. Policy makers should use the present study as complementary to other research isolating different mode choice behaviours in their systematic review, e.g. walking or cycling as an alternative to using the car (Ogilvie et al., 2004). The aggregation of 'non-car' user was also used in the two following studies (Chapter 3 and 4) to mean individuals who are car owners and drivers. However, this categorisation potentially overly simplified underlying motives for a single mode use behaviour, e.g. cycling, and overlooked perceptions of people who are not car owners/drivers

Further limitations in relation to participant recruitment and characteristics in both, the Repertory Grid (Chapter 3) and qualitative study (Chapter 4) should be noted. The sampling strategy was used to capture a wide range of views, not determined by geographically homogenous groups. However, this also implies that no inferences can be made about how views might be shaped by the respective transport environment. The sampling frame did not include accessibility to or previous knowledge of the transport modes discussed during the interview. Participants may have not or infrequently used particular modes, which may affect the extent of their perceptions about these. Investigating perceptions of a more homogeneous set of participants might remove some of the variability that geography, built environment and location can account for. Future research may recruit a sample with a shared destination, placing greater emphasis on underlying mode choice motivations for specific journeys. A limitation inherent to qualitative research is the small sample sizes are small and lack of generalisability of findings as participants cannot be considered representative of the UK population. As such, participants were highly educated and many without children. Level of education and number of children are important antecedents of mode choice and may therefore also affect perceptions of travel modes. In total, the interviews lasted approximately 2 hours each and the

length may have impacted on the concentration of both, the interviewer and interviewee. The long duration was chosen to minimise drop outs and to use resources efficiently. Participants in both studies were invited to reflect on their evaluations and choices. Habitual influences have been well-documented in the literature, asserting strong influences on behaviour (Gardner, 2009; Verplanken et al., 1998). Such automated habitual processes can impact the extent to which individuals deliberate choices and motivational messages delivered through interventions might not be attended by frequent drivers.

Limitations of the Repertory Grid method (Chapter 3) also include a lack of retest reliability. Kelly (1977) acknowledged that construction of events and resulting perceptual maps, are subject to experience and influences. If replicated, the same study participants may portray different perceptual maps. This implies that the Repertory Grid may be a useful tool for before and after comparisons within process evaluation of intervention. Respondents vary in their construction of reality, thus Repertory Grids are a unique and subjective account of a person's interpretation of the world. Thematic analysis and grouping of similar constructs on group-level may have distorted the level of subjectivity by which participants arrived at these interpretations (Katz, 1984). However, to preserve individual meaning, analysis was purposefully conducted on individual level and avoided aggregation of responses in composite grids.

The qualitative study (Chapter 4) was informed by the preceding Repertory Grid interview and may have omitted other potentially ambivalent attitudes because the semi-structured interview drew on previously identified elicitations. The sampling frame purposely targeted travel mode users with established travel habits to obtain very different views. However, participants with strong car use or non-car use habits may not be optimal group to elicit ambivalent evaluations from. For instance, studies have shown that ambivalence was strongest for individuals in the middle stages of

the Transtheoretical Model (Armitage, Povey, & Arden, 2003). A different sampling strategy may be used in future studies to widen understanding of attitudinal ambivalence amongst other groups of travel mode users.

The experimental priming study (Chapter 5) could only partially support research hypotheses, which could be explained by various study limitations. MTurk participants completed the questionnaire in an uncontrolled environment which could impact priming effect is several ways. Competing influences in the immediate environment could have reduced salience of potentially activated goals. With the research only exerting limited or no control over activities before or during completion of the questionnaire, it cannot be excluded that participants may have pursued other (conflicting) goals simultaneously. It is also likely that respondents did not fully engage with the survey because MTurk participants repeatedly complete similar questionnaires. Merely using questions as a means to implicitly prime goals appears to be insufficient to detect strong priming effects. Increased control and alternative implicit priming methods might be increased through laboratory-based experiments, however, these are constrained by resources and significantly smaller sample sizes. Limitations in relation to the study design should also be acknowledged. The selection of goals to be included in the study was based on previous findings (Chapter 4 and 5) in which the sample consisted of UK residents. It is plausible that different goals may be suitable in different geographical and cultural settings, i.e. a sample drawn from the US may respond differently to environmental and physical activity goal primes compared to participants from UK. Successful goal activation and pursuit is also dependent on various factors and can include attention to the goal (Fishbach & Ferguson, 2007), motivation to achieve the goal (Strahan, Spencer, & Zanna, 2002), or self-relevance of the goal (Moskowitz, 2002). For the current study sample, the selected goals may not meet these criteria. Perhaps, goal motivation measure could have provided clarification in this regard. Ultimately, a better understanding of travel-relevant goals and goal dynamics is needed to inform

future goal priming studies. Moreover, future research may also include an implicit attitude measure, because studies have shown that implicit priming can have an influence on subconscious rather than overt attitudes (e.g. Tate et al., 2014). Despite using awareness of influence checks to exclude potential correction bias, research has shown that correction processes can occur subconsciously (Laran, Dalton, & Andrade, 2011). The reversed priming effect may be a result of the subconscious rejection of similar stimuli (i.e. “green” and “healthy” lifestyles) to which participants may have been overexposed in other commercial and non-commercial environments. Previous research testing attitude changeability through implicit priming reported effects on implicit attitudes (Tate et al., 2014). This study did not include implicit attitude measures because it was considered incompatible with the recruitment strategy and data collection methods which favoured a bigger sample size. Increasing criticism directed towards implicit priming studies, some of which underpin the rationale of this study, should also be noted. The robustness and replicability of priming effects have been challenged by initiatives such as the “Many Labs” Replication Project (Klein et al., 2014) or The Reproducibility Project (Open Science Collaboration, 2015). For example, a recent study aimed to replicate findings of 100 psychological publications, reporting a success rate of only 37%. Studies conducted by Pashler and colleagues (C. R. Harris, Coburn, Rohrer, & Pashler, 2013; Pashler, Coburn, & Harris, 2012b; Rohrer, Pashler, & Harris, 2015) also failed to obtain experimental priming effects previously reported, including implicit primes of money leading to changes political views (Caruso, Vohs, Baxter, & Waytz, 2013) and priming spatial distance resulting in social distance (Williams & Bargh, 2008). Studies also failed to replicate evidence on the enhancing effect of performance goals on successful task completion (Bargh et al., 2001). Ultimately, this raises concerns about validity of priming manipulations in general. Positive publication biases within the psychological literature (Fanelli, 2012), the so-called file

drawer problem (Rosenthal, 1979), can potentially conceal wider failure of priming studies.

Research reported in this thesis assumes unidirectional relationship in that travel is an effect which is caused by various factors, e.g. modal choice is a result of a person's attitudes. This approach may be incorrect and it is plausible attitudes are a result of modal choices (Festinger, 1962; Scheiner, 2018). More complex longitudinal studies may be able to shed light on the direction of relationships.

These limitations notwithstanding, implications for practice and research can be drawn from the present research.

6.3 Implications for practice

The studies reported in this thesis have shown that perceptions of travel modes are complex and dynamic amongst different mode user groups. The main implications for practice are (i) continued use of specific attitudes and (ii) development of situated travel behaviour change campaigns, taking into consideration attitudinal instability.

Implications for interventions incorporating attitudes

Chapter 2 confirms that attitudes are well-supported in the extant literature but also highlight that current understandings of general car use attitudes may not work well for interventions based in rural areas, that target non-commuting journeys or European populations. Chapter 2 and other systematic reviews of available evidence (e.g. Arnott et al., 2014; Graham-Rowe et al., 2011) concluded that heterogeneity of current studies is a serious concern. This has implications for policy seeking to evaluate existing evidence to replicate efforts in other populations. Local transport policy should base interventions on previous studies in similar context and similar populations, rather than adopting a one-size-fits-all approach. This should also

feature in practical guides to travel plan development (MHCLG, 2014). Similarly, different journey purposes, lengths and type of destination prompt a change in evaluations and emphasises the need for interventions to distinguish between these contexts to enhance their effectiveness.

Findings in all studies reported in this thesis suggest that environmental and health/fitness related concerns may not be effective motives for frequent drivers to change their behaviour. This is an important finding, suggesting that key benefits of sustainable travel options may not be successful in persuading heavy car users. Alternative modes which guarantee route and time flexibility might lead to behavioural shifts but ultimately necessitates further service and infrastructural improvements. This may not be desirable from an economic perspective. In the short run, it is recommended that efforts focus on individuals willing to make changes or already using non-car modes occasionally (Chapter 5).

Studies presented here have investigated within-person changeability of attitudes, each contributing to a more realistic account of evaluations of travel modes. Such variability of attitudes requires a more person-centred approach to intervention development. This ultimately requires smart technological solutions, able to learn and analyse individual travel patterns and capable of predicting future travel needs. In this regard, collaboration with private sector organisations is indispensable (Docherty et al., 2017). These approaches necessitate large scale data collection and algorithms processing personal meta-data to become a meaningful cue-driven application. For example, personal motoring costs can be made salient at a time when MOT or insurance payments need to be renewed. This information can be compared to personal costs of travel alternatives (e.g. “Your next MOT will cost £X, this equals X months unlimited bus travel in your area or X years cycling”).

Attitudinal changeability also has implications for target groups identified through attitudinal measures (e.g. Anable, 2005; Bösehans & Walker, 2016; Haustein &

Hunecke, 2007). Marketing efforts based on static attitudinal segmentation of the population (e.g. Anable & Wright, 2013; Outwater et al., 2003) may benefit from adopting dynamic approaches that see people move between segments, depending on the context. Further, such segmentation approaches could be enhanced by including implicit attitudinal measures (e.g. Greenwald et al., 1998).

Shifting priorities of attitudes in changing contexts and explorative goal maps identified in Chapter 4 highlighted the relationship between mode choice decisions and other central aspects of individuals' lives. This implies that travel information and car use reduction interventions can be integrated in a range of other initiatives. NICE Guidance on Physical Activity already incorporates walking and cycling in their recommendations (NICE, 2012), however, there are opportunities for wider integration of transport in other areas, such as mental health and wellbeing or financial savings interventions (e.g. Fry, Mihajilo, Russell, & Brooks, 2008; Loibl, Grinstein-Weiss, Zhan, & Red Bird, 2010).

Need for situated car use reduction interventions

The research further suggests that attitudes may be best targeted in situated interventions. Whilst more research is needed to fully understand traveller's situational representations of different transport modes, findings imply that such campaigns can use situational cues to retrieve specific positive representations of non-car modes or negative representations of driving. For instance, a regular car commuter may shift his evaluation about driving upon real time updates of high volumes of road traffic, linked to comparatively lower current travel times of non-car modes.

New or existing interventions can remove, replace or add situational cues to trigger a change in evaluations (Best & Papies, 2017). Limiting exposure to private transport in a car-dominated society is difficult, however, increasing display of available

alternative modes in the transport environment may be effective in prompting salience of evaluations about non-car modes. Chapter 5 has shown that mere semantic primes might not suffice in activating goals in all circumstances for all individuals but requires careful selection and segmentation. There are, however, other sources of information can act as context stimuli. These can include information about space and time, representations of people or objects, actions, sensory or affective information (Barsalou, 2016) might be better tested in practice, rather than in research settings.

Marketing campaigns incorporated into situated interventions can also draw on strategies to enhance attention to context. It has been argued that expectancy-violating information can effectively influence individuals' evaluations in that context (Brannon & Gawronski, 2018; Gawronski et al., 2018). In line with other recent work (Bamberg, 2013a, 2013b; Olsson et al., 2018), research reported in Chapter 5 suggests that intended effects might be maximise when targeting individuals who can be identified as 'already motivated to change behaviour'.

Social media may be a suitable tool, offering quick, immediate and locally-relevant information distribution (Delbosc & Mokhtarian, 2018). Recommendations drawn from Chapter 5 include that these may be maximised when targeting individuals in the middle stages of the Transtheoretical Model. Insights from other research applying stage-based models (e.g. Forward, 2014; Olsson et al., 2018) suggest that these individuals are predominantly multi-modal. The presence of situational cues, however, entails not only knowing how travel mode evaluations are formed (and change), but also *when* mode decisions are made and which tools might be used to aid decision making. Although beyond the scope of this work, Chapter 4 began to explore the range of decision time points. These ranged from minutes to weeks before the actual journey. Surprisingly few scholars have explored what kind of travel-related information are consumed and when, and moreover, in which ways

these might influence day-to-day journey planning. A range of different tools may be used as marketing platform to situate prompts to encourage use of alternative travel modes. Details of pre-trip decision making and precise time points remains a key research area.

Importantly, situated interventions are presumed to attenuate existing habits (Best & Papies, 2017), particularly important for car use decisions (Chng et al., 2017; Gardner & Abraham, 2008; Hoffmann et al., 2017).

Optimising information campaigns through ambivalence

Effectiveness of traditional information campaigns can be enhanced through the use of ambivalent attitudes. Greater levels of attitudinal ambivalence is characterised by increased levels of information processing (Maio, Esses, & Bell, 2000) and susceptibility to persuasive communication (Armitage & Conner, 2000b). This offers opportunities for existing and future interventions. Communicative strategies to discourage car use can use ambivalent attitudes identified in Chapter 4. Findings can be used by marketers of non-car options, for example, drawing on convenient aspects about public transit.

Thereby, marketing strategies should apply a more agile approach to communication, reacting to the local transport environment. For example, flexibility and low costs aspects of cycling could be promoted at times of increased congestion and parking costs. Effectiveness may be further boosted by targeting population segments who demonstrate greater levels of ambivalence towards mode choice, i.e. individuals in the middle stages of the Transtheoretical Model. Raising awareness of ambivalent attitudes and making salient positive attitudes about non-car modes may facilitate behaviour change through mechanisms of behavioural consistency (Bagozzi, 1992). Such campaigns, however, must be carefully designed, guarding against individuals' strategies to cope with ambivalence, e.g. diffusion of

responsibility (Chapter 4), which might not be beneficial in promoting non-car use. Similarly, conflicting beliefs (Chapter 4) may also affect responses to campaigns.

Encouraging multimodality

Many daily journeys are multi-modal and encounter many transport environments. In reality, people are faced with multiple competing travel options, especially in dense urban environments. The research has demonstrated that comparisons of multiple modes can be helpful in prompting attitudinal ambivalence. However, Chapters 2 and 3 have also shown that comparisons can be inaccurate and assessments of non-car modes biased. Information campaigns offering accurate and comparative information about cost and speed of available travel options can help to overcome some of these misconceptions. Increasing salience of alternative modes may also encourage more deliberative processes. This can range from increasing advertisement space of non-car travel options in one particular city or prioritising non-car travel modes in descriptions of directions.

The research also suggests that transport policy should focus on increasing contact with non-car modes. This includes making continued use of “free trials”, but also further developing schemes such as Park & Ride, Park & Stride or rarely used Park & Cycle in order to remove outgroup homogeneity effects. Moreover, combining the latter with a network of bicycle sharing schemes might remove some of the perceived barriers to cycling (De Geus, De Bourdeaudhuij, Jannes, & Meeusen, 2007; Fishman, Washington, & Haworth, 2012). Thus, perceptual spaces of car users may be augmented. Overall, it is suggested that increasing provision of shared mobility, including car clubs, ride sharing schemes or public bicycle schemes can all help towards reducing single occupancy car use (Circella, Alemi, Tiedeman, Handy, & Mokhtarian, 2018).

Chapter 2 has shown that the car can be placed among a portfolio of other travel options situated in a perceptual map of attributes that can be used by policy makers and transit authorities. Whilst more representative matrices may be sought in studies with bigger sample sizes, the perceptual maps presented here can provide a basis for general communicative strategies. Perceptual maps also offer an opportunity for local authorities to develop specific strategies. Self-administered tools like WebGrid (http://webgrid.uvic.ca/) extend applicability of RepGrid to a wide range of contexts and offer possibilities of locally relevant research. In this respect, examining specific populations over a longer period of time can be beneficial in evaluating responses to changes in the transport environment and findings can be used to devise new communicative strategies or meet changing transport needs.

Policy-relevant research

Findings from this study have implication for research commissioned by policy, e.g. the annual National Travel Survey. Such tools should consider biases in measurement and variability of attitudes when interpreting results and deriving recommendations for transport strategy. In fact, recent comparisons of attitudinal data in the National Travel Survey investigated biases in attitude responses (DfT, 2017a). For instance, it was shown that there were differences between questionnaire items completed by individuals and by household which were not explained by socio-demographic differences between the two groups. Whilst the report concludes that social desirability may be a possible explanation, policy should also take into account other sources of bias identified in Study 3 (Chapter 4). National travel surveys may also be enhanced by adopting stages of change measures to identify and obtain more information about optimal target groups.

Attitude changeability may also have implications for travel demand forecasting which should consider biases identified in the studies in uncertainty analyses (Rasouli & Timmermans, 2012).

Overall, the four studies reported in this thesis demonstrated the utility of alternative approaches to rational, one-dimensional choice models, commonly used to inform policy. The work elucidated the complexity and context sensitivity of evaluations, in particular when multiple modes are evaluated simultaneously (Chapters 3 and 4) or when different groups are investigated (Chapter 2 and 5). This research therefore might have wider policy implications and suggests a move towards participatory approaches to transport policy design which allows to include contextually sensitive policies (see Marchi et al., 2001 for different methods). This shift towards public participation can result in a better understanding of the complexities of travel patterns and can lead to an increased acceptance of policy change (Curtis, 2008; Rietbergen-McCracken, 2017). Likewise, qualitative and mixed-method approaches presented here provide useful information about positive and negative aspects of transport and suggest ways to improve transport systems. Thus, alternative approaches to top-down behaviour change programmes can be important to achieve sustained change.

6.4 Implications and directions for research

The rationale for this thesis was derived from an incomplete understanding of transport-relevant attitudes. The four studies presented sought to address gaps in the knowledge of how evaluations of travel modes are shaped, how they are interlinked and how they might change in different contexts. The thesis demonstrates that transport-relevant attitudes are ambivalent and depend on the context in which travel modes are evaluated in. Findings presented in this thesis offer new insights into how transport-relevant attitudes can be conceptualised and how they may influence behavioural choices in different decision situations. The research contributes to an improved understanding of the value-action gap in psychological

transport research and has several implications and recommendations for future work in this area.

Improving accuracy of attitude measurement

Current travel mode choice research and applications of prediction models predominantly aggregate behavioural beliefs of expected consequences of the behaviour, assuming that these are stable across time and place. The thesis established that the same person can hold simultaneous positive and negative evaluations toward the same travel mode (Chapter 4). The research also provided evidence that existing attitude measures may be less or more predictive of travel mode choice, depending on contexts (Chapter 2). Current studies also fail to identify that some specific beliefs may be more important to individuals (Chapter 3) and moreover, that priority of such beliefs might change in different contexts (Chapter 4). Further, Chapter 2 showed that there is considerable variability in operationalisation of the concept of attitudes in transport research. Contextual factors are rarely acknowledged and reported, posing challenges for comparing and replicating results across populations. Retrospective discussions of questionnaire responses in Chapter 4 showed little cohesion between survey results and individuals' narratives, especially with regards to environmental concern. This ultimately raises concerns of how adequate current measures represent true evaluations and how reliable current predictions of travel mode intention and/or behaviour from attitudes are.

Therefore, the main recommendation is that further research needs to challenge traditional perspectives of attitudes being stable entities. Ambivalence has implications for applications of TPB-based questionnaire items (Francis et al., 2004) which favour "overall evaluations", e.g. "general car use attitudes" (e.g. Bamberg et al., 2003). Likewise, classification of attitudinal items may dilute meaningful differences between transport-relevant beliefs. This includes current categorisations of, e.g. general instrumental and affective attitudes (e.g. Anable & Gatersleben,

2005; Bergstad et al., 2011; Lois & López-Sáez, 2009; Steg, 2005; Steg et al., 2001). Alternative measures of attitudes should be adopted in future work, including implicit measures of attitudes (e.g. Greenwald et al., 1998), to remove some of response biases observed for explicit measures (Chapter 4). Work reported here has shown that individuals do not hold a single evaluation, but rather "any number of attitudes depending on the number of schemas available for thinking about the objects" (Tesser, 1978, p. 298). Such 'number of schemas' may be derived from Study 2 (Chapter 3). Recommendations include applications of more specific and comprehensive set of beliefs, taking into account different modes and varying contexts. A comprehensive review of attitudes identified in quantitative and qualitative transport studies, taking into account population and research setting, could facilitate development of standardised and validated scales. The present research only made a small contribution to a wider range of issues that attitudinal ambivalence implicates. Further investigation is required to establish effects on attitude-behaviour relationships. Adopting measures of ambivalence in subsequent research (Priester & Petty, 2001), can improve our understanding of associations in travel mode choice. For instance, greater attitudinal ambivalence is characterised by a weaker attitude-intention and attitude-behaviour link (Armitage & Conner, 2000a). Future research might therefore endeavour to identify ways in which attitudinal ambivalence towards driving can be maximised and how attitudinal ambivalence towards non-car use can be minimised.

Increased understanding of transport-relevant attitudinal ambivalence

The studies reported in Chapters 2 and 3 were the first to report attitudinal ambivalence within the transport literature using a small sample. Attitudinal ambivalence presents an important area in social psychology (Conner & Armitage, 2008), having informed persuasive message strategies in, e.g. political campaigning

(Zemborain & Johar, 2006). Attitudinal ambivalence demands more attention in this area. Quantitative methods may draw on intra-attitudinal categories identified in Chapter 3 and test our findings amongst a larger representative sample. Proposed quantitative measures of attitudinal ambivalence can also help to e.g., distinguish between potential ambivalence (M. M. Thompson, Zanna, & Griffin, 1995) and felt ambivalence (Priester & Petty, 1996). Attitudinal ambivalence has gained much research attention over the past decade and its dynamics are already well understood in other research contexts. For instance, the strength of attitudinal ambivalence varies from person to person and may be higher for individuals in need of consistency (Newby-Clark, McGregor, & Zanna, 2002) or lower among mindful (Haddock, Foad, Windsor-Shellard, Dummel, & Adarves-Yorno, 2017). Levels of attitudinal ambivalence may also depend on stages of change (Miller & Rollnick, 2012) and it was found that individuals in the middle stages show highest levels of ambivalence (Armitage et al., 2003). Chapter 5 supports this view, because respondents in the middle stages of the Transtheoretical Model l showed variability in their motivations not to drive. Future research could draw on this knowledge and can further explore the degree of attitudinal ambivalence among individuals already motivated to switch to more sustainable travel modes. Further investigations may establish a link between socio-demographic characteristics and ambivalence to facilitate intervention development. For example, it may be plausible that young people living in urban areas are more likely to hold higher levels of ambivalence compared to an older rural population.

A wider understanding of mechanisms of attitudinal ambivalence can also contribute to effectiveness of interventions. As such, future research may extend investigations of underlying values and goals to develop a comprehensive framework of transport-relevant goals. Identifying short and long-term, conflicting and complementary, stable and inactive goals, can aid development of strategies to increase sustainable travel. Qualitative studies could continue investigating underlying goal structures and the

changing salience of these in varying circumstances. Conclusive experimental evidence is needed to uncover effective ways in which these goals may be subconsciously activated. Chapter 5 demonstrated various limitations of implicit goal priming in a non-controlled setting and concluded that priming questions are of only limited utility. Unconscious goal priming in practical settings can face similar problems where a range of situational variables can exert competing influences. Chapter 5 used two goals incongruent with car user which were identified from travel mode group differences in Chapters 3 and 4. The explorative map of inter-related goals suggests that (field) experiments could use other goals identified in this research, such as minimising stress by being driven or avoiding congestion, to test changeability of cognitions. Future research might also investigate the extent in which alternative cues, such as interoceptive, affective and bodily states can prime transport-relevant evaluations (Barsalou, 2016).

Future research could also explore predictors of ambivalent attitudes to better understand their underlying mechanisms. For example, a study by Chang (2011) found scepticism towards environmental claims was an important predictor of ambivalence towards green products. Identifying influencing factors that underpin transport-relevant attitudinal ambivalence can enhance efficacy of communicative strategies. Further research needs to establish how robust attitudinal ambivalence is across different individuals or whether level of ambivalence may depend on psychological or socio-demographic characteristics.

Development of situation-specific models of travel mode choice

Chapters 2 and 3 highlighted the complexity of mode decisions and amalgamation of travel and day-to-day activities relevant for the pursuit of individuals' live goals. Travel modes serve specific purposes (e.g. quick journey) but can also satisfy hedonic needs (e.g. freedom), but the priorities of both can shift. Current models are ill-equipped to account for multi-modal environments, situational factors and the

resulting change of priority of evaluations. Evidence presented here calls for situation-specific models of travel mode choice which can support situated intervention development to reduce single occupancy driving. The work presented here suggests including contextual factors as predictors in current models. One study by Klöckner and Friedrichsmeier (2011), for example, have included situational factors such as day of the week, public transport disruption, weather and destination choice in their model to predict car use. Studies should attempt to expand on this evidence to include other behavioural options and relevant situational factors. Additions to currently used questionnaires can also include importance ratings of each attitudinal items.

Identifying specific situations which can prompt a change in mode choice behaviour requires further attention and research may use a bigger, more homogenous sample to identify clear and generalisable patterns. This can, for example, be specific to certain journey purposes, destinations, lengths and trip times. This also requires the expansion of our knowledge about salient situational influences for specific journeys. It is suggested in this thesis that further applications of the RepGrid technique can be a versatile and effective way to elicit a comprehensive set of evaluations, thereby incorporating a wide range of choice options. Whilst Study 2 (Chapter 3) focussed on travel in general, specific destinations and journey purposes amongst a specific group of people can be examined in the same way. For instance, a recent study showed that Australian consumers hold 21 salient attributes when considering stopover destinations during travel in Europe (Pike & Kotsi, 2016). Ultimately, more sophisticated models of travel mode choice are needed, accounting for automatic processes. For instance, future research should investigate which situational cues might cause habitual responses, and which cause functional responses (Aarts & Dijksterhuis, 2000).

Enquiries into intra-person variability of behaviour and antecedents of mode choice are an important avenue for future research. Longitudinal panel studies examining the day-to-day decisions of a single person's mode choice can be beneficial in this regard. Investigating non-car user's decisions to choose alternatives over time in can yield valuable insights. Some research has begun to explore this intra-person variability (e.g. Heinen & Chatterjee, 2015; Heinen, Maat, & van Wee, 2011) but evidence is still limited.

Importance of methodological variety

The research built on recent calls to diversify methodological approaches in transport research (e.g. Arnott et al., 2014) and thereby also addressed recommendations made in Chapter 2. In particular, further studies should aim to theoretically integrate frameworks not informed by rational choice theories. Recently, applications of stage models have gained greater attention (e.g. Forward, 2014; Gatersleben & Appleton, 2007a; Olsson et al., 2018) and goal intentions feature in Bamberg's (2013a) work but assume personal change goals being consciously pursued. Alternative models incorporating unconscious processes are necessary.

Changing transport environments demand generally more complex models of travel mode choice behaviour. The research has demonstrated the utility of taking into account a range of travel modes when exploring perceptions of transport options. In this thesis, the proposed RepGrid methodology presents a useful tool and hopefully encourages future use of this technique. Other elicitation methods, for instance word association task (e.g. Roininen, Arvola, & Lähteenmäki, 2006), should also receive attention. Modelling approaches should depart from single-day and single-activity modelling are required. Arentze et al. (2013) provide a recent example of how such complexities were addressed in Bayesian models of destination choices.

Surprisingly few studies directly compare regular and irregular users of a specific mode. Studies 2 and 3 have demonstrated that contrasts can identify important targets for interventions but also highlight which aspects may not be worth targeting. Differences and similarities of distinct mode user groups can be further explored in quantitative studies, providing potentially useful insights not explored when solely focussing on car users. Multiple groups comparisons may also offer more integrated perspectives of the complexity of reducing car use.

Lastly, multi-disciplinary research is indispensable as no single perspective or research framework can answer all questions. Future research should combine insights from many disciplines to foster travel behaviour change.

6.5 Conclusion

The research outlined in this thesis has applied four different methodologies, utilising inductive and deductive approaches to investigate changeability of transport-relevant attitudes. The studies presented show that attitudes towards travel modes are ambivalent, that evaluations depend on decision contexts and that current attitude conceptualisation and measurement does not account for such dynamics. Inconsistent operationalisations of various dimensions of attitudes in the transport literature may be a reason for an inconclusive attitude-behaviour relationship. Specificity and standardised measurements need to be addressed urgently within travel behaviour research. The findings support attitudinal ambivalence towards travel modes, demonstrating that car use can be perceived as expensive, inflexible, stressful, inconvenient and dangerous. Increasing contact between car users and non-car users as well as increasing salience of multiple modes might succeed in expanding car users' perceptual spaces and influencing deliberative processes. The research also highlighted the importance of context in affecting mode users' evaluations and suggests that journeys for leisure, long distance trips into urban

areas and business travel are suitable intervention targets. Findings elucidated explicit change targets for interventions for which individuals who are already motivated to change behaviour presents a potentially optimal target group. Attitudinal ambivalence and context sensitivity have implications for research and intervention development and should be considered more explicitly when designing studies and when delivering and evaluating interventions to reduce car use. Diversifying methodologies and theoretical approaches in future studies may further advance our understanding travel mode choice in a changing transport environment. Situated intervention development may be successful in achieving longer term behaviour change.

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Appendix A Supplementary material for Chapter 2

The following pages contain supplementary files for Chapter 2 ‘What cognitive mechanisms predict travel mode choice? A systematic review with meta-analysis’.

A.1 Systematic search and screening

The systematic review searched ten databases: Applied Social Sciences Index and Abstracts, ABI/Inform Complete, ProQuest Sociology, Sociological Abstracts, Web of Science Core Collection, Business Source Complete, Environment Complete, PsychINFO, Psychology and Behavioural Science Collection and Transport Research Information Services Database. Table A.1 shows an example of an applied search strategy for the database Web of Science.

Overall, 4,156 records were initially identified. After removing 805 duplicates 3,393 unique citations remained for title and abstract screening. 3,005 were deemed not relevant, leaving 388 references for further investigation of full texts. If necessary, authors were contacted to request the full text of inaccessible studies (*N* = 19). Following these inclusion criteria, a full text screening identified 47 studies to be eligible for inclusion. Four data sets were found to underpin more than one paper, leading to the exclusion of four studies to avoid double-counting. Frequently, studies only test a relationship between a cognitive mechanism and intention or measured a non-cognitive or affective mechanism. Some publications focussed on elderly or children only. A few studies were excluded on the basis of not representing travel in general. Reduced chauffeur trips to school is an important behaviour change target as it can contribute to increased physical activity in children (Cooper et al., 2010). School runs cannot be looked at in isolation but interdependencies with travel patterns of parents should be taken into account (McDonald, 2017). Likewise, the decision to drive children to school is often a result of intra-household interactions, composition and shared responsibilities rather than individual intrinsically-motivated

travel mode choice (Yarlagadda & Srinivasan, 2008). It can therefore be argued that school runs can be classified as an agent of socialisation (Baslington, 2008). As a result, different cognitive mechanisms underpin school travel mode choice of parents, e.g. worry about safety (Ahlport, Linnan, Vaughn, Evenson, & Ward, 2008; DiGuiseppi, Roberts, Li, & Allen, 1998). We therefore did not include school runs in our systematic review and recommend separate analysis of such studies.

Database: Web of Science **Limiters: English, Document Type=Article, Abstract of published item**
TS=((Mode NEAR/3 choice$) OR (Choice$ NEAR/2 modes) OR (Modal NEAR/2 choice$) OR (Transport*5 NEAR/3 decision$) OR (Transport*5 NEAR/3 choice$) OR (Travel NEAR/3 decision$) OR (Travel NEAR/3 choice$) OR (Modal NEAR/2 switch*3) OR (Mode NEAR/2 switch*3) OR (Modes NEAR/2 switch*3) OR (Mode NEAR/2 shift$) OR (Modes NEAR/2 shift$) OR (Modal NEAR/2 shift$) OR (Modal NEAR/2 split) OR (Mode NEAR/2 split) OR (Modes NEAR/2 split) OR (Mode NEAR/2 share) OR (Modes NEAR/2 share) OR (Modal NEAR/2 share) OR (Multimodal NEAR/2 transport*5) OR (Transport*5 NEAR/3 mode) OR (Transport*5 NEAR/3 modes) OR (Travel NEAR/3 mode) OR (Travel NEAR/3 modes) OR (Mode NEAR/3 change$) OR (Modes NEAR/2 change$) OR (Modal NEAR/3 use) OR (Mode NEAR/3 use) OR (Modes NEAR/3 use) OR (Mode NEAR/3 select*3) OR (Modal NEAR/2 selection) OR (travel NEAR/10 behavio$r) OR (commut*3 NEAR/10 behavio$r) OR (transport*5 NEAR/10 behavio$r))
AND
TS=(((Cogniti*2) OR (Antecedent$) OR (Determin*3) OR (Correlate$) OR (Expla*7) OR (Motivat*3) OR (Cause$) OR (Causing) OR (Predict*3) OR (Effect$) OR (Mechanism$) OR (Regulat*3) OR (Influen*4) OR (Control*4) OR (Mediat*2) OR (Moderat*2) OR (affects) OR measure$) OR relationship OR role$ OR factor$ OR psychol*4)
AND
TS=((Public N/2 transport*5) OR (Private N/2 travel) OR (Private N/2 transport*5) OR Driving OR Automobile$ OR (Car N/2 driver$) OR (Car N/2 dependenc$) OR (Car N/2 use) OR car OR cars OR (Car N/2 owner*4))

Table A.1 Illustration of a systematic review search strategy

A.2 Characteristics of Included Studies

Based on 42 studies that reported the sample size, the mean was 584, ranging from 56 to 2000 participants. Only 32 studies (74.42%) reported the mean age of their

sample (min 24.5, max 50.8, average 38.29) and even less specified the SD (*N* = 9, 20.94%). No information could be extracted from six studies with regards to gender distribution so that, based on 37 studies, the average percentage of female participants was 54%. In 15 studies (40.54%) the proportion of the female population was 55% and above and 60% or more in seven out of 37 studies (19.92%). Seven studies (16.28%) sampled students only. Information concerning car ownership or access and driver's licence varied across studies, with participants consisting of only drivers or only commuters, but also a mixed population with non-car owners. For example, 23 out of 38 studies (60.53%) reported that their sample consisted of driver's license holders only, with at least frequent access to a car. Five studies did not report details with regards to driver's licence or car access. The majority of studies applied a cross-sectional design (*N* = 26, 60.47%). Experimental studies (*N* = 7; 16.28%) and prospective studies (*N* = 6; 13.95%) were conducted less frequently. A longitudinal approach was the least frequently employed study design (*N* = 4, 9.3%). Only 16.28% (*N* = 7) of all studies were conducted outside of Europe with the majority of these from the USA (*N* = 3) and Australia (*N* = 3). Within Europe, Germany (*N* = 13) and the Netherlands (*N* = 8) were major contributors to the TMC literature, accounting for 48.84% of all included studies. Table A.2 summarises the extracted study characteristics and shows the number of incidences for different sub-groups. The more detailed evidence table can be found in Table A.3, presenting summarised characteristics of each individual study.

	All studies included in the review	Studies that applied a theoretical framework	Studies that applied TPB	Studies included in Meta-Analysis
	Number and % of *N* = 43	Number and % of *N* = 24	Number and % of *N* =16	Number and % of *N* = 35
Study design				
Cross-sectional	26 (60.47)	13 (54.17)	9 (56.25)	22 (62.86)
Experimental	7 (16.28)	5 (20.84)	2 (12.5)	6 (17.14)
Longitudinal	4 (9.3)	1 (4.17)	1 (6.25)	3 (8.57)
Prospective	6 (13.95)	5 (20.84)	4 (25)	4 (11.43)
Study Context				
Commuting	19 (44.19)	10 (41.67)	6 (37.5)	14 (40)
General Purpose	23 (53.49)	14 (58.34)	10 (62.5)	20 (57.14)
Not reported	1 (2.33)	-	-	1 (2.86)
Study Setting				
Urban	27 (62.79)	17 (70.84)	10 (62.5)	20 (57.14)
Mixed	8 (18.60)	4 (16.67)	3 (18.75)	7 (20)
Rural	3 (6.98)	2 (8.34)	2 (12.5)	3 (8.57)
Not reported	5 (11.63)	1 (4.17)	1 (6.35)	4 (11.43)
Geographical Location				
UK	7 (16.28)	5 (20.84)	4 (25)	7 (20)
Germany	13 (30.23)	10 (41.67)	7 (43.75)	9 (25.71)
Australia	3 (6.98)	2 (8.34)	1 (6.25)	2 (5.71)
Netherlands	8 (18.60)	4 (16.67)	2 (12.5)	7 (20)
Canada	1 (2.33)	1 (4.17)	1 (6.25)	1 (2.86)
Switzerland	2 (4.65)	2 (8.34)	1 (6.25)	2 (5.71)
Sweden	4 (9.30)	-	-	4 (11.43)
USA	3 (6.98)	-	-	2 (5.71)
Spain	1 (2.33)	-	-	1 (2.86)
Belgium	1 (2.33)	-	-	-
Dependent Variable				
Car-use	32 (74.42)	16 (66.67)	11 (68.75)	26 (74.29)
Non-car-use	11 (25.58)	8 (33.34)	5 (31.25)	9 (25.71)
Unclear	1 (2.33)	-	-	-
Population				
Total Sample Size	24517	11584	10130	18770
Average % female	54	54.95	60.66	54.64
Age (grand mean)	38.29	39.61	39.2	39.2
Min mean age	24.5	24.5	24.5	24.7
Max mean age	50.77	50.77	50.77	50.77

Table A.2 Study characteristics of different sub-groups

Author(s) (year)	Country (Sample Size; %female; mean age [*SD*], age range)[a]	Setting	Journey Purpose	Design *[Analysis]*	Dependent Variable (TMC Behaviour measure)	Quality Score
Abrahamse et al. (2009).	Canada (*N* = 241; 66.5%; 18-65 years)	Urban	Commuting	Cross-sectional *[Multiple regression analyses]*	Car use ratio (typical)	1.0
Armitage et al. (2013)	UK (*N* = 423; 57.2%; 50.77 [14.33] years)	Rural	General Purpose	Panel *[Hierarchical regression analysis]*	Car use frequency (typical)	1.5
Baldassare (1991)	USA	NR	Commuting	Cross-sectional *[Regression analysis]*	Car use (SOV) preference (typical)	1.0
Bamberg (2006)	Germany (*N* = 241; 53%; 28.6 [13.9], 17-58 years)	Urban	Commuting, Shopping, Leisure	Experimental *[SEM]*	PT vs. car use proportion (actual)	0.1
Bamberg et al. (2003)	Germany (*N* = 592; 58%; 25, 20-37 years)	Urban	Commuting	Experimental *[SEM]*	Car use proportion (actual) [DV]	1.0

Author(s) (year)	Country (Sample Size; %female; mean age [*SD*], age range)[a]	Setting	Journey Purpose	Design *[Analysis]*	Dependent Variable (TMC Behaviour measure)	Quality Score
Bamberg & Schmidt (2003)	Germany (*N* = 254; 24.5 years)	Urban	Commuting	Prospective *[SEM]*	Car use proportion (actual) [DV]	1.1
Bergstad et al. (2011)	Sweden (*N* = 1127; 53.7%; 46.3 [12.4] years)	Mixed	General Purpose	Cross-sectional *[Regression Analysis]*	Car vs. other mode use frequency (typical)	1.0
Cao & Mokhtarian (2005)	USA (*N* = 1283; 50.9%)	Mixed	Commuting	Cross-sectional *[Binary logit model]*	Car use preference (typical) [DV]	1.0
Collins & Chambers (2005)	Australia (*N* = 205; 50%; 18-58 years)	Urban	Commuting	Cross-sectional *[Multiple regression analysis]*	PT vs. Car use preference (typical)	0.9
Davidov (2007)	Germany (*N* = 123; 44%)	Urban	NR	Experimental *[Binary logit regression analysis]*	Car use vs. PT use frequency (actual) [DV]	0.5

Author(s) (year)	Country (Sample Size; %female; mean age [*SD*], age range)[a]	Setting	Journey Purpose	Design *[Analysis]*	Dependent Variable (TMC Behaviour measure)	Quality Score
Friedrichsmeier et al. (2013)	Germany (*N* = 1048; 53.4%)	Urban	Commuting, Shopping, Leisure	Prospective *[Correlation analysis]*	Car use ratio (actual)	0.3
Gardner (2009)	UK (*N* = 107; 69.16%; 27.53 [9.69], 18-55 years)	NR	Commuting	Prospective *[Hierarchical regression analysis]*	Car use vs. non-car mode use ratio (actual)	1.8
Gardner & Abraham (2010)	UK (*N* = 190; 60.53%; 36.9 [18.2], 18-86 years)	Urban	General purpose	Cross-sectional *[Multiple regression analysis]*	Car (incl taxi) vs. other mode use ratio (typical)	2.0
Gärling et al. (2001)	Sweden (*N* = 60; 50%; 27.4 [6.9], 20-49 years)	NR	Commuting	Cross-sectional *[SEM]*	Car use frequency (typical)	0.8
Golob & Hensher (1998)	Australia (*N* = 963)	Urban	Commuting	Cross-sectional *[SEM]*	Car use (SOV) frequency (typical)	1.0

Author(s) (year)	Country (Sample Size; %female; mean age [*SD*], age range)[a]	Setting	Journey Purpose	Design *[Analysis]*	Dependent Variable (TMC Behaviour measure)	Quality Score
Harland et al. (1999)	Netherlands (*N* = 198; 78.7%; 47 years)	NR	Short distance	Cross-sectional *[Hierarchical regression analysis]*	Non-car use frequency (typical)	0.8
Haustein & Hunecke (2007)	Germany (*N* = 1545; 50%; 46.5, 18-80 years)	Urban	Commuting, Shopping, Leisure	Cross-sectional *[SEM]*	Environmentally friendly mode use (incl. walking, cycling, PT [bus, tram/subway, regional train, long-distance train]) vs. car use (inlc. Motorcycle, car share,rental car, taxi) ratio (typical)	3.0
Hunecke et al. (2001)	Germany (*N* = 160; 46.3%)	Urban	City centre	Experimental, prospective *[ANOVA]*	Subway vs car use ratio (actual)	0.9
Hunecke et al. (2007)	Germany (*N* = 1991; 53%)	Urban	General purpose	Cross-sectional *[Hierarchical regression analysis]*	Car use (incl. Motorcycle, car share, rental cars, taxis) vs. environmentally friendly mode use (Walking, cycling, PT [bus, tram/subway,	2.0

Author(s) (year)	Country (Sample Size; %female; mean age [*SD*], age range)[a]	Setting	Journey Purpose	Design *[Analysis]*	Dependent Variable (TMC Behaviour measure)	Quality Score
					regional train, long-distance train]) ratio (typical)	
Joireman et al. (1997)	Netherlands (*N* = 102; 37.25%; 33.2 years)	Urban	Commuting	Cross-sectional *[Correlation Analysis]*	Car vs PT use preference (typical)	0.0
Kaiser & Gutscher (2003)	Switzerland (*N* = 895; 46.4, 18-79 years)	Mixed	City centre	Cross-sectional *[Multiple regression analysis]*	Non-car use frequency (typical)	1.0
Kerr et al. (2010)	Australia (*N* = 186; 79%)	Urban	Commuting	Cross-sectional *[Hierarchical regression analysis]*	Car use frequency (typical)	1.0
Klöckner & Blöbaum (2010)	Germany (*N* = 389; 60.7%; 24.7, 19-52 years)	Urban	General purpose	Prospective *[SEM]*	Car use ratio (actual)	2.0
Klöckner & Matthies (2004)	Germany (*N* = 160; 36.9%; 38.5, 19-78 years)	Urban	Commuting	Prospective *[Binary logistic*	PT vs car use ratio (actual) [DV]	0.6

Author(s) (year)	Country (Sample Size; %female; mean age [*SD*], age range)[a]	Setting	Journey Purpose	Design *[Analysis]*	Dependent Variable (TMC Behaviour measure)	Quality Score
				regressions analysis]		
Lois & López-Sáez (2009)	Spain (*N* = 284; 50.3%; 34.4 [10.43] years)	Urban	Shopping	Cross-sectional *[SEM]*	Car use frequency (typical) - Shopping	2.0
			visiting friends/family		Car use frequency (typical) - visiting friends/family	
			commuting		Car use frequency (typical) - commuting	
			leisure trips		Car use frequency (typical) - leisure trips	
Mann & Abraham (2012)	UK (*N* = 229; 49.78%; 40.59, 19-76 years)	Mixed	Commuting	Prospective *[Hierarchical regression analyses]*	Car use ratio (actual)	2.0
Matthies et al. (2006)	Germany (*N* = 297; 37.7%; 45 years)	Urban	General purpose	RCT *[Multiple logistic regression analysis]*	Car-use ratio (actual)	0.3

Author(s) (year)	Country (Sample Size; %female; mean age [*SD*], age range)[a]	Setting	Journey Purpose	Design *[Analysis]*	Dependent Variable (TMC Behaviour measure)	Quality Score
Murtagh et al. (2012)	UK (*N* = 419; 62%; 40, 20-61 years)	Urban	Commuting General Purpose	Cross-sectional *[Multiple regression analysis]*	Car use ratio (typical)	3.0
Nilsson & Küller (2000)	Sweden (*N* = 157; 58%; 40 years)	Urban	General Purpose	Cross-sectional [*Hierarchical regression analysis]*	Mode use frequency (typical)	0.7
Panter et al. (2013)	UK (*N* = 137; 76.6%; 43.7 [11.9] years)	Mixed	Commuting	Panel *[logistic regression]*	Car use frequency (typical) [DV]	0.7
Polk (2003)	Sweden (*N* = 1145; 18-80 years)	Mixed	Commuting, General purpose	Cross-sectional *[Correlation analysis]*	Car use frequency (typical)	1.0
Scheiner & Holz-Rau (2007)	Germany (*N* = 2690)	Urban	General purpose	Cross-sectional *[SEM]*	Car vs PT use (incl. motorcycle) ratio (typical) PT vs. Car use ratio (typical)	1.0

Author(s) (year)	Country (Sample Size; %female; mean age [*SD*], age range)[a]	Setting	Journey Purpose	Design *[Analysis]*	Dependent Variable (TMC Behaviour measure)	Quality Score
Steg (2005)	Netherlands (*N* = 113; 27%; 42 years)	Urban	Commuting	Cross-sectional *[Multiple regression analysis]*	Car use ratio (typical)	2.0
Steg & Sievers (2000)	Netherlands (*N* = 413)	NR	General purpose	Cross-sectional *[Correlation Analysis]*	Car use frequency (typical)	0.5
Tanner (1999)	Switzerland (*N* = 153; 33%; 46 years)	Mixed	Commuting, Shopping, Leisure	Cross-sectional *[Multiple regression analyses]*	Car (incl. motorcycle) use frequency index (typical)	1.0
Tischer & Phillips (1979)	USA (*N* = 502)	Urban	Commuting	Panel study *[Cross-lagged correlation]*	Car use vs. bus vs. car pool ratio (typical)	0.0
Van Acker et al. (2011)		Urban	active leisure activities	Cross-sectional *[SEM]*	Car use frequency (typical) [DV]	1.5

Author(s) (year)	Country (Sample Size; %female; mean age [*SD*], age range)[a]	Setting	Journey Purpose	Design *[Analysis]*	Dependent Variable (TMC Behaviour measure)	Quality Score
	Belgium (*N* = 1878; 58.7%; 30.6 years)		family visits fun shopping			
Van Vugt et al. (1995)	Netherlands (*N* = 56; 55.36%; 32 years)	Urban	Commuting	Experiment *[ANOVA]*	Car vs PT use preference (typical)	0.1
Van Vugt et al. (1996)	Netherlands (*N* = 192; 45.83%; 35.8 years)	Urban	Commuting	Experimental *[ANOVA]*	PT vs. car use preference (typical)	0.0
Verplanken et al. (1994)	Netherlands (*N* = 199; 53.77%; 39.9, 19-65 years)	Rural	Shopping trip outside village	Cross-sectional *[Path analysis]*	Car use frequency (typical)	0.3
Verplanken et al. (1998)	Netherlands (*N* = 200; 52%; 43.1, 20-70 years)	Rural	General trips outside village	Experimental *[Multiple regression analysis]*	Car use ratio (actual)	0.4

Author(s) (year)	Country (Sample Size; %female; mean age [*SD*], age range)[a]	Setting	Journey Purpose	Design *[Analysis]*	Dependent Variable (TMC Behaviour measure)	Quality Score
Verplanken et al. (2008)	UK (*N* = 433; 56%; 41.30 [11.29], 20-64 years)	Mixed	Commuting	Cross-sectional *[Multiple regression analyses]*	Car (incl. motorcycle & taxi) vs. alternative mode use ratio (typical)	1.0
Yang-Wallentin et al. (2004)	Germany (*N* = 912; 53%; 44.3 [15.7])	Urban	General purpose	Panel *[SEM]*	PT vs. car use ratio (actual)	1.0

SD = Standard Deviation, UK = United Kingdom, USA = United States of America, SEM = Structural Equation Modelling, PT = Public Transport, NR = Not reported, ANOVA = Analysis of Variance, DV = Dichotomous Variable, SOV = Single Occupancy Vehicle

[a] if SD not provided, Range is given [b] where information provided

Table A.3 Summary of study characteristics

A.3 Methodological quality

Table A.4 presents the criteria used to determine methodological quality assessing sample size, sample representativeness and validity and reliability of measures used.

High quality studies achieved an average score of 2.28, medium quality studies 1.16 and low quality studies 0.43. Three studies did not meet any of the quality criteria (Joireman et al., 1997; Tischer & Phillips, 1979; Van Vugt et al., 1996). Two studies met all quality assessment criteria and achieved a maximum score of 3 (Haustein & Hunecke, 2007; Murtagh, Gatersleben, & Uzzell, 2012). Studies with a prospective research design scored highest (M = 1.3), followed by cross-sectional studies (M = 1.2), longitudinal studies (M = 0.8). Experimental studies presented the lowest average quality rating (M = 0.5). Independent scores for each quality indicator can be found in Table

		present (1)	absent (0)	Unclear or inadequately reported (0)
Criteria to be applied to each individual study	**1. Was the sample size large enough?**	Study performed a power analysis and met the required sample size.	Power analysis conducted and required sample size not achieved.	Study reports sample size included in the study but no power analysis was conducted or sample size included in the study is not reported.
	2. Was the sample size large enough when SEM was performed?	Where applicable, SEM/Path analysis is performed and N >200	Where applicable, SEM/Path analysis is performed and N <200	Sample size included in the study is not reported.
	3. Was the sample representative of the target population?	Study explicitly states that sample used for analysis is fully or to a large part representative of the target population.	Study explicitly states that sample did not match the target population.	Study does not give any information concerning representativeness
Criteria to be applied to each individual measure of a cognitive mechanism	**4. Did the study use a valid measure?**	Study reported use of a previously used or tested scale of this measure (content validity)	Study explicitly stated not to have used a previously used or tested measure	Study did not reference measure or gave information about measure validity
	5. Did the study use a reliable measure?	Where applicable, study reported at least acceptable internal reliability for multiple item scales (>2) (Cronbach's alpha >0.6) or reported Pearson's *r* > .7 for 2-item scales used to measure cognitive mechanisms	Where applicable, study reported inadequate internal reliability (Cronbach's alpha <0.6) or Pearson's *r* > .7	Where applicable, study did not report internal reliability data (Cronbach's alpha or Pearson's *r*)

Table A.4 Indicators of study quality

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
Abrahamse et al. (2009)	Intentions - Non-car use	n/a	1	0	n/a	0	**1.0**
	Attitudes - Car use	1	1				
	SN - Car use expectation	n/a	1				
	PBC - non-car use	1	1				
	PN - car and non-car use	1	1				
	Awareness of Consequences - Car use	1	1				
	Ascription of responsibilities - Car use	1	1				
Armitage et al. (2013)	PBC - reduce car use	1	0	0	n/a	1	**1.5**
	Attitudes - reduce car use	1	0				
	SN - reduce car use	1	0				
	Intention - reduce car use	1	0				
Baldassare (1991)	Attitudes about freeway satisfaction	n/a	0	0	n/a	1	**1.0**
	Attitudes about traffic problems	n/a	0				
Bamberg (2006)	Intention - PT vs Car	0	0	n/a	0	0	**0.1**
	Attitude - PT vs Car	0	0				
	PBC - PT vs Car	0	0				
	Change Intention - PT vs car	0	0				
	SN - PT vs car	0	0				
	Habit - Car vs PT	n/a	1				
Bamberg et al. (2003)	Intention - Car use	0	0	n/a	1	0	**1.0**
	Habit	0	0				
	Attitudes - Car use	0	0				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	SN - Car use	0	0				
	PBC - Car use	0	0				
Bamberg & Schmidt (2003)	Role beliefs - Car use	0	0	n/a	1	0	**1.1**
	Intention - Car use	0	0				
	SN - Car use	0	0				
	Behavioural beliefs - Car use	0	1				
	Control beliefs - Car use	0	1				
	Normative beliefs - Car use	0	1				
	Ascription of responsibilities - Traffic	0	0				
	Habit - Car use (script-based)	0	0				
	Awareness of consequences - Traffic	0	0				
	PN - non-car use	0	0				
	PBC - Car use	0	0				
	Attitudes - Affective car use	0	0				
	Attitudes - Car use	0	0				
Bergstad et al. (2011)	Instrumental motives - visit family and friends	n/a	1	0	n/a	0	**1.0**
	Instrumental motives - can go out	n/a	1				
	Independent motives - free to stop everywhere	n/a	1				
	Independent motives - chose own route	n/a	1				
	Instrumental motives - makes life more easy	n/a	1				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	Independent motives - not dependent on others	n/a	1				
	Independent motives - brings wherever I want	n/a	1				
	Instrumental motives - comfortable	n/a	1				
	Independent motives - freedom	n/a	1				
	Independent motives - time saving	n/a	1				
	Instrumental motives - Protection against bad weather	n/a	1				
	Independent motives - car always available	n/a	1				
	Instrumental motives - good road holding	n/a	1				
	Instrumental motives - Safe in car	n/a	1				
	Instrumental motives - enables holiday trips	n/a	1				
Cao & Mokhtarian (2005)	Attitudes - Pro-environmental	0	0	0	n/a	1	**1.0**
	Personality - Calm	0	0				
	Personality - Loner	0	0				
	Attitude - Commute benefit	0	0				
	Attitude - Travel stress	0	0				
	Attitude - Pro-hi density	0	0				
	Personality - Adventure seeking	0	0				
	Lifestyle - Frustrated	0	0				
	Lifestyle - Family and community oriented	0	0				
	Lifestyle - Status seeker	0	0				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	Lifestyle - Workaholic	0	0				
Collins & Chambers (2005)	Social values - Environment	1	1	0	n/a	0	**0.9**
	Biospheric values - Environment	1	1				
	Egoistic values - Environment	1	1				
	Social beliefs - Environmental threat of cars	0	1				
	Control beliefs (perceived) - environmental threat of cars	1	1				
	Egoistic beliefs - environmental threat of cars	1	1				
	Biospheric beliefs - environmental threat of cars	0	1				
	Consideration of future consequences - Environment	1	1				
Davidov (2007)	Habit - PT use	0	1	0	n/a	0	**0.5**
Friedrichsmeier et al. (2013)	Habit - Past behaviour	0	1	0	n/a	0	**0.3**
	Intention - Car use	0	0				
	Habit Strength	0	0				
	Habit - RFM	0	1				
	Habit - Context stability	0	1				
Gardner (2009)	Habit	1	1	1	n/a	0	**1.8**
	Intention - Car use	1	0				
Gardner & Abraham (2010)	Intention - Car use	1	1	1	n/a	0	**2.0**
	PBC - Environmental problem reduction	1	1				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	Environmental concern	1	1				
	Attitude - Non-car use	1	1				
	PBC - Car use	1	1				
	Attitude - Car use	1	1				
	SN - Non-car use	1	1				
	Descriptive norm - Car use	1	1				
	SN - Car use	1	1				
	PBC - Non-car use	1	1				
	PN - Non-car use	1	1				
	Environmental problem awareness	1	1				
Gärling et al. (2001)	Attitude - Car use	1	0	n/a	0	0	**0.8**
	Habit - Script-based driving frequency	1	1				
Golob & Hensher (1998)	Attitudes - Traffic congestion is not so bad [ordinal]	n/a	0	n/a	1	0	**1.0**
	Attitudes - Car as status symbol [ordinal]	n/a	0				
	Attitudes - GGE abatement is possible [ordinal]	n/a	0				
	Attitudes - GGE is a serious threat [ordinal]	n/a	0				
Harland et al. (1999)	PN - Non-car use	1	1	0	n/a	0	**0.8**
	Intention - Non-car use	n/a	0				
	PBC - Non-car use	n/a	1				
	Attitude - Non-car use	n/a	1				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	Environmental Involvement (awareness of consequences)	1	0				
	SN - Non-car use	n/a	1				
Haustein & Hunecke (2007)	Intention1 - PT vs car	n/a	1	n/a	1	1	**3.0**
	Intention2 - PT vs car	n/a	1				
	PBC1 - PT vs car	n/a	1				
	PBC2 - PT vs car	n/a	1				
	SN1 - PT vs car	n/a	1				
	SN2 - PT vs car	n/a	1				
	Attitude - Car autonomy	n/a	1				
	Attitude - Car excitement	n/a	1				
	Attitude - Car competence 1	n/a	1				
	Attitude - Car competence 1	n/a	1				
	Attitude - PT excitement 1	n/a	1				
	Attitude - PT excitement 2	n/a	1				
	Attitude - Bicycle excitement	n/a	1				
	Attitude - Bicycle autonomy	n/a	1				
	Perceived mobility necessity 1	n/a	1				
	Perceived mobility necessity 2	n/a	1				
Hunecke et al. (2001)	Perception of ecological problem - Car use	1	1	0	n/a	0	**0.9**
	PBC - Subway use	0	1				
	Personal ecological norm	1	1				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	SN - Subway vs car	1	1				
	Feelings of ecological guilt - car use	1	1				
	Awareness of consequences - car use	1	1				
Hunecke et al. (2007)	Values - Conservation	1	1	0	n/a	1	**2.0**
	Values - Self-transcendence	1	1				
	Values - Openness to change	1	1				
	Values - Self-enhancement	1	1				
Joireman et al. (1997)	Concern - Comfort	n/a	0	0	n/a	0	**0.0**
	Concern - Travel time	n/a	0				
	Concern - Flexibility	n/a	0				
	Concern - Environment	n/a	0				
	Concern - Public Health	n/a	0				
Kaiser & Gutscher (2003)	Intention - Non-car use	1	1	0	n/a	0	**1.0**
	PBC - Non-car use	1	1				
	Attitude - Non-car use	1	1				
	Descriptive norm - Car use	n/a	1				
	SN - Non-car use	n/a	1				
Kerr et al. (2010)	Intention - Car use	1	1	0	n/a	0	**1.0**
	Habit	n/a	1				
	SN - Car use	1	1				
	Attitude - Car use, convenience, reliability, comfort, security, pleasantness	1	1				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	PBC - Car use	1	1				
Klöckner & Blöbaum (2010)	Ecological Intention - PT vs car	1	1	n/a	1	0	**2.0**
	PBC	1	1				
	Habit - Car choice	1	1				
	Personal Ecological Norm	1	1				
	Social Ecological Norm	1	1				
	Awareness of need	1	1				
	Awareness of consequences	1	1				
Klöckner & Matthies (2004)	PN - non-Car use	1	0	0	n/a	0	**0.6**
	SN	1	0				
	Habit - Car choice	n/a	1				
Lois & Lopez-Saez (2009)	Symbolic motivations - Car use (Shopping)	1	1	n/a	1	0	**2.0**
	Instrumental motivations - Car use (Shopping)	1	1				
	Symbolic motivations - Car use (visiting friends/family)	1	1				
	Instrumental motivations - Car use (visiting friends/family)	1	1				
	Symbolic motivations - Car use (commuting)	1	1				
	Instrumental motivations - Car use (commuting)	1	1				
	Symbolic motivations - Car use (leisure trips)	1	1				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	Instrumental motivations - Car use (leisure trips)	1	1				
Mann & Abraham (2012)	Intention - Car use	1	1	1	n/a	0	**2.0**
	Attitude - Car use	1	1				
	Moral Norm - Car use	1	1				
	PBC - Car use	1	1				
	PBC - Non-car use	1	1				
	Behavioural beliefs car use - Environment - bad	n/a	1				
	Behavioural beliefs car use - Cost-effective	n/a	1				
	Behavioural beliefs car use - Comfortable	n/a	1				
	Behavioural beliefs car use - Stress free	n/a	1				
	Behavioural beliefs car use - Reliable	n/a	1				
	Behavioural beliefs car use - Safe	n/a	1				
	SN	1	1				
	Behavioural beliefs car use - Healthy	n/a	1				
	Behavioural beliefs car use - Flexibility	n/a	1				
	Behavioural beliefs car use - time efficiency	n/a	1				
	Control beliefs car use - Congestion	n/a	1				
	Control beliefs car use - Journey chaining	n/a	1				
	Control beliefs car use - Parking difficulties	n/a	1				
	Control beliefs car use - Accident risk	n/a	1				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	Descriptive norm - Car use	n/a	0				
Matthies et al. (2006)	Perceived Behavioural Costs - PT vs Car	0	0	0	n/a	0	**0.3**
	PN - Car use reduction	1	0				
	Habit	n/a	1				
	SN - PT vs car	0	0				
Murtagh et al. (2012)	Social identity - Parent (Commuting)	n/a	1	1	n/a	1	**3.0**
	Transport identity - Motorist (Commuting)	n/a	1				
	Social identity - Worker (Commuting)	n/a	1				
	Transport identity - PT user (Commuting)	n/a	1				
	Transport identity - Pedestrian (Commuting)	n/a	1				
	Transport identity - Cyclist (Commuting)	n/a	1				
	Social identity - Member of local community (Commuting)	n/a	1				
	Social identity - Parent (General Purpose)	n/a	1				
	Transport identity - Motorist (General Purpose)	n/a	1				
	Social identity - Worker (General Purpose)	n/a	1				
	Transport identity - PT user (General Purpose)	n/a	1				
	Transport identity - Pedestrian (General Purpose)	n/a	1				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	Transport identity - Cyclist (General Purpose)	n/a	1				
	Social identity - Member of local community (General Purpose)	n/a	1				
Nilsson & Küller (2000)	Attitudes - PT	0	1	0	n/a	0	**0.7**
	Attitudes - hazard/efficacy	1	1				
	Attitudes - Personal concern	0	1				
	Attitudes - Car affection	1	1				
	Attitudes - Environmental concern	0	1				
	Environmental Knowledge	0	1				
Panter et al. (2013)	Intention - Car use	0	1	0	n/a	0	**0.7**
	Attitude - Car use	0	1				
	PBC - Car use	0	1				
	Social Norm - Car use	0	1				
	Habits	0	1				
	Perceptions of route environment - pleasant to walk	n/a	1				
	Perceptions of route environment - dangerous to cycle	n/a	1				
	Perceptions of route environment - convenient to cycle	n/a	1				
	Perceptions of route environment - little traffic	n/a	1				
	Perceptions of route environment - convenient PT	n/a	1				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	Perceptions of route environment - no convenient routes for walking	n/a	1				
	Perceptions of route environment - safe to cross the road	n/a	1				
Polk (2003)	Attitudes - Positive evaluation of automobility	n/a	1	0	n/a	0	**1.0**
	Attitudes - Automobility as a cause of environmental problems	1	1				
	Attitudes - Negative evaluation of automobility	n/a	1				
	Attitudes - Opinions of specific proposals to reduce car use	n/a	1				
	Attitudes - Environmental Concern	1	1				
Scheiner & Holz-Rau (2007)	Location attitudes - Subjective importance PT	n/a	0	n/a	1	0	**1.0**
	Location attitudes - Subjective importance shopping/services	n/a	0				
	Location attitudes - Subjective importance access to centre	n/a	0				
	Lifestyle - Out of home self-realisation	0	0				
	Location attitudes - Subjective importance PT	n/a	0				
	Location attitudes - Subjective importance shopping/services	n/a	0				
	Location attitudes - Subjective importance access to centre	n/a	0				
	Lifestyle - Out of home self-realisation	0	0				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
Steg (2005)	Symbolic motives - Descriptive norm	1	1	0	n/a	1	**2.0**
	Symbolic motives - Social comparison and self-presentation	1	1				
	Symbolic motives - SN (expectations family)	n/a	1				
	Instrumental motives - Attitudes car commute (8)	1	1				
Steg & Sievers (2000)	Environmental beliefs - Problem awareness	1	0	0	n/a	0	**0.5**
	Environmental beliefs - Efforts useful	1	0				
	Environmental beliefs - responsibility	1	0				
Tanner (1999)	Subjective constraints - Perceived behavioural barriers (car use reduction)	n/a	1	0	n/a	0	**1.0**
	Subjective constraints - Sense of responsibility (preservation of environment)	n/a	1				
	Biospheric values - General problem awareness	1	1				
	Egoistic values - Personal problem awareness (environment)	1	1				
	Perceived efficacy (change in environmental degradation)	1	1				
Tischer & Phillips (1979)	Beliefs - Car use attributes (18)	0	0	0	n/a	0	**0.0**
van Acker et al. (2011)	Travel attitudes - Pro-environment	0	1	n/a	1	0	**1.5**
	Lifestyle - Home-oriented traditional family	0	1				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	Lifestyle - Culture lover	0	1				
	Residential attitudes - Open space and quietness	0	1				
	Travel mode attitudes - bike/on foot = positive effects	0	1				
	Travel mode attitudes - bike/on foot = comfortable	0	1				
	Travel mode attitudes - Car = negative effects	0	1				
	Travel mode attitudes - Car = comfortable	0	1				
	Lifestyle - Home-oriented but active family	0	1				
	Residential attitude - Car alternatives	0	1				
	Lifestyle - Friends & trends	0	1				
	Residential attitude - Accessibility	0	1				
	Travel mode attitudes - PT = comfortable	0	1				
	Travel mode attitudes - PT = time-saving	0	1				
	Travel mode attitudes - PT = positive effects	0	1				
	Travel attitudes - Reduced driving social expectation	0	1				
	Travel attitudes - Frustrated traveller	0	1				
	Residential Attitudes - Social Context (ns)	0	1				
	Residential Attitudes - Safety & neatness (ns)	0	1				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	Lifestyle - Low-budget and active/creative	0	1				
	Lifestyle - low-budget and active/creative	0	1				
	Lifestyle - home-oriented traditional family	0	1				
	Residential attitudes - Open space and quietness	0	1				
	Travel attitudes - Pro-environment	0	1				
	Lifestyle - Home-oriented but active family	0	1				
	Residential attitude - Car alternatives	0	1				
	Travel mode attitudes - Car = comfortable	0	1				
	Travel mode attitudes - bike/on foot = comfortable	0	1				
	Travel mode attitudes - Car = negative effects	0	1				
	Residential attitude - Accessibility	0	1				
	Travel attitudes - Reduced driving social expectation	0	1				
	Lifestyle - Friends & trends	0	1				
	Travel mode attitudes - PT = comfortable	0	1				
	Travel mode attitudes - PT = time-saving	0	1				
	Travel mode attitudes - PT = positive effects	0	1				
	Travel Attitudes - Frustrated traveller	0	1				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	Residential Attitudes - Social Context (ns)	0	1				
	Residential Attitudes - Safety & neatness (ns)	0	1				
	Travel mode attitudes - bike/on foot = positive effects	0	1				
	Lifestyle - Culture lover	0	1				
	Residential attitudes - Open space and quietness	0	1				
	Travel attitudes - Pro-environment	0	1				
	Residential attitude - Car alternatives	0	1				
	Lifestyle - Home-oriented but active family	0	1				
	Travel mode attitudes - bike/on foot = comfortable	0	1				
	Travel mode attitudes - Car = negative effects	0	1				
	Travel mode attitudes - Car = comfortable	0	1				
	Lifestyle - Culture lover	0	1				
	Residential attitude - Accessibility	0	1				
	Lifestyle - Home-oriented traditional family	0	1				
	Travel mode attitudes - PT = comfortable	0	1				
	Travel mode attitudes - PT = time-saving	0	1				
	Travel mode attitudes - PT = positive effects	0	1				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	Lifestyle - Low-budget and active/creative	0	1				
	Travel attitudes - Reduced driving social expectation	0	1				
	Travel Attitudes - Frustrated traveller	0	1				
	Residential Attitudes - Social Context (ns)	0	1				
	Residential Attitudes - Safety & neatness (ns)	0	1				
	Lifestyle - Friends & trends	0	1				
	Travel mode attitudes - bike/on foot = positive effects	0	1				
van Vugt et al. (1995)	Prosocial Value Orientation	0	1	n/a	0	0	**0.1**
	Importance environment	n/a	0				
	Importance travel flexibility	n/a	0				
	Importance public health	n/a	0				
	Importance Cost	n/a	0				
	Importance Convenience	n/a	0				
	Importance Weather	n/a	0				
	Importance travel time	n/a	0				
van Vugt et al. (1996)	Collective motives (prosocial) - Concern for environmental pollution	n/a	0	0	n/a	0	**0.0**
	Individual motives (proself) - Travel flexibility	n/a	0				
	Individual motives (proself) - Protection against the weather	n/a	0				

Author(s) (year)	Cognitive Mechanism(s)	Indicators of Study Quality					
		reliable	valid	Large sample (Power Analysis)	Large Sample (SEM/Path = >200)	Representativeness	**Total Score**
	Individual motives (proself) - Travel convenience	n/a	0				
	Individual motives (proself) - Travel time	n/a	0				
Verplanken et al. (1994)	Attitudes - Car use	0	0	n/a	0	0	**0.3**
	Habit - RFM	n/a	1				
	Decisional involvement	1	0				
	Attitudes - Train use	0	0				
Verplanken et al. (1998)	Habit - RFM	n/a	1	0	n/a	0	**0.4**
	Habit - SPB	n/a	1				
	Intention - Car use	n/a	0				
	PBC - Car use	n/a	0				
	SN - Car use	n/a	0				
	Attitudes - Car use	1	0				
Verplanken al. (2008)	Environmental concern	1	1	0	n/a	0	**1.0**
Yang-Wallentin et al. (2004)	Intention 1 - PT vs car	0	0	n/a	1	0	**1.0**
	Intention 2 - PT vs car	0	0				
	Intention 3 - PT vs car	0	0				
	PBC 1 - PT vs car	0	0				
	PBC 2 - PT vs car	0	0				

n/a = not applicable, PT = public transport, PBC = perceived behavioural control, RFM = Response Frequency Measure, SPB = Self-reported frequency of past behaviour, SN = social norms, PN = personal norms, GGE = greenhouse gas emission

Table A.5 Detailed quality assessment scores

A.4 Cognitive Mechanisms of Travel Mode Choice

The emerging groups were driven by the literature and often represent the structure of socio-psychological models, in particular the Theory of Planned Behaviour (TPB) (Ajzen, 1991). Sub-groups emerged where studies measured the same cognitive mechanism but with a conceptually distinctive content of that mechanism. Hence, cognitive mechanisms were often divided into car use and non-car-use. For example, studies measured the intention to use the car (car use Intentions) or the intention to use the car less (non-car-use Intentions). Other cognitive mechanisms, such as Identity, could not be considered conceptually distinct but correlations reported by three car-use studies (reporting 17 associations) could be considered congruent with car use (pro-car Identity) and incongruent with car use (anti-car Identity). Added specificity to modifiable determinants of socio-psychological models has been shown to add to their predictive validity (Kaiser & Gutscher, 2003; Sheppard, Hartwick, & Warshaw, 1988) and is now frequently adapted in transport research (e.g. Gardner & Abraham, 2008; Mann & Abraham, 2012).

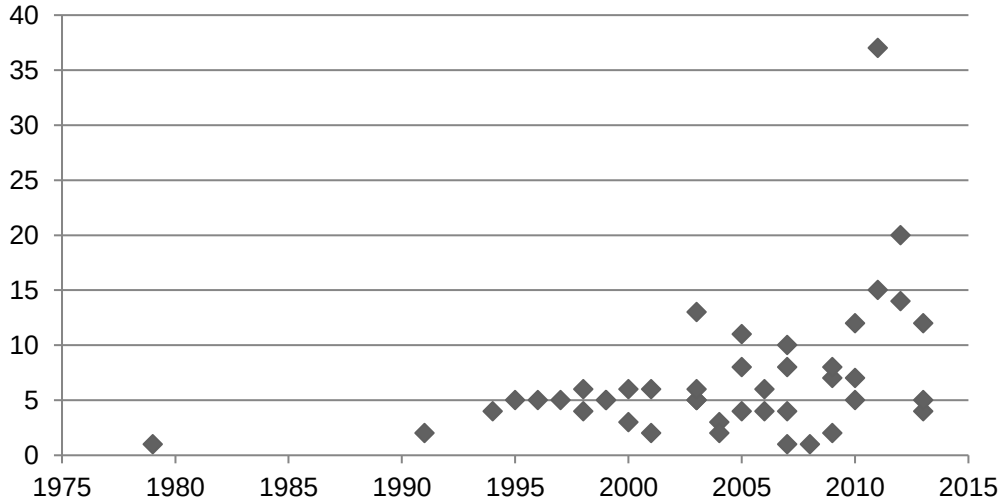


Figure A.1 Number of cognitive mechanisms measured over time

Overall, 333 associations were identified in the literature. Figure A.1 presents the number of cognitive mechanisms studies over time. Attitudes were the most widely researched cognitive mechanism. A plethora of associations characterised by inconsistent conceptualisations and operationalisations suggested a more fragmented approach to the synthesis of attitudinal variables. What studies denoted as “attitudes” varied from (1) general evaluations or beliefs about specific car use/ non-car-use attributes to, (2) concerns about or subjective importance of factors not related to car use/ non-car-use. Hence, we classified these into five different categories: (1) car use attitudes, (2) non-car-use attitudes, (3) attitudes towards travel in general, (4) attitudes towards the environment and health, and (5) attitudes towards transport environment.

Table A.6 shows an overview of the emerged categories of cognitive mechanisms and the corresponding definition can be viewed in Table A.7. For illustrative purposes, Table S6 includes the numbers for a meta-analysis where $k \geq 2$.

Cognitive mechanism	*N* of unique studies	*N* of unique associations	N unique studies in MA car use behaviour	N unique studies in MA non-car-use behaviour	Component of which model
Attitude	**32**	**125**	**20**	**4**	
Car use	18	40	13	0	
Non-car-use	10	25	3	4	TPB
Travel in general	5	17	3	0	
Environment & health	11	14	7	0	
Travel in general	5	17	3	0	
Subjective norm (SN)	19	23	8	5	
Car use SN	8	8	6	0	TPB
Non-car-use SN	12	15	3	5	
Descriptive norm	4	4	3	0	TPB
Control Beliefs	**20**	**31**	**12**	**5**	
Perceived Behavioural Control (PBC)	17	26	11	5	TPB
Car use PBC	8	13	6	0	

Non-car-use PBC	11	13	5	5	
PBC - Environment	5	5	4	0	
Intention	17	21	10	5	
Car use Intention	9	9	7	0	TPB
Non-car-use Intention	8	12	3	5	
Personal Norm	9	9	5	2	NAM
Ascription of Responsibility	**5**	**5**	**3**	**0**	NAM
Awareness of Consequences	**8**	**11**	**5**	**0**	NAM
Altruistic Value Orientation	**5**	**11**	**2**	**0**	VBN
Identity, Role Beliefs & Personality	**5**	**38**	**3**	**0**	TIB
Anti-car identity	3	11	2	0	
Pro-car identity	3	12	3	0	
Social Comparison	**3**	**6**	**2**	**n/a**	n/a
Habit	**14**	**18**	**9**	**2**	
RFM	11	11	6	2	TIB
Other measures	5	7	5	0	

TPB = Theory of Planned Behaviour, NAM = Norm Activation Model, VBN = Value-Belief-Norm model, TIB = Theory of Interpersonal Behaviour

Table A.6 Overview of cognitive mechanisms studied and number of associations tested

Cognitive Mechanism Category	Definition	Example Question
Car use Attitude	Relates to general evaluation of car use as being good or bad, positive or negative, favourable or unfavourable. Also contains car-use-relevant beliefs (affective and behavioural)	"Making most of my journeys next week by car would be" good/bad "The most cost-effective way of getting to campus is by driving there every day" agree/disagree
Non-car-use Attitude	Relates to general evaluation of not using the car or using any other transport mode but the car as being good or bad, positive or negative, favourable or unfavourable. Also contains non-car-use-relevant beliefs (affective and behavioural)	"Making most of my journeys next week without my car would be" good/bad
Attitude - Travel in General	Evaluations, concerns or subjective importance of travel characteristics not specific to a particular mode.	"To which extent are you concerned with flexibility while traveling"

Cognitive Mechanism Category	Definition	Example Question
		very much/not at all
Attitude - Environment & Health	Comprises of general or specific evaluations, subjective importance, worry, opinions or concerns, about environment and public health	“I am worried about environmental problems such as air pollution, noise, and energy use” agree/disagree
Attitude - Transport Environment	Combines evaluations, concerns or subjective importance of spatial characteristics, elements of urban design or aspects of built-environment	“How important are the following features of the neighbourhood for your personal decision in favour of a certain place of residence?” agree/disagree
Car use Subjective Norm	Are injunctive norms or normative beliefs that refer to the individuals perception of important others' beliefs about personal car use	“If I use a car for most of my journeys in the next week, most people who are important to me would approve.” agree/disagree
Non-car-use Subjective Norm	Are injunctive norms or normative beliefs that refer to the individuals perception of important others' beliefs about the individual's non-car travel	“People who are important to me expect that I will use environmentally friendly means of transportation." agree/disagree
Descriptive Norm	Is the individual perception of other people's car-use-relevant behaviour	“Most people who are important to me use a car for most of their journeys within the city” agree/disagree
Car use Intention	Refers to the intention to choose the car for journeys (over a certain period of time or at a specific time point)	“I intend to use the car for most of my journeys during the next week” agree/disagree
Non-car-use Intention	Is the intention to reduce car use or to use any other form of transport than/instead of the car	“I intend to use PT instead of the car for daily trips from my residence” agree/disagree
Car use PBC	Refers to beliefs about the capability of using the car	“Circumstances force me to use the car on my frequent trips” agree/disagree
Non-car-use PBC	Are beliefs about the capability of using any other mode of transport than/instead of the car	“For me to use PT instead of the car for daily trips from my residence would be” easy/difficult
PBC - Environment	Relate to beliefs about the capability of reducing environmental problems by	“Through my transport

Cognitive Mechanism Category	Definition	Example Question
	decisions regarding transport. Can also relate to personal belief/opinion about activities that are essential in ameliorating the environmental state.	decisions, I can make a difference to the environment" agree/disagree
Non-car-use Personal Norm	Relates to the moral obligation or the individual's values to use non-car travel modes	"Due to values important to me, I feel obliged to use the car as little as possible." agree/disagree
Awareness of Consequences	Describes certain degree of awareness/ concern with consequences that individual's own actions or other people's actions with regards to car use are harmful/have bad consequences for the environment and society	"Car use causes serious air pollution in the world" agree/disagree
Ascription of Responsibilities	Refers to the extent to which the individual feels responsible that his/her own car-use-related actions or other people's car-use-related actions can influence these consequences/(environment and societal) problems	"I feel personally obliged to reduce smog" agree/disagree
Altruistic Value Orientation	Items were categorised when studies explicitly referred to the construct as being a value orientation	"How important is [value] to you as a guiding principle of life?" very important/not at all
Identity, Role Beliefs & Personality	Refers to several measures/ways in measuring of an individual's set of characteristics/lifestyle desires/personality or general efforts to establish a person's individuality	"How important to you is [identity] in defining who you are?" very important/not at all
Social Comparison	Refers to items asking in how far people compare their own actions with others' and also in how far they try to exceed others	"I can distinguish myself from others" agree/disagree
Car use Habit - RFM	Car use habit measured using the Response Frequency Measure (RFM) by Verplanken et al. (1994)	n/a
Car use Habit - Other Measures	Car use habit measured not using the RFM	n/a

Table A.7 Definition of emerged categories of cognitive mechanisms

A.5 Further details on the meta-analysis

Correlation coefficients could be extracted from 26 retrieved papers. In addition, 19 authors were asked to provide missing data and nine were willing/able to do so. We excluded Nilsson and Küller's (2000) study because it was not possible to determine if the dependent variable measured car use or non-car-use and because four out of six scales measure cognitive mechanisms showed low internal reliability e.g., Attitude – public transport (α = .48), Attitude - personal concern (α = .35), Attitude - environmental concern (α = .50), Environmental Knowledge (α = .44). One study reported cognitive mechanisms for both, car use and non-car-use (Scheiner & Holz-Rau, 2007) and was therefore included in both meta-analyses. The following chapters complement the results section and further describes salient observations made during the synthesised literature as well as more detailed results tables

A.5.1 Car use intentions towards car use

The high heterogeneity index could be due to considerably different individual effect sizes. Two of the non-urban studies (Panter, Desousa, & Ogilvie, 2013; Verplanken, Aarts, van Knippenberg, & Moonen, 1998) reported effect sizes of r = .11 and r = .20, respectively, whereas (Mann & Abraham, 2006) reported a very large relationship between intentions and car use (r = .88). This can be explained by the study being conducted at a location (Falmer Campus, Sussex University) that is very accessible via multiple modes of transport and is being served by regular public transport. Therefore, although being in a rural location, the geographical conditions are not representative for rural locations, traditionally considered remote.

A.5.2 Awareness of consequences towards car use

Studies used different measures to assess the awareness of consequences. Some items referred to impacts on the environment or society due to actions of the individual (Steg & Sievers, 2000) and some to the behaviour in general (Tanner,

1999). This might be due different conceptualisations of this cognitive mechanism that exist in the literature. Steg (2005), for instance, explains that a “person needs to be aware of consequences of their own behaviour for others or the environment” (Awareness of Consequences) and that he “needs to feel personally responsible for these problems” (Ascription of Responsibilities). Stern et al. (1999) define Awareness of Consequences as “awareness of threats to nonhuman species and the biosphere” and Ascription of Responsibilities as “the belief that action can alleviate consequences”. Lastly, Schwartz (1977) adopted the general approach and conceptualised Awareness of Consequences as “the extent to which someone is aware of adverse consequences of not acting prosocial for others or for other things one values” and Ascription of Responsibilities as a construct that “reflects feelings of responsibility for negative consequences of not acting prosocial”

A.5.3 Car use habit – other measure towards car use

Friedrichsmeier, Matthies, and Klöckner (2013) included four different operationalisations of habit and tested associations of script-based, past behaviour, self-report habit index and context stability separately. Therefore, this study was included in the category of RFM of car use habit and also in the category for other habit measures. Likewise, Verplanken et al. (1998) applied two different measures for habit (RFM and past behaviour) and provided two separate correlation coefficients for the two measures hence are included in both groups. Klöckner and Blöbaum (2010) used two different measures of habit (RFM and self-report habit index) but combined the two scales into one variable on the grounds of acceptable inter-correlation (α =.73). This study was therefore included in the category “other habit measures”.

A.5.4 Longitudinal studies

We identified four longitudinal studies in the review of which three were eligible to be entered into meta-analyses (Armitage et al., 2013; Friedrichsmeier et al., 2013;

Tischer & Phillips, 1979). Across three studies, ten associations with car use were tested, all corresponding to a different cognitive mechanism category (see table below). In all cases, individual effect sizes were the expected direction and in many cases the magnitude was consistent with the pooled effect size for the cognitive mechanism. Unfortunately, we were unable to conduct a separate meta-analysis for those studies as insufficient number of studies reported correlation coefficients for the same cognitive mechanism.

Study	Cognitive Mechanism Category	study effect size *r*	*r*+
Tischer & Phillips (1979)	Car Use Attitudes	0.29	0.36
Friedrichsmeier et al. (2013)	Car Use Habit - RFM	0.44	0.47
	Car Use Intentions	0.51	0.5
Armitage et al. (2013)	Non-car-use PBC	-0.261	-0.47
	Non-car-use Attitudes	-0.098	-0.23
	Non-car-use Subjective Norms	-0.072	-0.15
	Non-car-use Intentions	-0.127	0.38

Table A.8 Effect sizes of longitudinal studies

Cognitive mechanism (sub-groups)	*n*	*k*	*K*	*r+*	95% CI	I^2 (%)	X^2	*Egger's test*
Car Use Attitudes	**4647**	**38**	**12**	**0.22*** **	**0.13, 0.30**	**91.6**	**115.52*** **	**6.8 (*p*=.01)**
non-urban	3186	29	6	0.14***	0.06, 0.23	87.2	28.54***	8.8 (*p*=.07)
urban	1461	9	6	0.31***	0.21, 0.41	83.2	28.66***	3.6 (*p*=.17)
non-commuting journeys	3019	24	6	0.15**	0.05, 0.25	92.4	52.85***	9.4 (*p*=.12)
commuting journeys	1628	14	6	0.34***	0.26, 0.42	78	21.33***	4.2 (*p*=.11)
non-European	927	3	3	0.37***	0.26, 0.48	83.9	11.55**	7.8 (*p*=.10)
European	3720	35	9	0.18***	0.09, 0.27	90.8	73.57***	6.3 (*p*=.04)
typical car use	4218	28	10	0.21***	0.12, 0.30	92.3	101.16***	6.5 (*p*=.01)
actual car use	429	10	2	0.28*	0.06, 0.50	92	12.47***	-
TPB measures	1290	6	6	0.33***	0.20, 0.46	89.3	42.97***	2.8 (*p*=.62)
Beliefs	3586	32	7	0.19***	0.09, 0.29	92.2	69.25***	9.2 (*p*=.01)
Non-car-use Attitudes	**812**	**3**	**3**	**-0.23****	**-0.40, -0.06**	**90.7**	**20.14*** **	**-**
Attitudes - Travel in General	**1486**	**10**	**3**	**0.05**	**-0.05, 0.15**	**84.6**	**11.92****	**-**
Attitudes - Environment & Health	**4097**	**9**	**7**	**-0.10****	**-0.17, -0.03**	**86.2**	**40.68*** **	**-**
non-urban	2804	3	3	-0.09	-0.18, 0.00	89	18.31***	-
urban	1293	6	4	-0.13*	-0.25, 0.00	87.4	21.31***	-
Attitudes - Transport Environment	**4811**	**12**	**4**	**-0.28*** **	**-0.41, -0.15**	**97.5**	**104.16*** **	**-**
non-urban	1759	8	2	-0.17***	-0.23, -0.11	70.5	3.34	-
urban	3052	4	2	-0.35***	-0.52, -0.17	98.6	64.26***	-
Car Use Subjective Norms	**1455**	**6**	**6**	**0.20****	**0.05, 0.35**	**91.3**	**53.18*** **	**12.2 (*p*=.20)**
Non-car-use Subjective Norms	**944**	**3**	**3**	**-0.15*** **	**-0.20, -0.11**	**0**	**1.31**	**-**
Car Use Descriptive Norms	**532**	**3**	**3**	**-0.07**	**-0.35, 0.21**	**94.2**	**32.44*** **	**-**

Car Use PBC	**1605**	**9**	**5**	**0.39*** **	**0.18, 0.6**	**97.1**	**110.83*** **	**-6.3 (*p*=.75)**
Non-car-use PBC	**1200**	**5**	**5**	**-0.42*** **	**-0.57, -0.28**	**93**	**49.24*** **	**-**
PBC - Environment	**324**	**4**	**4**	**-0.08** **	**-0.17, -0.05**	**52.8**	**6.3**	**-**
Car Use Intentions	**2375**	**7**	**7**	**0.50*** **	**0.31, 0.68**	**98.3**	**262.35*** **	**8.3 (*p*=.33)**
non-urban	844	3	3	0.34	-0.04, 0.71	99.2	118.42***	-
urban	1531	4	4	0.59***	0.47, 0.70	95.6	49.6***	9.1 (*p*=.01)
non-commuting journeys	1438	3	3	0.50***	0.33, 0.67	96.7	54.89***	-
commuting journeys	937	4	4	0.50**	0.15, 0.85	98.9	207.12***	26.4 (*p*=.24)
typical car use	1839	4	4	0.47***	0.26, 0.67	97.9	135.45***	6.2 (*p*=.62)
actual car use	536	3	3	0.62***	0.25, 0.98	98.7	143.41***	-
Non-car-use Intentions	**943**	**3**	**3**	**-0.38***	**-0.68, -0.09**	**98.1**	**87.86*** **	**-**
Non-car-use Personal Norms	**793**	**5**	**5**	**-0.35*** **	**-0.42, -0.28**	**69.3**	**12.32***	**-**
Ascription of Responsibilities	**642**	**3**	**3**	**-0.14**	**-0.31, 0.03**	**87.7**	**14.69*** **	**-**
Awareness of Consequences	**2139**	**6**	**5**	**-0.22*** **	**-0.29, -0.16**	**69.1**	**12.72***	**-**
Altruistic Value Orientation	**184**	**3**	**2**	**-0.32*** **	**-0.34, -0.29**	**0**	**0.07**	**-**
Identity Anti-Car	**1609**	**11**	**2**	**-0.08** **	**-0.11, -0.02**	**39.1**	**1.64**	**-**
Identity Pro-Car	**4229**	**11**	**3**	**0.05*** **	**0.04, 0.07**	**0**	**0.88**	**-**
Social Comparison	**1247**	**6**	**2**	**0.16** **	**0.06, 0.26**	**84.5**	**6.61***	**-**
Car Use Habit - RFM	**2058**	**6**	**6**	**0.47*** **	**0.39, 0.56**	**89**	**37.70*** **	**2.7 (*p*=.42)**
typical car use	445	3	3	0.53***	0.39, 0.66	87.9	11.55**	-
actual car use	1613	3	3	0.46***	0.35, 0.57	92.1	24.19***	-
Car Use Habit - Other Measures	**2160**	**7**	**5**	**0.38*** **	**0.20, 0.56**	**97.8**	**128.33*** **	**7 (*p*=.48)**
past behaviour	1248	2	2	0.58***	0.37, 0.78	97.7	60.06***	-
SRHI	523	2	2	0.28	-0.08, 0.64	98.6	40.97***	-
latent variable	1437	2	2	0.49***	0.29, 0.69	98.6	52.62***	-

*p<.05, **p<.01, ***p<.001
[a] K refers to the unique number of studies included in the analysis.

Table A.9 Detailed results of the meta-analysis of car use

Cognitive mechanism (sub-groups)	***n***	***k***	***K***	***r+***	**95% CI**	***I²* (%)**	***X²***	***Egger's test***
Non-car-use Attitudes	**2597**	**7**	**4**	**0.36*** **	**0.21, 0.51**	**97.1**	**79.26*** **	**11.3 (*p*=.19)**
Non-car-use Subjective Norms	**2745**	**6**	**5**	**0.28*** **	**0.14, 0.41**	**95.6**	**78.47*** **	**5.1 (*p*=.41)**
Non-car-use PBC	**3500**	**9**	**5**	**0.49*** **	**0.41, 0.57**	**93.9**	**55.08*** **	**8.3 (*p*=.14)**
typical non-car-use	2347	4	3	0.49***	0.39, 0.59	93.3	26.02***	-
actual non-car-use	1153	3	2	0.50***	0.34, 0.66	97.2	29.11***	-
Non-car-use Intentions	**3493**	**8**	**5**	**0.48*** **	**0.35, 0.61**	**97.3**	**131.63*** **	**11.8 (*p*=.18)**
* p < .05, ** p < .01, ***p < .001								

Table A.10 Detailed results of the meta-analysis of non-car-use

Appendix B Supplementary material for Chapter 3

The following pages contain supplementary files for Chapter 4 ‘Cognitive Construction of Travel Modes among high mileage car users and non-car users - A repertory grid analysis’.

B.1 The Repertory Grid procedure

The Repertory Grid (RepGrid) technique has been widely applied to many research areas, theoretical stances and research purposes. Whilst this proves its adaptability and flexibility, several design decisions need to be made in order to answer this study’s research questions. For example, the selection of elements proves an important factor to elicit comprehensive and suitable constructs (Wright & Lam, 2002). This study aimed to elicit general and common perceptions of travel modes and therefore necessitated elements which are amongst a typical and realistic set of choice options for travellers and to ensure meaningful and wide-ranging contrasts. Specifically, we chose six common travel modes investigated in the National Travel Survey (DfT, 2018), which includes driving, walking, cycling, train, bus and coach. We also included ‘tram’ as an additional form of (light) rail transport to ensure sufficient heterogeneity to elicit comprehensive sets of constructs (Wright & Lam, 2002) and because of its current and predicted future relevance in urban centres (TfL, 2016). Neutral pictures of elements were presented in black and white (see Figure B.1 below) to minimise activation of potentially confounding concepts, e.g. a specific car brand that could be associated with concepts of security or masculinity. Table B.1 summarises all decisions made in this research and illustrates design alternatives a researcher can choose from.

Car	Bus	Train	
			
Coach	**Tram**	**Bicycle**	**Walking**
			

Figure B.1 Pictures used for triadic elicitation procedure

Design Category	Alternatives	Design Choices
Research Perspective	Qualitative / quantitative	Qualitative
Nature of RepGrid	Idiographic / nomothetic	Idiographic
Element Selection	Elicited / supplied	Elicited
	Number of elements	7
Construct Elicitation	Minimum context form (triads or dyads) / full elicitation / group elicitation - with or without laddering	Minimum Context (triadic elicitation) with laddering
	Comparison of elements random / systematic	Systematic (triads were selected to oppose different categories of modes, i.e. ‘car vs. electricity powered PT vs. motorised PT’, followed by ‘car vs. active modes’ and ‘active mode vs. motorised PT vs. electricity powered PT’)
Linking elements to constructs	Yes / No	Yes
	Ranking / rating / dichotomising	(1) Rating of elements to bi-polar dimensions (5-point scale) and (2) Importance ranking of constructs

Table B.1 Pictures used for triadic elicitation procedure

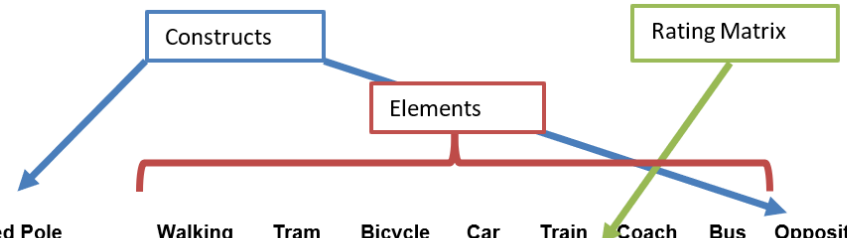
During a 60-minute face-to-face session, RepGrid constructs were elicited individually from each participant. The respondent was presented with a triad of elements, i.e. a series of three groups of three neutral pictures each showing a different mode of travel. This is a crucial part of the RepGrid as the interviewer must decide on a suitable way to present the different elements so that meaningful constructs will derive (Goffin, 2002). Therefore, the triad represented a purposely selected combination: (1) car, bus and train, (2) car, bicycle and walking, (3) walking, coach and tram (see below for pictures used). Kelly's (1955) notion of self-identification to ensure elements are personally relevant was assured by the inclusion of at least one travel mode that every participant uses themselves.

Constructs were elicited asking the participant to think of "ways in which two of the travel modes are similar to each other, but different from the third" Kelly (1955). When only similarities were identified, the participant was further asked what he/she thinks the opposite would be, in order to complete the bi-polar structure of the construct. To obtain a more in-depth understanding of people's 'meaning-making', the interviewer asked laddering questions to obtain further underlying motivations linked to the expressed dimension. Participants were also prompted to reveal a subjective interpretation of constructs thus semantic ambiguity during analysis can be avoided. No constructs were supplied, instead the interview procedure relied on subjective elicitation from participants. The interviewer took notes in an Excel spreadsheet while the triadic elicitation method was repeated until no novel responses could be obtained. Participants were prompted to add additional constructs at the end of the task to ensure saturation (Fransella et al., 2004).

In a second step, participants allocated a score for each of the seven travel modes using a five-point scale and every elicited construct as semantic endpoints of this scale. They were asked to rate whether each mode is best described by the phrases in the left-hand columns (-2) or if they are most accurately described by the phrases on the right-hand columns (+2). For example, participants rated the construct of relative speed of walking on a scale of -2 = 'fast' to +2 = 'slow' (Fransella et al., 2004;

Jankowicz, 2005). Ratings were recoded for analyses in WebGrid 5 with scores ranging from 1 to 5.

In a last step, constructs were given a ranking indicating the importance of a construct when making travel decisions. The participant was asked to assign the value of 1 to the most important construct, 2 to the second most important etc. until all constructs were ranked. If participants asked about the journey type, they were instructed to think of their most frequent journey. The interview resulted in a tabulated grid as illustrated in Figure B.2. It displays the completed grid with seven elements (columns) and elicited constructs (rows). Each bipolar response translated into one construct. Duplicated responses did not lead to a repeated construct.



Expressed Pole	Walking	Tram	Bicycle	Car	Train	Coach	Bus	Opposite Pole	Rank
fast	+2	0	+1	-2	-2	-1	0	slow	2
just yourself	-1	+2	-1	-2	+1	+1	+2	lots of people	7
own space	-1	+2	-1	-2	+2	+1	+2	crowded	6
private transport	-1	+2	-1	-2	+2	+1	+2	public transport	11
shared road space	-1	+2	-2	-2	+2	-1	-1	dedicated space	13
being driven	0	-2	+2	+2	-2	-2	-2	have to drive yourself	12
go when you want	-2	+2	-2	-2	+2	+2	+2	stick to set times	9
go where you want	-2	+2	-2	-2	+2	+1	+1	fixed routes	10
reliable	-2	+1	-2	-1	+1	+1	+2	unreliable	5
environmentally friendly	-2	-1	-2	+2	-2	-2	-1	unsustainable	8
predictable	-2	0	-2	-1	+1	+1	+2	unexpected factors	4
suitable for short distance	-2	+1	-1	+2	+2	+2	+1	suitable for long distance	1
physically active	-2	+2	-2	+2	+2	+2	+2	sedentary	3

Figure B.2 Illustration of a completed RepGrid matrix

Theoretical saturation was achieved on an individual level (i.e. participants were prompted until no new constructs were elicited) and on a group level (i.e. no new categories of constructs were elicited) (Fransella et al., 2004). In this study, theoretical saturation occurred after 6 interviews with non-car users and 9 interviews

with car users. Figures B.3 and B.4 below show the theoretical saturation curve for both group separately.

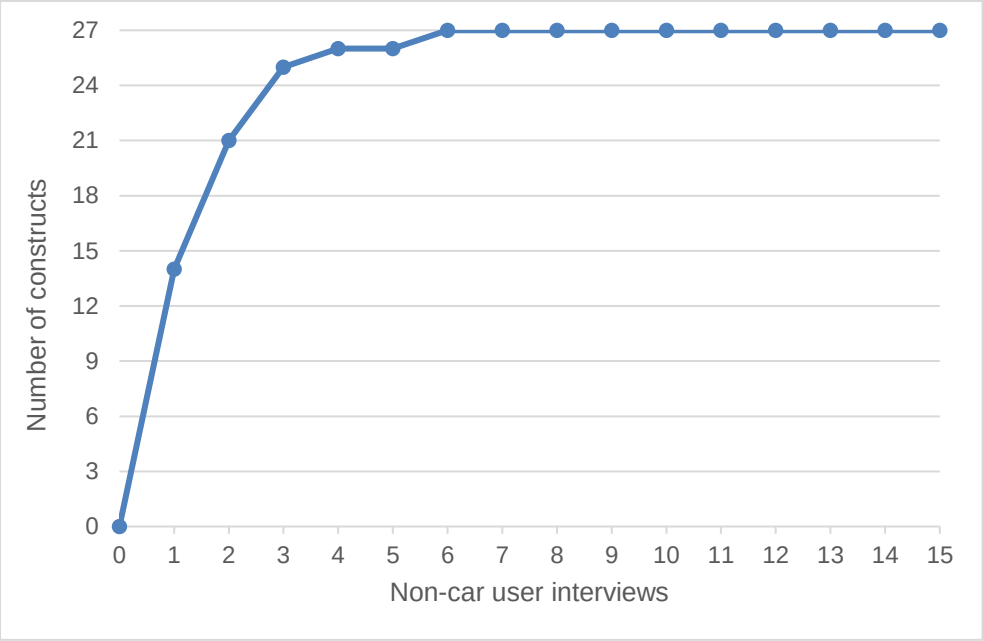


Figure B.3 Theoretical saturation curve for non-car user interviews

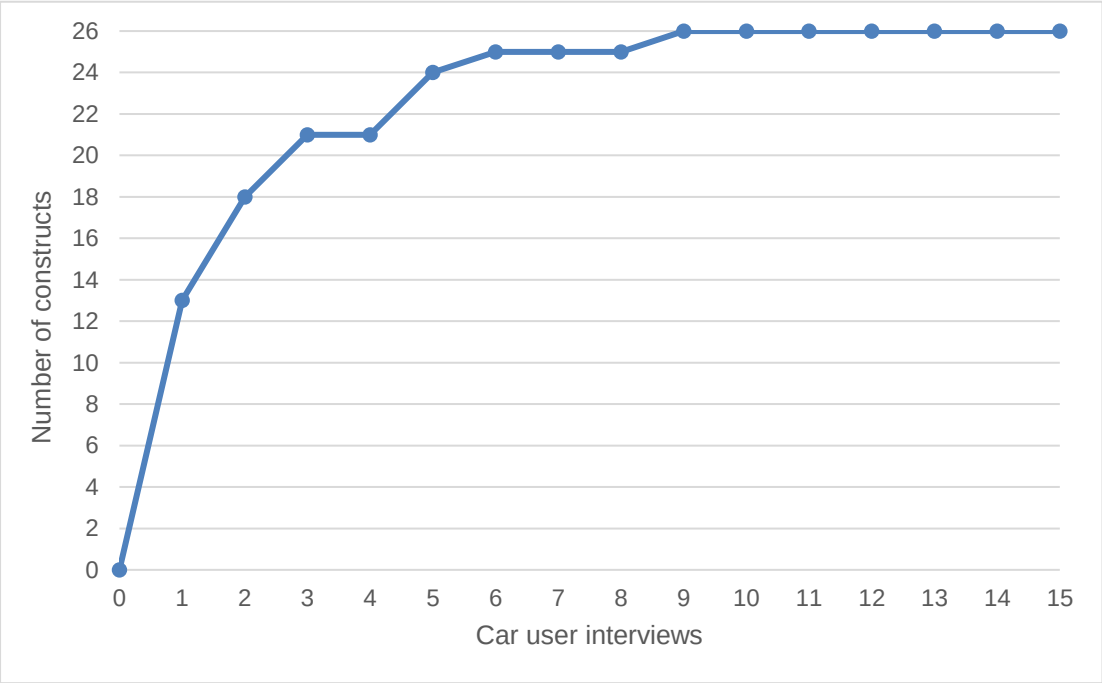


Figure B.4 Theoretical saturation curve for non-car user interviews

B.2 Thematic analysis

The RepGrid elicitation procedure generated a wealth of narrative content which is necessary to understand the meaning of subjective constructs. For instance, participants use different words for describing the same constructs content. Often, interviewees also ascribe multiple meanings to one construct. Thematic analysis was used to generate homogenous categories of constructs that share the similar meaning. Tables B.2 and B.3 show the generated categories of constructs and synonymous terms used by different participants as well as their positive and negative meaning attached to these constructs.

Elicited bi-polar construct	Description
go where you want ; fixed route	**Route flexibility:** Participants referred to door-to-door ability and the freedom to stop where they want along the route. Conversely, they described boundaries and constraints to where they can go and explained indirect and limited route choices to their destination.
go when you want ; stick to set times	**Time flexibility:** was described as travel according to the individual's own schedule and also often labelled "independent" travel. The opposite was perceived as restrictive and being dependent on pre-defined timetables.
cheaper ; expensive	**Cost:** Perceived costs of a travel mode.
fast ; slow	**Speed:** Perceived pace of a particular travel mode in the context of the activity.
reliable ; unreliable	**Reliability:** Referred to the ability to arrive at an expected time (or on time), without any delays
physically active ; sedentary	**Physical activity:** The level of exercise attributed to using a mode. The opposite was seen as passive travelling, unhealthy and sometimes labelled "lazy".

environmentally friendly ; unsustainable	**Pro-environment:** Perceived level of damage to the environment. Participants understood travel modes as environmentally friendly if they were green, eco-friendly, fuel-efficient and without impact on the environment.
just yourself ; lots of people	**Number of people:** Participants discussed the implication of the how many people vs. single-occupancy transport. More people led to paticipants seeing transport as more economical and efficient but also more complex. Single occupancy travel, on the other hand, was perceived more wasteful but able to provide high levels of comfort.
predictable ; unexpected factors	**Control:** Perceived level of control and certainty over one's journey. This included knowing the parameters and external factors using a transport mode.
own space ; crowded	**Privacy:** Narratives focussed on affective motives of having one's personal space, including the feeling of a "home away from home" and an intimate atmosphere. The opposite was often defined as infringement of one's privacy or personal space.
suitable for short distance ; suitable for long distance	**Distance:** Suitability of travel mode to cover a specific length of a journey. This was discussed in the context of journey requirements.
ability to transport lots of items ; not able to carry much	**Transportability:** Level of storage and capacity available to transport or carry a large number of items.
no planning needed ; requires planning	**Planning requirements:** Level of planning, organisation and thought involved when using a travel mode, ususally discussed in terms of familiar vs. unfamiliar journeys.
protected from elements ; exposed to elements	**Weather:** the degree to which bad weather can have an affect when travelling using a particular mode.
safe ; unsafe	**Safety:** Level of perceived risk and security involved. This included discussions of potential accidents but also security of storage and personal safety, e.g. at night.
relaxed travelling ; stressful journey	**Stress:** Participants interpreted stressful as high levels of difficulty and complexity, whereas absence of worry was seen as a "release".
can do something else ; can't do anything else	**Multi-tasking:** the extent to which other activities can be combined with travel which implied efficient use of time and avoiding "dead time".
shared road space ; dedicated space	**Road space:** The amount of space and infrastructual priority modes receive in the built transport environment.
enjoyable ; means to end	**Enjoyment:** Includes feelings of pleasure and adventurousness in using a mode. The opposite was described as monotonous and functional travel.
private transport ; public transport	**Ownership:** Identification of a transport mode as either privately or publicly owned.
minimal responsibility ; individual's responsibility	**Responsibility:** Participants referred to the level of accountability and commitment involved, often discussing personal and external responsibility of journeys and travel mode ownership.
sociable ; isolated	**Social:** The extent to which travelling is perceived as a social/communal activity, entailing human interaction. The opposite was perceived as solitary activity, not on public display.
being driven ; have to drive yourself	**Being the driver:** the level of control over the vehicle or transport mode.

more accessible ; less accessible	**Accessibility:** the extent to which a wide range of the population are able to access a travel mode. This contains the need for licences or permissions and access restrictions.
interesting ; boring	**Technology:** The personal interest in the underlying mechanics and technological intricacy of a travel mode and the level in which a person can engage with that mode.
no maintenance needed ; requires high maintenance	**Maintenance requirements:** Level of personal care and maintenance needed for the upkeep of the travel mode.
conveys status ; no status attached	**Status symbol:** Travel mode's capacity to convey symbolic meaning and the ability to "express yourself" by using that mode.
external power supply ; internal fuel supply	**Power supply:** referred to different ways in which travel mode are powered and run, ultimately linked to resource efficiency.

Table B.2 Description of categories of constructs

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
lots of people	more people, mass transport, shared space	more efficient, less congestion, conversations, everyone has access, group transport, use less natural resources, less disruptive to wildlife	not guaranteed a seat, either hot or cold, social etiquette, smelly, no choice who you travel with, loud, collide with other people's world, conform to social norms	**just yourself**	single occupancy, few people,	seat guaranteed, can turn radio up, control temperature, not being judged, talk to yourself, do what you want, adjust level of comfort, choose passenger,	conscious about environmental impact, inefficient, empty space, waste of fuel, waste of space,
crowded	packed, no space, suffer	more people are served, in company of other people,	packed, cramped uncomfortable, unpleasant, infringement of privacy, less relaxing, closed space	**own space**	privacy, individual space,	liberating, individual thinking time, solving problems, no distractions, secure, own happy world,	rely on yourself to get there, isolated,
physically active	self-powered, human-powered, exercise, propelled by human energy, get there under own steam	healthy, built-in exercise, cheaper, feel pleased, doesn't deplete resources	requires human effort, humanly powered, bad when its hilly	**sedentary**	no exercise, passive, sitting, unhealthy		out of shape, just sitting and not doing anything, static

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
environmentally friendly	sustainable, environmental, green, wasteful, no impact on environment	greener, electricity powered, better choice, sustainable		**unsustainable**	polluting, not environmentally friendly	often most affordable and easiest option	diesel/petrol, environmental impact, bad, burning fossil fuels, higher emissions, moral issue, fumes
sociable	communal activity, social element	able to see people, recognise people, put you in contact with other people, enlightens mood, cheerful		**isolated**	solitary	insulated from other people	no interaction with people, a thing that moves, metal box
ability to transport lots of items	carry lots of stuff, can leave everything in the car, able to carry heavy things	carry food shopping, luggage storage, easy, comfortable, practical		**not able to carry much**	inability to transport stuff, limited to what you can carry		Need to carry everything with you, not secure, impractical, can't take as much stuff

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
fast	quicker	work and life demands it, when time is limited, meet appointments, don't waste free time, leave later and get home earlier, longer distances, cut through traffic		**slow**		not always a problem as it depends on activity, holiday	waste of time, frustrating, not cover same mileage, stuck on road
can do something else	efficient use of time, able to multitask, redeem time, can do other things	more time for other things, redeem time, do some reading		**can't do anything else**	waste of time, single activity		wasted time, frustrating, impact on quality of life, can't work
expensive	too expensive, more expensive	creating exclusivity	costs add up, hidden costs, maintenance, ongoing costs, running costs, have to have resources, need change, not economic, less free, booking involved	**cheaper**	less expensive, free, inexpensive	use of money for other things, one-off cost, appropriate cost, more journeys, more accessible to public, sometimes even free	

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
stressful journey	aggressive, tiring, motion sickness		madness on the road, aggressive, impatient, time pressure, potential accident, (stuck in) traffic, hassle, have to pay attention	**relaxed travelling**		can do something else, read book, listen to music, in control, nicer, don't use brain, release	
have to drive yourself	in control of the vehicle	active, enjoyable, in control	dangerous, stressful, tense less relaxed, tiredness, nerve wracking, knackering, experience needed, constantly aware of traffic	**being driven**	passenger	passive, relaxing, multi-tasking, don't have to think about driving, easier, less responsibility, productive, enjoy, less stressful	reliant on someone else
requires planning	preparation, organise		check fuel & wheels etc., unforeseen incidents, buy tickets, think about what to wear especially for meeting, more organisation	**no planning needed**		don't need anything else, more convenient, don't get stuck, don't worry about weather, jump in the car and go, in control, stay as long as you want, no schedule	

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
reliable	on time, expected, get to destination on time	when expected to be punctual, no disruptions,		**unreliable**	delayed, random frequency		stressful, increased anxiety, wasted time
stick to set times	stick to timetable, dependent on timetable, limited service/frequency, operate to timetable, schedules	positive when it fits in with own timetable	compromise, timetable provided by transport providers, got to be organised, no escape, have to kill time, look up times, less frequent	**go when you want**	independent travel, according to own schedule, not restricted to timing	independent travel, autonomy, ideal (own) schedule, freedom, control time, make your own timetable, easier, no planning needed	tiring, have to plan
go where you want	directly to destination, flexible, door-to-door, direct, flexibility to move around	freedom, journey chaining, not live according to schedule, more control, stop anywhere, no planning, flexibility, convenient, direct, spontaneity, do your own thing	depends on parking	**fixed route**	set route, set destination, limited route, indirect routes, constraint by where you can go, restricted, fixed points, multiple modes, boundaries to where you can go, only goes to certain places	sometimes not affected by traffic	fixed route, fixed destination, have to plan, involves detours, involves more time for travel, can't control routes, predetermined, takes away freedom of choice, complicated, accessibility issues

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
exposed to elements	outside, get wet	outdoors, fresh air, better sense of surroundings, connected to outside	vulnerable, no protection from weather and noise, special equipment needed,	**protected from elements**	inside, closed	confident, cushioned, good temperature, clean air	inside, removed from environment
conveys status	can express yourself, status attached, status symbol	wealth, masculinity, symbolic, seen as step to adulthood, license almost requirement, self-expression		**no status attached**	no status		no pride in choosing mode, bus, seen as cheaper way
enjoyable	enjoyable journeys, trips for leisure/fun, enjoy the scenery, travel as an experience, adventurous	always different, leisure, can explore, don't mind how long it takes, journey is part of the trip, able to see things		**means to an end**	compulsory journeys, monotonous	daily routine	commuting, compulsory journeys, busy finding parking, not enjoyable, take the only one route that is on offer, no choice, just for the purpose of transport, don't see the world

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
requires high maintenance	have to worry about maintaining, need to take care,		worry about insurance, maintenance	**no maintenance needed**	requires low maintenance, don't have to take care of anything,	maintained by others, get in/on and go,	
individual's responsibility	feeling of responsibility, milestone of responsibility	decide yourself what to spend, which route to take	pay attention, injuries, accidents, where to park, safe place, more vulnerable, have to worry about passengers	**minimal responsibility**	no commitments, decisions made for you, local responsibility	more freedom, managed by others, pay as you go	compromise
interesting		Technology and mechanics behind it		**boring**			no technology or mechanics
private transport	Individual use, personal use, single use	single occupancy, singular		**public transport**	communal use	communal space used by other people	

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
shared road space	use roads, road network, road transport, have wheels	more direct, well-developed, have supremacy, get to remote places	noise, delays, swallow up country, require infrastructure, deal with traffic and other cars, unnecessary journeys, single occupancy, motion sickness, pollution, narrow streets, maintenance required, scary, contributing to pollution	**dedicated space**	rail network, go on separate tracks, dedicated route	no traffic jams or other sense of congestion, less noticeable, wear out less quickly, rare accidents, no intervention necessary, no need for tarmac, can walk everywhere	limited places , indirect, not as joined up, older infrastructure, considered less important modes
suitable for short distance	shorter journeys, shorter travel time, intra-city, urban transport	getting around the city, quicker, less stressful,	affects career choices, not open to travelling,	**suitable for long distance**	inter-city, longer travel time,	part of working career, visit family, get to places quicker, get out of town	more planning
more accessible	no permission necessary, provide service for everyone, regular service, provide service	day to day travel,	pay to use	**less accessible**	need permission, need licence, restricted/barriers to access	step to young professional, no need to buy a ticket, privileged to have access	have to have a licence, luxury, need to be entitled to, learn how to drive, embarrassed when no driving license

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
safe	secure	car at night, confidence in getting to destination, stress relieve		**unsafe**	dangerous, higher risk		dangerous, unpredictable pedestrians, accidents, frosty, darkness, vulnerable, crowded roads, other people and other traffic
predictable	in control, know parameters, not constrained by external factors, know what to expect	no uncertainties, no waiting time, takes out unknown, removes variability, no worries, make it how you want it to be		**unexpected factors**	out of control, road traffic, affected by external factors, lots of variables, unknown parameters, not in control	not held accountable, not responsible	could be traffic, could be delayed, stuck in traffic, less convenient, under control of someone else, not guaranteed to arrive on time, letting people down, no influence, getting stuck, lots of unknown variables

Table B.3 Emerged categories of constructs for non-car users

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
enjoyable	recreational purpose, adventurous, enjoyment	get more out of it, versatile way to get anywhere, freedom, adrenalin, challenging		**means to an end**	monotonous, functional,	sometimes easier for work	compulsory journey, restricted
safe	safer	more protected, familiarity	drive carefully, avoid peak hours	**unsafe**	risky, more dangerous, higher risk		damage car, collision, exposed to road, dark, busy road, high traffic volumes, people doing their own thing, stressful tiring, train at night-time,

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
suitable for short distance	cant go far, reserved for city centres, city centre access, town transport, short distances	only when physically fit, good network, less hassle, more practical, enables you to walk to shops, can use any form of transport, social activity, choose to walk, easier, complex one way system, likely to walk or cycle, happy to walk, cycle	limiting, hilly, narrower field of activity	**suitable for long distance**	travel from city to city, go out of town, rural transport	reach faraway places, reach rural areas, important for work, go further with same energy expenditure, go to different cities	takes hours to get there, less time to do particular journey, something you have to do, no efficient use of time, not good for environment, not likeable, little choices

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
physically active	using muscles, healthy, healthier, human powered, exercise, burning energy	built-in exercise, fitness, healthier, enjoyable, use of energy, more exercise, better for you, lower costs, better for environment, cardio vascular benefits, strength, muscular benefits, feeling better	slower, travel not substantial exercise, depends how far you are going and how much effort it is	**sedentary**	lazy, inactivity, unhealthy, no health benefit,	easy option, no effort required	don't move, sitting, causes diseases, getting fat, uses fuel, long term sitting, pain, exposed to fumes, more expensive, wasteful, limited resources

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
go where you want	right where you want to go, freedom to stop wherever, any direction, door to door, go direct	go to specific place, makes life easier, in control, greater flexibility, point to point, relaxing, cut through traffic, more convenient, easier with family, can park in front of the door, go to places you can't go with PT,	parking in city stressful	**fixed routes**	not get close enough, tied down to destination, designated stops, tight to a route, designated route, particular destination, runs on set routes, going out of your way	when you are not in a rush, less chance of getting lost	restricts, enter and exit at predetermined places, stressful, don't know how to get home, can't go off road, no control, bound by stops designated by the route, only go certain location, adds time to journey, not as convenient, more of a mission, less options, limiting
interesting		engaging, less boring transport, time passes quicker		**boring**			Boring type of transport, waiting for time to pass

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
fast	getting from a to b quicker, faster	gives more time, longer distance, get there quicker, go through traffic quicker, shortest journey, get home quickly, fit in other activities during the day especially morning, PT on long journeys	usually involves time constraint	**slow**	takes longer, slower, snail pace, slowest	for leisure, can be good when no purpose to it	tiring, need more time, not as enjoyable, have to go via somewhere, complicated, held up by traffic, waste of time, bad for work
environmentally friendly	not polluting, green, more eco-friendly, Fuel efficient	better for environment, feel better, don't ruin landscape, reduces impact, careful use of resource	one person does not make a difference, not enough motivation	**unsustainable**	motorised transport, not environmentally sound, damaging to the environment, pollution, not fuel efficient		burns fossil fuels, chemicals where there shouldn't be, industrialised society, climate impact, use up resources at quicker rate
private transport	individually owned, personal travel			**public transport**			

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
just yourself	limited amount of people, one person,	easier, more comfortable, controlled environment, clean surrounding, listen to radio, comfortable seat, not smelly, don't have to interact,	waste of resources, not efficient, take it for granted	**lots of people**	carry more people, multiple people, predetermined environment,	make use of space, better for economy, doesn't matter as long as there is enough space	never enough seats, exposed to noise, talk, crying babies, hot, dirty, uncomfortable, proximity of other people
own space	personal space, intimate, personal control of your space, environment that is yours	privacy, relax, feels like home, opportunity to be alone, physical difference,		**crowded**	shared space, go with public, mass transit		packed like sardines, cramped, reliant on other people providing level of control, stressful, invasion of personal space, interfering people, don't know people, infringe on space
ability to transport lots of items	can carry things, practical, can carry lots	more convenient, shopping, easier, luggage, travel in a group		**not able to carry much**	not practical		no storage, not able to carry lots of shopping, large items

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
cheaper	affordable, less costly, free	don't pay for maintenance, pay less over the year, more money for other things, attractive to avoid parking, pay upfront, don't have to think about it, individual travel on PT	Fare depends on time of the day	**expensive**	more expensive, costs a lot of money, costly	depending on how many are travelling, not significant for businesses	parking, insurance, petrol, ongoing costs, pay as you go, have to have cash, family travel
protected from elements	weather resistance, dry, sheltered, less affected by weather	dry and warm, more convenient, comfortable, more control		**exposed to elements**	get wet, subject to weather	only when its pleasant, not dressed appropriately,	dangerous, get wet, cold wind, outside, affects modal choice,
no planning needed	don't think about too much, familiar journey, simple journey	can go whenever, convenient, know where you are going, get there at particular time, flexibility of changing mind, easy and quick to do something		**requires planning**	unfamiliar journey, got to navigate		less convenient, get ticket, timetabling, find out closest stops, how many people are travelling, not worth amount of time and effort

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
		you haven't thought about					
can do something else	other activities while travelling, work while travelling	saves times, use time efficiently, more relaxed,		**can't do anything else**	wasted time, dead time		not do anything useful, put pressure on you
shared road space	On the road	stop right outside, more convenient, matter of planning, dependent on road transport, crucial for everybody	things get in the way, narrow roads, (avoidable) traffic, not the best way of getting things to people, dangerous	**dedicated space**	off-road, runs on rail network	no traffic, work on rail, sometimes quicker, relaxing, time to do what you want	stop at location not easily accessible, get someone to pick you up, fixed routes, not always better, disruptions, better infrastructure needed,

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
go when you want	time cheap, control over timing	change of plans, in control of own time, able avoid problems, walk out of door and get straight in, balance time against costs, less stressful, go off schedule, use it when you need, come and go when you want, rigid timetable		**stick to set times**	run to time table		wait a long time, multimodality, need to be there, committed to be on time, inflexible, restrictive
reliable	no delays, on time	more convenient, easy to plan, regular, not dependent on anybody else, sitting inside	exceptions	**unreliable**	delays, late, not on time		takes up time, frustrating, annoying when in a rush, stressful when alone, left outside standing in rain and weather
external power supply	overhead lines	more efficient, more resource friendly,	restricted to specific routes, where you can go	**internal fuel supply**	powered by internal combustion engine	easy	inefficient in energy use, waste of resources

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
		generated in bulk,					
being driven	controlled by driver, lack of control	steered independently, someone else is responsible	unsettling, worrying, frightening, stressed, don't know what is going to happen	**have to drive yourself**	in driver's seat	control what you do and what not, knowing what to anticipate and adjusting driving style, avoiding dangerous situations	can't control what other people are doing
more accessible	no license needed	change of plans possible, more possibilities, more people can use it		**less accessible**	access needed, license needed, rural transport		
sociable	social situation	not alone,	people don't know each other, more aware of actions in public display	**isolated**	private	no one is taking up space, less self-monitoring, not on display,	
relaxed travelling	reduction in complexity, few changes, hassle free	sit down and relax, no responsibility, free cognitive resources to do other things, no worries		**stressful journey**	difficult		have to worry about tickets, in big cities, bad traffic, being late, anxiety, worry, hassle

Expressed pole	Synonyms	Positive meaning	Negative meaning	Opposite pole	Synonyms	Positive meaning	Negative meaning
predictable	(in) control, level of certainty	less variables, less that can go wrong, get to destination for sure, know exactly where to get on and off,		**unexpected factors**	uncontrollable, out of control, uncertainty, limited control		break downs, never know when it arrives, mechanical problems, frustrating, don't know what's going on, difficult when new journey,
minimal responsibility	secession of responsibility	other people's problems		**individual's responsibility**	personally accountable		have to control vehicle, stay focussed, respond to environment

Table B.4 Emerged categories of constructs for car users

B.3 Content analysis

			NON-CAR USERS				CAR USERS			
Elicited bi-polar constructs	**N**	**Average Relevance**	**n**	**Frequency (%)**	**Importance**	**Relevance**	**n**	**Frequency (%)**	**Importance**	**Relevance**
go where you want ; fixed route	29	4.71	14	6.19	0.60	3.74	15	6.76	0.84	5.68
go when you want ; stick to set times	26	4.56	13	5.75	0.71	4.06	13	5.86	0.86	5.05
cheaper ; expensive	23	3.65	11	4.87	0.68	3.30	12	5.41	0.74	4.00
fast ; slow	24	3.59	11	4.87	0.60	2.94	13	5.86	0.72	4.23
reliable ; unreliable	22	3.35	11	4.87	0.63	3.07	11	4.95	0.73	3.62

physically active ; sedentary	26	3.28	13	5.75	0.76	4.35	13	5.86	0.38	2.22
environmentally friendly ; unsustainable	21	2.81	11	4.87	0.79	3.84	10	4.50	0.39	1.78
just yourself ; lots of people	25	2.71	12	5.31	0.41	2.18	13	5.86	0.55	3.24
predictable ; unexpected factors	18	2.65	10	4.42	0.60	2.64	8	3.60	0.74	2.66
own space ; crowded	19	2.30	7	3.10	0.59	1.84	12	5.41	0.51	2.76
suitable for short distance ; suitable for long distance	21	1.93	8	3.54	0.40	1.41	13	5.86	0.42	2.45
ability to transport lots of items ; not able to carry much	16	1.91	5	2.21	0.54	1.19	11	4.95	0.53	2.62
no planning needed ; requires planning	14	1.81	6	2.65	0.62	1.65	8	3.60	0.55	1.98
protected from elements ; exposed to elements	14	1.77	6	2.65	0.55	1.47	8	3.60	0.57	2.07
safe ; unsafe	16	1.63	8	3.54	0.50	1.76	8	3.60	0.42	1.50
relaxed travelling ; stressful journey	10	1.62	5	2.21	0.79	1.76	5	2.25	0.66	1.48
can do something else ; can't do anything else	14	1.55	6	2.65	0.50	1.31	8	3.60	0.49	1.78
shared road space ; dedicated space	20	1.49	11	4.87	0.34	1.68	9	4.05	0.32	1.31
enjoyable ; means to end	12	1.24	5	2.21	0.45	0.99	7	3.15	0.48	1.50
private transport ; public transport	22	1.24	13	5.75	0.30	1.71	9	4.05	0.19	0.78
minimal responsibility ; individual's responsibility	10	1.23	8	3.54	0.56	1.98	2	0.90	0.53	0.48
sociable ; isolated	10	0.90	8	3.54	0.48	1.71	2	0.90	0.11	0.09
being driven ; have to drive yourself	12	0.88	8	3.54	0.37	1.30	4	1.80	0.26	0.47
more accessible ; less accessible	8	0.36	5	2.21	0.16	0.36	3	1.35	0.27	0.36
interesting ; boring	3	0.30	1	0.44	0.71	0.32	2	0.90	0.32	0.29
no maintenance needed ; requires high maintenance	4	0.25	4	1.77	0.29	0.51	0	0.00	0.00	0.00
conveys status ; no status attached	6	0.21	6	2.65	0.16	0.42	0	0.00	0.00	0.00
external power supply ; internal fuel supply	3	0.09	0	0.00	0	0.00	3	1.35	0.13	0.18

Table B.5 Detailed results of content analysis

B.4 Analysis of means

Mean ratings for each category of construct can be seen in Table S5 (colours correspond to the *Frequency*/*Importance* Matrix presented in the manuscript). In addition to the analysis of high *Importance*, high *Frequency* constructs in the manuscript, we also compared constructs of low *Importance*, low *Frequency* in the same manner. Tables B.5 and B.6 highlight differences between non-car users and car user mean ratings.

Eight constructs displayed low scores for *Importance* and *Frequency*. Two of these ('no maintenance needed' vs. 'requires high maintenance', 'external power supply' vs. 'internal fuel supply') were only elicited from one group, so did not provide data for a pairwise comparison.

In general, constructs showed higher inconsistent ratings across both groups compared to constructs rated high in *Importance* and *Frequency*: 28 (57.14%) ratings displayed absolute difference ($|x|$) values of ≥ 0.5. The average absolute difference was 0.91. This was considerably higher compared to low *Importance*, low *Frequency* constructs.

The construct 'interesting' vs. 'boring' showed the highest discrepancy in mean scores ($|x| = 14.50$) with absolute differences ≥ 0.5 across all seven transport modes. It also displayed the highest difference for Tram ($|x| = 3$). However, this was based on only three participants. 'Enjoyable' vs. 'means to an end' was the second most inconsistently rated construct (total $|x| = 7.69$) with non-car users entirely agreeing on coaches being an enjoyable means of transport (M_{non}-car = -2.00). In contrast, car users view coach rather as a means to an end (M_{car} = 0.71). 'Being driven' vs. 'have to drive yourself' was the most homogenously rated construct (total $|x| = 2.88$) with absolute difference values ≥ 0.5 across three transport modes.

Across the six constructs, coach displayed the highest score of total absolute difference (total $|x| = 6.97$), followed by bus (total $|x| = 6.45$). Bicycle showed the lowest score with total $|x| = 2.91$.

	NON-CAR							CAR						
Constructs	**Walking**	**Tram**	**Bicycle**	**Car**	**Train**	**Coach**	**Bus**	**Walking**	**Tram**	**Bicycle**	**Car**	**Train**	**Coach**	**Bus**
enjoyable ; means to end (*N* = 5, 7)	-1.60	2.00	-1.00	0.80	-1.00	-2.00	0.00	-1.57	1.43	-1.29	-1.00	0.43	0.71	0.86
more accessible ; less accessible (*N* = 5, 3)	-1.20	-1.80	-1.40	1.60	-0.80	-0.80	-0.80	-2.00	-1.67	-1.00	2.00	-1.00	-1.67	-0.33
no maintenance needed ; requires high maintenance (*N* = 4, 0)	-2.00	-1.75	0.75	2.00	-1.75	-1.75	-1.75	-	-	-	-	-	-	-
ability to transport lots of items ; not able to carry much (*N* = 5, 11)	0.60	0.40	0.40	-1.20	0.00	0.00	0.20	0.91	1.18	1.00	-2.00	1.45	0.64	1.45
sociable ; isolated (*N* = 8, 2)	-0.50	-0.25	0.50	1.50	-0.63	-0.25	-0.13	0.50	-1.00	0.00	0.50	-1.00	-0.50	-0.50
being driven ; have to drive yourself (*N* = 8, 4)	0.50	-1.00	0.88	1.50	-1.75	-1.75	-1.50	1.50	-1.75	1.50	1.50	-1.75	-1.75	-2.00
interesting ; boring (*N* = 1, 2)	2.00	-2.00	-2.00	0.00	-2.00	-1.00	-1.00	-0.50	1.00	-1.50	-0.50	0.50	1.50	2.00
external power supply ; internal fuel supply (*N* = 0, 3)	-	-	-	-	-	-	-	-1.33	0.67	-1.33	-0.67	0.67	-0.33	-0.33

Table B.6 Non-car user and car user mean ratings of low Importance, low Frequency constructs across seven travel modes

Constructs	**Walking**	**Tram**	**Bicycle**	**Car**	**Train**	**Coach**	**Bus**	**Total**
enjoyable ; means to end (*N* = 5, 7)	0.03	**0.57**	0.29	**1.80**	**1.43**	**2.71**	**0.86**	**7.69**
more accessible ; less accessible (*N* = 5, 3)	**0.80**	0.13	0.40	0.40	0.20	**0.87**	0.47	**3.27**
ability to transport lots of items ; not able to carry much (*N* = 5, 11)	0.31	**0.78**	**0.60**	**0.80**	**1.45**	**0.64**	**1.25**	**5.84**
sociable ; isolated (*N* = 8, 2)	**1.00**	**0.75**	**0.50**	**1.00**	0.38	0.25	0.38	**4.25**
being driven ; have to drive yourself (*N* = 8, 4)	**1.00**	**0.75**	**0.63**	0.00	0.00	0.00	**0.50**	**2.88**
interesting ; boring (*N* = 1, 2)	**2.50**	**3.00**	**0.50**	**0.50**	**2.50**	**2.50**	**3.00**	**14.50**
Total	**5.64**	**5.99**	**2.91**	**4.50**	**5.96**	**6.97**	**6.45**	

Table B.7 Absolute difference between non-car user and car user mean ratings of low Importance, low Frequency constructs across all seven travel modes.

Red-rimmed numbers indicate $|x| > 0.5$

	NON-CAR							CAR						
Constructs	Walking	Tram	Bicycle	Car	Train	Coach	Bus	Walking	Tram	Bicycle	Car	Train	Coach	Bus
go where you want ; fixed route (*N* = 14, 15)	-1.64	1.43	-1.43	-1.07	1.57	1.50	1.36	-1.67	0.93	-1.53	-1.13	1.53	1.53	1.40
go when you want ; stick to set times (*N* = 13, 13)	-1.85	1.62	-1.85	-1.92	1.69	1.69	1.62	-1.31	1.00	-1.31	-1.38	1.23	1.46	1.46
cheaper ; expensive (*N* = 13 , 12)	-1.92	1.23	-2.00	2.00	1.08	1.46	1.46	-1.50	0.25	-1.08	-0.25	0.83	0.17	0.42
fast ; slow (*N* = 11, 13)	1.18	-0.27	-0.36	-0.82	-0.55	-0.09	0.55	1.00	0.31	-0.08	-1.54	0.31	0.69	0.77
reliable ; unreliable (*N* = 11, 11)	-1.64	0.27	-1.45	-0.09	0.55	0.91	1.18	-2.00	0.36	-1.55	-1.36	1.36	1.09	1.36
physically active ; sedentary (N = 13, 13)	-1.92	1.23	-2.00	2.00	1.08	1.46	1.46	-1.92	0.92	-1.92	1.77	1.00	1.15	1.15
environmentally friendly ; unsustainable (*N* = 11, 10)	-1.09	-0.45	-1.09	1.18	-0.73	0.36	0.64	-1.80	-0.60	-1.40	0.90	-0.60	0.20	0.10
just yourself ; lots of people (*N* = 12, 13)	-1.17	1.50	-1.00	-1.42	1.42	1.67	1.83	-1.54	1.69	-1.46	-1.69	1.77	1.69	1.85
predictable ; unexpected factors (*N* = 10, 8)	-1.10	0.00	-1.10	-0.30	-0.60	0.60	0.50	-1.63	0.63	-1.38	-0.38	1.13	1.38	1.38
own space ; crowded (*N* = 7, 12)	-1.00	0.43	-1.43	-1.29	0.57	0.43	1.29	-1.25	1.00	-1.25	-2.00	1.75	1.75	1.83
suitable for short distance ; suitable for long distance (*N* = 8, 13)	-1.75	-1.38	-1.13	1.25	1.63	1.50	-1.13	-1.92	-0.31	-1.69	1.31	1.85	1.62	0.69
ability to transport lots of items ; not able to carry much (*N* = 5, 11)	0.60	0.40	0.40	-1.20	0.00	0.00	0.20	0.91	1.18	1.00	-2.00	1.45	0.64	1.45
no planning needed ; requires planning (*N* = 6, 8)	-1.83	0.50	-0.50	-1.00	1.17	1.33	1.00	-0.88	0.63	-0.50	-0.88	0.75	1.00	0.50
protected from elements ; exposed to elements (*N* = 6, 8)	1.67	-1.50	2.00	-1.83	-1.17	-1.17	-1.17	1.88	-1.13	1.88	-2.00	-1.50	-1.13	-0.88
safe ; unsafe (*N* = 8, 8)	-0.25	-1.38	1.13	-0.25	-1.38	-0.63	-0.50	0.00	-0.63	0.63	-0.38	-1.38	-1.13	-0.88
relaxed travelling ; stressful journey (*N* = 5, 5)	-1.80	0.20	-1.00	0.40	-0.80	0.80	0.60	-0.60	0.20	-0.80	-1.60	0.20	0.80	1.00
can do something else ; can't do anything else (*N* = 6, 8)	-0.33	-0.50	0.33	1.17	-1.83	-0.50	-0.33	1.50	-0.50	1.63	1.75	-2.00	-0.75	-0.38
shared road space ; dedicated space (*N* = 11, 9)	0.45	1.18	-0.27	-1.73	1.45	-1.18	-1.27	-0.67	1.44	-1.00	-1.00	1.33	-0.44	0.56
enjoyable ; means to end (*N* = 5, 7)	-1.60	2.00	-1.00	0.80	-1.00	-2.00	0.00	-1.57	1.43	-1.29	-1.00	0.43	0.71	0.86
private transport ; public transport (*N* = 9, 13)	-1.15	2.00	-1.23	-1.69	1.92	1.62	2.00	-1.78	1.89	-2.00	-2.00	1.89	1.78	1.89
minimal responsibility ; individual's responsibility (*N* = 8, 2)	-1.00	-1.63	-0.38	1.25	-1.63	-1.38	-1.25	-0.50	-2.00	0.50	2.00	-2.00	-2.00	-2.00
sociable ; isolated (*N* = 8, 2)	-0.50	-0.25	0.50	1.50	-0.63	-0.25	-0.13	0.50	-1.00	0.00	0.50	-1.00	-0.50	-0.50
being driven ; have to drive yourself (*N* = 8, 4)	0.50	-1.00	0.88	1.50	-1.75	-1.75	-1.50	1.50	-1.75	1.50	1.50	-1.75	-1.75	-2.00
more accessible ; less accessible (*N* = 5, 3)	-1.20	-1.80	-1.40	1.60	-0.80	-0.80	-0.80	-2.00	-1.67	-1.00	2.00	-1.00	-1.67	-0.33
interesting ; boring (*N* = 1, 2)	2.00	-2.00	-2.00	0.00	-2.00	-1.00	-1.00	-0.50	1.00	-1.50	-0.50	0.50	1.50	2.00
no maintenance needed ; requires high maintenance (*N* = 4, 0)	-2.00	-1.75	0.75	2.00	-1.75	-1.75	-1.75	-	-	-	-	-	-	-
conveys status ; no status attached (*N* = 6, 0)	2.00	1.17	0.83	-1.83	0.67	1.17	1.50	-	-	-	-	-	-	-
external power supply ; internal fuel supply (*N* = 0, 3)	-	-	-	-	-	-	-	-1.33	0.67	-1.33	-0.67	0.67	-0.33	-0.33

Table B.8 Detailed table of mean ratings

Mean construct ratings are shown in Figures B.5, B.6 and B.7 and offer a visual juxtaposition of non-car user and car user stratified by the clustered elements.

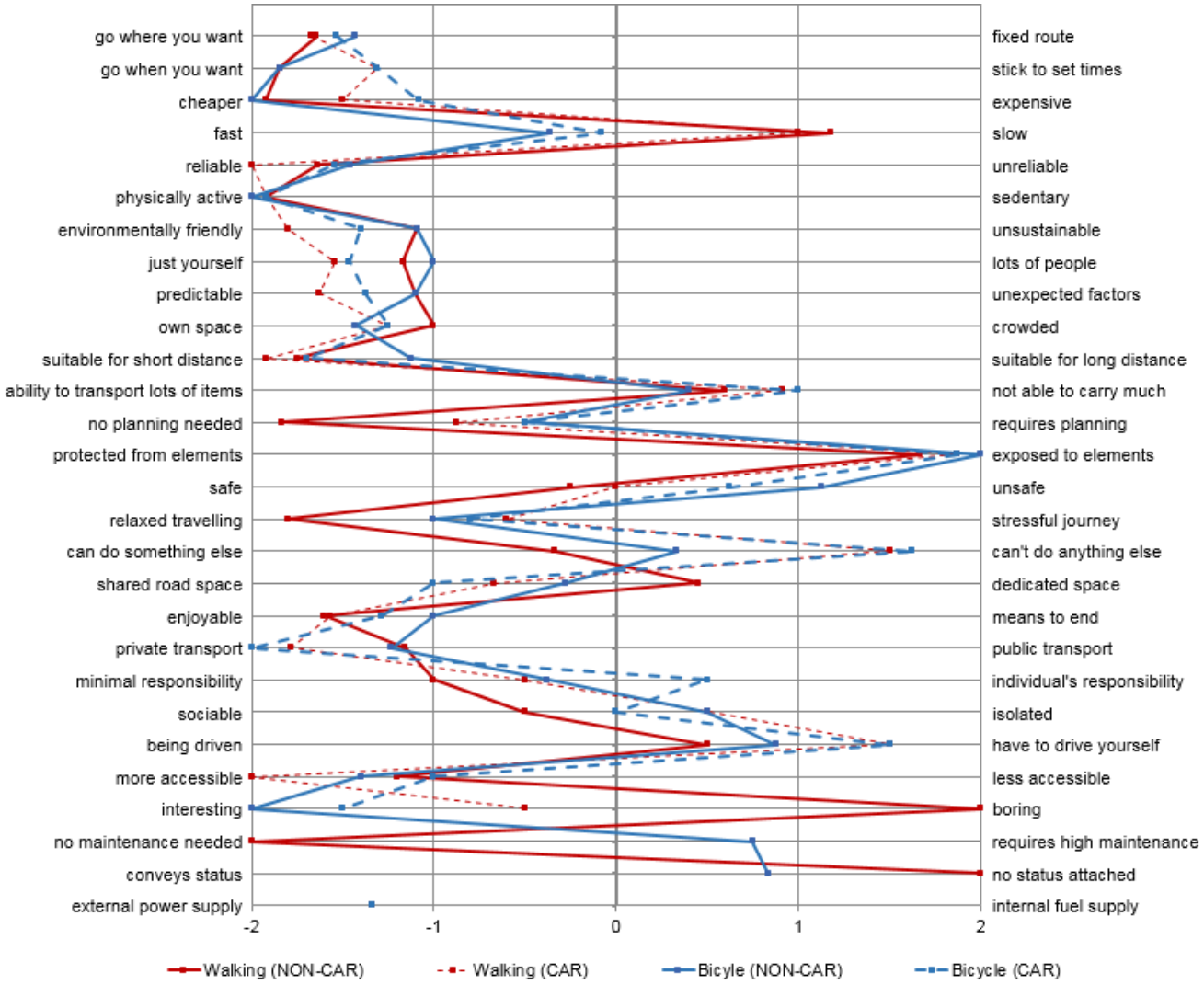


Figure B.5 Active transport mean ratings of non-car users and car users

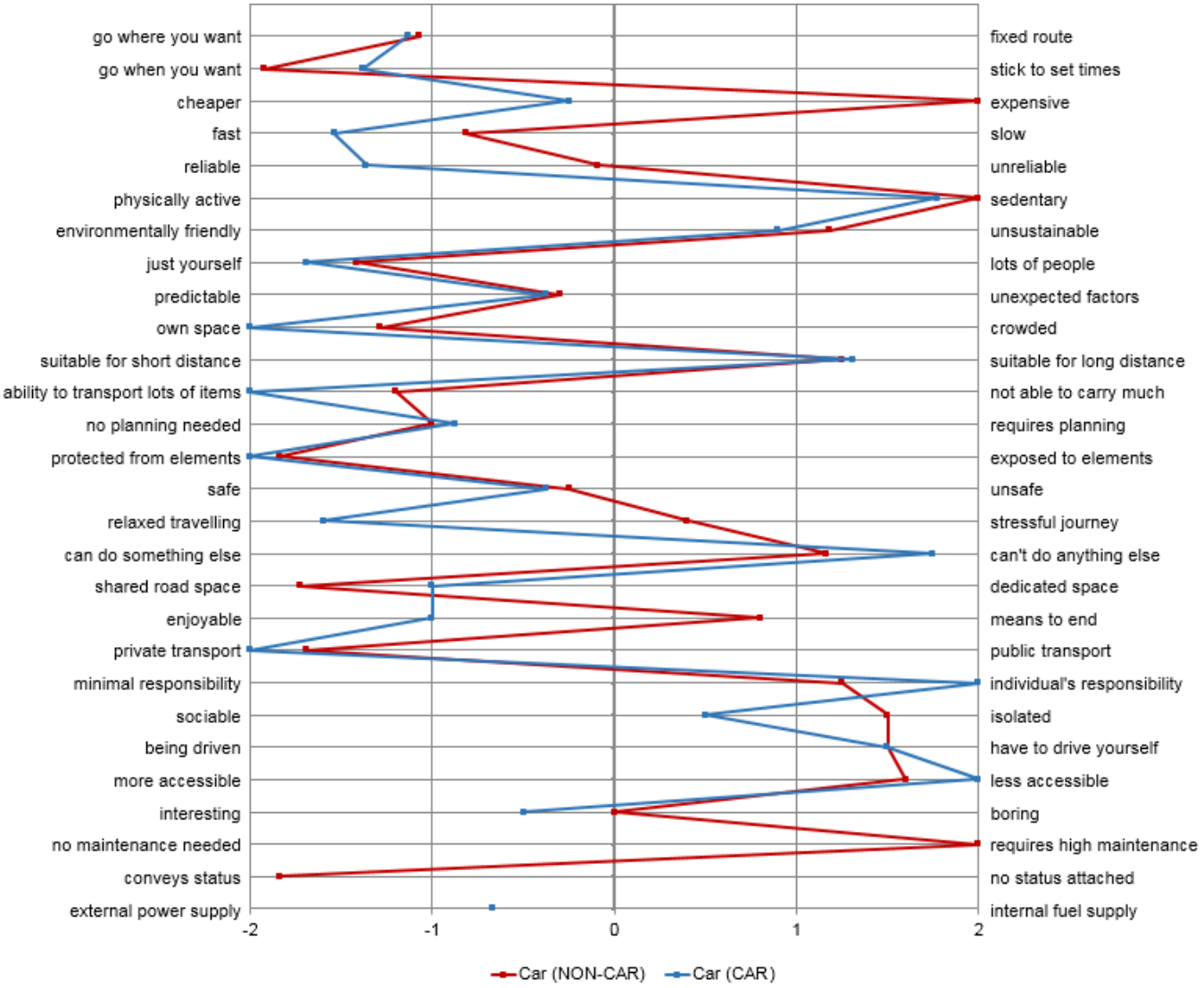


Figure B.6 Car mean ratings of non-car users and car users

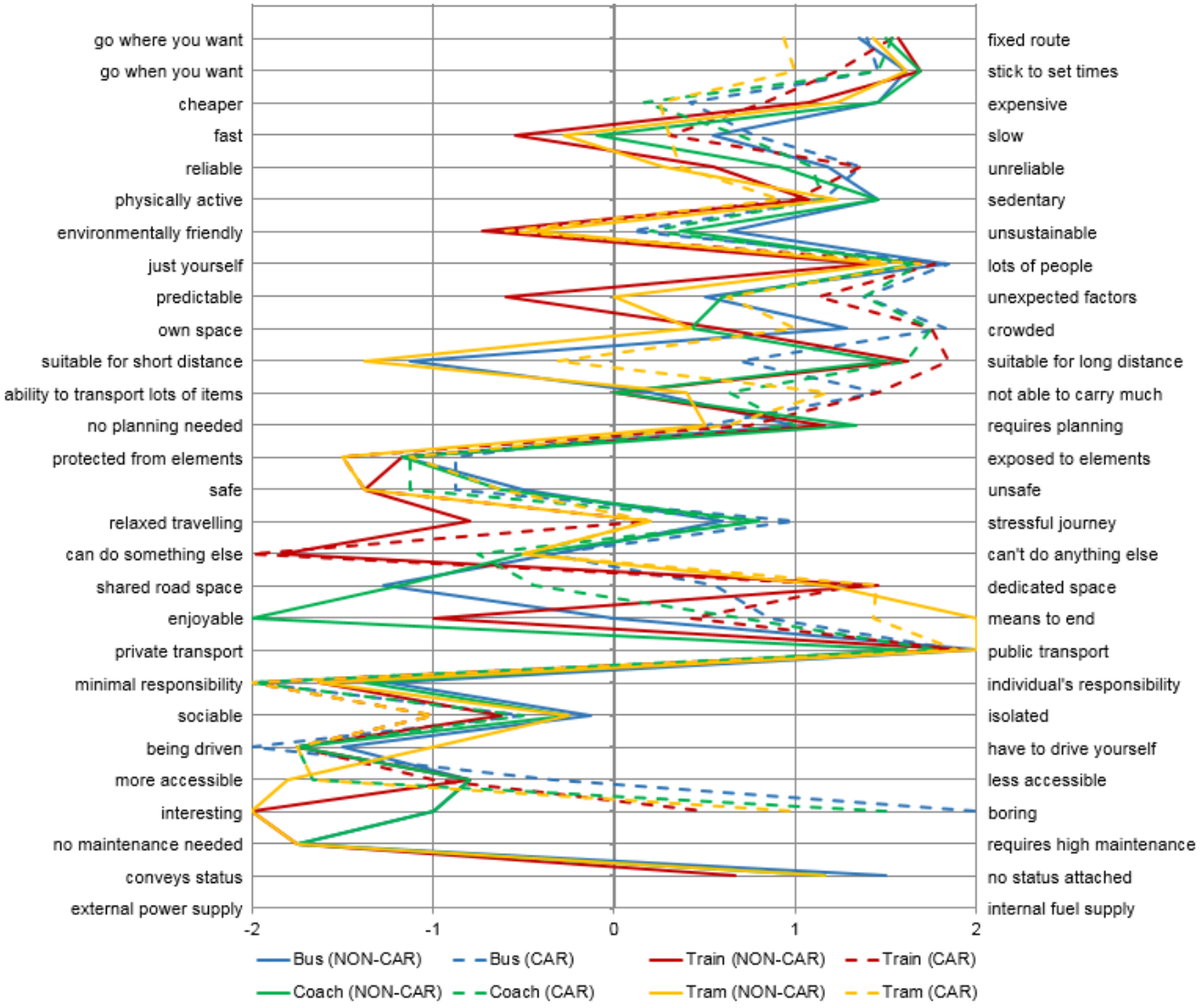
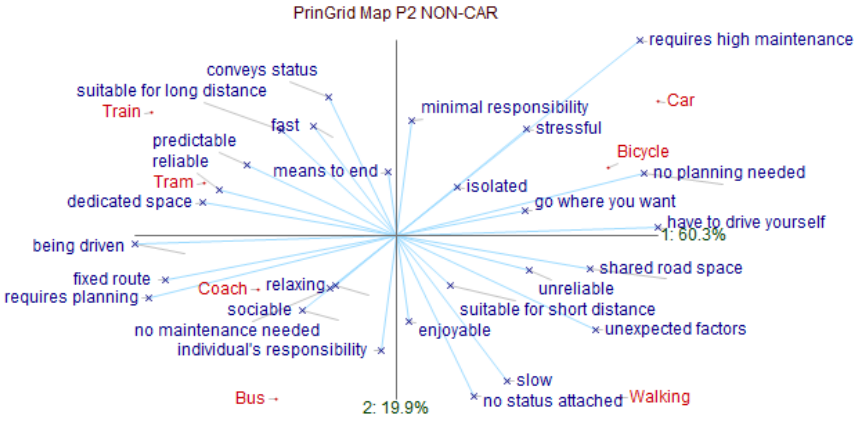
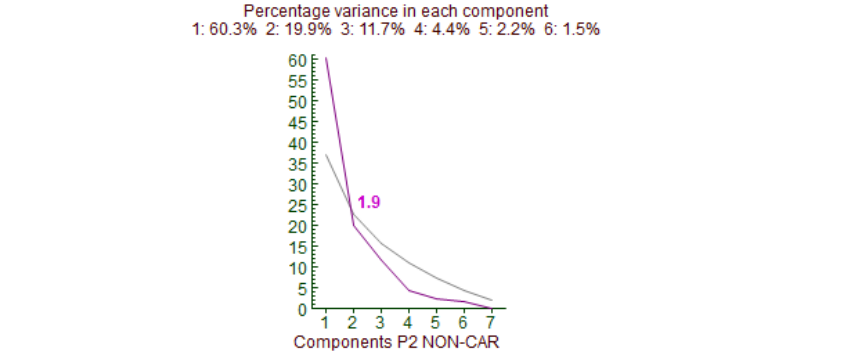


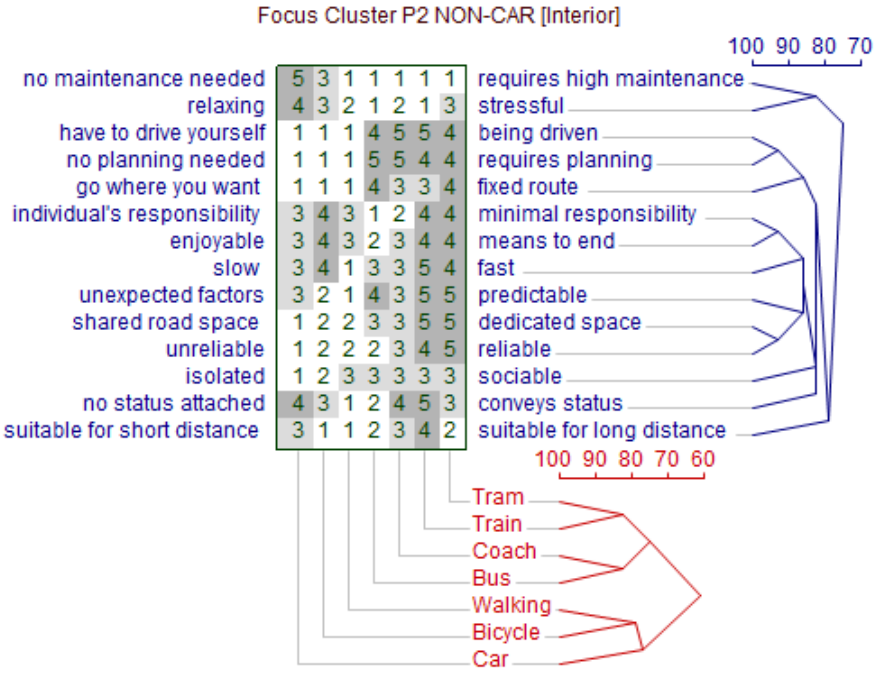
Figure B.7 Public transport mean ratings of non-car users and car users

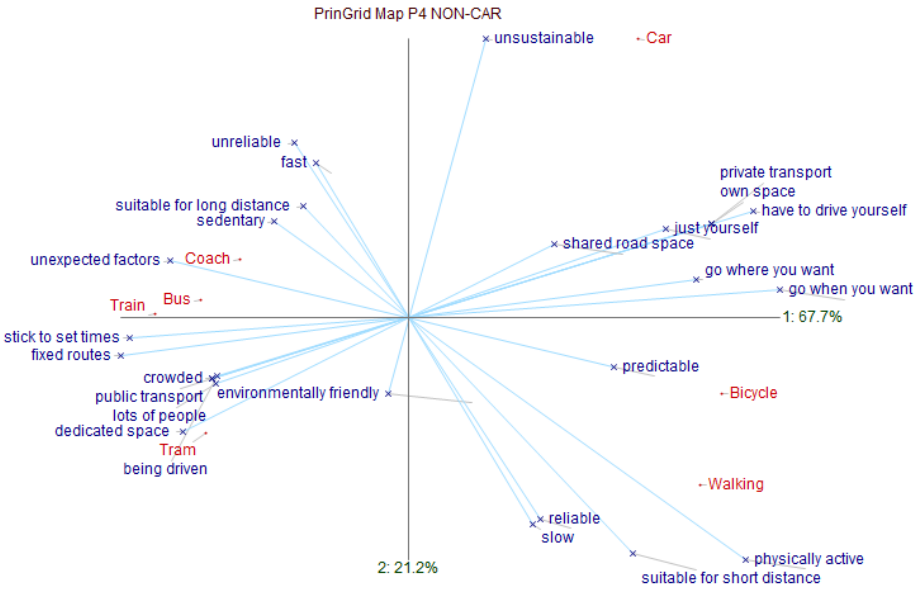
B.5 Cluster analysis and principal component analysis

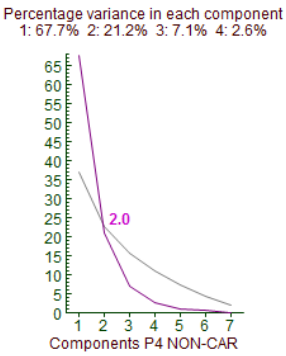
Dendrograms resulting from cluster analysis and principal component maps of all non-car users are displayed below.

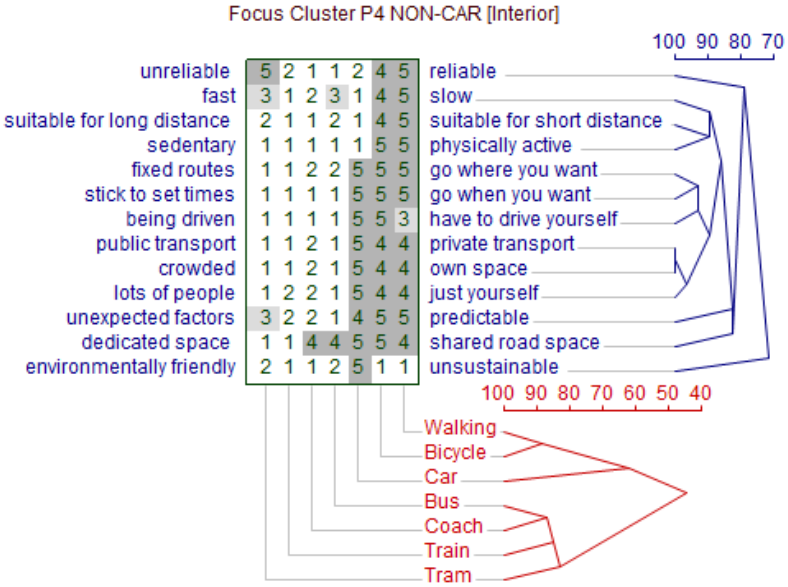

PrinGrid Map P2 NON-CAR
requires high maintenance
conveys status
suitable for long distance
Train
fast
minimal responsibility
Car
stressful
predictable
reliable
means to end
Bicycle
no planning needed
Tram
isolated
dedicated space
go where you want
have to drive yourself
1: 60.3%
being driven
shared road space
fixed route
Coach
relaxing
unreliable
requires planning
sociable
suitable for short distance
no maintenance needed
enjoyable
unexpected factors
individual's responsibility
slow
Bus
no status attached
Walking
2: 19.9%

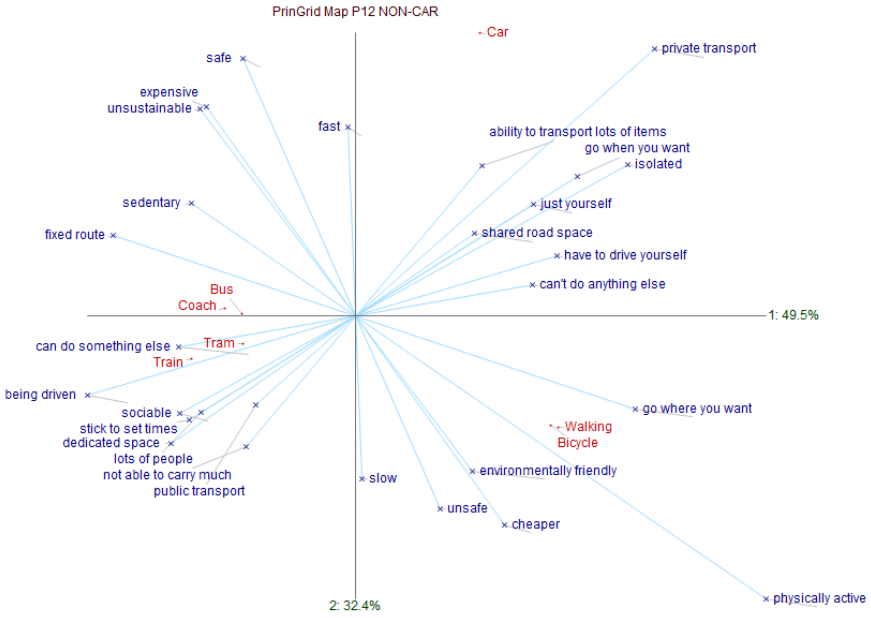

Percentage variance in each component
1: 60.3% 2: 19.9% 3: 11.7% 4: 4.4% 5: 2.2% 6: 1.5%
60
55
50
45
40
35
30
25
20
15
10
5
0
1.9
1 2 3 4 5 6 7
Components P2 NON-CAR

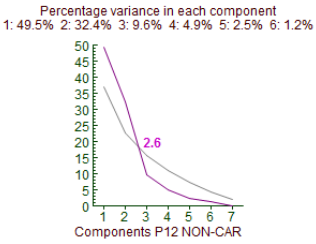

Focus Cluster P2 NON-CAR [Interior]
100 90 80 70
no maintenance needed 5 3 1 1 1 1 requires high maintenance
relaxing 4 3 2 1 2 1 3 stressful
have to drive yourself 1 1 1 4 5 5 4 being driven
no planning needed 1 1 1 5 5 4 4 requires planning
go where you want 1 1 1 4 3 3 4 fixed route
individual's responsibility 3 4 3 1 2 4 4 minimal responsibility
enjoyable 3 4 3 2 3 4 4 means to end
slow 3 4 1 3 3 5 4 fast
unexpected factors 3 2 1 4 3 5 5 predictable
shared road space 1 2 2 3 3 5 5 dedicated space
unreliable 1 2 2 2 3 4 5 reliable
isolated 1 2 3 3 3 3 3 sociable
no status attached 4 3 1 2 4 5 3 conveys status
suitable for short distance 3 1 1 2 3 4 2 suitable for long distance
100 90 80 70 60
Tram
Train
Coach
Bus
Walking
Bicycle
Car

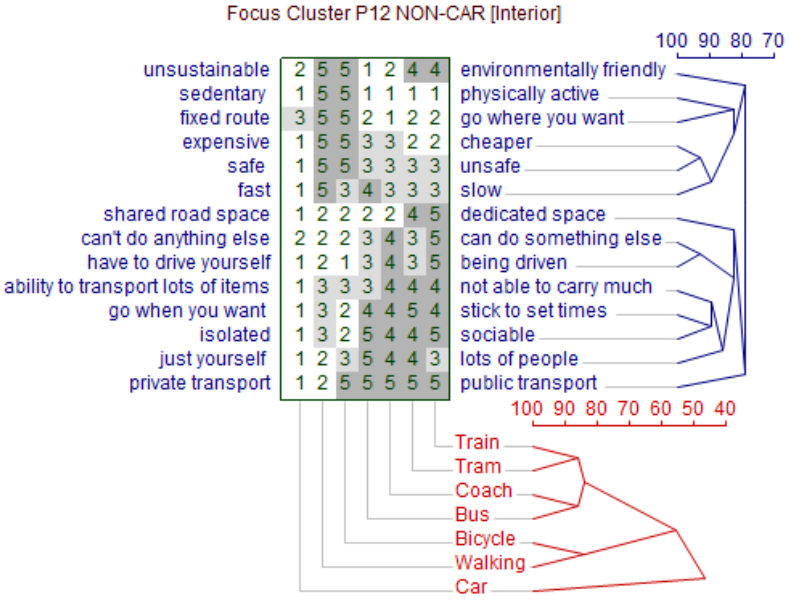

PrinGrid Map P4 NON-CAR
unsustainable
Car
unreliable
fast
private transport
own space
have to drive yourself
suitable for long distance
sedentary
just yourself
shared road space
unexpected factors
Coach
go where you want
go when you want
Train
Bus
1: 67.7%
stick to set times
fixed routes
predictable
crowded
public transport
lots of people
dedicated space
Tram
being driven
environmentally friendly
Bicycle
Walking
reliable
slow
physically active
suitable for short distance
2: 21.2%

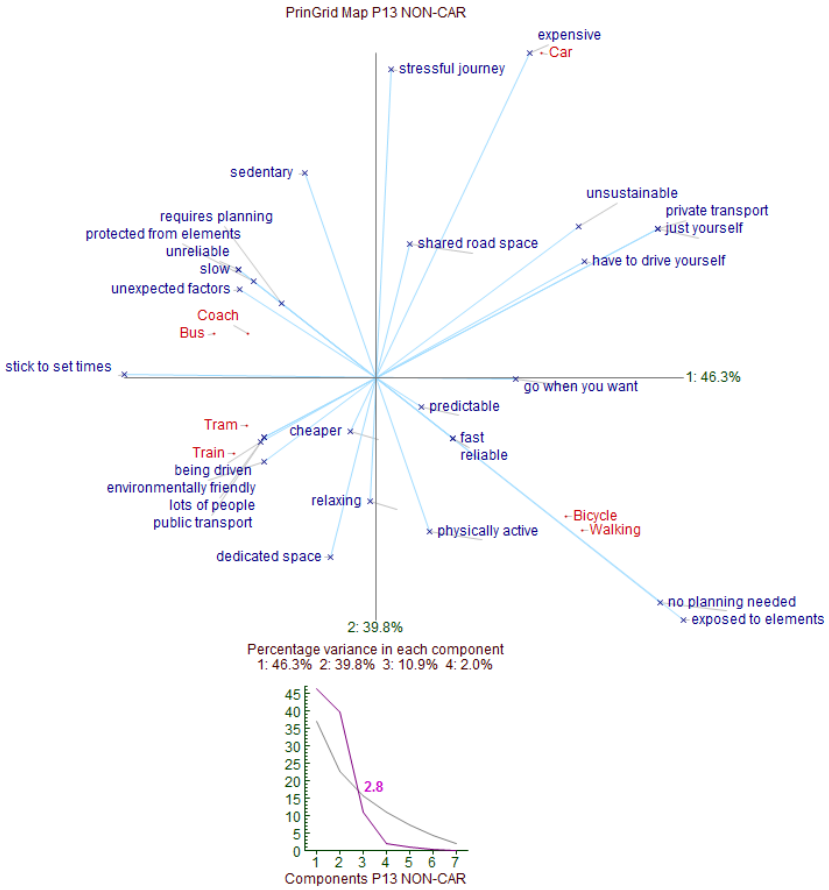

Percentage variance in each component
1: 67.7% 2: 21.2% 3: 7.1% 4: 2.6%
65
60
55
50
45
40
35
30
25
20
15
10
5
0
2.0
1 2 3 4 5 6 7
Components P4 NON-CAR

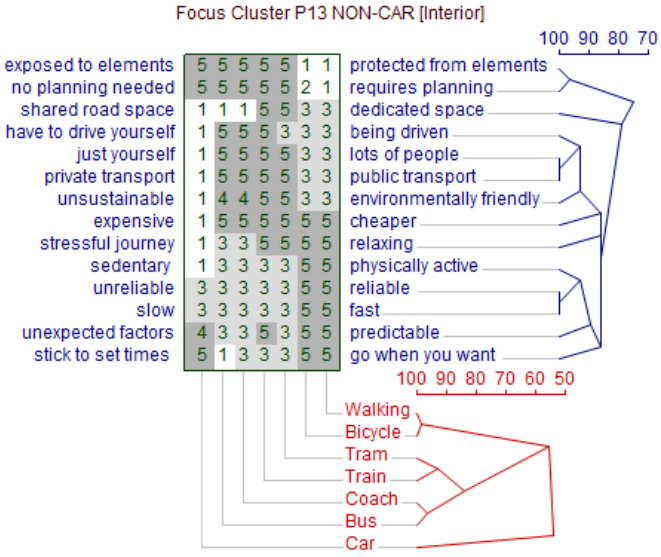

Focus Cluster P4 NON-CAR [Interior]
100 90 80 70
unreliable 5 2 1 1 2 4 5
fast 3 1 2 3 1 4 5
suitable for long distance 2 1 1 2 1 4 5
sedentary 1 1 1 1 1 5 5
fixed routes 1 1 2 2 5 5 5
stick to set times 1 1 1 1 5 5 5
being driven 1 1 1 1 5 5 3
public transport 1 1 2 1 5 4 4
crowded 1 1 2 1 5 4 4
lots of people 1 2 2 1 5 4 4
unexpected factors 3 2 2 1 4 5 5
dedicated space 1 1 4 4 5 5 4
environmentally friendly 2 1 1 2 5 1 1
reliable
slow
suitable for short distance
physically active
go where you want
go when you want
have to drive yourself
private transport
own space
just yourself
predictable
shared road space
unsustainable
100 90 80 70 60 50 40
Walking
Bicycle
Car
Bus
Coach
Train
Tram

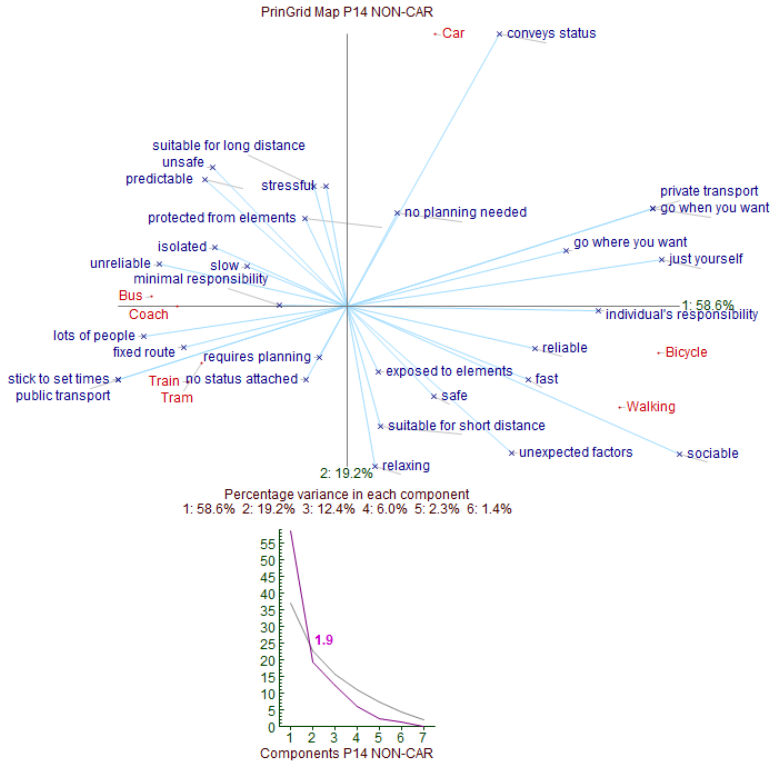

PrinGrid Map P12 NON-CAR
Car
private transport
safe
expensive
unsustainable
fast
ability to transport lots of items
go when you want
isolated
just yourself
sedentary
shared road space
fixed route
have to drive yourself
can't do anything else
Bus
Coach
1: 49.5%
can do something else
Tram
Train
being driven
sociable
go where you want
stick to set times
Walking
Bicycle
dedicated space
lots of people
environmentally friendly
not able to carry much
public transport
slow
unsafe
cheaper
physically active
2: 32.4%

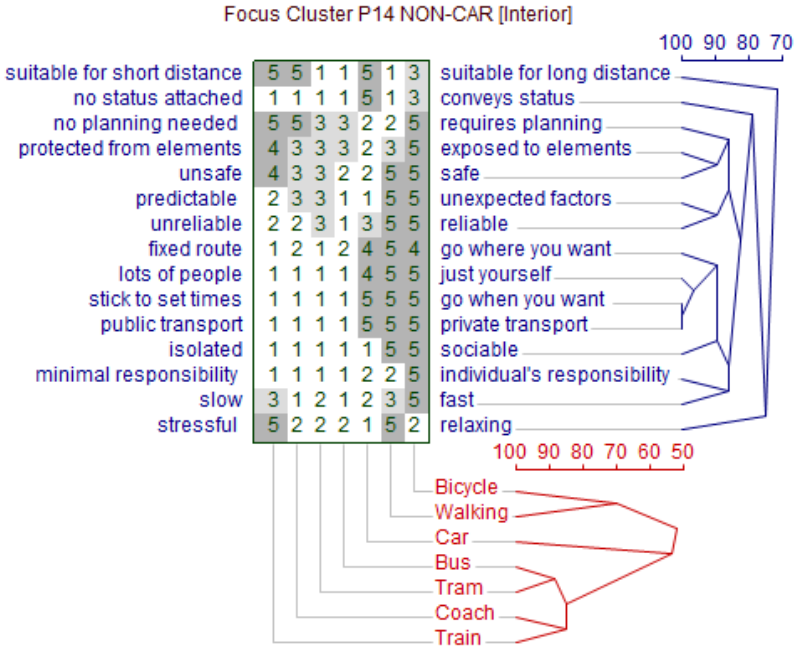

Percentage variance in each component
1: 49.5% 2: 32.4% 3: 9.6% 4: 4.9% 5: 2.5% 6: 1.2%
50
45
40
35
30
25
20
15
10
5
0
2.6
1 2 3 4 5 6 7
Components P12 NON-CAR


Focus Cluster P12 NON-CAR [Interior]
100 90 80 70
unsustainable 2 5 5 1 2 4 4
sedentary 1 5 5 1 1 1 1
fixed route 3 5 5 2 1 2 2
expensive 1 5 5 3 3 2 2
safe 1 5 5 3 3 3 3
fast 1 5 3 4 3 3 3
shared road space 1 2 2 2 2 4 5
can't do anything else 2 2 2 3 4 3 5
have to drive yourself 1 2 1 3 4 3 5
ability to transport lots of items 1 3 3 3 4 4 4
go when you want 1 3 2 4 4 5 4
isolated 1 3 2 5 4 4 5
just yourself 1 2 3 5 4 4 3
private transport 1 2 5 5 5 5 5
environmentally friendly
physically active
go where you want
cheaper
unsafe
slow
dedicated space
can do something else
being driven
not able to carry much
stick to set times
sociable
lots of people
public transport
100 90 80 70 60 50 40
Train
Tram
Coach
Bus
Bicycle
Walking
Car

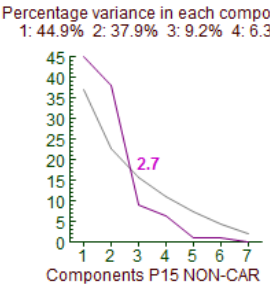

PrinGrid Map P13 NON-CAR
expensive
Car
stressful journey
sedentary
unsustainable
private transport
just yourself
requires planning
protected from elements
unreliable
slow
unexpected factors
shared road space
have to drive yourself
Coach
Bus
stick to set times
1: 46.3%
go when you want
predictable
Tram
cheaper
fast
reliable
Train
being driven
environmentally friendly
lots of people
public transport
relaxing
Bicycle
Walking
physically active
dedicated space
no planning needed
exposed to elements
2: 39.8%
Percentage variance in each component
1: 46.3% 2: 39.8% 3: 10.9% 4: 2.0%
45
40
35
30
25
20
15
10
5
0
2.8
1 2 3 4 5 6 7
Components P13 NON-CAR

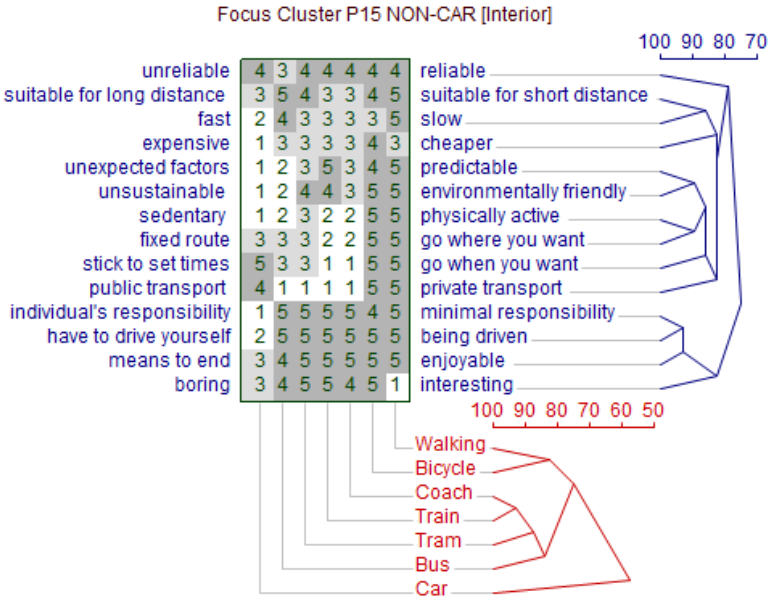

Focus Cluster P13 NON-CAR [Interior]
100 90 80 70
exposed to elements 5 5 5 5 5 1 1 protected from elements
no planning needed 5 5 5 5 5 2 1 requires planning
shared road space 1 1 1 5 5 3 3 dedicated space
have to drive yourself 1 5 5 5 3 3 3 being driven
just yourself 1 5 5 5 5 3 3 lots of people
private transport 1 5 5 5 5 3 3 public transport
unsustainable 1 4 4 5 5 3 3 environmentally friendly
expensive 1 5 5 5 5 5 5 cheaper
stressful journey 1 3 3 5 5 5 5 relaxing
sedentary 1 3 3 3 3 5 5 physically active
unreliable 3 3 3 3 3 5 5 reliable
slow 3 3 3 3 3 5 5 fast
unexpected factors 4 3 3 5 3 5 5 predictable
stick to set times 5 1 3 3 3 5 5 go when you want
100 90 80 70 60 50
Walking
Bicycle
Tram
Train
Coach
Bus
Car

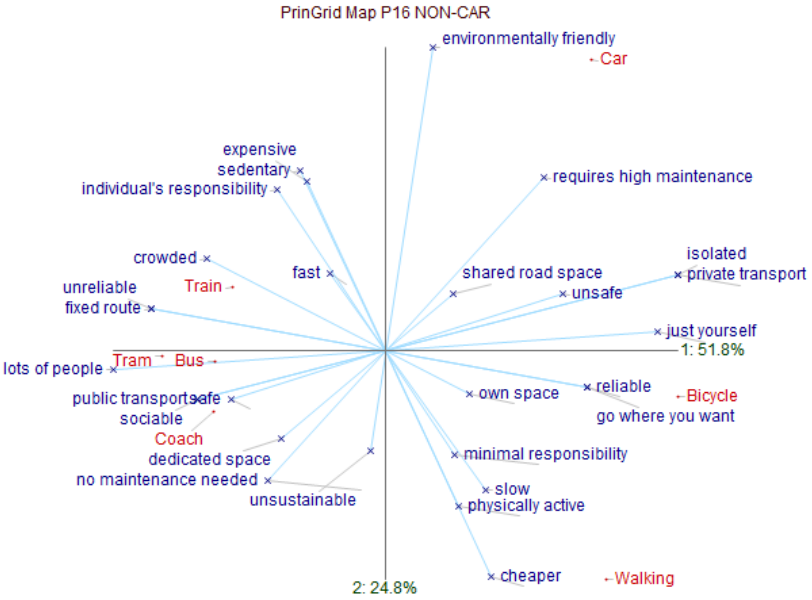

PrinGrid Map P14 NON-CAR
Car
conveys status
suitable for long distance
unsafe
predictable
stressful
protected from elements
no planning needed
private transport
go when you want
go where you want
just yourself
isolated
unreliable
slow
minimal responsibility
Bus
Coach
1: 58.6%
individual's responsibility
lots of people
fixed route
requires planning
reliable
Bicycle
stick to set times
public transport
Train
Tram
no status attached
exposed to elements
fast
safe
Walking
suitable for short distance
unexpected factors
sociable
relaxing
2: 19.2%
Percentage variance in each component
1: 58.6% 2: 19.2% 3: 12.4% 4: 6.0% 5: 2.3% 6: 1.4%
55
50
45
40
35
30
25
20
15
10
5
0
1.9
1 2 3 4 5 6 7
Components P14 NON-CAR


Focus Cluster P14 NON-CAR [Interior]
100 90 80 70
suitable for short distance 5 5 1 1 5 1 3 suitable for long distance
no status attached 1 1 1 1 5 1 3 conveys status
no planning needed 5 5 3 3 2 2 5 requires planning
protected from elements 4 3 3 3 2 3 5 exposed to elements
unsafe 4 3 3 2 2 5 5 safe
predictable 2 3 3 1 1 5 5 unexpected factors
unreliable 2 2 3 1 3 5 5 reliable
fixed route 1 2 1 2 4 5 4 go where you want
lots of people 1 1 1 1 4 5 5 just yourself
stick to set times 1 1 1 1 5 5 5 go when you want
public transport 1 1 1 1 5 5 5 private transport
isolated 1 1 1 1 1 5 5 sociable
minimal responsibility 1 1 1 1 2 2 5 individual's responsibility
slow 3 1 2 1 2 3 5 fast
stressful 5 2 2 2 1 5 2 relaxing
100 90 80 70 60 50
Bicycle
Walking
Car
Bus
Tram
Coach
Train

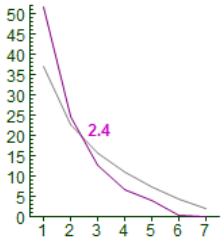

PrinGrid Map P15 NON-CAR
individual's responsibility
Car
have to drive yourself
means to end
unexpected factors
unsustainable
private transport
go when you want
boring
expensive
sedentary
fast
suitable for long distance
go where you want
reliable
1: 44.9%
Bus
unreliable
Bicycle
Walking
fixed route
suitable for short distance
interesting
slow
enjoyable
being driven
physically active
Coach
Tram
public transport
cheaper
environmentally friendly
predictable
Train
minimal responsibility
stick to set times
2: 37.9%


Percentage variance in each component
1: 44.9% 2: 37.9% 3: 9.2% 4: 6.3%
45
40
35
30
25
20
15
10
5
0
2.7
1 2 3 4 5 6 7
Components P15 NON-CAR

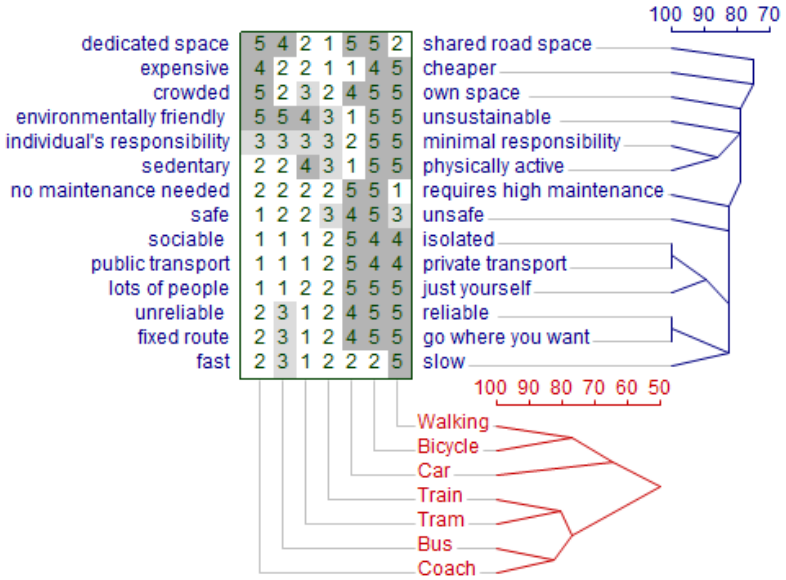

Focus Cluster P15 NON-CAR [Interior]
100 90 80 70
unreliable 4 3 4 4 4 4 4 reliable
suitable for long distance 3 5 4 3 3 4 5 suitable for short distance
fast 2 4 3 3 3 3 5 slow
expensive 1 3 3 3 3 4 3 cheaper
unexpected factors 1 2 3 5 3 4 5 predictable
unsustainable 1 2 4 4 3 5 5 environmentally friendly
sedentary 1 2 3 2 2 5 5 physically active
fixed route 3 3 3 2 2 5 5 go where you want
stick to set times 5 3 3 1 1 5 5 go when you want
public transport 4 1 1 1 1 5 5 private transport
individual's responsibility 1 5 5 5 5 4 5 minimal responsibility
have to drive yourself 2 5 5 5 5 5 5 being driven
means to end 3 4 5 5 5 5 5 enjoyable
boring 3 4 5 5 4 5 1 interesting
100 90 80 70 60 50
Walking
Bicycle
Coach
Train
Tram
Bus
Car

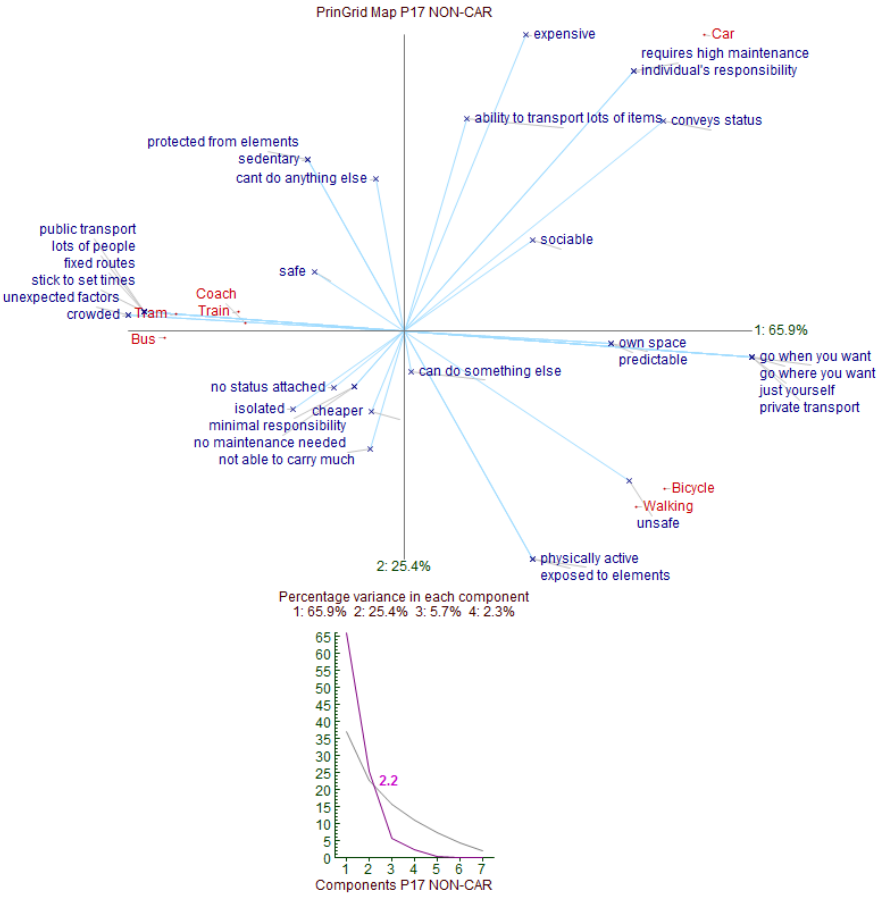


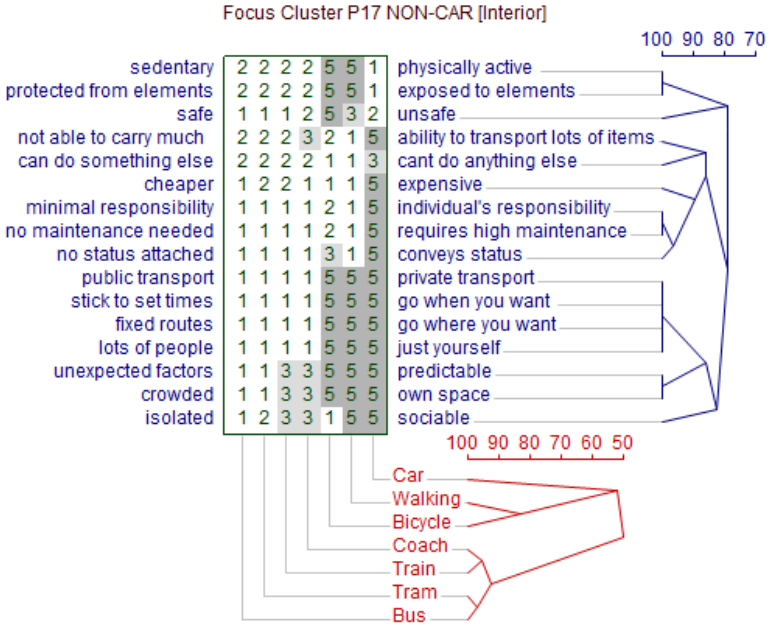
Percentage variance in each component
1: 51.8% 2: 24.8% 3: 12.5% 4: 6.6% 5: 4.0%

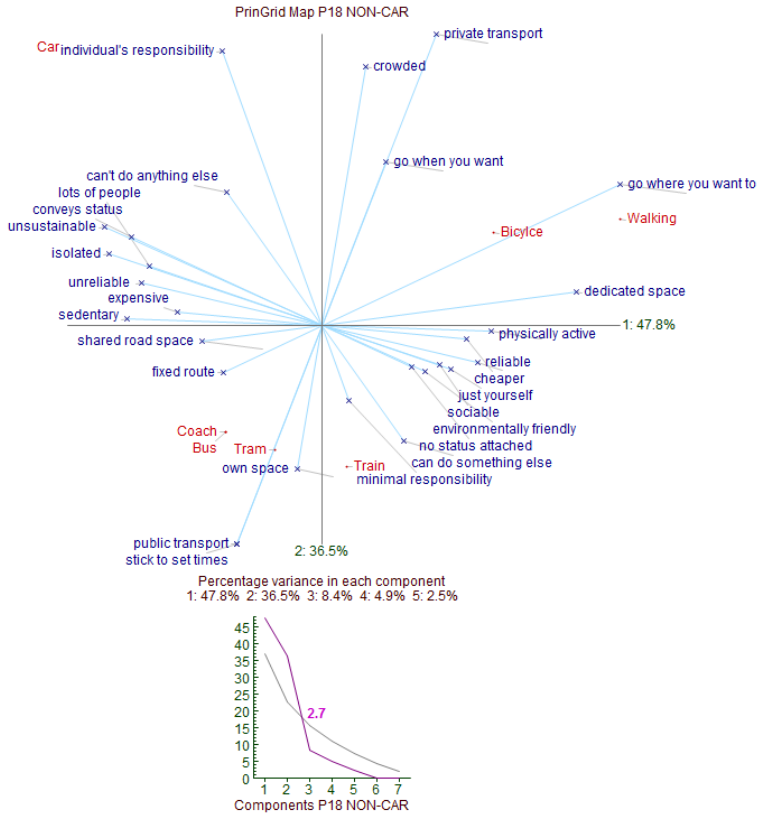


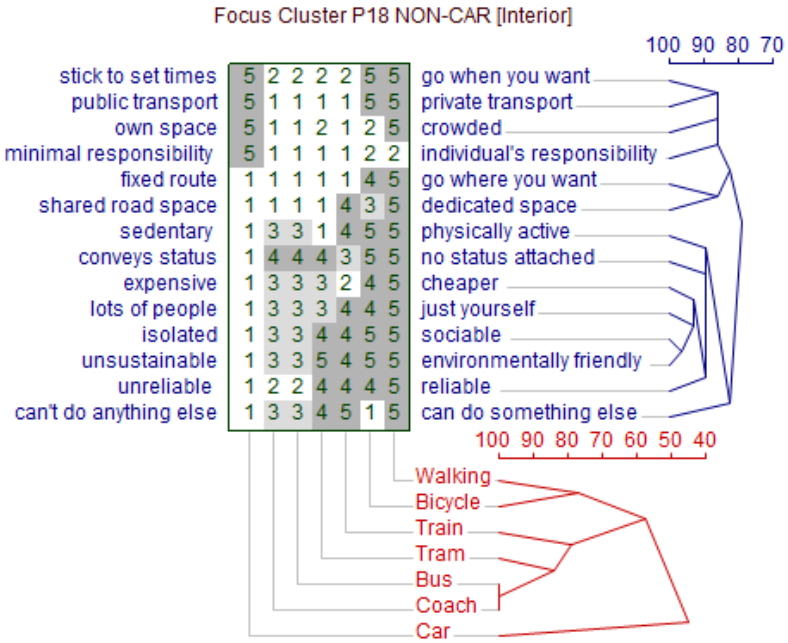
Focus Cluster P16 NON-CAR [Interior]

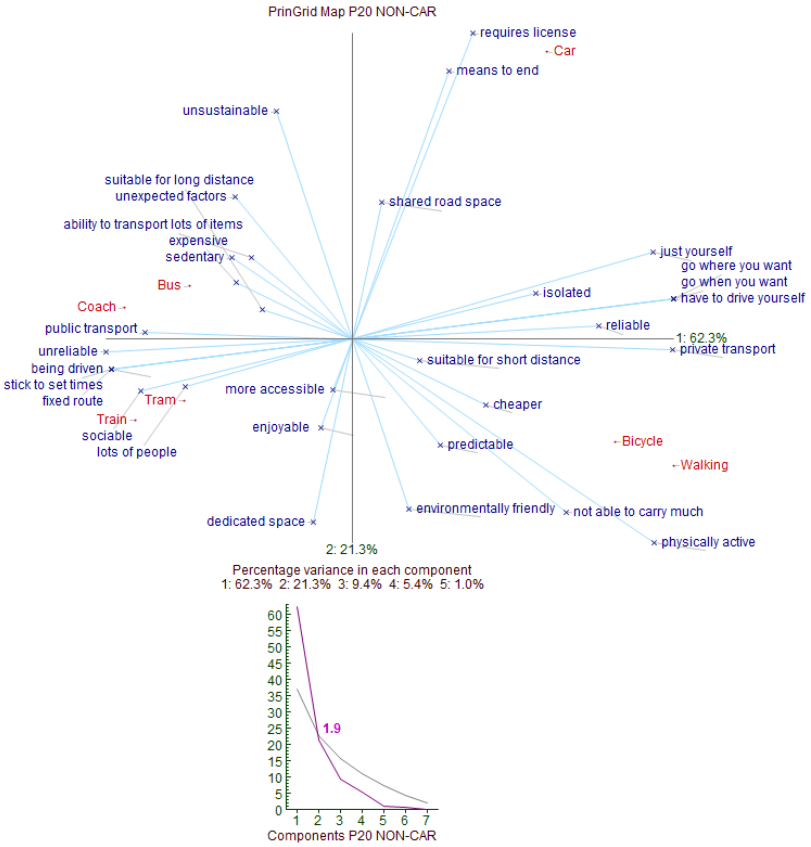


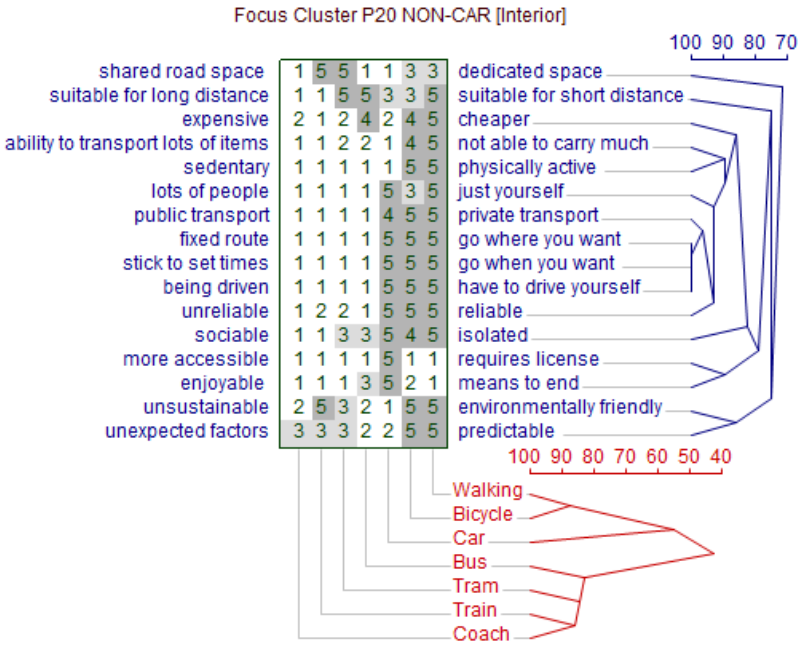

PrinGrid Map P17 NON-CAR
expensive
Car
requires high maintenance
individual's responsibility
ability to transport lots of items
conveys status
protected from elements
sedentary
cant do anything else
public transport
lots of people
fixed routes
stick to set times
unexpected factors
crowded
Tram
Coach
Train
Bus
safe
sociable
1: 65.9%
own space
predictable
go when you want
go where you want
just yourself
private transport
can do something else
no status attached
isolated
cheaper
minimal responsibility
no maintenance needed
not able to carry much
Bicycle
Walking
unsafe
physically active
exposed to elements
2: 25.4%
Percentage variance in each component
1: 65.9% 2: 25.4% 3: 5.7% 4: 2.3%
2.2
Components P17 NON-CAR

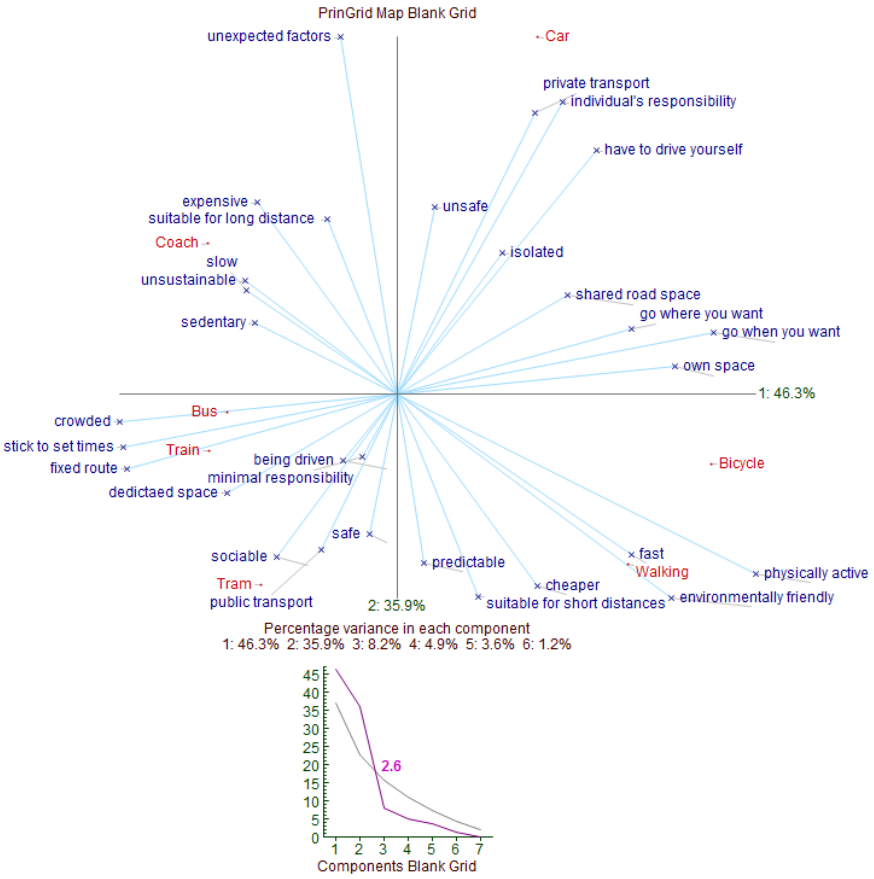

Focus Cluster P17 NON-CAR [Interior]
100 90 80 70
sedentary 2 2 2 2 5 5 1 physically active
protected from elements 2 2 2 2 5 5 1 exposed to elements
safe 1 1 1 2 5 3 2 unsafe
not able to carry much 2 2 2 3 2 1 5 ability to transport lots of items
can do something else 2 2 2 2 1 1 3 cant do anything else
cheaper 1 2 2 1 1 1 5 expensive
minimal responsibility 1 1 1 1 2 1 5 individual's responsibility
no maintenance needed 1 1 1 1 2 1 5 requires high maintenance
no status attached 1 1 1 1 3 1 5 conveys status
public transport 1 1 1 1 5 5 5 private transport
stick to set times 1 1 1 1 5 5 5 go when you want
fixed routes 1 1 1 1 5 5 5 go where you want
lots of people 1 1 1 1 5 5 5 just yourself
unexpected factors 1 1 3 3 5 5 5 predictable
crowded 1 1 3 3 5 5 5 own space
isolated 1 2 3 3 1 5 5 sociable
100 90 80 70 60 50
Car
Walking
Bicycle
Coach
Train
Tram
Bus

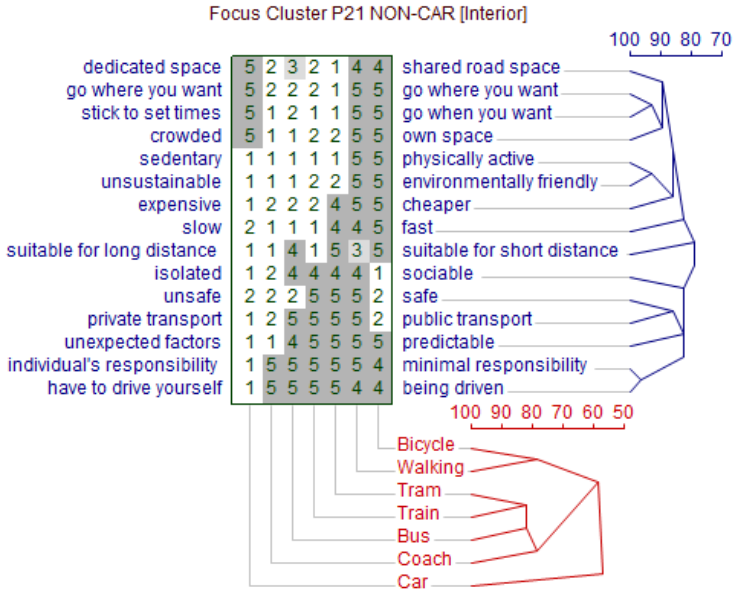

PrinGrid Map P18 NON-CAR
Car
individual's responsibility
private transport
crowded
go when you want
go where you want to
Walking
Bicyle
can't do anything else
lots of people
conveys status
unsustainable
isolated
unreliable
expensive
sedentary
dedicated space
1: 47.8%
physically active
shared road space
reliable
cheaper
just yourself
sociable
environmentally friendly
fixed route
Coach
Bus
Tram
own space
Train
minimal responsibility
no status attached
can do something else
public transport
stick to set times
2: 36.5%
Percentage variance in each component
1: 47.8% 2: 36.5% 3: 8.4% 4: 4.9% 5: 2.5%
45
40
35
30
25
20
15
10
5
0
2.7
1 2 3 4 5 6 7
Components P18 NON-CAR

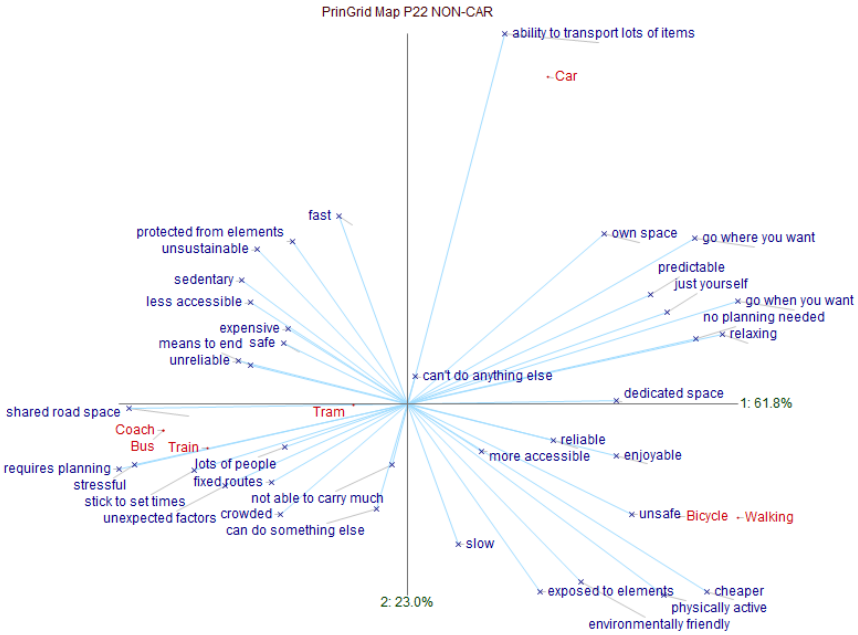

Focus Cluster P18 NON-CAR [Interior]
100 90 80 70
stick to set times 5 2 2 2 2 5 5
public transport 5 1 1 1 1 5 5
own space 5 1 1 2 1 2 5
minimal responsibility 5 1 1 1 1 2 2
fixed route 1 1 1 1 1 4 5
shared road space 1 1 1 1 4 3 5
sedentary 1 3 3 1 4 5 5
conveys status 1 4 4 4 3 5 5
expensive 1 3 3 3 2 4 5
lots of people 1 3 3 3 4 4 5
isolated 1 3 3 4 4 5 5
unsustainable 1 3 3 5 4 5 5
unreliable 1 2 2 4 4 4 5
can't do anything else 1 3 3 4 5 1 5
go when you want
private transport
crowded
individual's responsibility
go where you want
dedicated space
physically active
no status attached
cheaper
just yourself
sociable
environmentally friendly
reliable
can do something else
100 90 80 70 60 50 40
Walking
Bicycle
Train
Tram
Bus
Coach
Car

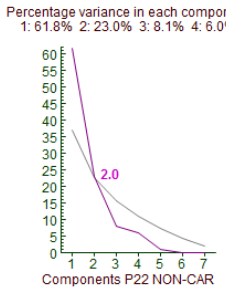

PrinGrid Map P20 NON-CAR
requires license
Car
means to end
unsustainable
suitable for long distance
unexpected factors
shared road space
ability to transport lots of items
expensive
sedentary
Bus
Coach
public transport
unreliable
being driven
stick to set times
fixed route
Tram
Train
sociable
lots of people
more accessible
enjoyable
just yourself
go where you want
go when you want
have to drive yourself
isolated
reliable
1: 62.3%
private transport
suitable for short distance
cheaper
predictable
Bicycle
Walking
environmentally friendly
not able to carry much
physically active
dedicated space
2: 21.3%
Percentage variance in each component
1: 62.3% 2: 21.3% 3: 9.4% 4: 5.4% 5: 1.0%
1.9
Components P20 NON-CAR

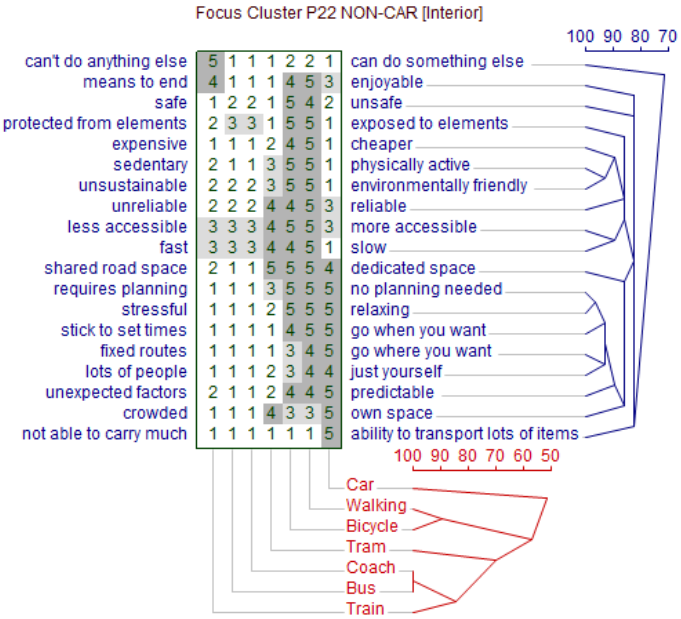

Focus Cluster P20 NON-CAR [Interior]
100 90 80 70
shared road space 1 5 5 1 1 3 3
suitable for long distance 1 1 5 5 3 3 5
expensive 2 1 2 4 2 4 5
ability to transport lots of items 1 1 2 2 1 4 5
sedentary 1 1 1 1 1 5 5
lots of people 1 1 1 1 5 3 5
public transport 1 1 1 1 4 5 5
fixed route 1 1 1 1 5 5 5
stick to set times 1 1 1 1 5 5 5
being driven 1 1 1 1 5 5 5
unreliable 1 2 2 1 5 5 5
sociable 1 1 3 3 5 4 5
more accessible 1 1 1 1 5 1 1
enjoyable 1 1 1 3 5 2 1
unsustainable 2 5 3 2 1 5 5
unexpected factors 3 3 3 2 2 5 5
dedicated space
suitable for short distance
cheaper
not able to carry much
physically active
just yourself
private transport
go where you want
go when you want
have to drive yourself
reliable
isolated
requires license
means to end
environmentally friendly
predictable
100 90 80 70 60 50 40
Walking
Bicycle
Car
Bus
Tram
Train
Coach

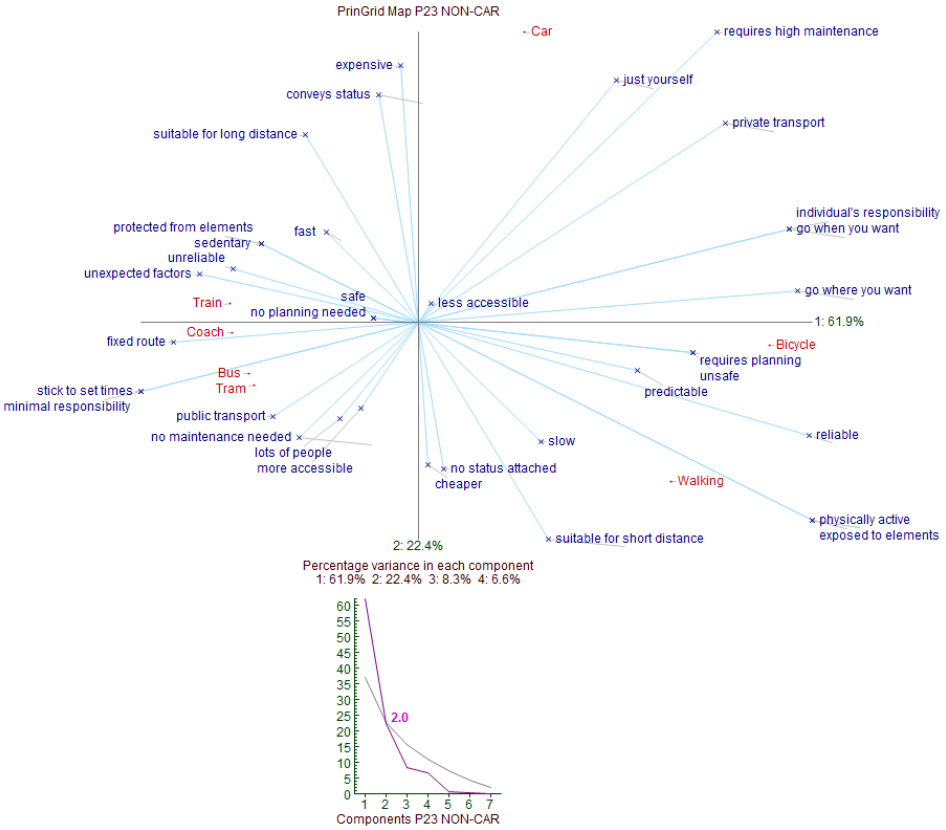

PrinGrid Map Blank Grid
unexpected factors
Car
private transport
individual's responsibility
have to drive yourself
expensive
suitable for long distance
unsafe
Coach
slow
unsustainable
isolated
shared road space
go where you want
sedentary
go when you want
own space
1: 46.3%
Bus
crowded
stick to set times
Train
fixed route
being driven
minimal responsibility
dedictaed space
Bicycle
safe
sociable
fast
Walking
predictable
physically active
Tram
public transport
cheaper
suitable for short distances
environmentally friendly
2: 35.9%
Percentage variance in each component
1: 46.3% 2: 35.9% 3: 8.2% 4: 4.9% 5: 3.6% 6: 1.2%
45
40
35
30
25
20
15
10
5
0
2.6
1 2 3 4 5 6 7
Components Blank Grid

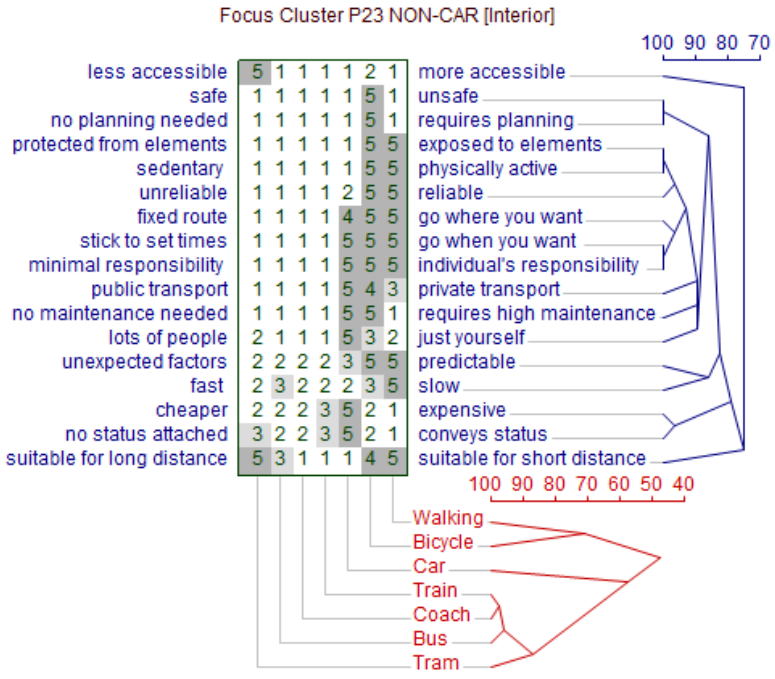

Focus Cluster P21 NON-CAR [Interior]
100 90 80 70
dedicated space 5 2 3 2 1 4 4
go where you want 5 2 2 2 1 5 5
stick to set times 5 1 2 1 1 5 5
crowded 5 1 1 2 2 5 5
sedentary 1 1 1 1 1 5 5
unsustainable 1 1 1 2 2 5 5
expensive 1 2 2 2 4 5 5
slow 2 1 1 1 4 4 5
suitable for long distance 1 1 4 1 5 3 5
isolated 1 2 4 4 4 4 1
unsafe 2 2 2 5 5 5 2
private transport 1 2 5 5 5 5 2
unexpected factors 1 1 4 5 5 5 5
individual's responsibility 1 5 5 5 5 5 4
have to drive yourself 1 5 5 5 5 4 4
shared road space
go where you want
go when you want
own space
physically active
environmentally friendly
cheaper
fast
suitable for short distance
sociable
safe
public transport
predictable
minimal responsibility
being driven
100 90 80 70 60 50
Bicycle
Walking
Tram
Train
Bus
Coach
Car

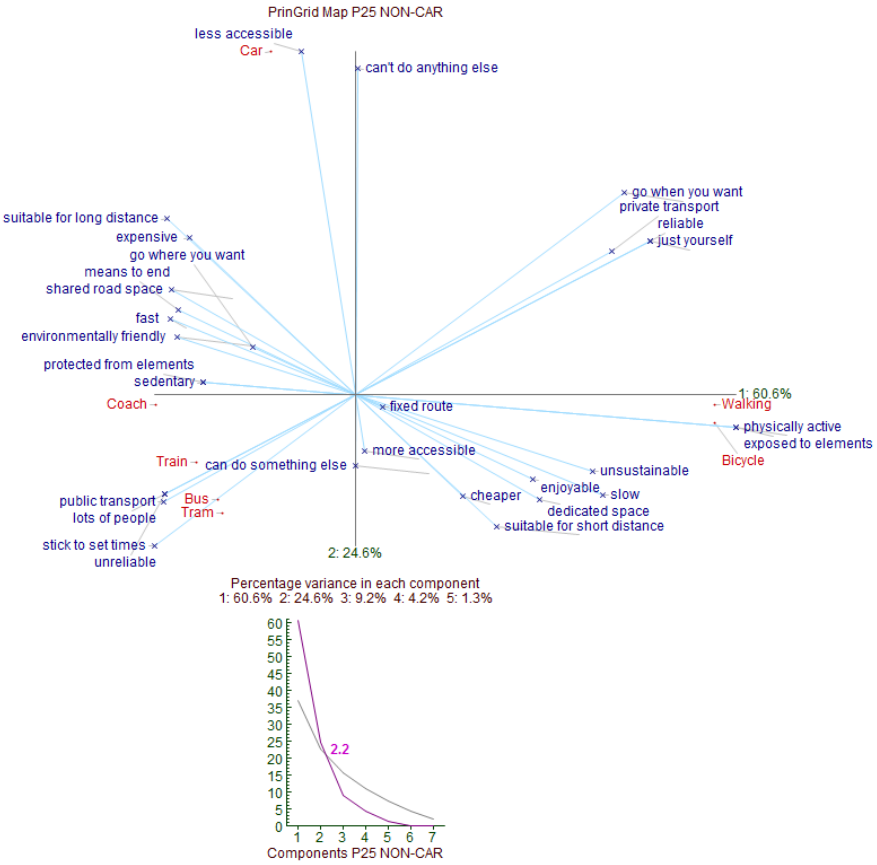

PrinGrid Map P22 NON-CAR
ability to transport lots of items
Car
fast
protected from elements
unsustainable
own space
go where you want
predictable
just yourself
go when you want
no planning needed
relaxing
sedentary
less accessible
expensive
means to end
safe
unreliable
can't do anything else
dedicated space
1: 61.8%
shared road space
Tram
Coach
Bus
Train
requires planning
stressful
lots of people
fixed routes
stick to set times
unexpected factors
not able to carry much
crowded
can do something else
reliable
more accessible
enjoyable
unsafe
Bicycle
Walking
slow
exposed to elements
cheaper
physically active
environmentally friendly
2: 23.0%

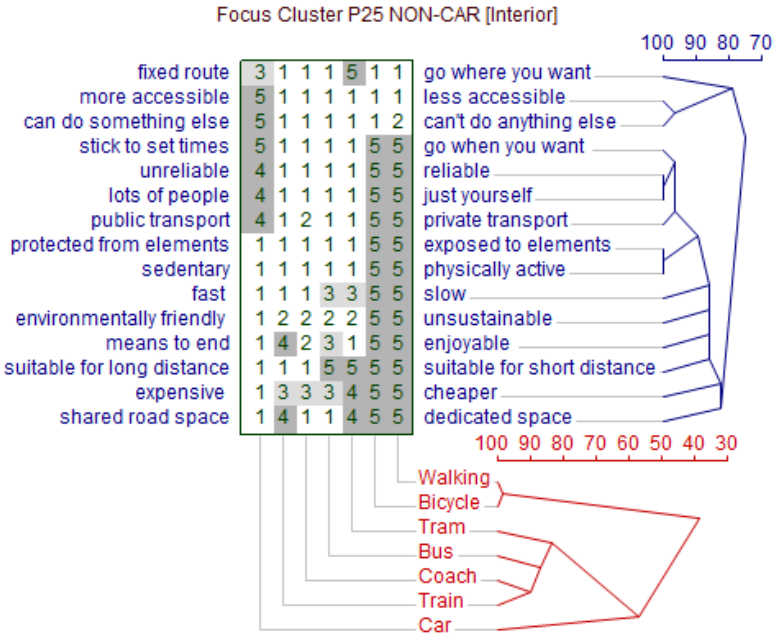

Percentage variance in each component
1: 61.8% 2: 23.0% 3: 8.1% 4: 6.0%
60
55
50
45
40
35
30
25
20
15
10
5
0
2.0
1 2 3 4 5 6 7
Components P22 NON-CAR

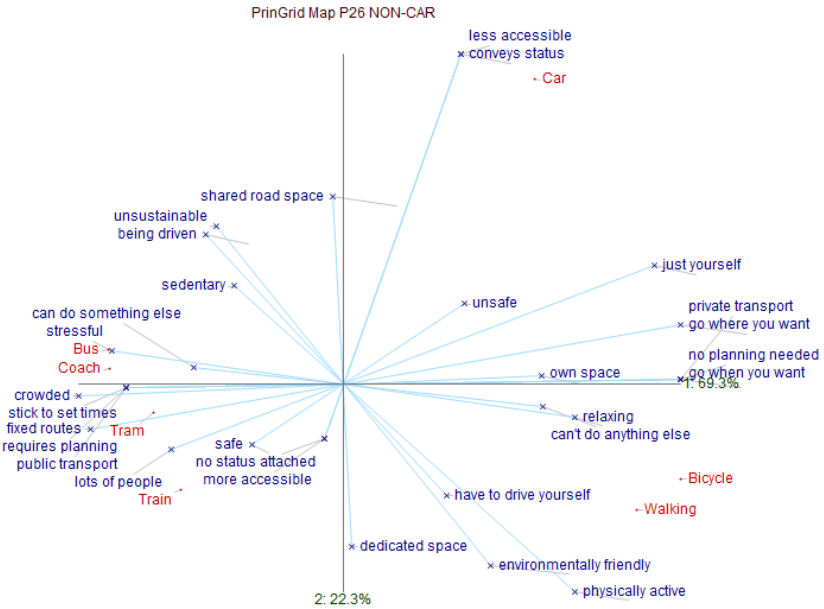

Focus Cluster P22 NON-CAR [Interior]
100 90 80 70
can't do anything else 5 1 1 1 2 2 1 can do something else
means to end 4 1 1 1 4 5 3 enjoyable
safe 1 2 2 1 5 4 2 unsafe
protected from elements 2 3 3 1 5 5 1 exposed to elements
expensive 1 1 1 2 4 5 1 cheaper
sedentary 2 1 1 3 5 5 1 physically active
unsustainable 2 2 2 3 5 5 1 environmentally friendly
unreliable 2 2 2 4 4 5 3 reliable
less accessible 3 3 3 4 5 5 3 more accessible
fast 3 3 3 4 4 5 1 slow
shared road space 2 1 1 5 5 5 4 dedicated space
requires planning 1 1 1 3 5 5 5 no planning needed
stressful 1 1 1 2 5 5 5 relaxing
stick to set times 1 1 1 1 4 5 5 go when you want
fixed routes 1 1 1 1 3 4 5 go where you want
lots of people 1 1 1 2 3 4 4 just yourself
unexpected factors 2 1 1 2 4 4 5 predictable
crowded 1 1 1 4 3 3 5 own space
not able to carry much 1 1 1 1 1 1 5 ability to transport lots of items
100 90 80 70 60 50
Car
Walking
Bicycle
Tram
Coach
Bus
Train

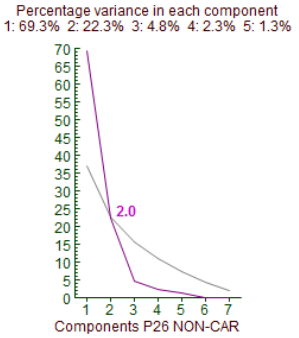

PrinGrid Map P23 NON-CAR
Car
requires high maintenance
expensive
just yourself
conveys status
private transport
suitable for long distance
individual's responsibility
go when you want
protected from elements
fast
sedentary
unreliable
unexpected factors
go where you want
Train
safe
less accessible
no planning needed
1: 61.9%
Coach
fixed route
Bicycle
requires planning
unsafe
Bus
Tram
predictable
stick to set times
minimal responsibility
public transport
reliable
no maintenance needed
slow
lots of people
more accessible
no status attached
cheaper
Walking
physically active
exposed to elements
suitable for short distance
2: 22.4%
Percentage variance in each component
1: 61.9% 2: 22.4% 3: 8.3% 4: 6.6%
2.0
Components P23 NON-CAR

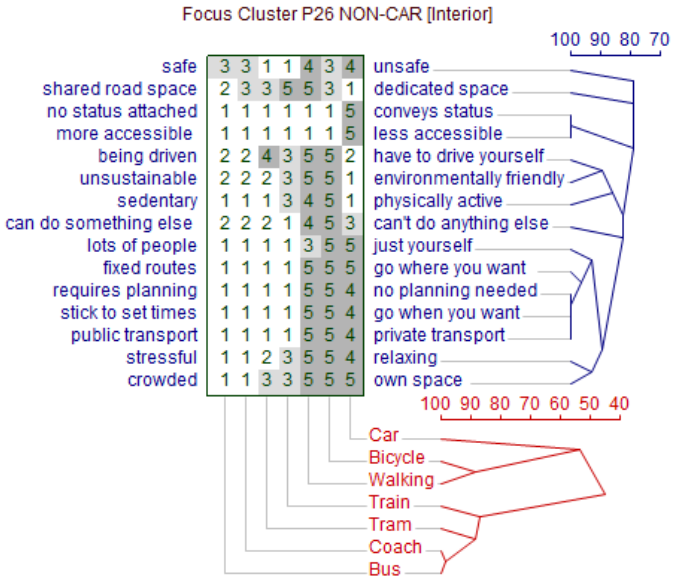

Focus Cluster P23 NON-CAR [Interior]
100 90 80 70
less accessible 5 1 1 1 1 2 1 more accessible
safe 1 1 1 1 1 5 1 unsafe
no planning needed 1 1 1 1 1 5 1 requires planning
protected from elements 1 1 1 1 1 5 5 exposed to elements
sedentary 1 1 1 1 1 5 5 physically active
unreliable 1 1 1 1 2 5 5 reliable
fixed route 1 1 1 1 4 5 5 go where you want
stick to set times 1 1 1 1 5 5 5 go when you want
minimal responsibility 1 1 1 1 5 5 5 individual's responsibility
public transport 1 1 1 1 5 4 3 private transport
no maintenance needed 1 1 1 1 5 5 1 requires high maintenance
lots of people 2 1 1 1 5 3 2 just yourself
unexpected factors 2 2 2 2 3 5 5 predictable
fast 2 3 2 2 2 3 5 slow
cheaper 2 2 2 3 5 2 1 expensive
no status attached 3 2 2 3 5 2 1 conveys status
suitable for long distance 5 3 1 1 1 4 5 suitable for short distance
100 90 80 70 60 50 40
Walking
Bicycle
Car
Train
Coach
Bus
Tram


PrinGrid Map P25 NON-CAR
less accessible
Car
can't do anything else
go when you want
private transport
reliable
just yourself
suitable for long distance
expensive
go where you want
means to end
shared road space
fast
environmentally friendly
protected from elements
sedentary
Coach
fixed route
1: 60.6%
Walking
physically active
exposed to elements
Bicycle
more accessible
Train
can do something else
unsustainable
enjoyable
slow
cheaper
dedicated space
suitable for short distance
public transport
lots of people
Bus
Tram
stick to set times
unreliable
2: 24.6%
Percentage variance in each component
1: 60.6% 2: 24.6% 3: 9.2% 4: 4.2% 5: 1.3%
60
55
50
45
40
35
30
25
20
15
10
5
0
2.2
1 2 3 4 5 6 7
Components P25 NON-CAR

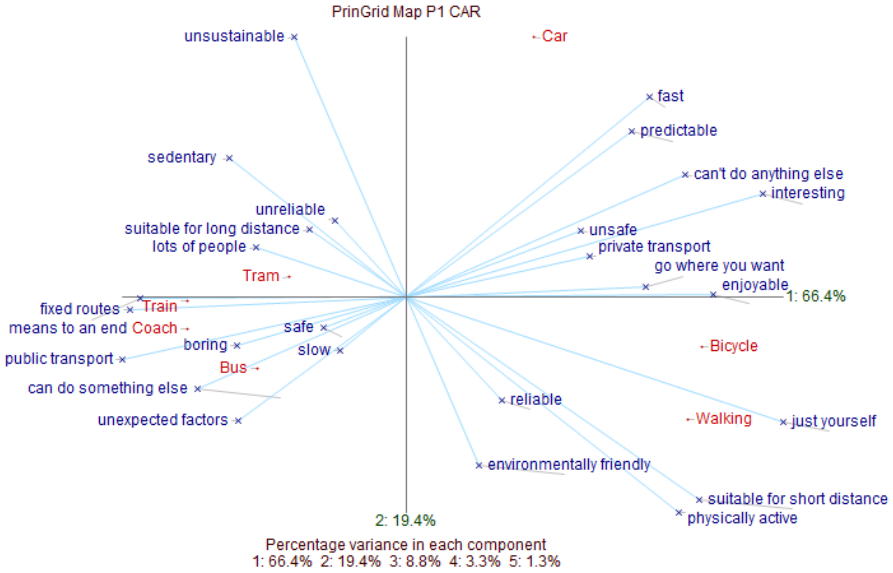

Focus Cluster P25 NON-CAR [Interior]
100 90 80 70
fixed route 3 1 1 1 5 1 1 go where you want
more accessible 5 1 1 1 1 1 1 less accessible
can do something else 5 1 1 1 1 1 2 can't do anything else
stick to set times 5 1 1 1 1 5 5 go when you want
unreliable 4 1 1 1 1 5 5 reliable
lots of people 4 1 1 1 1 5 5 just yourself
public transport 4 1 2 1 1 5 5 private transport
protected from elements 1 1 1 1 1 5 5 exposed to elements
sedentary 1 1 1 1 1 5 5 physically active
fast 1 1 1 3 3 5 5 slow
environmentally friendly 1 2 2 2 2 5 5 unsustainable
means to end 1 4 2 3 1 5 5 enjoyable
suitable for long distance 1 1 1 5 5 5 5 suitable for short distance
expensive 1 3 3 3 4 5 5 cheaper
shared road space 1 4 1 1 4 5 5 dedicated space
100 90 80 70 60 50 40 30
Walking
Bicycle
Tram
Bus
Coach
Train
Car

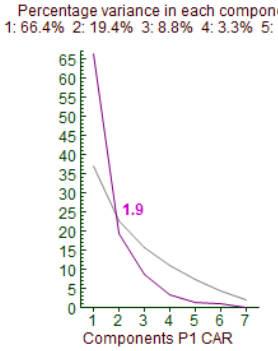

PrinGrid Map P26 NON-CAR
less accessible
conveys status
Car
shared road space
unsustainable
being driven
sedentary
just yourself
unsafe
private transport
go where you want
no planning needed
go when you want
can do something else
stressful
Bus
Coach
own space
1: 69.3%
crowded
stick to set times
fixed routes
Tram
requires planning
public transport
lots of people
Train
safe
no status attached
more accessible
relaxing
can't do anything else
Bicycle
have to drive yourself
Walking
dedicated space
environmentally friendly
physically active
2: 22.3%

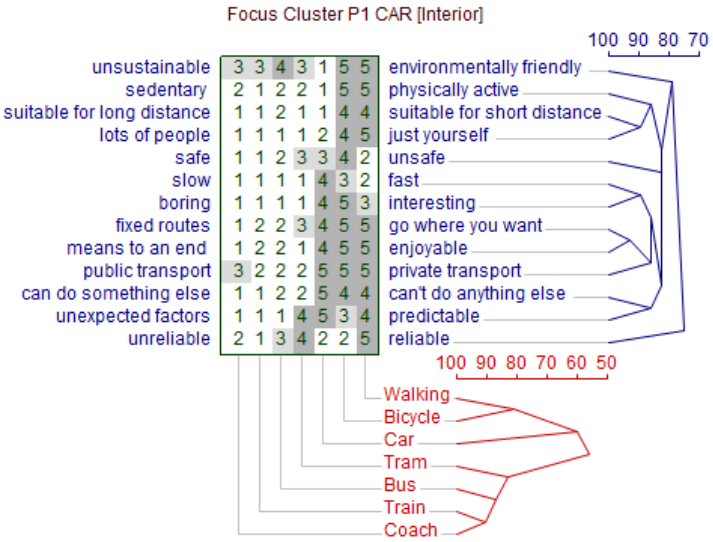

Percentage variance in each component
1: 69.3% 2: 22.3% 3: 4.8% 4: 2.3% 5: 1.3%
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
2.0
1 2 3 4 5 6 7
Components P26 NON-CAR

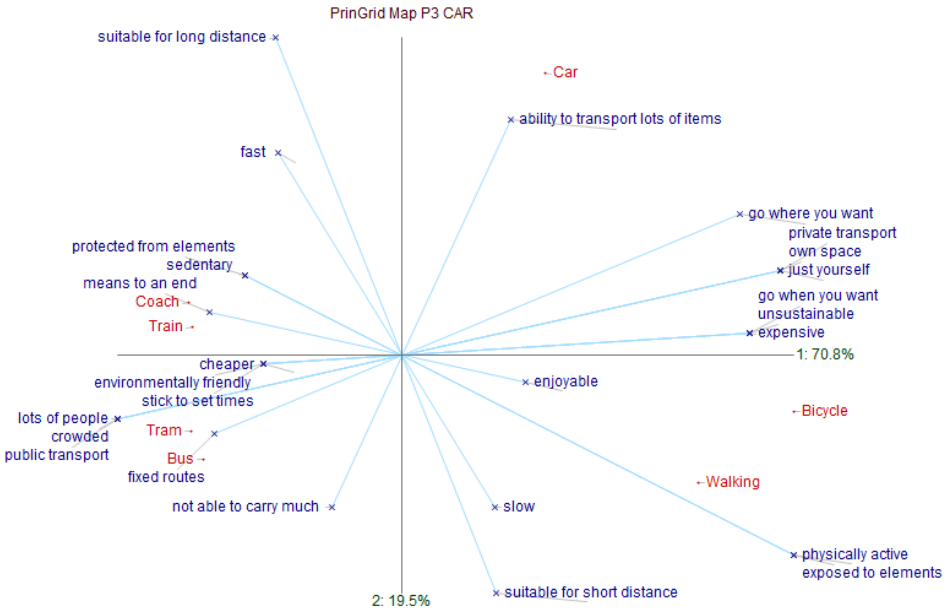

Focus Cluster P26 NON-CAR [Interior]
100 90 80 70
safe 3 3 1 1 4 3 4 unsafe
shared road space 2 3 3 5 5 3 1 dedicated space
no status attached 1 1 1 1 1 1 5 conveys status
more accessible 1 1 1 1 1 1 5 less accessible
being driven 2 2 4 3 5 5 2 have to drive yourself
unsustainable 2 2 2 3 5 5 1 environmentally friendly
sedentary 1 1 1 3 4 5 1 physically active
can do something else 2 2 2 1 4 5 3 can't do anything else
lots of people 1 1 1 1 3 5 5 just yourself
fixed routes 1 1 1 1 5 5 5 go where you want
requires planning 1 1 1 1 5 5 4 no planning needed
stick to set times 1 1 1 1 5 5 4 go when you want
public transport 1 1 1 1 5 5 4 private transport
stressful 1 1 2 3 5 5 4 relaxing
crowded 1 1 3 3 5 5 5 own space
100 90 80 70 60 50 40
Car
Bicycle
Walking
Train
Tram
Coach
Bus

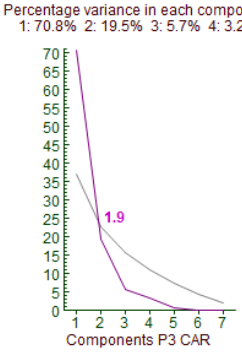
Dendrograms resulting from cluster analysis and principal component maps of all car user participants are displayed below.

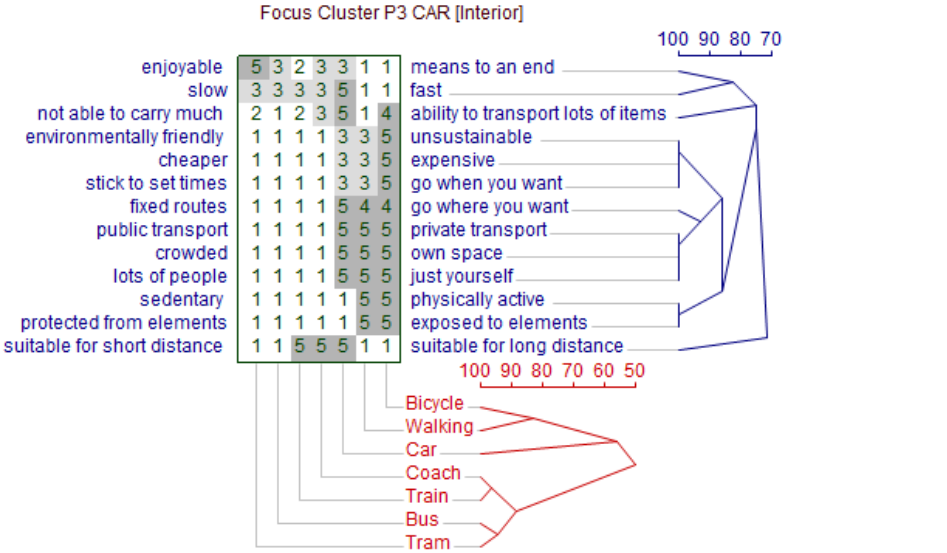


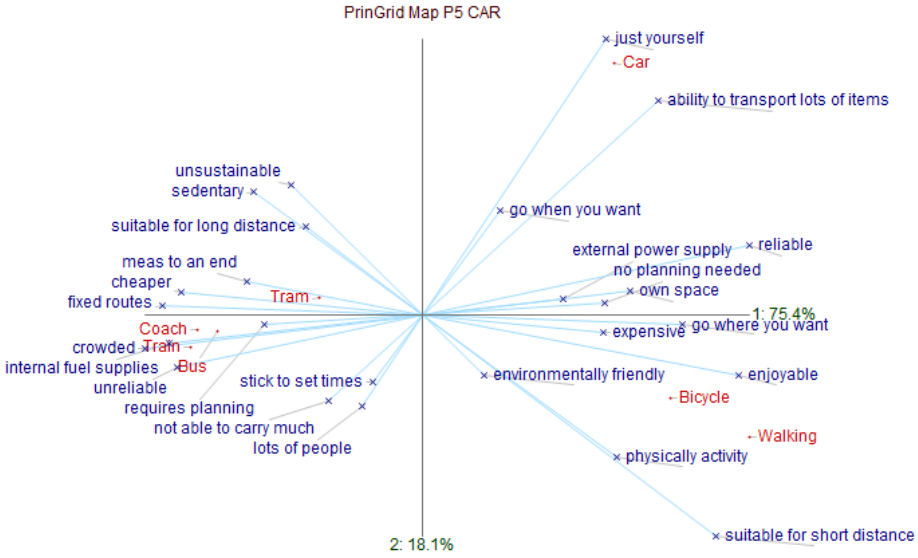


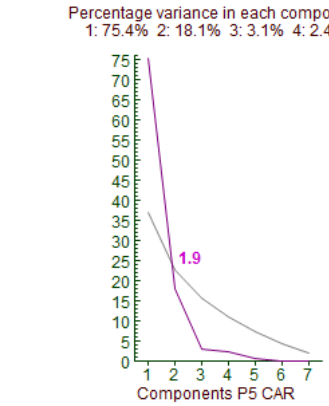


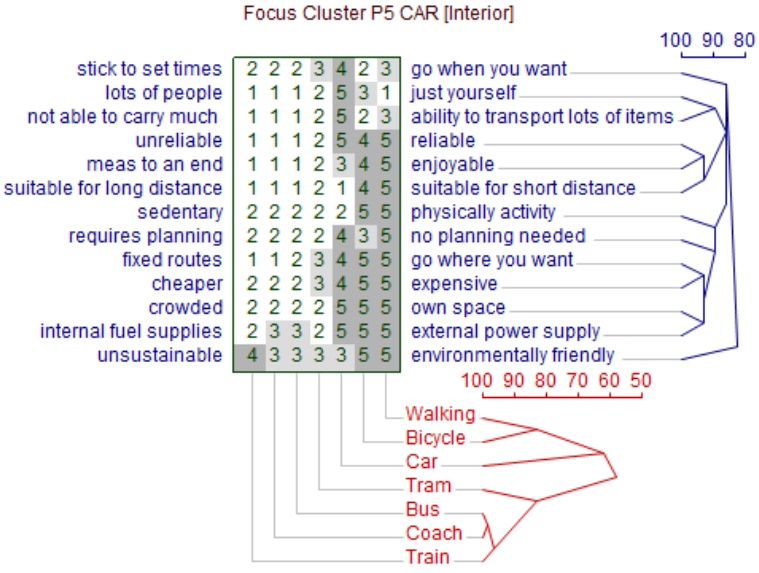

PrinGrid Map P3 CAR
suitable for long distance
Car
ability to transport lots of items
fast
go where you want
private transport
own space
just yourself
go when you want
unsustainable
expensive
protected from elements
sedentary
means to an end
Coach
Train
cheaper
environmentally friendly
stick to set times
lots of people
crowded
public transport
Tram
Bus
fixed routes
1: 70.8%
enjoyable
Bicycle
Walking
not able to carry much
slow
physically active
exposed to elements
suitable for short distance
2: 19.5%

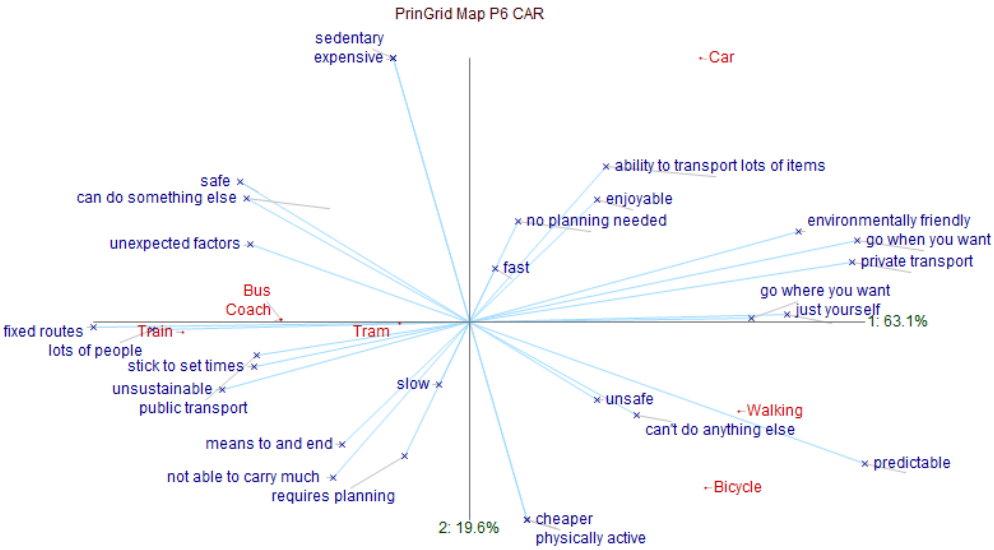

Percentage variance in each component
1: 70.8% 2: 19.5% 3: 5.7% 4: 3.2%
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1.9
1 2 3 4 5 6 7
Components P3 CAR


Focus Cluster P3 CAR [Interior]
100 90 80 70
enjoyable 5 3 2 3 3 1 1
slow 3 3 3 3 5 1 1
not able to carry much 2 1 2 3 5 1 4
environmentally friendly 1 1 1 1 3 3 5
cheaper 1 1 1 1 3 3 5
stick to set times 1 1 1 1 3 3 5
fixed routes 1 1 1 1 5 4 4
public transport 1 1 1 1 5 5 5
crowded 1 1 1 1 5 5 5
lots of people 1 1 1 1 5 5 5
sedentary 1 1 1 1 1 5 5
protected from elements 1 1 1 1 1 5 5
suitable for short distance 1 1 5 5 5 1 1
means to an end
fast
ability to transport lots of items
unsustainable
expensive
go when you want
go where you want
private transport
own space
just yourself
physically active
exposed to elements
suitable for long distance
100 90 80 70 60 50
Bicycle
Walking
Car
Coach
Train
Bus
Tram

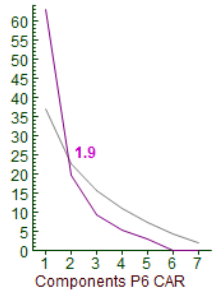

PrinGrid Map P5 CAR
just yourself
Car
ability to transport lots of items
unsustainable
sedentary
go when you want
suitable for long distance
external power supply
reliable
meas to an end
no planning needed
cheaper
own space
Tram
fixed routes
1: 75.4%
Coach
go where you want
expensive
crowded
Tram
internal fuel supplies
Bus
environmentally friendly
enjoyable
unreliable
stick to set times
Bicycle
requires planning
Walking
not able to carry much
physically activity
lots of people
suitable for short distance
2: 18.1%


Percentage variance in each component
1: 75.4% 2: 18.1% 3: 3.1% 4: 2.4%
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1.9
1 2 3 4 5 6 7
Components P5 CAR

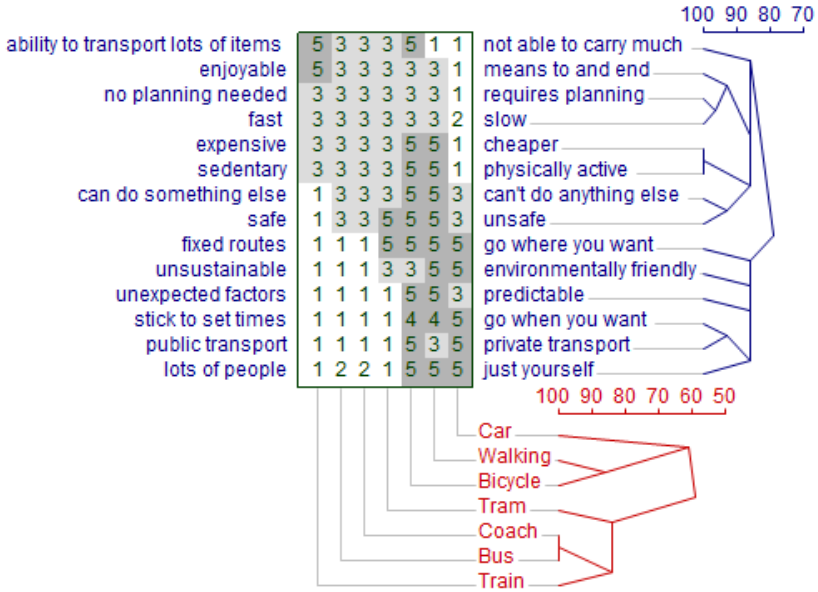

Focus Cluster P5 CAR [Interior]
100 90 80
stick to set times 2 2 2 3 4 2 3 go when you want
lots of people 1 1 1 2 5 3 1 just yourself
not able to carry much 1 1 1 2 5 2 3 ability to transport lots of items
unreliable 1 1 1 2 5 4 5 reliable
meas to an end 1 1 1 2 3 4 5 enjoyable
suitable for long distance 1 1 1 2 1 4 5 suitable for short distance
sedentary 2 2 2 2 2 5 5 physically activity
requires planning 2 2 2 2 4 3 5 no planning needed
fixed routes 1 1 2 3 4 5 5 go where you want
cheaper 2 2 2 3 4 5 5 expensive
crowded 2 2 2 2 5 5 5 own space
internal fuel supplies 2 3 3 2 5 5 5 external power supply
unsustainable 4 3 3 3 3 5 5 environmentally friendly
100 90 80 70 60 50
Walking
Bicycle
Car
Tram
Bus
Coach
Train

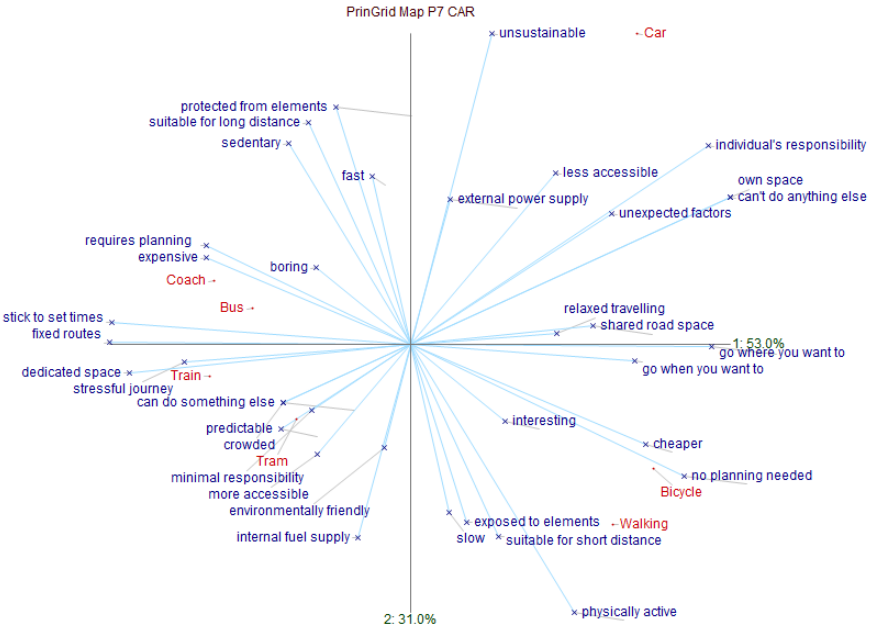


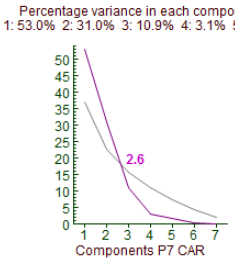
Percentage variance in each component
1: 63.1% 2: 19.6% 3: 9.3% 4: 5.2% 5: 2.9%

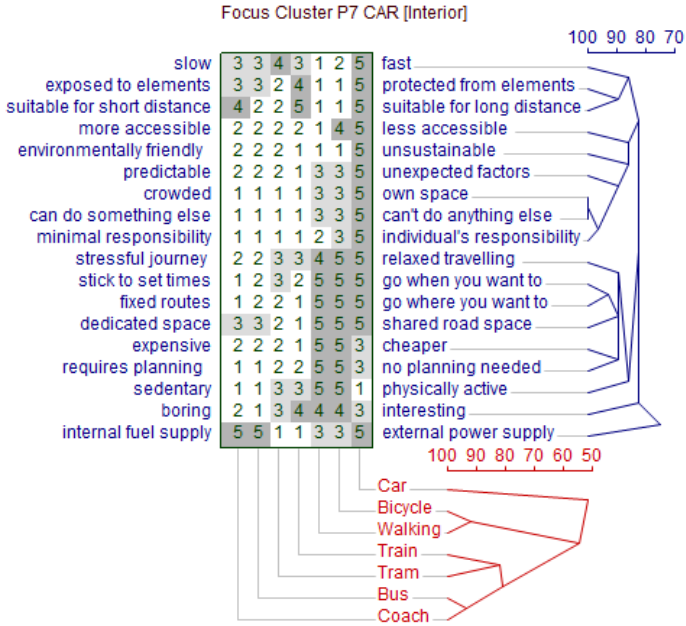


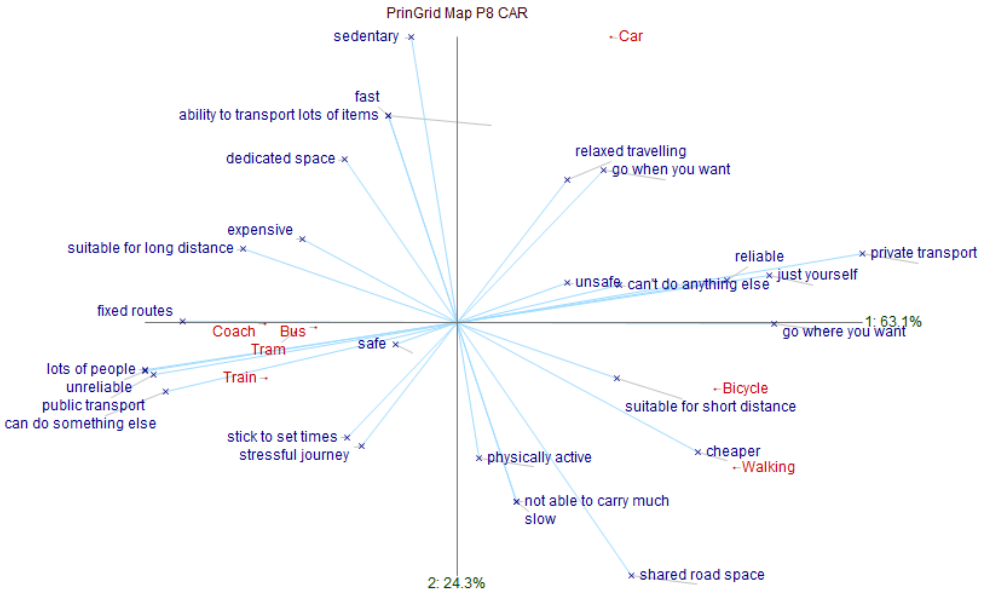
Focus Cluster P6 CAR [Interior]

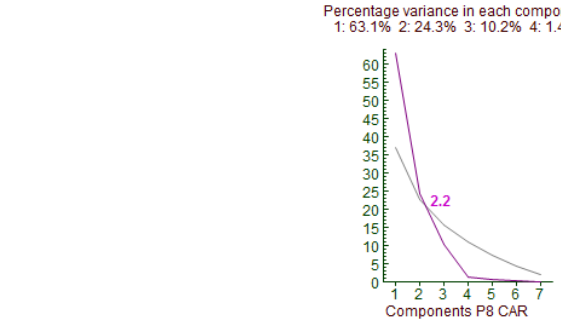


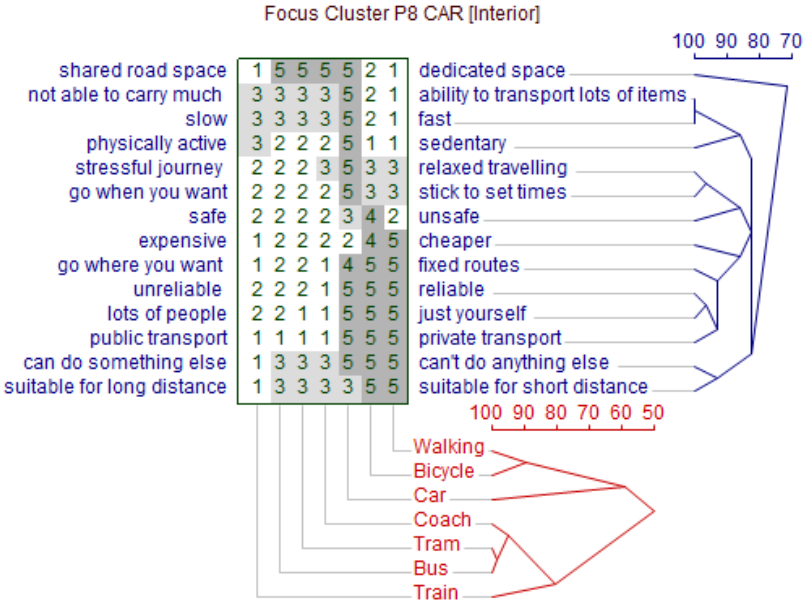

PrinGrid Map P7 CAR
unsustainable
Car
protected from elements
suitable for long distance
sedentary
fast
individual's responsibility
less accessible
own space
external power supply
can't do anything else
unexpected factors
requires planning
expensive
boring
Coach
Bus
stick to set times
fixed routes
relaxed travelling
shared road space
1: 53.0%
go where you want to
go when you want to
dedicated space
Train
stressful journey
can do something else
interesting
predictable
crowded
cheaper
Tram
minimal responsibility
more accessible
no planning needed
Bicycle
environmentally friendly
exposed to elements
Walking
internal fuel supply
slow
suitable for short distance
physically active
2: 31.0%

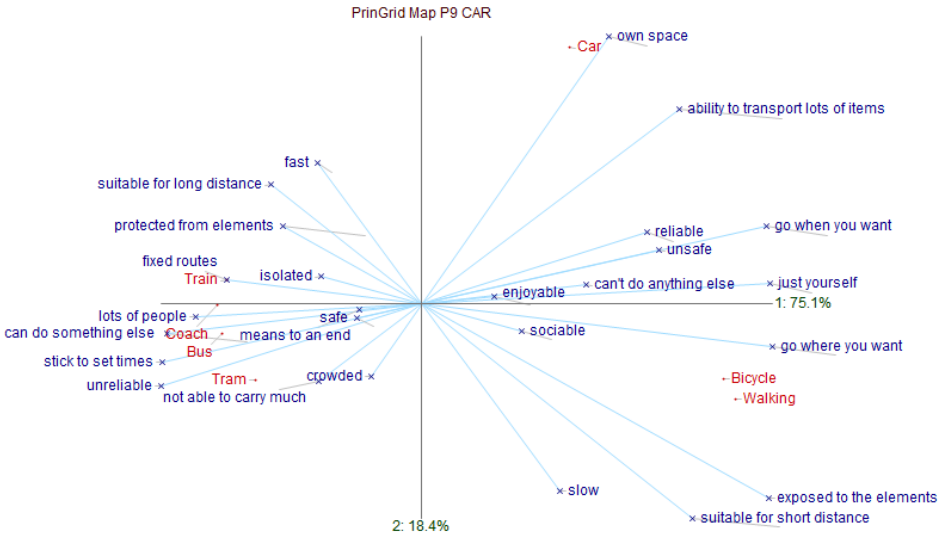

Percentage variance in each component
1: 53.0% 2: 31.0% 3: 10.9% 4: 3.1% 5: 1.6%
50
45
40
35
30
25
20
15
10
5
0
2.6
1 2 3 4 5 6 7
Components P7 CAR

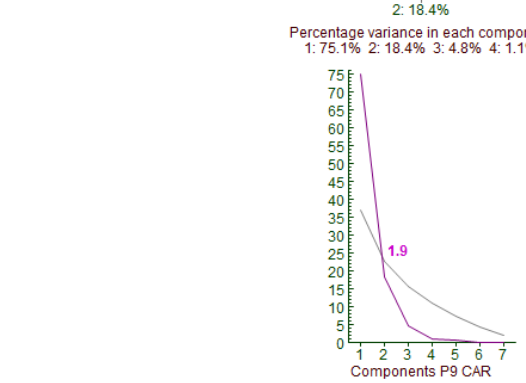

Focus Cluster P7 CAR [Interior]
100 90 80 70
slow 3 3 4 3 1 2 5 fast
exposed to elements 3 3 2 4 1 1 5 protected from elements
suitable for short distance 4 2 2 5 1 1 5 suitable for long distance
more accessible 2 2 2 2 1 4 5 less accessible
environmentally friendly 2 2 2 1 1 1 5 unsustainable
predictable 2 2 2 1 3 3 5 unexpected factors
crowded 1 1 1 1 3 3 5 own space
can do something else 1 1 1 1 3 3 5 can't do anything else
minimal responsibility 1 1 1 1 2 3 5 individual's responsibility
stressful journey 2 2 3 3 4 5 5 relaxed travelling
stick to set times 1 2 3 2 5 5 5 go when you want to
fixed routes 1 2 2 1 5 5 5 go where you want to
dedicated space 3 3 2 1 5 5 5 shared road space
expensive 2 2 2 1 5 5 3 cheaper
requires planning 1 1 2 2 5 5 3 no planning needed
sedentary 1 1 3 3 5 5 1 physically active
boring 2 1 3 4 4 4 3 interesting
internal fuel supply 5 5 1 1 3 3 5 external power supply
100 90 80 70 60 50
Car
Bicycle
Walking
Train
Tram
Bus
Coach

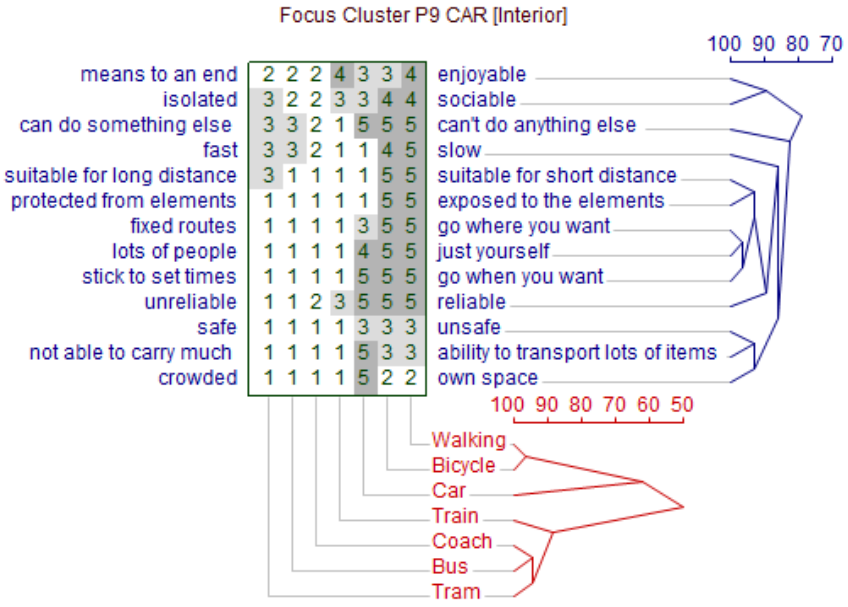

PrinGrid Map P8 CAR
sedentary
Car
fast
ability to transport lots of items
dedicated space
relaxed travelling
go when you want
expensive
suitable for long distance
reliable
private transport
just yourself
unsafe
can't do anything else
fixed routes
Coach
Bus
Tram
safe
1: 63.1%
go where you want
lots of people
unreliable
public transport
can do something else
Train
Bicycle
suitable for short distance
stick to set times
stressful journey
physically active
cheaper
Walking
not able to carry much
slow
shared road space
2: 24.3%

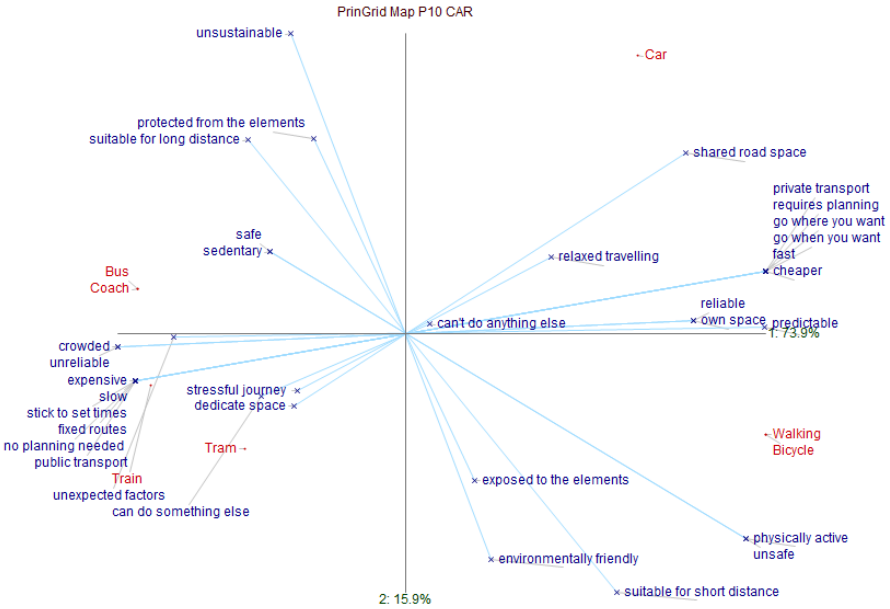

Percentage variance in each component
1: 63.1% 2: 24.3% 3: 10.2% 4: 1.4%
60
55
50
45
40
35
30
25
20
15
10
5
0
2.2
1 2 3 4 5 6 7
Components P8 CAR

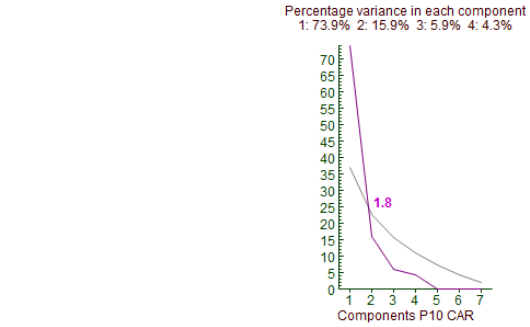

Focus Cluster P8 CAR [Interior]
100 90 80 70
shared road space 1 5 5 5 5 2 1 dedicated space
not able to carry much 3 3 3 3 5 2 1 ability to transport lots of items
slow 3 3 3 3 5 2 1 fast
physically active 3 2 2 2 5 1 1 sedentary
stressful journey 2 2 2 3 5 3 3 relaxed travelling
go when you want 2 2 2 2 5 3 3 stick to set times
safe 2 2 2 2 3 4 2 unsafe
expensive 1 2 2 2 2 4 5 cheaper
go where you want 1 2 2 1 4 5 5 fixed routes
unreliable 2 2 2 1 5 5 5 reliable
lots of people 2 2 1 1 5 5 5 just yourself
public transport 1 1 1 1 5 5 5 private transport
can do something else 1 3 3 3 5 5 5 can't do anything else
suitable for long distance 1 3 3 3 3 5 5 suitable for short distance
100 90 80 70 60 50
Walking
Bicycle
Car
Coach
Tram
Bus
Train

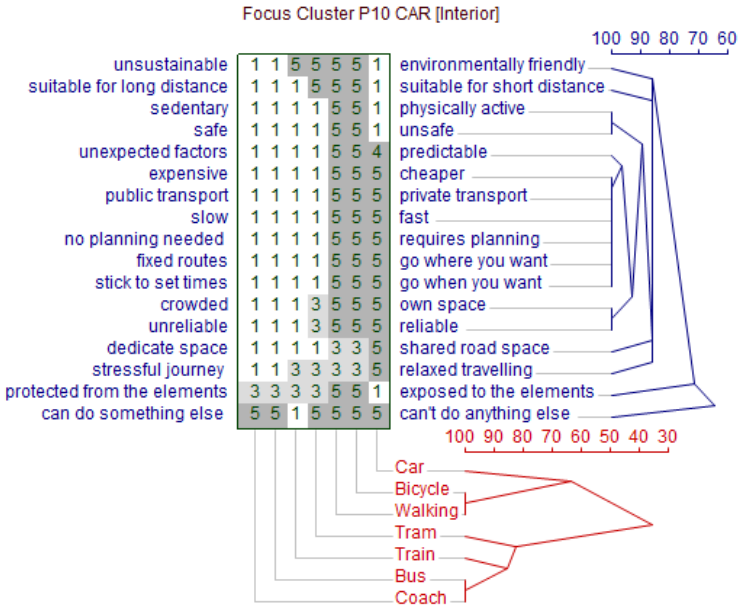

PrinGrid Map P9 CAR
own space
Car
ability to transport lots of items
fast
suitable for long distance
protected from elements
reliable
go when you want
unsafe
fixed routes
Train
isolated
enjoyable
can't do anything else
just yourself
1: 75.1%
lots of people
safe
can do something else
Coach
means to an end
sociable
go where you want
Bus
stick to set times
Bicycle
Walking
unreliable
Tram
crowded
not able to carry much
slow
exposed to the elements
suitable for short distance
2: 18.4%

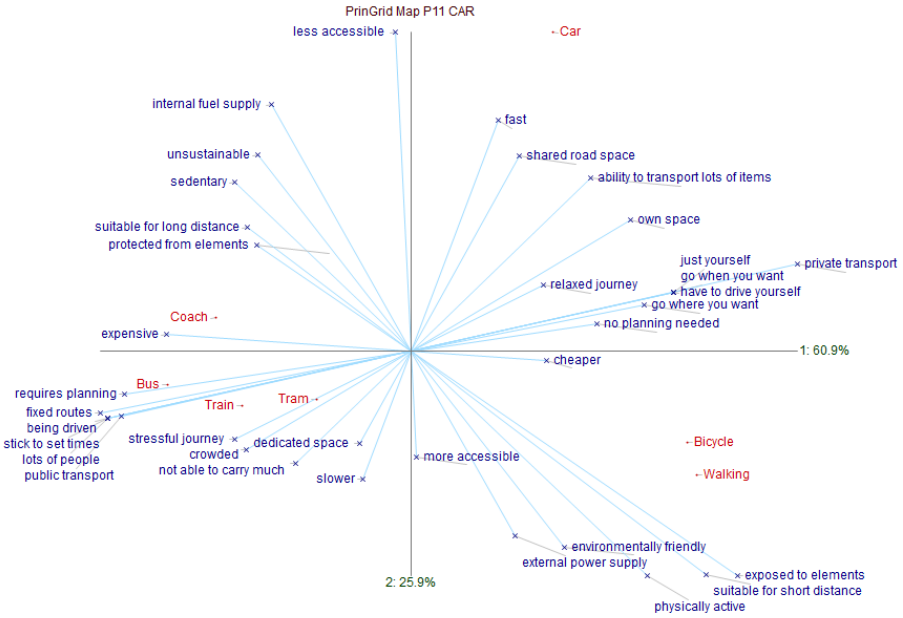

Percentage variance in each component
1: 75.1% 2: 18.4% 3: 4.8% 4: 1.1%
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1.9
1 2 3 4 5 6 7
Components P9 CAR

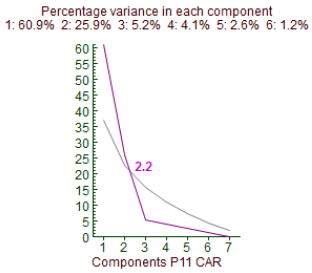

Focus Cluster P9 CAR [Interior]
100 90 80 70
means to an end 2 2 2 4 3 3 4 enjoyable
isolated 3 2 2 3 3 4 4 sociable
can do something else 3 3 2 1 5 5 5 can't do anything else
fast 3 3 2 1 1 4 5 slow
suitable for long distance 3 1 1 1 1 5 5 suitable for short distance
protected from elements 1 1 1 1 1 5 5 exposed to the elements
fixed routes 1 1 1 1 3 5 5 go where you want
lots of people 1 1 1 1 4 5 5 just yourself
stick to set times 1 1 1 1 5 5 5 go when you want
unreliable 1 1 2 3 5 5 5 reliable
safe 1 1 1 1 3 3 3 unsafe
not able to carry much 1 1 1 1 5 3 3 ability to transport lots of items
crowded 1 1 1 1 5 2 2 own space
100 90 80 70 60 50
Walking
Bicycle
Car
Train
Coach
Bus
Tram

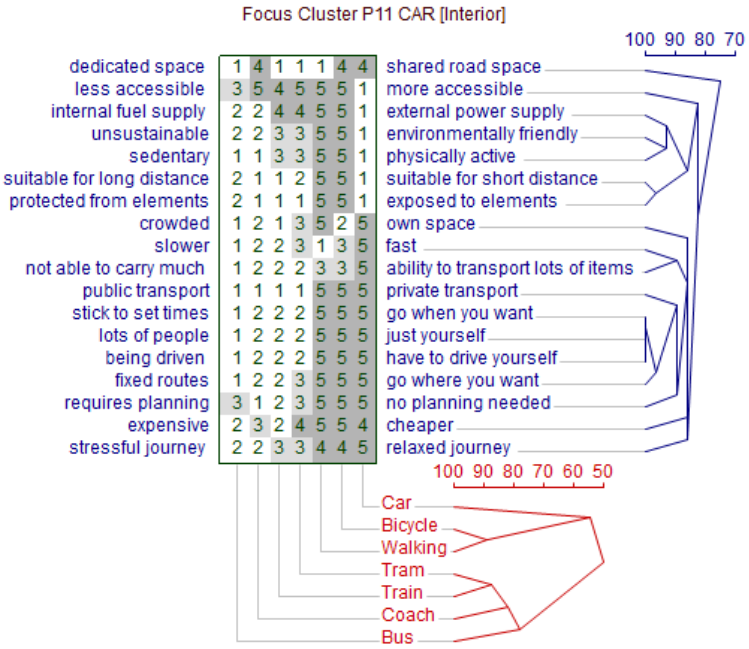

PrinGrid Map P10 CAR
unsustainable
Car
protected from the elements
suitable for long distance
shared road space
private transport
requires planning
go where you want
go when you want
fast
cheaper
safe
sedentary
relaxed travelling
Bus
Coach
reliable
own space
predictable
can't do anything else
1: 73.9%
crowded
unreliable
expensive
slow
stressful journey
dedicate space
stick to set times
fixed routes
no planning needed
public transport
Tram
Walking
Bicycle
Train
unexpected factors
can do something else
exposed to the elements
physically active
unsafe
environmentally friendly
suitable for short distance
2: 15.9%

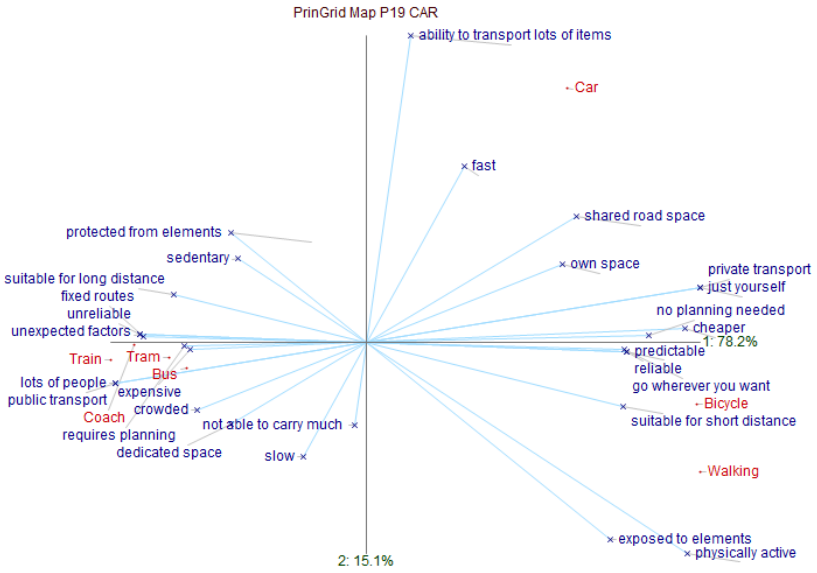

Percentage variance in each component
1: 73.9% 2: 15.9% 3: 5.9% 4: 4.3%
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1.8
1 2 3 4 5 6 7
Components P10 CAR

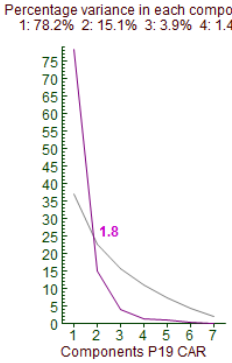

Focus Cluster P10 CAR [Interior]
100 90 80 70 60
unsustainable 1 1 5 5 5 5 1 environmentally friendly
suitable for long distance 1 1 1 5 5 5 1 suitable for short distance
sedentary 1 1 1 1 5 5 1 physically active
safe 1 1 1 1 5 5 1 unsafe
unexpected factors 1 1 1 1 5 5 4 predictable
expensive 1 1 1 1 5 5 5 cheaper
public transport 1 1 1 1 5 5 5 private transport
slow 1 1 1 1 5 5 5 fast
no planning needed 1 1 1 1 5 5 5 requires planning
fixed routes 1 1 1 1 5 5 5 go where you want
stick to set times 1 1 1 1 5 5 5 go when you want
crowded 1 1 1 3 5 5 5 own space
unreliable 1 1 1 3 5 5 5 reliable
dedicate space 1 1 1 1 3 3 5 shared road space
stressful journey 1 1 3 3 3 3 5 relaxed travelling
protected from the elements 3 3 3 3 5 5 1 exposed to the elements
can do something else 5 5 1 5 5 5 5 can't do anything else
100 90 80 70 60 50 40 30
Car
Bicycle
Walking
Tram
Train
Bus
Coach

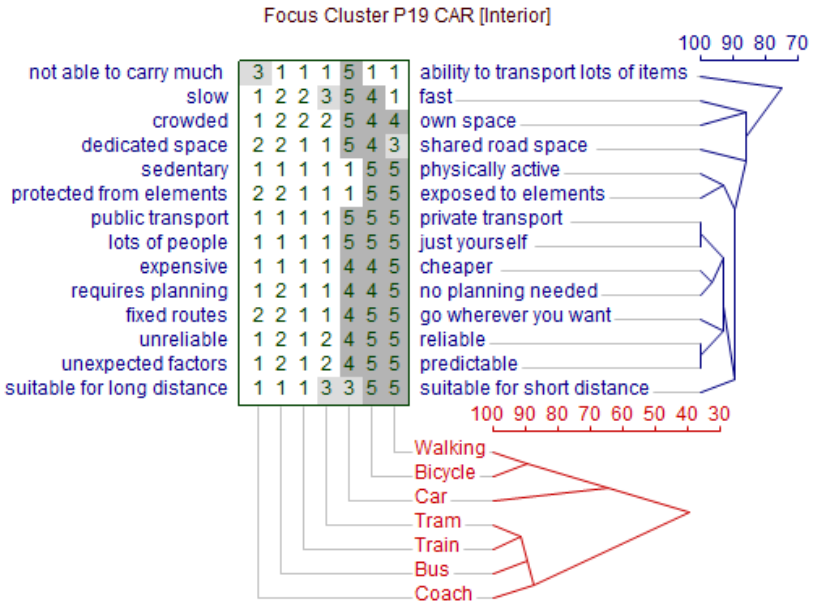

PrinGrid Map P11 CAR
less accessible
Car
internal fuel supply
fast
unsustainable
shared road space
sedentary
ability to transport lots of items
own space
suitable for long distance
protected from elements
just yourself
go when you want
have to drive yourself
go where you want
private transport
relaxed journey
Coach
expensive
no planning needed
1: 60.9%
cheaper
Bus
requires planning
fixed routes
being driven
stick to set times
lots of people
public transport
Train
Tram
stressful journey
crowded
not able to carry much
dedicated space
slower
more accessible
Bicycle
Walking
environmentally friendly
external power supply
exposed to elements
suitable for short distance
physically active
2: 25.9%

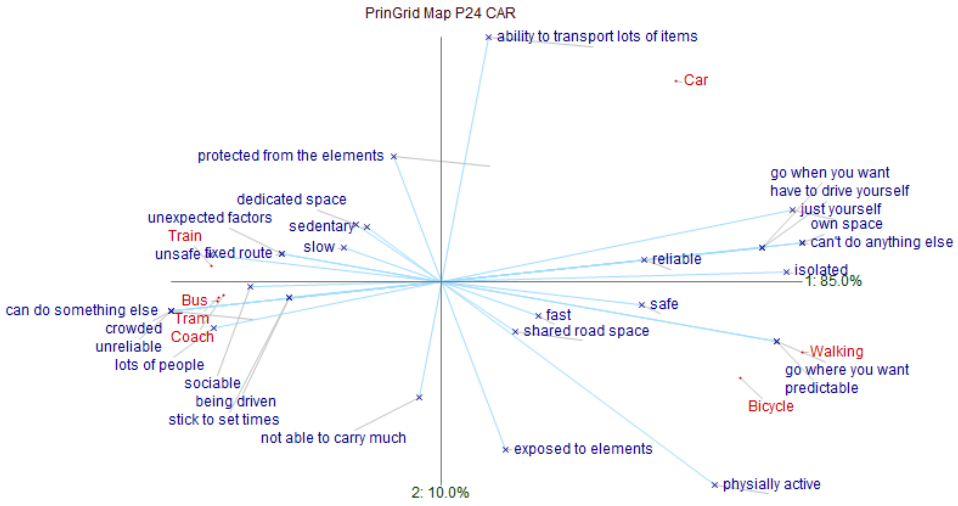

Percentage variance in each component
1: 60.9% 2: 25.9% 3: 5.2% 4: 4.1% 5: 2.6% 6: 1.2%
60
55
50
45
40
35
30
25
20
15
10
5
0
2.2
1 2 3 4 5 6 7
Components P11 CAR

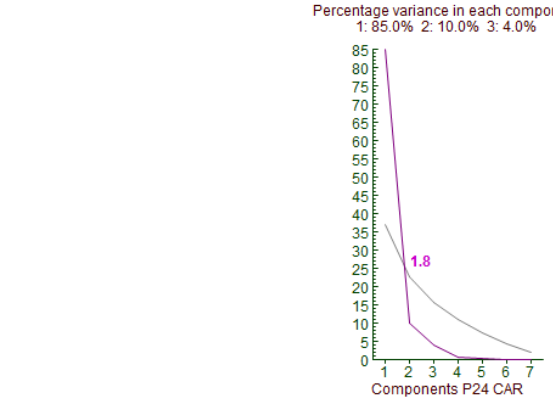

Focus Cluster P11 CAR [Interior]
100 90 80 70
dedicated space 1 4 1 1 1 4 4 shared road space
less accessible 3 5 4 5 5 5 1 more accessible
internal fuel supply 2 2 4 4 5 5 1 external power supply
unsustainable 2 2 3 3 5 5 1 environmentally friendly
sedentary 1 1 3 3 5 5 1 physically active
suitable for long distance 2 1 1 2 5 5 1 suitable for short distance
protected from elements 2 1 1 1 5 5 1 exposed to elements
crowded 1 2 1 3 5 2 5 own space
slower 1 2 2 3 1 3 5 fast
not able to carry much 1 2 2 2 3 3 5 ability to transport lots of items
public transport 1 1 1 1 5 5 5 private transport
stick to set times 1 2 2 2 5 5 5 go when you want
lots of people 1 2 2 2 5 5 5 just yourself
being driven 1 2 2 2 5 5 5 have to drive yourself
fixed routes 1 2 2 3 5 5 5 go where you want
requires planning 3 1 2 3 5 5 5 no planning needed
expensive 2 3 2 4 5 5 4 cheaper
stressful journey 2 2 3 3 4 4 5 relaxed journey
100 90 80 70 60 50
Car
Bicycle
Walking
Tram
Train
Coach
Bus

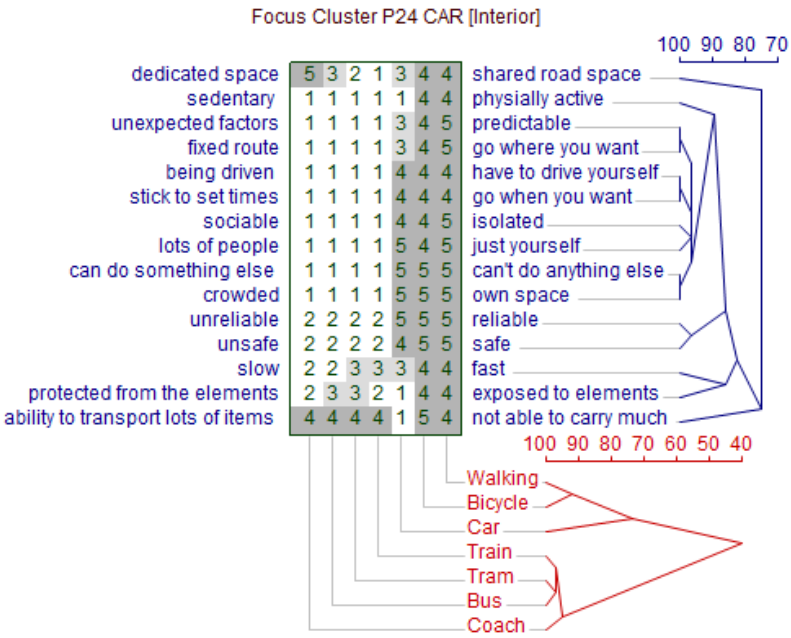

PrinGrid Map P19 CAR
ability to transport lots of items
Car
fast
shared road space
own space
private transport
just yourself
no planning needed
cheaper
predictable
reliable
go wherever you want
Bicycle
suitable for short distance
Walking
exposed to elements
physically active
protected from elements
sedentary
suitable for long distance
fixed routes
unreliable
unexpected factors
Train
Tram
Bus
lots of people
public transport
expensive
crowded
Coach
requires planning
dedicated space
not able to carry much
slow
1: 78.2%
2: 15.1%

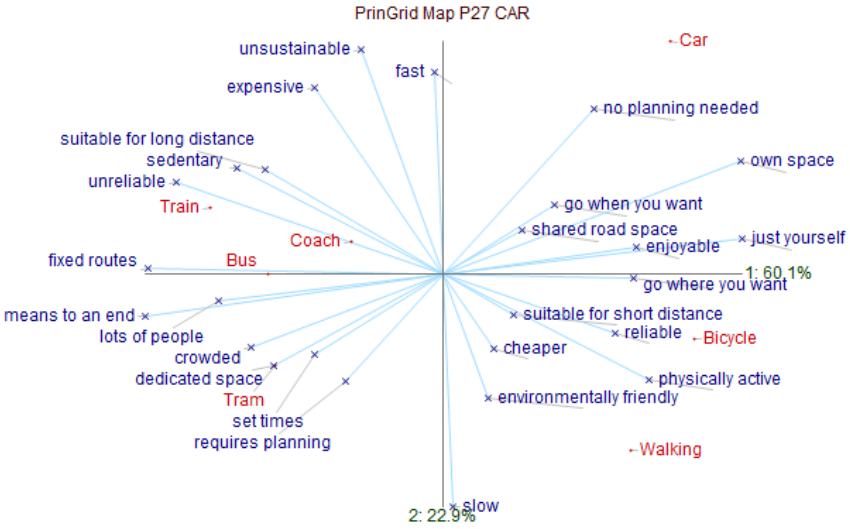

Percentage variance in each component
1: 78.2% 2: 15.1% 3: 3.9% 4: 1.4%
1.8
Components P19 CAR


Focus Cluster P19 CAR [Interior]
100 90 80 70
not able to carry much 3 1 1 1 5 1 1
slow 1 2 2 3 5 4 1
crowded 1 2 2 2 5 4 4
dedicated space 2 2 1 1 5 4 3
sedentary 1 1 1 1 1 5 5
protected from elements 2 2 1 1 1 5 5
public transport 1 1 1 1 5 5 5
lots of people 1 1 1 1 5 5 5
expensive 1 1 1 1 4 4 5
requires planning 1 2 1 1 4 4 5
fixed routes 2 2 1 1 4 5 5
unreliable 1 2 1 2 4 5 5
unexpected factors 1 2 1 2 4 5 5
suitable for long distance 1 1 1 3 3 5 5
ability to transport lots of items
fast
own space
shared road space
physically active
exposed to elements
private transport
just yourself
cheaper
no planning needed
go wherever you want
reliable
predictable
suitable for short distance
100 90 80 70 60 50 40 30
Walking
Bicycle
Car
Tram
Train
Bus
Coach

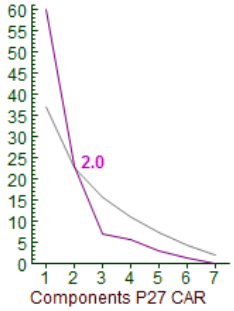

PrinGrid Map P24 CAR
ability to transport lots of items
Car
protected from the elements
dedicated space
unexpected factors
sedentary
Train
slow
unsafe
fixed route
go when you want
have to drive yourself
just yourself
own space
can't do anything else
reliable
isolated
1: 85.0%
Bus
can do something else
Tram
crowded
Coach
unreliable
lots of people
sociable
being driven
stick to set times
not able to carry much
fast
shared road space
safe
Walking
go where you want
predictable
Bicycle
exposed to elements
physially active
2: 10.0%


Percentage variance in each component
1: 85.0% 2: 10.0% 3: 4.0%
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1.8
1 2 3 4 5 6 7
Components P24 CAR

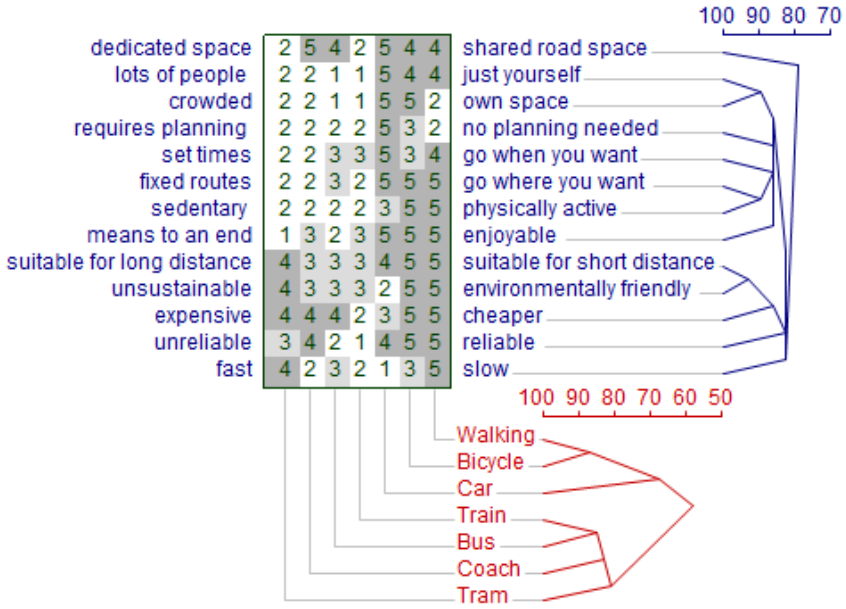

Focus Cluster P24 CAR [Interior]
100 90 80 70
dedicated space 5 3 2 1 3 4 4 shared road space
sedentary 1 1 1 1 1 4 4 physially active
unexpected factors 1 1 1 1 3 4 5 predictable
fixed route 1 1 1 1 3 4 5 go where you want
being driven 1 1 1 1 4 4 4 have to drive yourself
stick to set times 1 1 1 1 4 4 4 go when you want
sociable 1 1 1 1 4 4 5 isolated
lots of people 1 1 1 1 5 4 5 just yourself
can do something else 1 1 1 1 5 5 5 can't do anything else
crowded 1 1 1 1 5 5 5 own space
unreliable 2 2 2 2 5 5 5 reliable
unsafe 2 2 2 2 4 5 5 safe
slow 2 2 3 3 3 4 4 fast
protected from the elements 2 3 3 2 1 4 4 exposed to elements
ability to transport lots of items 4 4 4 4 1 5 4 not able to carry much
100 90 80 70 60 50 40
Walking
Bicycle
Car
Train
Tram
Bus
Coach

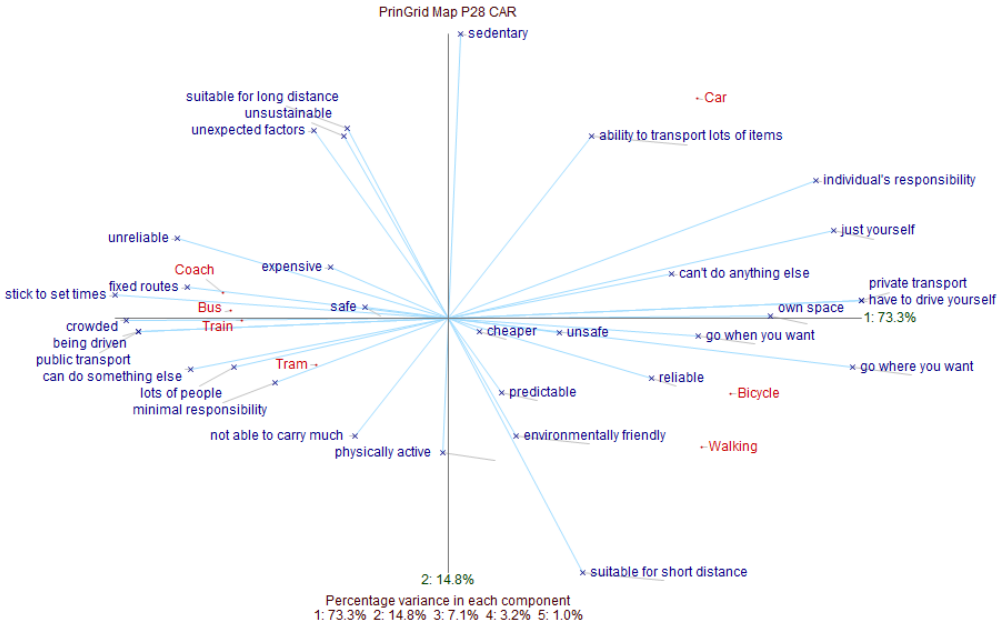


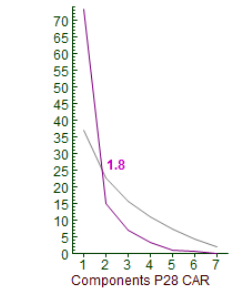
Percentage variance in each component
1: 60.1% 2: 22.9% 3: 7.0% 4: 5.5% 5: 3.0% 6: 1.5%

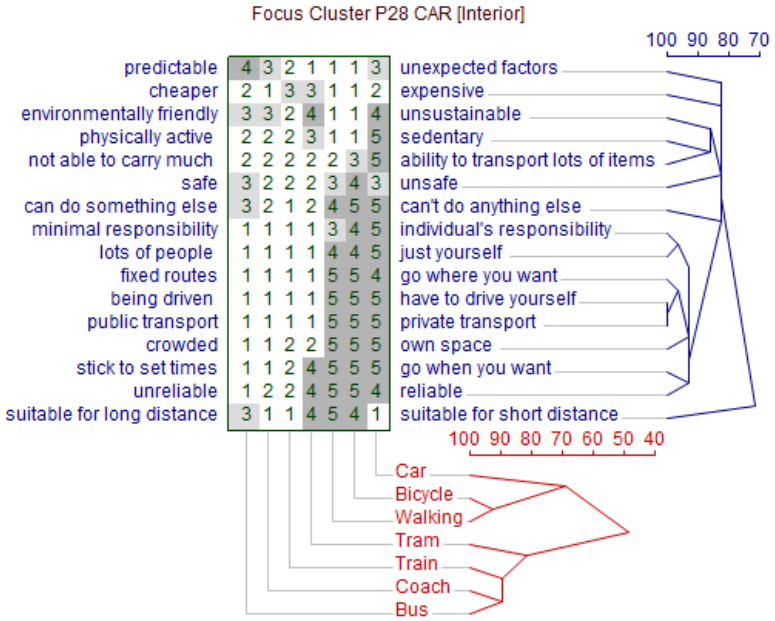


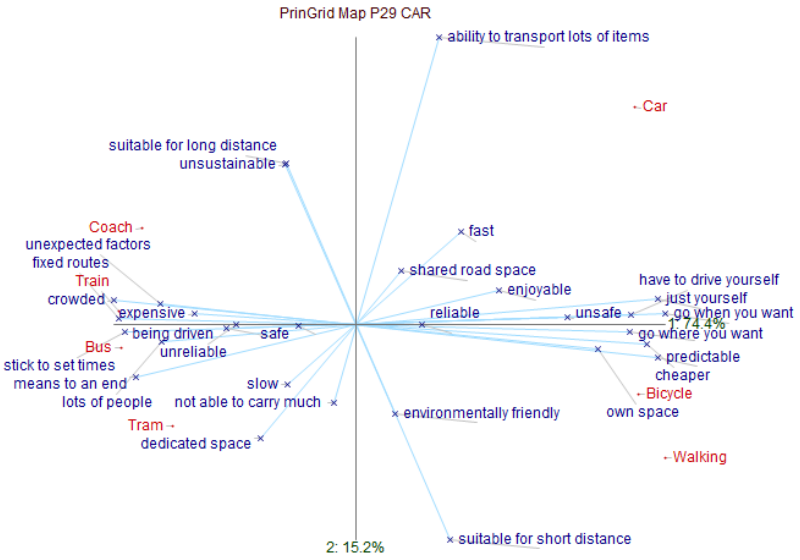
Focus Cluster P27 CAR [Interior]

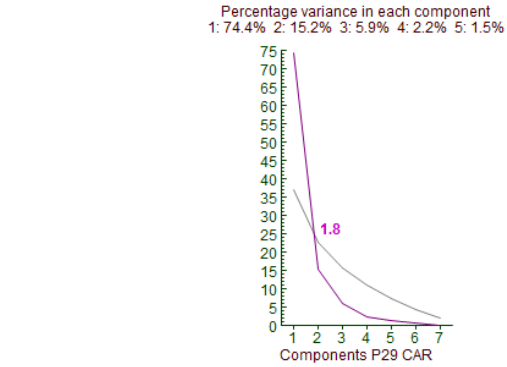


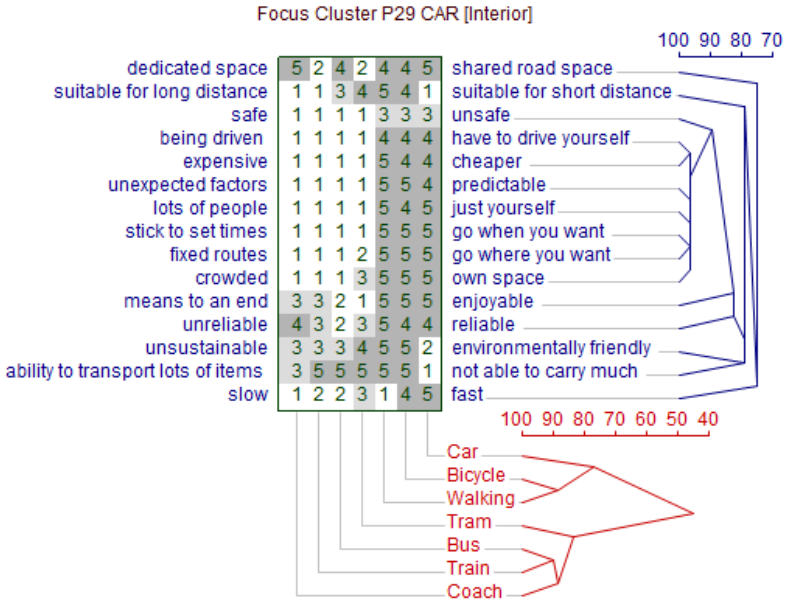

PrinGrid Map P28 CAR
sedentary
suitable for long distance
unsustainable
unexpected factors
Car
ability to transport lots of items
individual's responsibility
just yourself
unreliable
expensive
Coach
fixed routes
stick to set times
Bus
safe
can't do anything else
private transport
have to drive yourself
own space
1: 73.3%
crowded
being driven
public transport
Train
cheaper
unsafe
go when you want
go where you want
can do something else
Tram
reliable
lots of people
minimal responsibility
predictable
Bicycle
not able to carry much
environmentally friendly
physically active
Walking
suitable for short distance
2: 14.8%

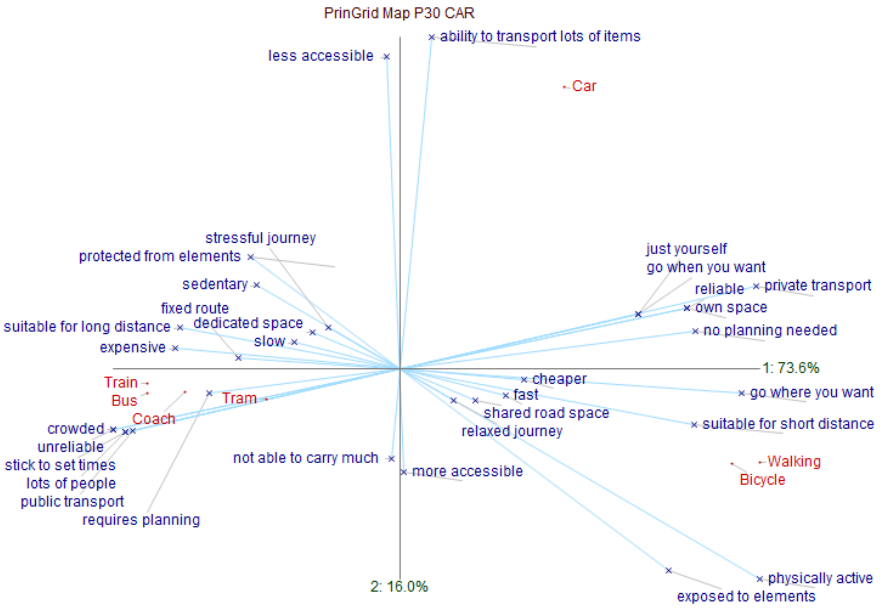

Percentage variance in each component
1: 73.3% 2: 14.8% 3: 7.1% 4: 3.2% 5: 1.0%
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1.8
1 2 3 4 5 6 7
Components P28 CAR

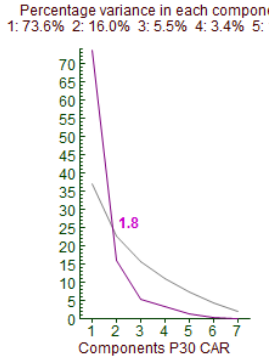

Focus Cluster P28 CAR [Interior]
100 90 80 70
predictable 4 3 2 1 1 1 3 unexpected factors
cheaper 2 1 3 3 1 1 2 expensive
environmentally friendly 3 3 2 4 1 1 4 unsustainable
physically active 2 2 2 3 1 1 5 sedentary
not able to carry much 2 2 2 2 2 3 5 ability to transport lots of items
safe 3 2 2 2 3 4 3 unsafe
can do something else 3 2 1 2 4 5 5 can't do anything else
minimal responsibility 1 1 1 1 3 4 5 individual's responsibility
lots of people 1 1 1 1 4 4 5 just yourself
fixed routes 1 1 1 1 5 5 4 go where you want
being driven 1 1 1 1 5 5 5 have to drive yourself
public transport 1 1 1 1 5 5 5 private transport
crowded 1 1 2 2 5 5 5 own space
stick to set times 1 1 2 4 5 5 5 go when you want
unreliable 1 2 2 4 5 5 4 reliable
suitable for long distance 3 1 1 4 5 4 1 suitable for short distance
100 90 80 70 60 50 40
Car
Bicycle
Walking
Tram
Train
Coach
Bus

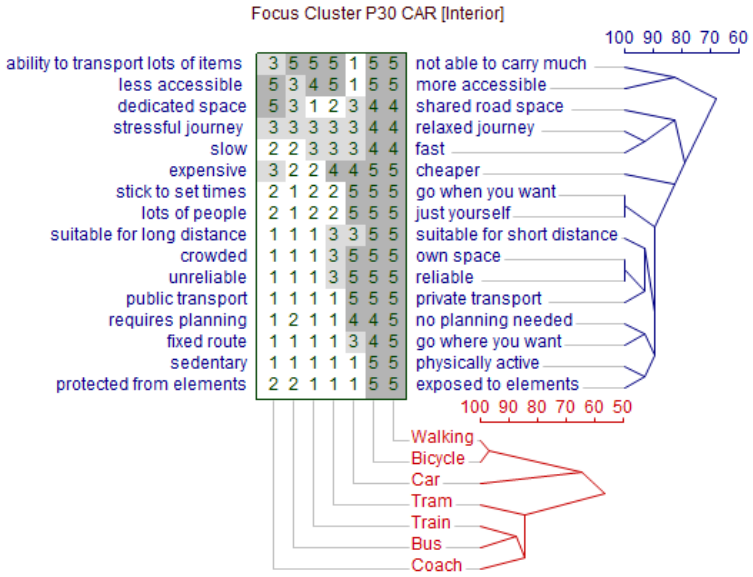

PrinGrid Map P29 CAR
ability to transport lots of items
Car
suitable for long distance
unsustainable
Coach
unexpected factors
fixed routes
Train
crowded
expensive
being driven
safe
Bus
unreliable
stick to set times
means to an end
lots of people
slow
not able to carry much
Tram
dedicated space
fast
shared road space
enjoyable
reliable
unsafe
have to drive yourself
just yourself
go when you want
go where you want
predicted
cheaper
Bicycle
own space
environmentally friendly
Walking
suitable for short distance
1: 74.4%
2: 15.2%


Percentage variance in each component
1: 74.4% 2: 15.2% 3: 5.9% 4: 2.2% 5: 1.5%
1.8
Components P29 CAR


Focus Cluster P29 CAR [Interior]
100 90 80 70
dedicated space 5 2 4 2 4 4 5 shared road space
suitable for long distance 1 1 3 4 5 4 1 suitable for short distance
safe 1 1 1 1 3 3 3 unsafe
being driven 1 1 1 1 4 4 4 have to drive yourself
expensive 1 1 1 1 5 4 4 cheaper
unexpected factors 1 1 1 1 5 5 4 predictable
lots of people 1 1 1 1 5 4 5 just yourself
stick to set times 1 1 1 1 5 5 5 go when you want
fixed routes 1 1 1 2 5 5 5 go where you want
crowded 1 1 1 3 5 5 5 own space
means to an end 3 3 2 1 5 5 5 enjoyable
unreliable 4 3 2 3 5 4 4 reliable
unsustainable 3 3 3 4 5 5 2 environmentally friendly
ability to transport lots of items 3 5 5 5 5 5 1 not able to carry much
slow 1 2 2 3 1 4 5 fast
100 90 80 70 60 50 40
Car
Bicycle
Walking
Tram
Bus
Train
Coach


PrinGrid Map P30 CAR
ability to transport lots of items
less accessible
Car
stressful journey
protected from elements
sedentary
fixed route
suitable for long distance
dedicated space
slow
expensive
just yourself
go when you want
reliable
private transport
own space
no planning needed
1: 73.6%
Train
Bus
Tram
Coach
crowded
unreliable
stick to set times
lots of people
public transport
requires planning
cheaper
fast
shared road space
relaxed journey
go where you want
suitable for short distance
not able to carry much
more accessible
Walking
Bicycle
physically active
exposed to elements
2: 16.0%


Percentage variance in each component
1: 73.6% 2: 16.0% 3: 5.5% 4: 3.4% 5: 1.2%
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1.8
1 2 3 4 5 6 7
Components P30 CAR


Focus Cluster P30 CAR [Interior]
100 90 80 70 60
ability to transport lots of items 3 5 5 5 1 5 5 not able to carry much
less accessible 5 3 4 5 1 5 5 more accessible
dedicated space 5 3 1 2 3 4 4 shared road space
stressful journey 3 3 3 3 3 4 4 relaxed journey
slow 2 2 3 3 3 4 4 fast
expensive 3 2 2 4 4 5 5 cheaper
stick to set times 2 1 2 2 5 5 5 go when you want
lots of people 2 1 2 2 5 5 5 just yourself
suitable for long distance 1 1 1 3 3 5 5 suitable for short distance
crowded 1 1 1 3 5 5 5 own space
unreliable 1 1 1 3 5 5 5 reliable
public transport 1 1 1 1 5 5 5 private transport
requires planning 1 2 1 1 4 4 5 no planning needed
fixed route 1 1 1 1 3 4 5 go where you want
sedentary 1 1 1 1 1 5 5 physically active
protected from elements 2 2 1 1 1 5 5 exposed to elements
100 90 80 70 60 50
Walking
Bicycle
Car
Tram
Train
Bus
Coach

Appendix C Supplementary material for Chapter 4

The following pages contain supplementary files for Chapter 4 ‘Ambivalent about travel mode choice? A qualitative investigation of car user and non-car user attitudes’.

C.1 Participant details and questionnaire

A questionnaire (Table C.1) was distributed to participants two weeks prior to the interview and assessed their transport-relevant attitudes. The questionnaire also asked for socio-demographic details which are detailed in Table C.2, separating non-car users and car users.

Question	Answer options (if applicable)
Gender	• Female • Male
Location of residence	• Urban • Rural
Age	*[open-text field]*
Highest education level	*[open-text field]*
Occupation	*[open-text field]*
Household composition	• Number of adults • Number of children
Annual income (before tax)	• > £10,000 • £10,000 - £19,999 • £20,000 - £29,999 • £30,000 - £39,999 • £40,000 - £49,999 • £50,000 - £74,999 • £75,000 - £99,999 • >100,000
Which 3 modes of transport are mainly used for	• Daily travel → *[3 open-text fields]* • Longer journeys → *[3 open-text fields]*
Annual driven mileage (approx.)	*[open-text field]*
Please respond to the statements below by indicating how much you agree or disagree. It is important that you don’t spend too much time	Q1: Changing travel habits is a great way of helping the environment Q2: It is easy for me to change mode of transport for daily travel Q3: We need more public transport services Q4: Car driving is affordable and good value for money Q5: Increased walking and cycling will help to tackle climate change

deliberating, but rather answer as quickly as possible. 1 – strongly disagree 2 – agree 3 – stand neutral 4 – agree 5 – strongly agree 6 – Don't know	Q6: I like travelling in a car Q7: The government should take more of a lead in protecting the environment, even if people don't like it Q8: Using public transport is convenient Q9: Using a car is the safest way to travel Q10: I am quite flexible about what types of transport I use Q11: When I am getting ready to go out, I usually don't think about how I am going to travel, I just get in my car Q12: We should increase prices of petrol to reduce congestion and air pollution Q13: Using public transport is a satisfying experience Q14: The car I own says a lot about the kind of person I am Q15: People should be allowed to use their cars as much as they like, even if it causes damage to the environment Q16: I find travelling by car can be stressful sometimes Q17: Being environmentally responsible is important to me as a person Q18: For the sake of the environment, car users should pay higher taxes Q19: Environmental threats, such as global warming, have been over exaggerated Q20: It is important to build more roads to reduce congestion Q21: I like travelling by bus Q22: I would like to travel by car more often Q23: The way I drive says a lot about the kind of person I am Q24: I am actively trying to use my car less Q25: Reducing my car use would make me feel good Q26: There are no practical alternatives to most of the car trips I make Q27: I would be willing to pay higher taxes on car use if I knew that the revenue would be used to support public transport Q28: I would only travel by bus if I had no other choice Q29: I am not interested in reducing my car use Q30: It would be easy for me to reduce some of my car use

Table C.1 Participant questionnaire

		NON-CAR		CAR	
		Range	**Mean (SD)**	**Range**	**Mean (SD)**
Age		22 - 59	37.9 (10.8)	22 - 64	41.5 (13.6)
Annual driven mileage		0 - 5000	1,020 (1722.5)	9000 - 20000	13,866.7 (3997.6)
		Frequency	**%**	**Frequency**	**%**
Gender	male	5	33.3	11	73.3
	female	10	66.7	4	26.7
Area of residence	rural	1	6.7	7	46.7
	urban	14	93.3	8	53.3
Educational level	HND	1	6.7	0	0
	Bachelor	4	26.7	4	26.7
	Masters	4	26.7	4	26.7
	MBA	0	0	1	6.7
	PHD	6	40	6	40
Occupational category	professional	6	40	4	26.67
	scientific/academic	6	40	7	46.67

	managerial	2	13.3	3	20
	full time education	1	6.7	1	6.7
Income category	< 10,000	1	6.7	0	0
	10,000 - 19,999	2	13.3	2	13.3
	20,000 - 29,999	5	33.3	4	26.7
	30,000 - 39,999	4	26.7	3	20
	40,000 - 49,999	2	13.3	3	20
	50,000 - 74,999	1	6.7	2	13.3
	75,000 - 99,999	0	0	1	6.7
Number of children	0	13	86.7	9	60
	1	1	6.7	1	6.7
	2	1	6.7	5	33.3

Table C.2 Demographic details of non-car user and car user participants

C.1.1 Attitudinal ambivalence

The table below show all quotes used to support findings for the overarching theme 'Attitudinal ambivalence'.

Cost
So there is a limit to what I would be prepared to pay out. I think we were saying that last time you know sometimes train travel for example is certainly something that I would do I would take a train into London any time over driving into London but it can be really very expensive and very unreliable in this country. For weekends I tend to use the car. That's probably because actually public transport options are there but they're expensive Car driving probably it is the most expensive way to travel because first you have to own a vehicle and then you have to insure it and then you have to pay tax for it and then you pay for petrol. I think that we all those of us who own cars only ever look at the cost of the diesel or the petrol when you hop in it So when I'm reflecting on it it's a very expensive way to travel if you take the whole cost into account. If I look at it in terms of well I've already paid out all of that so when I hop in it and do something it's actually convenient and relatively speaking in expensive – it's a dichotomy does that make sense. I do have a plan in future for how I'm going to live when I retire and paying out ridiculous amounts of money on really horrible trains you know it's a balance. (P12, non-car user)
Well for me, it has the implication of elitism I suppose to a certain extent. Well I think you need certain amount of resources to own and run a car. So I see it as a more expensive option than PT. In the long term anyway. (P13, non-car user)
The coach, you wouldn't get on the coach from here to go to city centre but its good if you want to you further away and its really affordable as well. The coach is tons cheaper than the train. Which makes it a lot more attractive than driving and parking.

Well you would have to pay for parking, insurance, all those things add up after all. It can cost quite a lot of money. So now when I drive to [workplace] I park about 15 min walk away and get some exercise in. That depends on the situation. So I would much rather have cheap...I would take public transport if it was cheap and it was faster. And if it were cheaper than petrol, then I would look at it and maybe consider it. Today, I walked into town to avoid like paying for parking, so I just walked into town. (P27, car user)
It's the cheapest, and its cheaper than the car. The car is much more expensive. You've got much more responsibility in terms of.. its an expensive piece of equipment. So I have a family and with a family its much more expensive to go on public transport it can be more expensive than car actually. If I take the bus, compared to walking, it's a 10 minute difference and that is worth the fun, its much cheaper so actually very expensive for a single ticket. When I used to commute in [city], there were two options. One option was the bus with moderate walking and the other option was the train with a large amount of walking. Time wise it was probably the same. But walking wise it was different. So I did decide to take the route with the longer walk and I needed good shoes for that. And it turned out that my cost for shoes were about the same per mile than owning a car. (P15, non-car)
Well I think for me it is cheaper to take PT. Taking PT isn't cheap but because you are only paying for the journeys that you make when you make them, it feels cheaper. I think overall, it will be a cheaper thing but its not just a straight forward it costs less per mile than the car. Do I want to sell it and get something different and that made me think well actually the amount of money that it costs to have a car even if you buy a very efficient car or one that needs no you know very few repairs or repairs that I could do myself it's still money on something that I don't really want to have. (P18, non-car user)
And in some cases there's the cost as well. Unless you book a long time in advance it can be a lot more expensive than driving. I know for some people it is necessity and you just have to do it. My cousin, for example, who works in Central London, there's no point in driving. It would cost him a fortune, so he does the train and the tube every day. But because he goes at peak times it costs him stupid amounts of money. For certain things it is. For certain things it isn't. Well, I would think if I lived in the city, for example, and I didn't go very far and if I was using local buses and possibly the train or in London, if you were using the tube, I guess, although that's got more expensive these days – then you'd probably spend less than having to keep a car. When I was saying more expensive, I was talking more about the keeping of a car as opposed to the price per mile. I'm sure that if you work it out, trains and buses are probably not that far different in terms of price of a ticket, especially the peak hour ticket to the price per mile if you drove. But you add onto that your insurance, your road tax, all of that and the maintenance and things, it makes it more expensive from that point of view. (P3, car user)
And because the idea of sharing it, the cost with other people makes it viable. Cheaper than let's say getting a train to the place and then when you are there not having the freedom to go to places. (P21, non-car user)
You know, you have to learn how to drive a car, you have to go through a process of getting assessed whether or not you have the right skills. There is a bit of a hurdle for getting into a car and then having access to a car is a kind of privilege in a way. Trains and buses tend to be more accessible modes on a day to day basis. Although perhaps if you use them often enough cost really tend to add up compared to what you might spend, you know, I don't know… you kind of have to work out the calculation for what kind of travel you do. Bicycle and walking are very accessible modes of transport. I mean you have to spend money on a bike but it doesn't necessarily have to cost you that much money and it certainly is less expensive than a car. They don't cost that much to maintain or run. (P20, non-car user)

I think it costs about the same for me to get the train to work as it does for me to drive.

if I can walk places then I will to save the money on driving anywhere.

And I don't really have the money to waste on filling up my car 2 or 3 times a week. I have plenty of other things to spend it on like a mortgage

It was just the fact that its… well it should be cheaper.. If you are going into [city] once you factor in parking… most of the time I can walk, but perhaps if the weather is bad I think the bus would be a better choice. Or coming up here I can imagine it would be cheaper in some ways. So I think cost is a big thing.

And depending on where you are going. Trains can get very expensive. And you sometimes have to buys separate bits of the journey in sort of instalment so that it saves on cost. So I usually work it out how much it costs by train and then sort of roughly how much that would be in petrol.

Like I don't drive that fast because I am worried about how much it would cost in petrol and things like that and you know, the safety of it.

When you fill up your car with petrol very often that almost seems more expensive than paying out for the ticket online. It doesn't seem like your spending the money in the same way.

Because on a lot of the bus sites it doesn't tell you how much it's going to cost. That makes it difficult as well. I had to get the bus one day and I only had a 10 pound note and then I got one of those £5 vouchers as such. And this was the first time I got the bus in like 3 years so this may not be useful to me. You can go and change it up at a bus shop in town, so when am I next going to be there? When does this expire? So that was again another difficult thing. I think in modern times with everything on cards to suddenly have to have cash is not always that easy.
(P4, non-car user)

When it hurts the most is generally when I have to take my car off to MOT. That's just pure quantity of money more than anything. Obviously the amount of travelling I do puts my car under an awful lot of strain and stress and everything else and it's getting quite old now anyway. I can't actually remember an MOT where it's passed, which isn't terribly good. So yeah, that's always quite expensive. Especially when you're trying to save up, it doesn't feel great to have to have that extra bill.

I imagine it would be another cheapish type car that I can just kind of keep ticking along.

Sometimes I feel a bit guilty about having to drive in all the time, especially I'm obviously trying to save for a house and it's quite expensive, so I feel quite guilty about having to fill up my car all the time and taking the money out of our savings for that.

There's obviously quite a few negative implications in terms of […] money. They're quite expensive things to run.

If I lived in a place that was convenient for a train station I could walk to or a bus that I could take to get here or whatever. Both of which on their own would be cheaper than driving, but because I have to drive to get the train or drive to catch a bus or whatever, it's obviously that much more expensive.
(P1, car user)

I think if I had to pay for it myself I would look at the relative cost. Because cost is important; budgets are important and a train fare to London can be £150 depending on what time of the day you go, and if I can travel – I'm not sure what the petrol costs would be to London – but it would be less than half of that – that's quite a chunk of money that one would have to find.
(P24, car user)

I haven't got to try and find a parking space that's going to cost a lot of money.

For me, where I live, car is the cheapest form of transport.

And it's also getting more and more expensive, train fares and fares and this sort of thing. I can fill my car up. It will do 600 miles for about £43.

The advantage I have is because I've got a 13 year old car. I bought it when it was an 11 year old car. I know what its depreciation is. It's at the moment I've paid £2000 for it. I've had it for two years. I'll have it another two years. It's £500 a year. It's not huge. I fully understand all of that. Insurance is £150 for the year, but that's for the whole year so if you start factoring it down it's still means that it is cheaper. (P5, car user)
That depends whether you are travelling individually or whether you are travelling as a family. When you are tavelling individually then bus or train are the cheapest options, there is no doubt about that. however if you are travelling as a family, when you are talking about cost of a car, the train is usually more expensive even though you book tickets in advance it still works out a lot more pricey if you go any distance. The bus is probably the cheaper option than the car. (P11, car user)
I know that PT is gtting more and more expensive and trains are a lot more expensive than they used to be. But there is still… I haven't figured out what I spend on my car but if you spend money on fuel, insurance, tax, MOT and I never had a new car in my life and you always spend money on fixing cars. I do it myself, but its still expensive. Every year when the MOT is due, there is always something. Which I mean on a bus you dot pay for the maintenance, you don't pay for the diesel, you just pay fares. So I never actually worked it out but if you took the bus every day it would probably work out cheaper than the car over a year but I cant say for certain I haven't done the calculations. It works out easier, it may be more expensive, but its easier to just take your car. (P29, car user)
I don't actually know how it compares in terms of costs. I have not worked that out but I think driving is cheaper overall. Well there was a time when I first started driving into [city] the reason I got the train was because it was cheaper. But then the prices kept going up and though "well the amount im saving, I might as well have the extra flexibility and drive into [city] And it's [cycling] free so you don't have to worry about fuel and tax and all of that. (P30, car user)
If I had a free bus pass, would I use public transport more often? I might do, on my non-working days, but I still wouldn't use it on a working day, because it adds too much time in, even though I know it's costing me £5 each day to drive into work in petrol, and then there's the parking permit on top of that. And I do occasionally catch the bus or train because there are additional costs associated with the car. (P9, car user)
Certainly, very long distances I would travel by train if it was just me. And especially if its for business because the cost is not so significant. Cost even with maintaining it, because ive got a car and the marginal cost of me owning the car is on discount because I need it for most things. And usually the cost of travelling distances by car is still cheaper than going by train unless you can time it very precisely. But often there are restrictions with the advanced tickets and all that. Often those will be cheaper. But for business I always go by train when I can. And I cant justify a taxi to myself, almost never take a taxi if its just me and its my money. If it's the business money it makes sense because its my time, its wasting if I take half an hour to walk to somewhere its probably cheaper to take a taxi overall. So that's the mentality. I always think how much is this costing. Mostly in terms of money, quite often in terms of money as well. Saving money is important. Ive grown up like that. im just very careful with money and its quite obsessive. I think it's a sense of accomplishment behind that. I have 2 children they are now 15 and 13. And my eldest is currently in special school and the government doesn't want to pay for it anymore. Its saving for contingency, saving money for the future to do things we enjoy doing. Its that mentality, growing up with little money, you save. If one of us looses their jobs etc or for university for our children. And both of us would like to retire early and having enough to be able to afford that and be comfortable and relaxed. I like the idea of not having to worry about money at some point. no, it takes much more time, cost much more money and is a lot more wasteful because I don't have to be there. It takes ages to drive into London, then in terms of fuel it would be much more expensive because of the

congestion and congestion charge. There would be nowhere to park and all that. I generally do not drive into London. And the fact that there were 3 of us so the balance of cost and convenience again because three of us in the car is easier and probably cheaper than 3 of us on the train. there is the thing that the fare is per person whereas the car is however many people you can carry, the marginal cost of adding an extra person is very small. The marginal cost of adding a person on PT is very large. I have occasionally driven to Birmingham because there were 4 of us going. Whereas on the train, we would all travel but it would have cost more. So again it's a cost implication with more people, cars work better than trains and buses. Its that zero marginal cost both in terms of effort and of walking or cycling but for short distances. The longer route is slightly quicker, but potentially slightly higher fuel cost, because I'm travelling at higher speeds. The other thing that might change my attitude, I suppose equally, the balance being the cost of fuel massively going up, might change. (P7, car user)
It would depend where I was going and why and with me with my friend I've got a friend I meet in Bristol and I always go by coach. It's just actually it's a lot cheaper to go by coach to go to [city]. For private it [cost] would probably be the most important. Yeah because I mean journeys are so variable in terms of if you catch the train it can be you can get a ticket to London for anywhere between you know five and five hundred pounds it's stupid how much it varies and it depends on whether you are going you know first class when you travel. Yeah so cost I wouldn't go because it's only a journey I'd rather you know spend the money when I got there. (P10, car user)
The car is always more expensive. The car is always an investment. If you have to spend 20.000 on a new car, you can get a nice bike for about 100. And obviously fuelling it, petrol is more expensive than food and break cables, tyres. You need to know what you are doing. You need to know when to buy a ticket, where to get it from, how to get it at the best price. It does bother me because like everything most transport is privatised, its so designed to make you spend more money, make more journeys, buy more expensive tickets essentially, because they want to make money. So they make it harder for you to just get the cheapest ticket. Because there is like 10 different types of tickets and no one will ever tell you what is peak and off peak. So you just don't really know. And you don't want to spend all the money you earn on tickets. And sometimes you can only get tickets online, then you have to pick it up. it's very expensive. And it can make a huge difference. So I only own a certain amount of money. There will come a point where it gets any more expensive I will have to say, it's not worth working. I don't earn a lot of money, there is a limit to what I want to spend on transport. Its not about saving money, its about at what point does it become utterly ridiculous. so simple as that. Its just economics. (P22, non-car user)
I don't think the costs are excessive using a car. Ive got money to spend on other things. Maintenance around the house, rugby season tickets. Its important to have savings so that you have flexibility knowing that your disposal income is better than it would have been. Its quite nerve wracking when you don't have that safety zone, that buffer. (P6, car user)
Safety
Yes I do because of the number of road accidents that there are. Really accidents on public transport are much fewer or seem to hit the headlines less whereas road transport is actually quite a dangerous occupation. There was a one-off. I used to travel to school an awful lot you know by bus in fact I did nothing else for seven years as perhaps you may have done as well and that was just a one-off accident in the course of many, many journeys. You know yes I've done many, many journeys in a car but also you know I've had two accidents and I've seen numbers of others so you know deep down that road transport is actually quite a dangerous means

of transport simply because of the number of variables involved. Public transport especially trains, aeroplanes that sort of thing remove a lot of the variables so intrinsically they're safer. I don't know because I tend to think that if I am reasonable as a driver then I would be able to anticipate my way out of quite a lot of accidents so the question of safety I don't think really crosses my mind as something.. You know there is risk to everything and you have to live with that risk or you live in a little box which is you know you're safest place to be and yeah travel's risky but so is everything else. (P11, car user)
I actually feel road safety is- you're at a higher risk with road safety than you are with rail, but there are things you can do to mitigate that risk; the manner in which you drive, the type of vehicle you've got, and so yes, to me I will take as many mitigating actions as I can to maximise the safety. But equally, if you do a long commute on the motorway day after day you do wonder whether it will be your turn to be the one that somebody comes into. Because not all accidents are by any means your own fault. I think that makes the driving more stressful, so for example when you're going along the M4 every morning, which I do, and you get to Reading and it all sort of concertinas up as you hit the back of the wave, you see all the red lights, and then it eases up and you get these waves. I don't like driving that, I'm very familiar with the sort of patterns and the familiarity makes it safer because you're expecting it, fore armed, fore warned. (P8, car user)
I mean most of my travelling, my day to day travelling is on my bike. And the bus is in fact the most scary thing to go past you because they suck you out slightly. The theory that buses and cyclist can share bus lanes is an interesting idea. In [city name] I don't mind cycling where there are cars because most our roads aren't actually that fast. Because [city name] has a lot of cyclist, many of the car drivers are actually quite conscious about how much space cyclist need and the way cyclists behave. I'd probably feel safest, in [city name] I feel safest in a bus, I mean I don't use buses at all, followed by the car, followed by the bike. Actually. On a bike, other cyclists and pedestrians can be a complete chaos. Bikes are completely silent and pedestrians often walk out in front of them. So you don't get that with the bus. My car can feel safe if its late at night, if its dark, if im going somewhere where there isnt a better way to get there. I do try to cycle but will resort to my car. Im not cycling at the moment because it's frosty. Im afraid to slip off and either hurt myself just simply by hitting the ground or being underneath somebody's wheels. It would be unsafe in certain parts of the city to simply strolling around late at night. I would be afraid of other people or traffic. Because in the dark, later on, traffic can be much faster. The train feels safer as a mode of transport. Im kind of conscious that the car is probably the most dangerous form of transport. So I regard the car as the most dangerous in view of having an accident. Ive never fallen asleep in a car but people talk about it. So the train is much more relaxing. actually because I go down the cycle paths it's actually reasonably safe and it's it doesn't feel like travelling through the city. Actually probably if I was really honest the bike is the least safe option. I try if I'm going to have a drink not to take the car and then I will either use a bus or a taxi so the car becomes important again probably for convenience and safety actually. I don't do it when it's really cold or frosty or snowy or really windy. So you know will judge whether it's actually going to be genuinely unsafe to be on the bike but I will cycle in almost all weathers I don't mind if I'm wet when I get to work that's just an inconvenience I can get dry. I'm also occasionally not very often but occasionally completely horrified watching what someone else has done in a car and thinking you know that is an accident waiting to happen and scary and I am not a saint I am

sure there are things I do on occasion that are actually not good and are a bit dangerous. So that's the sort of stressful part of it. (P12, non-car user)
That's why lots of traffic would wind me up a bit. Maybe feel a little bit more anxious. Any sort of perceived altercation with the vehicle is always stressful. (P13, non-car user)
I rented a car a few years ago because we wanted to go skiing with friends. We had to rent a car because the university didn't provide the service of...I was going. Actually they provided but for a limited number of people, so with extra people had to provide for themselves. I rented a car on that occasion and I was responsible for it. If I am alone it is okay, if I have seven other people with me, because we rented a big van I was a bit stressed. Because I am responsible for them to. I need to pay attention to the road more. Well, I am a good driving. I think that I am a good driver, I am not reckless but at the same time...yes I didn't like the fact that they depended on me basically. I mean their safety it is a lot. I would feel different if I had my own car; I mean of course there is always an insurance. Any problems between insurance is who is the fault for the accident or not. (P25, non-car user)
The only time I don't like doing it is beyond twilight. (P5, car user)
Ive always felt more secure on a bike than in a car. Because essentially I think its like an extension of my own body rather than something that is just a shell where I press buttons. But on the other hand there is the vulnerability aspect. Because in the car, you are so cushioned and protected from weather, from other drivers, from pedestrians, cyclists, noise. Yeah, this is going to sound really strange. I see other cyclists as being very vulnerable but when im on my bike I feel very confident. I mean there are occasions when if somebody passes me really close that I feel quite vulnerable. But that exactly the same as I would feel in a car if someone passes really close or if someone was really close behind me. I see other people walking and cycling as vulnerable but I, myself I feel really secure. I know what im doing and if I really need to I can just get out of the way. But in a car I cant. I can probably think if it was a different city or a different time, there might be a question of the security of walking on my own somewhere and not feeling safe. everything is designed to cater for cars. If you go around a roundabout, best of luck. Nobody's going to see you. If you're a pedestrian and you wander around on a roundabout, you're going to get shouted at, you're going to get beeped at. You're going to get so much harassment. It doesn't make me feel safe; it doesn't make me feel secure. It makes me feel like everybody's out to get you for whatever reason it is. They feel that they have a lesson to teach you, and you are there to be taught, and I'm not. I'm just trying to get from A to B. (P14, non-car user)
If there is anything wrong you can get seriously injured. I don't like that cycling is very dangerous. You are very vulnerable on a bike. Sometimes, motorists, cars passing too quickly... It's a personal safety aspects, especially kids personal safety. That's why I am going along quiet roads. You are much safer in the car. But I also read that even with the risk of injuries, cycling is still better or your health and life expectancy. (P15, non-car user)
Just trying to get out of my front door with the bicycle can be really difficult because the cars are parked that much apart from each other. From a safety perspective, I actually feel a greater need for street lights when I'm on my bicycle than when im on my feet. Because I feel more responsible towards other road users. Probably because I'm less afraid of being run-over than I am of getting in somebody's way But having said that, I'd feel more vulnerable when im walking. But that's a decision I've made and it's not a decision made for me. I feel more responsible if im on a bike and I hit someone whereas if someday hit me I would think it's theirs. (P16, non-car user)
I can see how having a car is wonderful, it's a safe space and you can just go where you want to go.

I think it depends a little bit on the context. I mean you hear so much about terrible car crashed and of courses. And often someone else causes a nasty incidents. So for all of those reasons, it kind of feels that in the car theres always something that can happen. (P17, non-car user)
So if I was cycling that's probably the least safe out of all the modes because I'm not a very safe cyclist like I was saying I cut people up whereas safety in the car is like crashes which are probably which happen more frequently whereas crashes in public transport are less frequent but things like robbing and feeling unsafe is more apparent on public transport. but then I am comparing this to London 'cos that's where Ive use public transport I haven't used public transport in [city] so it might be really nice but I am just avoiding it. but I've got London transport in my head so I wouldn't choose it in preference yeah feeling safe from other poeple is more important than not feeling safe and by using public transport I would feel less safe. So I'd rather use my car and risk being in a crash. Cause then its safer in the car than it would be to have a crash in a train. but I would use the car my personal choice because it's safer but if I was going round the outskirts of London if I was to go into London then you wouldn't drive there's nowhere to park anyway it's ridiculous and its very trafficy. I guess it depends on your route as well. but going into London is not something I do very often. (P19, car user)
uh well, I think, cycling and journeys by car are more risky than train journeys just purely because of the amount of cars on the road. Anyone can drive and anyone can cycle. And statistics show that both modes are the most dangerous. So the stats are not in your favour. But with cycling you have no protection at all and you are very reliant on people around you to give you space. There were some really nasty near misses. And I had an incicdent in the dark ones where a woman did see me at the roundabout although I had my lights on and everything. And that particular incident made me actually take the car. Up until February I took the car. I think there would have been more set times when I would have driven. So after the incident I was like "that's it, I won't cycle anymore until its light" a year later, time passed, there was no incident, no run ins, so I cycled again. And now you ask me, and actually over the winter, I have continued to cycle. Yeah I totally forgot about that but that had a big role in that. in terms of what's safer, yeah a car is a lot safer than the bike but you are also going a lot quicker and longer journeys and journeys you don't know so much. So that is also something to consider. (P26, non-car user)
I think car are the safest form of travel. I suppose in icy condition, cars can be dangerous but it tends to be more dangerous when you are cycling and walking because you have got less contact with the ground and less weight behind you. (P29, car user)
I mean, I suppose when you look at the figures, pretty much any form of transport is safer than driving a car, isn't it, by quite a large amount usually I would imagine. So yeah, I guess there is that aspect to it that taking the train or taking the bus, you will probably be safer in the long run. Having said that, I suppose it's difficult because whenever you see a crash, a bus, a train, whatever, it stays with people because when it happens – like with an aeroplane, it's so much worse. So yeah, I can see that the safety aspect is there, but there's always that thought as well, "Well I am a good driver so it's less likely to happen to me." That's a fallacy as well, I know, because it's usually not the driver at fault. It's somebody else crashing into you. (P3, car user)
Often, if I drive in the morning up to work I have fallen asleep on the way up. Then you fight to stay awake, which is never good. Yeah, where you can feel your eyes closing and you're having to keep yourself awake which is kind of a horrible feeling. And it's scary. Like I don't drive that fast because I am worried about how much it would cost in petrol and things like that and you know, the safety of it. (P4, non-car user)
yeah whichever mode of transport you use. Traditionally, I feel that people think PT is probably safer than potentially using your car. But again, I guess it depends on where you are driving, where you are riding and where you are walking. Its not a one size fits all. When you are riding a bike or walking and you are just going across one of the parks in London, its perfectly safe but if you needed to commute from one side of London to the other on a bike, its probably quite risky.

yeah, as much as any other road user can be. You know. You can take risks if you chose to but if you are daft enough to drive 100 miles then you are unlikely to be safe. But if you drive carefully and correctly and properly… (P6, car user)
With cycling and walking you are a bit more vulnerable, if you cycle or walk in the same vicinity as buses, cars and lorries. Maybe a bike is slightly more dangerous than walking. Depends where you looking when you cross the road. Cars are dangerous, even if you are a good motorist, other motorists can be dangerous but you haven't got a nice lot of armoury around you on the bike or human body. (P22, non-car user)
if it's a very busy road, very narrow and its quite dangerous, those things stop. That feels like there are constraints and its limiting so there are certain places where you think I just can't go there or I don't want to go there because it's not safe. well I think I would group cycling and driving together but from my own personal experience I would say that cycling is the most dangerous. Well I guess cars… car accidents are frequent and when they happen they are usually high impact and dangerous. With the bike you only need to try and cycle up a busy road and you realise how dangerous it is. And im still amazed that I haven't been knocked off. The number of near misses and you can easily think of one instance everyday where things could have gone wrong. I definitely think walking is the safest, just because it's not sharing road space with other vehicles, there is less risk involved. I think streets are set up to have that protective space for walkers. Road crossings are provided, it's a protected space. (P23, non-car user)
Being the driver
My most frequent journeys are made by car. I drive into work and like that it's a slow start to the day. Because I leave so early, it's mostly congestion free, so quite a nice drive. I don't like having to drive into work every day. I prefer to do something like cycling or walking or something like that. (P1, car user)
It depends I think on the situation. I enjoy driving but if I'm stressed out or I'm in a hurry to get somewhere or there's heavy traffic I don't enjoy it so much. Especially in England traffic is a lot worse here. Not so enjoyable. I prefer to use PT for that reason when I travel in the UK. (P21, non-car user)
If I'm just thinking about work, it's about productivity. I think, for me, it's about feeling that time is being put to good use, or that it's being wasted, and time that you're travelling can often feel, for me, just wasted time, if you can't get any other benefit from that time. I guess, sometimes, if sort of travelling outside of work, for sort of leisure purposes, then it doesn't need to be a quick journey. Especially if we're going somewhere in [county] or [county], or the [area], sometimes it's the actual journey itself. You're sort of travelling around to see something new that you've not seen before, or have a scenic journey, or sometimes, to take a more scenic route. Then, it becomes about the journey, rather than the getting there as quickly as possible. But, I guess, unfortunately, we do those kinds of journeys less frequently than work-related ones. It depends, ultimately, I guess, how you enjoy driving. I can drive, and I have driven a lot. I don't necessarily always enjoy it. think I just find it a bit stressful, to drive. So, I find that quite stressful. I find the physical act of it quite tiring. But, at the same time, I feel absolutely beholden to it. I would never trade that skill in. Because I think it's just too useful. Just having it as an option of something that you can do, or you could do if you chose to, is quite liberating, because it gives you the freedom. [P23, non-car user]
I think it's not fun because you are not in control. However if you were driving the bus that might be more fun. But yes it is not fun because you don't have control. But it is not to say that you can't enjoy yourself on public transport, but it is a different type of enjoyment. Like I enjoy myself as a driver because I'm in control of the vehicle and I take the roads on and that is a challenge in one way. That is fun but when you are on public transport you can sit there and you can read a book, or read a newspaper. And you have got that luxury that you don't have with driving, because you have to focus on the road instead. So that is quite nice if you wanted

to unwind and chill out, you can get a train and just sit there for three or four hours and just read a book, it is nice.
(P27, car user)

I do like cars. I like driving them. I suppose there's an aspect of being driven that where you get to look around and you get to see what's going on. Whereas when you're driving you don't, because you're concentrating on the road in front of you.

Well, it's quite nice because… Even commuting to work there are so many things that if somebody else is driving, I notice. You wouldn't notice ever when you're driving yourself because you're not looking, and there's a big difference. It is quite nice that.

Well, being able to look around and not having to concentrate, being able to take in your surroundings and just the general environment that's around you and looking at interesting stuff and what's out there.
(P3, car user)

So for me, whilst I enjoy not using my car, the alternative thing that I enjoy doing is something like cycling or walking or running or whatever to get where I need to be.

I guess one of the things that might happen in a car would be if you are travelling alone, you are having your own personal space and you don't have to regulate or monitor your behaviour and similar when you are with a very close friend or partner. You are less self-monitoring. You can control the climate, the heat the air in there; you can control who you sit next to.

At the same time when you do travel by bus or train you don't have responsibility for your own safety and in some sense, that can free up, if you want, cognitive resources to do other things. You don't have to worry about other traffic around you. Whereas when you are in the car, you have to be focussed. So the advantage of travelling, not by bus, but by train, is that you have that capacity to do other things you couldn't do, like working, potentially. So it also has its benefits.

Generally I think, when I have a lot of work to do. So if I haven't prepared my presentation or documents the day before I kind of rely on the productive time I have on the train to finish stuff off. The other thing is weekend trips. Although you have a lot of planning to do in the first place… in terms of schedules and timings… you can kind of switch off once you are on the train and it's a different kind of relaxation I think. Providing everything goes smooth.
(P24, car user)

In the car, you are sedentary. You are moving but you are not. you are moving with the car. So you continue doing nothing and continue sitting. Sitting is bad, in general, for us, for our health. You are sitting on a bike too but you are not inactive or sedentary.

With the car you can just focus on the road. So the car I would just use it for the purpose of transport.

I mean I feel relaxed when I travel that way. The whole travel, no it is not relaxing. The travel experience it is not relaxing, pay attention to the time schedules, no delays.
I like having time when I travel...I like at that time to work, to read. Do work related readings and so on, it is good. I usually...well if I can do something else on that travels. I know that I need three hours. So I say okay, I can work or I can sleep, I can do whatever you know. have noticed it is more disruptive to me if it is only one hour and a half, two hours. I can't really concentrate and do something really; you know to focus really on my work. So I would prefer longer journeys. I know at least I need three hours like that.

So for instance in regard to comfort I have to say, because this brings me back to the discussion of going to London through the coach, using the coach. It was not comfortable, I didn't like it. There was no table so I couldn't work on my computer and I had to move many times because the seats are more comfortable than the normal ones. n that case I felt I wasted time because I couldn't do my work. I couldn't read because there was no light and I couldn't relax. In the end I ended up sleeping, then sleeping when you don't need it, it is like a waste of time.
(P25, non-car user)

I actually like being a single person in my car. I love driving. I didn't learn to drive until my mid-20ies and it felt like a very liberating experience.

its much more relaxing to have someone else do it. Certainly on the train, im quite happy to just sit on the train and read and do other things whereas obviously you cant do that in the car while you are driving.

I actually enjoy driving.

So the train is much more relaxing. So there are a lot of other things I can do on a train I couldn't do in a car. So when im in a train I feel like I am using the time, even if im just reading my own stuff, relaxing and enjoying myself, having a good time. Its not super important but it can be really nice. And often when im on the train it can be one of the only places where I really do relax and read. Well if im driving and sitting in traffic, other than listening to the radio or music there is absolutely nothing else I can do.

There's I mean the only thing I can do on a bus is I can't read I think I said to you is listen to the radio and there's a limit to how much of that I want to do simply because I'm forced to do it

I try if I'm going to have a drink not to take the car and then I will either use a bus or a taxi.

I've misrepresented myself I actually think at weekends for me it's the convenience and actually I really like driving it's a pleasure I am very fortunate it's something I genuinely enjoy doing.

I think there's a very strong and impatient part of me I get quite frustrated sitting in traffic jams I'm also occasionally not very often but occasionally completely horrified watching what someone else has done in a car and thinking you know that is an accident waiting to happen and scary and I am not a saint I am sure there are things I do on occasion that are actually not good and are a bit dangerous. So that's the sort of stressful part of it.

I didn't own a car until I was nearly forty I still get this kind of pleasure out of oh it's an exciting thing it's my little bubble that takes me from A to B.
(P12, non-car user)

If I was going into town and drinking, I wouldn't drive the car I would walk.
(P27, car user)

I don't like driving to see friends, I rarely do it. The good thing about driving is, I mean [town] is a good example, a lot of thinking is done between [city] and [town]. Because I know the roads, there are usually quiet. I have no issues and im relaxed and switch off completely. So I used to do this commute in the past and it did give me a lot thinking time and because I knew the road quite well I usually came back more relaxed then when I left work. And interestingly, I think I like driving alone much more than with other people. Particularly, its not so much of an issue if you know ther person really really well but the thing I hate the most is when I finish work and ive got to drive four tennis guys who im trying to impress and try to take them to a tiny little town and ive got no idea where it is. Its literally horrible. So actually unless im very comfortable with that person, I like driving on my own and all the benefits of me driving we talked about is only really realised when im on my own. Otherwise, I much prefer to take the train.

Especially at rush hour, trying to find a little town you didn't even know exists. Its not a pleasant experience. And its not necessarily wanting to impress them its more not coming across like a complete idiot. Its just more stressful.
(P26, non-car user)

Well I suppose there is an element of being slightly more in control because you can physically do the driving whereas on a bus or train you are reliant on somebody else. I mean it doesn't really bother me and it can be actually more stressful when you have to do the driving.

Because well you know, I hate driving, I hate being a passenger.

Its not to say that I occasionally not accept a lift from somebody if they are going my way. But I think, well if you are going that way anyways…

Occasionally if I go out for an evening and I don't have my bike for some reason. Perhaps if going out I'm having 2 or 3 drinks and I don't want to cycle when I drink. Sometimes home late night socialising I might have walked or accepted a lift from somebody who's going my way.

Sometimes home late night socialising I might have walked or accepted a lift from somebody who's going my way. I'm not against going in a car when it suits me (laughs) and that sounds a bit, what's the word, hypocritical, I suppose in a way.

If for some reason I leave later, the traffic is much worse and it puts me in a really bad mood because you know it's just less pleasant to cycle when there are a lot of cars on the road. That's the only downside really.

It's just nice, when you notice the first daffodils coming up or the blossom coming out on the trees along the riverside. Just generally, it feels like a nicer way to travel. That's why lots of traffic would wind me up a bit. Maybe feel a little bit more anxious. Any sort of perceived altercation with the vehicle is always stressful. When somebody cuts me up and nearly knocked me off on my bike. That makes me feel very angry. And I'd probably don't stop thinking about it and going over it in my mind so it makes it a bit more difficult for me to concentrate on my work I suppose.

I love train travel. Because it is generally very comfortable, a bit more relaxing, I can read my book, listen to radio on my headphones. It's just a more relaxing way to travel. Although you are inside as opposed to being outside. So outside you feel a bit more connected with your surroundings. Not removed from your environment. If you are walking it is easier to join up areas and you get a better sense of your area.
I just rather spend my time doing other things than travelling from A to B. I suppose, travelling in a car particularly feels to me like completely lost time. It just feels like you cant do anything but concentrate on the actual driving which I find personally in no way satisfying or relaxing or anything. I just find it stressful and unpleasant.

With all other forms of transport there is something more enjoyable in the actual journey itself . So the actual act of walking or cycling to me is just much more pleasant. I would necessarily…. I mean I often go out cycling because I enjoy the actual activity of cycling or enjoy the actual activity of walking. So travelling to work on my bike or walking to work I just kind of feel its an enjoyable activity in itself. In and above itself whereas travelling in a car just seems to be a means to an end. Just getting from A to B and there is nothing else good about it really. I can't think about anything else because I have to concentrate on driving, I can't read my book. You know, if I'm on the train or bus I can read a book and do something else. And it just feels like complete lost and waste of time and you are a bit in a vacuum.

Yeah, a little bit of interaction just makes the journey a little bit more interesting cause sometimes with journeys you kind of switch off completely. One minute you are at work, the next minute you are at home. And you have no regulation of what was going on. And I guess you just feel a little bit more in the moment I think sometimes when you are cycling.

I associate car travel with traffic jams and general unpleasantness on the roads. And I associate buses and trains with more relaxed travel and the ability to read a book.
(P13, non-car user)

Well, I do quite like driving. But compared to cycling, I'd prefer cycling to driving because I feel like I'm getting more out of it than just getting somewhere.

But you obviously cant go our for a drink in the evening because you then have got to drive back again.
(P30, car user)

it's about measuring, it's about balancing that, okay it takes a bit longer to use the bus, but it means I can go to the rugby with the guys, have a couple of beers, come home and I'm not then thinking about getting into a car and driving whilst having consumed alcohol.
(P6, car user)

The bus drivers that I see, they are completely mad. Its just nice knowing that someone else has to deal with it and its finally not me shouting at someone through the window, get out of my way. So I control the start and the finish of the journey and the bits in between are a bit odd. It depends a lot on what else is goin on around you and there are things which are genuinely you cant predict for, e.g a deer running in front of you.

Well, I guess it is my responsibility to behave in a particular way, to make sure that I get to, for instance, the bus stop on time, to catch the bus. But once I'm on the bus, where it goes and what it does, and whatever happens to it, is the driver's responsibility. And even if we're running late, there's absolutely nothing I can do to help the situation, so I just don't worry about it, because there's nothing I can do. And I know it's a really strange way of looking at it. But it makes me feel less stressful, knowing that it's on somebody else's head,

and despite the fact that I'm still running late, it's not in my control, and it's pretty well-established that buses do run late sometimes.

I feel the stress of being late, but I know that it's not my fault, there's nothing I can do.

And I have always felt intimidated out on the road, in a car.

I never felt comfortable driving around in Bristol, which is strange, because I feel pretty comfortable cycling. There are signs everywhere, and they tell you so many things, and there are signs on the road, which another car in front of you is on, and you just don't know what's going on. It's not that well-planned, despite whatever it is that the Department for Transport does. It's very piecemeal and stressful.

I think it's probably got to do with the fact that I feel more in control when I'm cycling.
I can use all my senses, so I can see all around me that I haven't got any blind spots, I haven't got anything obscuring my vision.
(P14, non-car user)

Well and actually, everything is convenient where you don't have to drive. Its much less responsibility, it's much easier. If there is anything wrong you can get seriously injured.

So when I rent cars I almost always rent electric vehicles. Because I like them and they are environmentally better. I do like them and find them interesting. It's a much better experience to drive them.

When you are walking you are just responsible for yourself if you are alone of course. On the bike, it's a bit more because you have to take care of pedestrians. But it's still much less responsibility than the car.

Because it's the most fun. It's the cheapest, the most fun, the most healthy. Its good to ride, its exercise, its… you can see the surroundings. You can actually do much more sightseeing than in the car.

And you don't see the world. You don't hear the world, you don't see the world.
(P15, non-car user)

Because its just nice to be able to get in the car. I do enjoy driving, I actually really like driving so… Every opportunity I would jump at it, to drive. I think it's the.. I love to watch those HTV drivers monuevre those vehicles because im so impressed with their skill. There is this sort of, I try and drive well as much as I can. I suppose it's the sense of confidence in handling the vehicle. It's a sort of "I know what im doing". Theres something about driving and you know that you've got all this power to move this thing at great speed.

Because you have to be aware of other people around you. So its I guess its just something I guess I just.. I am aware of that there is something that is something quite nice about sharing a car journey with family and friends and there is a real social aspect to it.
(P17, non-car user)

I know im gonna get angry and I know I'll almost always get involved in an accident. So PT is best because you are not active really.

I like driving at night, there is almost nobody. It just feels very nice. There is almost no one and you can really enjoy driving. Because I do like driving and I really enjoy the act of driving. To be honest I miss it a little… I love driving but it's just the people on the road that spoil the whole thing.

it's much more passive I think. Because you know where you are going and there is a driver who is going to take care of you and you don't have to worry about changing gears and just being careful with the traffic, because someone else is taking care of it. So that's really nice. You can just take the good aspect of PT and make the most of it.

I mean you need to stay focused. And that's tiring because you got to be acting in the sense of like being focused, careful and your life depends on it. And you've got no choice. Its tiring, much more than taking the train. I know if I had to take the car for 5 h I would be sooo tired and if I take the train for 5 h I would just be fine.

You can go very fast and not be tired and I do enjoy going around curves and changing gears and yeah, I really like it. It does tell a lot about me as well, the way I act on the road. You can express your personality and your mood as well. So this is also enjoyable. It's basically a big line and you don't really have to worry about anything, which is priceless. Driving my car, I get irritated on a daily basis, its so frustrating. People drive like maniacs. They disobey rules, and its just terrible. When I got in my car I knew I am going to get angry. So I always make sure I arrive on time. But last week for example, there was over an hour delay and I had to take another train but didn't know which one and I was almost late. So it was a really stressful situation and I had to run to arrive on time. In the end I did arrive on time but it was tough. if it was an ideal world it would awesome to take the car and to drive but I know that it is going to be stressful and it's going to be tiring as well. Or maybe trains because there is no way to escape the timetable. Sometimes you have to wait hours and that can be annoying. You've got to be organised. And that's a bit more stressful. And the very fact that you just sit there. (P2, non-car user)
Just getting from one place to another is faster and less boring (laughs). When for example, I am driving and I am focussing on something, time seems to pass quicker. Well I travel quite long distances every day and its quite tiring to travel in somewhere. And if I had to spend any more it takes a big chunk out of my day. The main reason is that I feel very tired. (P30, car user)
Because I suppose you can miss what's going on. The world's happening outside the windows of your car and you're not looking at it because you're concentrating on the little black bit of tarmac in front of you. You're not looking at the trees and the sheep and the scenery. So yeah, I suppose there are advantages to being in a public transport situation where you can just sit back and relax and take it in, but then I do enjoy driving. That's maybe masochistic of me, I don't know. (P3, car user)
A good thing about public transport is that you can actually see what's going on around you. MOre so in the train actually because often you go through countryside. In a car, you are just concentrating on the road ahead of you and other road users. I actually prefer to be a passenger, you get the best of both worlds. You can look outside, enjoy the comfort of the car and just relax. Mind you, compared to the train, the scenery is probably not as pretty. sometimes when we stayed for an after work drink then I was like "ah I wish I wouldn't have to drive home today". But that was more in hindsight because these things tend to happen more spontaneous. Because so many people at work live in walking distance or don't really have to rely on the bus or train to get home, it makes it easier for them just to decide there and then to go out for drinks. And they also don't have kids. So on rare occasions when I can actually join them, I do think "Wouldn't it be nice to have another pint or more". Sitting in a car and driving is a typical example of doing something without doing something. Sitting in a car gives you the opportunity to not do any exercise. (P29, car user)
Well you have control over your activity on the road what you don't have any control over is the fact that you have to do the journey every day. Because I have to concentrate on getting from A to B because of the nature of the roads it's not a journey that you can ever not concentrate on. You have to be very aware of what's going on. (P11, car user)
Well obviously the bus and the tram both have drivers for you and the car you drive yourself. So it means that you kind of get stuff done on the other two. Not necessarily, it often doesn't work out that way because ive got a smaller car than other people. But I just like to have that option that I can drive people if that's the best thing and no one else can drive. It would put me off going places if I was always like 'can I have a lift please, can I have a lift please?' Like every time

having to ask for it. So I think I think I would not go sometimes just to avoid having to always be the person taking a lift. (P4, non-car user)
I suppose equally with that is that you have the pressure of having to navigate in the car when it's somewhere… you know, I think the car is good when it's sort of in your local area. When you are having to go somewhere else then it's up to you to kind of find your way whereas the bus and tram will go where you expect them to go. (P8, car user)
You can get there and get straight back, but actually the disadvantage is you wouldn't be able to enjoy a drink with your friends, because you wouldn't legally be able to drive. (P6, car-user)
Comfort
I quite like having that time, so you've got that 40 minutes to yourself, where you can listen to the news or listen to the radio. That's the only good thing about it. Obviously, having to get up, get the car started, scrape the ice off, get all the right clothes on, get everything loaded in – and at the moment, there are lots of traffic jams on the way in. They're doing roadworks, and so you're in very slow-moving traffic. That's not convenient Getting the car started in the morning, having to get it ready, de-mist the windows, scrape the ice off, get everything loaded in. It'll be cold when you start off. It takes ages for the heater to warm up. Those are all disadvantages, but there's no choice, because I have to drive in. I don't like scraping the ice. I don't like being in the cold. My car doesn't warm up very quickly. I don't like sitting there with my hands frozen. Those are the things which I don't like about driving. Being caught in a traffic jam which is moving slowly, I just listen to the radio. I just get into a different zone. (P9, car user)
I think cars in general are more comfortable generally, because you can control the temperature you cant do that on a bus or a train. I find it more comfortable just being in the drivers seat. And you you don't have anyone infringing your space which is annoying. Some trains ive been on are very comfortable but some aren't. and same for buses. So it depends on how modern they are. (P27, car user)
Because most of time you get to where you want to go roughly the time you thought you were going to make it. In case sometimes there is a massive pile up on the motorway then you don't. But most of the time you do. But you can't work in a car, you can only drive in a car, whereas on the train unless there is a child screaming at you, you can work. I can't work on buses. So there is recouping of time on some PT. if the journey is long and quiet enough you can get work done. I mean if you are the train and you are going along a nice route, if nothing else, you can look out the window and see something nice. Likewise if you are in the car, you can take the urban route or as an alternative the country route, where the roads are a lot quieter. Its quite nice if you're stuck in transport. It is quite nice to look at something pretty you are interested in. It's quite pleasant. Its not always good. So when you are in the car, you can control your environment. In the car, you can filter air, so its quite clean air. Although you are at a mercy of a fair amount of pollution because you are driving on the road with cars in front of you and they have exhaust pipes. (P22, non-car user)
The environment in the car is rather luxurious compared to that. you can have it as you want it, depending on what car you have. So you can change like the air conditioning or the music and its quiet and there is no other people sitting on top of you. You've got your own personal space. well unpleasant. My car is pretty unpleasant atm. It's just old. Cars in general can be nice. I thinks it's just your own space rather than feeling crowded. I'm alright with it. My husband hates it. So partly I feel stressed for him. I get anxious and stressed on his behalf. (P19, car user)
You also have a lot of control over what happens in the car. You have control over safety, your own entertainment you have in the car. You are able to have conversation with either passenger or over the phone without concern about somebody overhearing your private conversations which may or may not be desirable. So I would probably say you relax well in the car. Or you may relax in a different way than you do when you are traveling by a train or bus.

(P24, car user)
Being cold. Trains and buses are cold. It just makes it unpleasant. If its quite busy as well. Last time when I came back from Sheffield it was quite busy and I had to stand up for 4 hours. well business. If there is lots of traffic or lots of people on the bus, people on the train. If you are trying to work on the train and there is lots of people shouting or you cant sit down you know… and also when you are on the bus and its chucking down with rain and its soaking wet and you've got people sitting wet and its steaming wet. Like this morning, I had to drop my car off at the garage so I had to take the bus. I could have walked but it was raining so badly. I mean the bus is quite nice, occasionally. If its like a nice sunny day and you are not in a rush. If you don't have to get anywhere at a certain time and its not rush hour. If you are just out for a nice pleasant journey its quite nice sitting on the bus or the train. (P10, car user)
Well you get wet and cold. In the car you are in a warm and dry environment, you maintain your artificial environment. Whereas on the bike you are outside. I like being outside and I like burning energy, certainly in terms of cycling. The radio that you have to listen to is tedious. (P11, car user)
actually standing, waiting for a mode of transport if its raining, if its really cold. Its inconvenient when it's absolutely packed to the gunnels and you cant sit down, its not very comfortable and pleasant. So the train is much more relaxing. So there are a lot of other things I can do on a train I couldn't do in a car. So when im in a train I feel like I am using the time, even if im just reading my own stuff, relaxing and enjoying myself, having a good time. Its not super important but it can be really nice. And often when im on the train it can be one of the only places where I really do relax and read. Well if im driving and sitting in traffic, other than listening to the radio or music there is absolutely nothing else I can do. Tangling with all of the commuting traffic, not knowing whether the trains are going to be there, whether they're reliable although there's usually not a seat because I'm usually doing it in commuting times it's a Friday evening and Sunday afternoon so you know it just became one of those things that I just thought I just can't do this. If our trains were better I think if they were clean if they were nice to use if they were reliable if you could guarantee that you would be able to sit down if there wasn't constant holdups on the line you know I never know when I'm going to get there. I don't do it when it's really cold or frosty or snowy or really windy. So you know will judge whether it's actually going to be genuinely unsafe to be on the bike but I will cycle in almost all weathers I don't mind if I'm wet when I get to work that's just an inconvenience I can get dry. (P12, non-car use)
Many people doesn't bother me. You can have a nice conversation with the person next to you. I mean it does bother me when you can't sit down. When everything is so crowded that you can't find a seat. Whereas on the train, you never know who you are going to be talking to and strike off a conversation on the train. Especially when you live in a city its very easy to close yourself off from other people. (P13, non-car use)
I suppose if it's going somewhere that's new. Journeys that I've done many times I'll quite usually just fall asleep and not worry about it. But if it's new scenery I can look out the window and find something interesting to look at. (P1, car user)
Buses and certainly train in [city name] are definitely overfilled at rush hour. When my partner's driving. Well, he's got all the responsibility, so it's kind of like getting on a bus but with no-one else around, just my partner. We can choose the music, I can choose the temperature, and it's much nicer than a bus. I guess one of the things I miss about bus journeys is that I could read my emails on the bus, and by the time I arrived at work, I'd know exactly what's going on.

(P14, non-car user)
Because what I like about PT is you meet people. Even though you don't talk to them and especially in the UK people are really friendly on the PT like the ticket inspector is helping you out, trying to make your journey as best as he can. And if you take your car you've got almost no good experience. I think sometimes on the train its good to not express yourself and just focus on what you are doing, just enjoy the moment and look outside the window and read. (P2, non-car user)
I think sometimes it's quite nice for me. I quite like it. Just cause its… you can turn the radio up as loud as you want and you control the temperature which, you know, sometime buses and trams are really cold or really hot. And yeah, you're kind of just in your own little space. And it's also one of the only times I listen to the radio. So I quite like that. I suppose you just more aware of other people around you when you're in a public space and you know can't really talk to yourself. especially with the bus, you know, you can't really sit down at a bus stop. Especially when you've been in the car on your own or whatever its nice to be around other people and rant about your day. cause I enjoy listening to the radio in the car anyway. So I generally don't get too stressed, sometimes a little. I think if you are driving yourself it can be more tense, the journey and it can end up not quite so relaxed when you get there, because if you've had people sort of cutting you up on the way. I get the train quite a lot. And they generally work out quite well. The timing fits in quite well. Erm, I think it can sometimes be frustrating where there are… the trains go every hour mostly so if you missed that one then you've got to wait another hour before you are back. Im sort of be able to have that bit of time to relax on the train. So its either working or just listening to a podcast or something like that. Its not a stressful journey (P4, non-car user)
If you are in your own environment you are more relaxed. You are more comfortable. I don't have to think about if I have to get off. I don't have to worry about what the person next to me is doing sometimes. Have I got my tickets. Its all sorts of other things. The car feels a more relaxed place to be. You could argue because somebody else is doing the driving in PT situations you should be more relaxed. And I can certainly see that as a point and I do agree that this contribute to being relaxed.
Oh well, that's only when I am sort of the tourist and go around, see places that I cannot reach easily with public transportation. Once, for example, If I want to go to Stonehenge there might be buses but I have to take 1,2,3, 4, 5 changes… No, id rather take a car. But I will not go there alone. I would go with people. So I would rent a car with other people, my girlfriend or friends. It is stressful, in general because you are surrounded by other people driving and you have to pay attention. It is stressful in that sense. And it becomes even more stressful when there are more people in the car and you are responsible for not just yourself. You cannot be relaxed. I have to say, I do enjoy driving. I like driving. I like driving and the car as well. But its stressful. I like to go in general…. And I like to travel. Car, it is stressful because of that, because you have to concentrate. (P25, non-car user)
I suppose to live without stress from a point of view of physical and mental wellbeing is a good thing to not be stressed out all the time and I can see situations where public transport would make people stressed out. Not that I'm saying that cars are any different. They make people stressed out as well, if not more so on occasion. don't mind sitting in my car. Not for too long though (P3, car user)
Speed
Well it should take less time on the bus but the problem is our roads are clocked up with cars so you get stuck.

Well walking is always slow but it depends what I am trying to do. I mean I do long-distance walks and I really like it. I don't need to go everywhere fast. But if im trying to achieve something and ive got a time limit, then I do. And in modern life I couldn't walk everywhere. I just couldn't. I couldn't even get to work and back because I live 5 or 6 miles away. It would be a question of leaving so early in the morning and getting back very late. So its probably just convenience, speed isnt something I must have for me personally. Bikes and walking are pretty efficient, they are not fast necessarily, or well… bikes can be quite fast but… it's the quickest mode of transport. buses aren't frequent enough so there are a lot of people getting onto any given bus that comes from this area so the bus is actually the very slowest option. (P12, non-car user)
Well it depends what city you are talking about. I have been to a couple of cities. And in a good city, public transport I think is nice, it's interesting, it gets you from a to b quicker and its cheaper than the car. (P15, non-car user)
t just depends. Like if you get the high speed train e.g. that can be really quick. You can get from Birmingham to London in 2h. you cant drive that. (P27, car user)
I live about ten minutes' walk away so that's fairly ((pause)) I did I have got a bicycle and I have thought would it be quicker to bike. To get the bike but it's kind of journey that by the time you've got the bike out the garage it's actually quicker just to walk. Generally, bikes are quicker in Central London. And perhaps even walking […] In rush hour a bike is probably quicker than a car." (P18, non-car user)
The traffic is generally quite bad in the mornings. It's not as bad in the evenings, and again it's worse when the kids are at school and everything else because you get the families going into [city] as well. I don't have to be in here obviously for nine o'clock every day. I try and get here for nine o'clock to keep myself motivated, but no, it's not generally a problem. It's just a bit frustrating. It's obviously a lot faster getting into [city] (P1, car user)
Generally waiting is not good. I am a very impatient person and I don't like to have my time wasted. And I feel like if im waiting for the bus I could have been using that time in a different way. I know that some old people they like to arrive early and like to talk to people. They don't see it as an inconvenience. But I don't like to have my time wasted and it adds extra time on to your journey. So if you were using the bus for work, it adds extra time onto your journey. If you were doing it socially in the evening, if you were catching the bus into [city name] you might not mind it quite so much because you were in a more relaxed frame of mind. if I didn't have enough time, if I have to be back on time for a meeting. I might chose to use the car but I use it less and less because parking is such an issue now that you cant gurarantee that you will be able to park when you arrive and that might add on extra time cause you got to drive to the public car park, find somewhere to park, see that you've got the right money, get from ther to the other location. So now, its actually quicker and less stressful to walk than to take the car. slower means its takes up more of your time. But slower can be good if there is not a purpose to it. Day before yesterday, I went out for a 10 mile walk and it took the whole day but the purpose was to do the walk and so that gave me great enjoyment doing that even though it was slow. I had planned it, I had planned the whole day walking. I knew wher I was going and I wanted to see something I haven't seen before. The whole thing was just going to be enjoyable. (P9, car user)

Having said that, generally I have found that cycling is faster, in rush hour definitely, even with the hills in [city name]. It depends on the situation. It depends what I'm doing. Generally, when I'm walking to work, my motivation is to go to work, and I want to get there, I guess, as quickly as possible (P14, non-car user)
Walking is the slowest form of movement isn't it. The fact that you can go from A to B especially in cities I suppose, car and on a bike are probably as fast as each other sort of orders of magnitude faster than you can walking. Perhaps not the case in all cities but the amount of distance you can travel is a lot higher when you have a wheel behind you than when you don't. (P29, car user)
I go on a train not because I enjoy riding a train but because I need to get to London and I know if I try and drive itll take me 3 hours and if I take the train itll rake me an 1 hour and 30 min or so. (P6, car user)
I don't like the fact that depending on what time of the morning I leave. I mean basically the earlier I leave the more pleasant it is. Because the fewer cars are around because I have to cycle through the centre of the city to get to work. So I mean I normally leave very early in the morning because I go to the gym or go swimming before work. If for some reason I leave later, the traffic is much worse and it puts me in a really bad mood because you know it's just less pleasant to cycle when there are a lot of cars on the road. That's the only downside really. I associate PT with being not so good on a Sunday or public holidays. There tend to be limited bus services on bank holidays, not so much with trains. That is certainly my experience. So you are less flexible. Yeah if I had to get somewhere for a specific time like a job interview or a trip to a theatre. So if I had to be somewhere at a specific time and I couldn't control that starting time then yes I suppose if I couldn't get the bus or train on time that would be a bit of an issue. I mean if I'm just going to visit people, if I'm just going shopping or on holiday it doesn't really matter how long it takes. Because if I don't have to be anywhere at a particular time then it doesn't matter to me how long it takes. When I've got an appointment or when I need to get to work. I would always imagine the train to be quickest. But it also depends on the journey obviously. Well, I would only get in the car as a passenger if I was going on a long journey to visit family and I don't have very much time, so might go in the car. Time would be the only factor. Or when you have to be somewhere at a specific time. But then you always have to find a parking space which seems to be a bit of a problem. In cities especially. (P13, non-car user)
Frustrating, I suppose when nine times out of ten you could probably get out and walk faster but you can't leave your car at the side of the road. If you could, it might be worth it. Yeah, it's a bit frustrating sitting in traffic. (P3, car user)
it comes down to if I'm travelling at weekends it's usually to go and do some form of scuba diving or something where I need to be able to control the times I get there because of tides and that sort of thing, or when the boats are going to go. (P5, car user)
So If im travelling on holiday or if im on my own and lets say going to see my sister in [city name], I know its going to take me the whole day to get there so it doesn't matter if it takes a couple of hours if I get a very simple journey at a cheaper cost. I mean I am very well aware of congestion all over the place, you expect congestion and as long as its normal congestion, that's fine. I know my journey takes 15 minutes longer if I travel at 8 o clock in the morning than it does if I travel at 10 o clock in the morning. But that's fine, its when it takes an extra hour longer then it becomes exceptional. (P7, car user)

"If I've got loads of stuff to do and I can't afford spending too much time on travel. And strangely enough it's whenever I'm not working that it bothers me to spend too much time on transport because I can't see my friends." time and distance so it would be how far can I go and how long will it take. So it's more this more mathematical side. I guess speed is important. Sometimes its quicker to just walk for 5 minutes than take your car. And sometimes its quicker to take your car for 5 min instead of walking for like 30 minutes. For instance, here in [city name] everything is walking and biking oriented, much more than any other city I've lived in. In France, for example, the local bakery is 2 min away but I would drive it. Whereas here in [city name] I'd walk it. Well, delays are my only worry. If I'm delayed then im gonna be late at work. That's really something that would bother me. Its really important for me to be there on time. So I always make sure I arrive on time. But last week for example, there was over an hour delay and I had to take another train but didn't know which one and I was almost late. So it was a really stressful situation and I had to run to arrive on time. In the end I did arrive on time but it was tough. So when I am waiting for someone or when someone is waiting for me it's also very important to be on time. But if there is no one to wait for, there's no problem, I don't mind. Because ive got the rest of the journey and the rest of the day to chill. I don't really mind. I just hate being late and so if I say lets meet at a certain time then I do my best to make it. And if there is a delay then this is as bad as if there was a delay for work. But then if theres nothing important to do I don't mind if there is a delay. (P2, non-car user)
Well, most of the time, I think yes. But yeah there are certainly times when you don't need a particular fast journey, like when you don't need to be anywhere at a certain time or if you are going on a trip to the countryside. If im going out for a walk, then it doesn't matter how fast I walk, I go, because its for my own pleasure and its relaxing rather than for a specific purpose. But because I have to work so much and spend most of my time on PT, I don't get to do those journeys very often. (P22, non-car user)
Yeah I think so in work terms, It shows responsibility if I can get myself to work on time and people know where I am at a certain time. So that is important within work. And outside of work as well, I think, with friends. If you are known as the person who is always late people get annoyed with you, they expect you are always going to be late, and get annoyed at that. I think it's nice if you say you will be somewhere there at a certain time, to be there on time. It doesn't matter so much when it is something I am doing on my own. Whether I am running late, say I want to do this at around this time. And I am running late, it doesn't matter to me because it is only going to affect me. And I am not getting annoyed about it because what is the point in there. It's just get there when I get there and then do what I want to do. And also on the weekends, I am more relaxed about getting, like, when I get to places. Whereas during the week I try to fit things, as many things as possible. And have my little to do list, whereas on the weekend I don't really care. I just go with the flow. (P21, non-car user)
I think it depends on the distance. For short distances, I would always say the car is quickest, unless you live right next door to the station and where you are going is right next to the station. And then train and then probably bus. I mean certain journeys are easier, I always get the bus to some places and I always get the train to other places and I always drive to other places. It's also they're doing the road between what's that road called… [road name] and the traffic is shocking so it's probably no it's definitely quicker to get the train particularly from here because I can walk to the station and get the train and then get the train back and then it's only twenty minutes up the road Being held up. It annoys me as I travel a lot of like you know not in rush hour so if I'm driving to work if I go along the [road name] I get stopped at every set of traffic lights. I'm the only car on the road and I have to stop at every set of traffic lights it's just it's nothing it's like minutes on my journey but it's you know it's just annoying and if you're yeah if you're in a rush and I have to do a workshop not that long ago and it's frustrating I think if you're the only car on the road and kind of nobody around and the road is clear and perfectly fine and

you know you've got speed restrictions or something and you've got to drive at 50 between and there's nothing there you don't see the point of this.

I mean, occasionally if there's a nice day i actually quite enjoy it. I live in [town] so if I caught the bus to [town] it goes via [seaside town] so it's nice if it's a nice sunny day and it's quite pretty views. It goes all the back way and all over the sea front and everything and that I mean that can be quite nice occasionally. but I wouldn't want to have to do it every day. That's more of an event rather than a commute. If I had to get somewhere for a specific time, I can drive it in twenty minutes, it's so much longer on the bus.

If it's a really nice day and I've got nothing else to do erm which is rare then I might think oh yeah that would be nice but it's slightly too long to do that you know it's kind of ok maybe if I'm going to meet somebody and they're going to bring me back something like that.
(P10, car user)

I mean car and bike are both quick forms of transport. I think about getting around [city name], a bike can be really quick because you can get down side streets, you can cut through places. The same way you could with walking but its quicker. Whereas with a car you couldn't do these shortcuts in the city because you need to stick to the road. But it still quicker than walking. And for me, with walking or cycling I can leave whenever I want and I don't have to be concerned about it. I can just bypass the congestion. With cars I would be worried about like peak traffic times.
(P21, non-car user)

If I were doing it every day, then yes, I would have to reconsider, because you can do that journey in an hour. To be fair, speaking to my colleagues, they often get trapped for two hours, because the A38 is a very slow road. But, on balance, I think, if I had to do that, then I would reconsider.

I'm trying to think when I've done that before. Like, I went and spend some time in Snowdonia a year or so ago, and there were two routes to get there. One goes all the way up the M5 to the West Midlands and then cuts across into Wales, and the other one is this very sort of windy road, all the way through Snowdonia, down into South Wales, Brecon Beacons and out again. And it's really spectacular scenery, and it feels like a shame – we weren't time-limited. It seems a shame to miss something quite special for the sake of just getting somewhere really quickly, because on that occasion, we didn't need to. But it's a balance, I guess, between, do you need to be there on time or not
I guess because it's different, or because you get special scenery. It's very picturesque. Because you're not travelling to get somewhere at a particular time, you can sort of absorb it and enjoy it.
(P23, non-car user)

Flexibility

So the car gives more freedom. Unless it's very very heavily congested through traffic jams. Especially on the weekends when literally everyone is driving.

It gives much less freedom in cities. You are much more constrained by the narrow streets.

I personally feel much more freedom on the bike than in a car.

Not if you have a car or bike. You don't have to stick to a certain time. Or having a dense public transport network so you don't have to care about timings. So if you have a bus every 5 minutes then you don't have to have car. You go down and you have to wait max. 5 min.

And sometimes buses even get delayed as well. So if I knew I would get the bus I would factor in that time and get to work earlier. But that's fine. Its not wasted time when you get to work earlier. But when you stand at the bus stop, waiting for a delayed bus for 15 minutes, that's wasted time.
(P15, non-car user)

Well with the car you can't access pedestrian areas. You can take a bike on a footpath and you can take it to locations you wouldn't be able to take the car, like off road. Same with walking, you can walk everywhere.

well you would have to park your car and then go for a walk from there. So when I went to [nature reserve] I took the bike in the car and cycled. So the car increases your.. it makes it so you can get somewhere to a certain point but then beyond there you either need to walk or bike and that kind of extends your outreach.

Sometimes, the train can be quite good. It just depends. Like if you get the high speed train e.g. that can be really quick. You can get from Birmingham to London in 2h. you cant drive that.

(P27, car user)
I very seldom rent a car, but if I go by car, I can use my own car and then park it wherever I want. it is more flexible and you have more control over time, you have more control over the schedule you want to put on your trip. When im in a car and sitting, I can't do anything else. Just driving and paying attention to the road. Would be very dangerous to do otherwise. Because I like to cycle, I like to see things. Bicycle gives you the time to look around, you can stop, I would say you are more free, more free to stop and look at things. With the car you can just focus on the road. So the car I would just use it for the purpose of transport. (P25, non-car user)
Tangling with all of the commuting traffic, not knowing whether the trains are going to be there, whether they're reliable although there's usually not a seat because I'm usually doing it in commuting times it's a Friday evening and Sunday afternoon so you know it just became one of those things that I just thought I just can't do this. The bike is very convenient in terms of being able to stop almost anywhere. So I can just get off the bike, put it on the pavement, lock it up. Actually fitting in with the bus timetable because by the evening they've dropped down to one every half an hour and it doesn't coincide with the start time of choir and it doesn't coincide with the finish time so I can be standing waiting. if you said to me why are you cycling I would probably put it because I am controlling the time I leave home, the time I arrive at work, the time I leave work and the time I get home. I am in control of that. Getting in the car and going somewhere is in my control, park close-by. I decide when I get in. I cant quite decide how long its going to take me but within certain boundaries, give or take, I know how long itll take me to get somewhere. Train, not guaranteed, they break down quite a lot our trains. So that's under my control. Likewise the bike, its in the house, get on and go. I will bring the car to work I don't cycle absolutely every day all through the year and again it feels independent it feels less reliable because I have no idea what sort of traffic I am going to sit in but it is quite independent. I think it's a car offers complete flexibility. I can put anything in it and take it with me so there are times when I've got golf clubs and cart, I've got you know weekend luggage, I've got a present, I've got walking boots 'cos we might go walking etc. etc. etc. so it is utterly convenient. I've got a little a big suitcase full of stuff that I am just moving from one place to another so that totally flexible. I haven't got to decide what we will do at the weekend I can make a plan for all eventualities and it doesn't matter if none of them happen because I haven't lugged something across the centre of London ((laughs)). (P12, non-car user)
The car is never late. Well you can plan it better because you are in control more and because there is less variables that can go wrong. If you want to be somewhere at a certain time there is less things that can go wrong and you get there when you had hoped to. I get lost very easily so I always leave a lot of time to cope with the fact that I get lost. When I went to [city] it took me 45 min to get to a venue that was 10 min away and it was just a straight road. But I left a lot of time so wasn't actually late. I left an hour to not be late. because I know I get lost. I have no understanding of directions so I have t leave enough time. Particularly in a very new place whereas in [town name] I know my way around so I don't need to leave as much time. But at new places I get stressed when I don't leave enough time. short distances you don't have as many… yeah you might be stuck in traffic jam but its not going to be there all the time whereas motorway jams tend to be a lot longer so I would leave a lot of time for motorway travelling if I had to be there at a certain time. (P19, car user)
It would very much depend on the person and the reason that im goig there. It's a sliding scale. If its sth where I know its not gonna hugely inconvenience that im 20 min late, that's not an issue. But if its something where

its crucial, that would be a bit of an issue. So I know somebody's got, im going to visit a friend and they've got a stew on the boil and I know its not gonna get spoiled just by cooking for an extra 20 min, not a stressful situation. I know that there is a boat of 20 ppl which has to leave on time, to catch the tide to be able to go and do a dive, if I dont get there, the boat cant leave and I then have upset 20 ppl, stop 20 ppl doing what they wanted to do. So I am responsible for those 20 other ppls decision and they probably have paid a lot of money to do it. So why should they be upset.

Can they be flexible if I suddenly need to work until ten o'clock at night because I've got to get a case finished, or I suddenly need to go off half way through the day because I've suddenly been called to court at short notice?

it comes down to if I'm travelling at weekends it's usually to go and do some form of scuba diving or something where I need to be able to control the times I get there because of tides and that sort of thing, or when the boats are going to go

that's not particularly stressful unless I try to be somewhere for a very specific purpose.
(P5, car user)

I guess it depends if its social or business. If its business, then yes, that's [flexibility] very important. If its social, no. personal travel is not as important.

I tend to favour PT when im working because going to meetings because it's a little easier to plan your journey and make sure you arrive on time.

But because of [city] being [city], it's a very difficult city to drive into, as my brother found out to his peril last year, he came up to visit us and he and his wife drove into [city]. We said, "We'll take you to the station, get the train in, it's really easy." No, they chose to drive, he picked up three bus lane tickets in the day that he was in Bath, because he just wasn't used to driving round Bath.
(P6, car user)

So If im travelling on holiday or if im on my own and lets say going to see my sister in [city name], I know its going to take me the whole day to get there so it doesn't matter if it takes a couple of hours if I get a very simple journey at a cheaper cost.

I think the versatility comes in when I am comfortable and familiar with the journey. So the unfamiliar journeys, I want planned precisely. I want to know whats going on. I have done the familiar journeys so many times I don't have to think about them. The journeys up to my parents, they are not far away and they are very predictable. We know they are congested at certain times that's why I was surprised that one day it was when the traffic jam shouldn't have been there. And therefore it can be versatile. And interestingly, thinking about it, the timetables on trains… they are a convenient but they are also a constraint. When I occasionally, very occasionally, come by train to work, there are trains roughly every half an hour in the morning.

I don't really like the idea of having to drive or walk or cycle longer distances.
(P7, car user)

In a car, you largely have the freedom to take any particular direction that you wish and to depart or arrive at a time of your choosing to a large extent. You can stop whenever you want, you might stop at the shops or go to the toilet. Its entirely under your control in the car. You are in control of your own time, and also responsible for it. And if you are late, then by and large you have control over that. Although you might have unforeseen traffic problems. it depends how you want to use that. Personally I would see that as a negative. I wanted to go to [town name] a couple of weeks ago and I drove because I could leave [city name] at 8.30 and arrive where I needed to be on time. The only other mode of transport was train and to arrive at the time that I needed id had to leave earlier which was impossible because I needed to take my son to school. So in that sense it can be more convenient to drive oneself. As it happened however, I was late because of traffic, which is frustrating.
(P24, car user)

It depends a bit. If I've got to be here for something specific, a meeting or something, then yes I do get annoyed when you're just sitting and not moving. And yeah, it's annoying when you know you're half a mile away and it's going to take you ten minutes because the traffic's moving at a snail's pace. It's a pain.

Well, most of the time when it is frustrating is because you need to be somewhere. There are probably other forms of transport that would be faster. I mean, sometimes it doesn't bother me. If I don't have any meetings

in the morning or if I'm early. It's if I'm late or if I've got something I need to do, it's frustrating because I need to be somewhere and there's a row of cars in front of you and you can't do anything about it.

It's if I'm late or if I've got something I need to do, it's frustrating because I need to be somewhere and there's a row of cars in front of you and you can't do anything about it.

It very much depends on when you need to be there.

If you've got to be on a connection from one thing to another thing, then it just makes your life harder rather than easier from getting from A to B.

I'm sure there are buses go past my house and I'm sure there are buses that come here. I'm sure I could do it, but then I think I would feel sometimes maybe a little bit trapped that I can't just go out to the shop
(P3, car user)

Well, probably when I am sort of waiting for the bus and waiting for the train that's delayed and kind of desperate to get home. Or you have to be in work and you know you don't know.. yeah it's sort of that lack of control that you don't know when the bus is gonna be late and you don't even know whether you in the right place to catch the bus.

the trains go every hour mostly so if you missed that one then you've got to wait another hour before you are back. Which can sometimes seem like quite a lot. Especially if you just had a meeting which means that you have to hang around for the next hour

I suppose its just.. you just want your day kind of go as you plan it to. And you don't want to.. be stuck hanging around if you had decided in your head you gonna be at work at a certain time if you got to be there to make meeting.

Erm, I think it is quite important. Its not necessarily being on time for a meeting. Its just being on time for whatever time I wanted to be there. it either feels like you are not doing your job properly, if its work related. Or you are letting people down if you are late to meet with them. So it again feels quite frustrating and annoying.

Well obviously just with working in [UK city], I have to be able to get to work quite quickly. So I need to either go by car or by train in order to get there within a decent time.

I like the fact that I am completely in control of my journey. I'm not reliant on anybody else.

It would be less flexible. If I was going to get the bus for example, I would have to fit in with the bus timetable so yeah it wouldn't be as convenient as walking or getting on my bike or arguably getting in the car.

I find walking and cycling more convenient than cars because there is less preparation involved. You can just put on your coat and shoes and can just walk out the door.

I would occasionally; I think PT can be inconvenient. I think you have to be a bit more flexible when you travel on PT and not expect everything to happen instantly according to your schedule. So I guess there are occasions when cars can be more convenient in terms of timing or journey.

I suppose I would do that journey by car if I had one partly because I might have to do it more often as my mom gets older and might need more support. so I can certainly see a time when I might have to go more often and that would make it pretty inconvenient doing that journey every weekend. I hate to say it but I can see a scenario where I a car can be useful for that particular journey. And it can also be useful for taking heavy loads of shopping and dog food to my mothers.
(P13, non-car user)

It requires the least thoughts. Although cycling probably requires the most planning. You need to know where you are going, you need to choose the routes and make sure its not full of traffic, its not full of hills. You are not going to run into someone, block someone's way. You need to make sure uve got a set of clothes or at least deodorant, wetwipes. You need to make sure your bike is mechanically sound and you've got spares in case something goes wrong. It sounds like its not the most flexible thing as it requires a lot of planning but as far as im concerned it is far more flexible than the car.

I think it's the freedom; that I don't need to wait for anything else.

It just means that we can't be a flexible and spontaneous couple. We're not the fun couple. We're the old, dowdy couple who have to go home at 11:00, because that's when the bus leaves.

No, not really, but it feels like you're setting yourself limits and it's kind of going, "Meh." It doesn't feel quite as exciting to go, "Yes, it's Friday night. We're going to go out. We're going to have lots and lots of fun at lots of different establishments." As opposed to, "Oh, yes, we're going to go and see some friends, and then we're going to go home at 11:00, which means that we've got to be out by 10:30, which means that we've got to say our goodbyes at 10:00, because it takes ages to say goodbye to everyone." And so that leaves us about two hours for conversation. It just feels really clinical, and you're planning your whole evening ahead, as opposed to, "We'll just go out."

I didn't need to plan ahead. Or somebody texted me and said, "Oh, my God. This really famous person is in this bar. Come out. You must see them." Yes, okay, I could do that. But I don't have that flexibility anymore. So, that's the price I pay for convenience of walking to work.

in this country definitely, buses and trains, they operate to a timetable of their own. So best of luck if you want to get somewhere on time. Having said that the traffic that is around [city name] you probably need a good hour to get anywhere in your car.

for me its an extra bit of control because I don't need to consider as many factors when walking to work. because all I do is get out of home, shut the door and then walk to work, and there's no disruptions, and I don't need to wait for anything, and nothing needs to wait for me.
(P14, non-car)

Just trying to get out of my front door with the bicycle can be really difficult because the cars are parked that much apart from each other. It's just really crowded; the parking is kind of in demand and I would worry about getting my car out of these spaces. And even when they redo the lines, they don't consider cyclists at all.
(P16, non-car user)

Being held up. It annoys me as I travel a lot of like you know not in rush hour so if I'm driving to work if I go along the [road name] I get stopped at every set of traffic lights. I'm the only car on the road and I have to stop at every set of traffic lights it's just it's nothing it's like minutes on my journey but it's you know it's just annoying and if you're yeah if you're in a rush and I have to do a workshop not that long ago and it's frustrating I think if you're the only car on the road and kind of nobody around and the road is clear and perfectly fine and you know you've got speed restrictions or something and you've got to drive at 50 between and there's nothing there you don't see the point of this.

I mean, occasionally if there's a nice day i actually quite enjoy it. I live in [town] so if I caught the bus to [town] it goes via [seaside town] so it's nice if it's a nice sunny day and it's quite pretty views. It goes all the back way and all over the sea front and everything and that I mean that can be quite nice occasionally. but I wouldn't want to have to do it every day. That's more of an event rather than a commute. If I had to get somewhere for a specific time, I can drive it in twenty minutes, it's so much longer on the bus.

If it's a really nice day and I've got nothing else to do erm which is rare then I might think oh yeah that would be nice but it's slightly too long to do that you know it's kind of ok maybe if I'm going to meet somebody and they're going to bring me back something like that.
Not being in a rush definitely being in a rush not having to go anywhere I'm you know just killing time it's quite nice and doing that.
(P10, car user)

The car is more independent travel, it goes where you want it to go, when you want it to go. So as an independent person I can chose whether to get a bus or a train, however, in a car I can chose exactly, with precision, where I want to go, as long as im driving it. If someone else is driving it, that's a different matter. Whereas on the train or bus I am totally dependent on a timetable and pre-set routes and cannot chose where to go. I might make it independent by combining a series of different routes on trains and buses but I have far less independence on PT than I do in the car. I mean there are presumably some places I can't drive to in the car, but not many.

Independence in the car is really nice, when you really just need to get somewhere. And its really important and you don't want the hassle of reading a timetable, waiting for the forms of transport to come, buying a

ticket. You just jump in the car and go. However, obviously, there is no saying that you won't get stuck in a traffic jam. So, does it mean to say you get there any quicker in the long run?

A nice sunny day where the final destination is not more that five miles away from the final point of PT its not too bad. But if its miles away and its tipping down with rain, that's not pleasant. Also when you are driving and you are driving to a car park, even the car park isnt that close to where you are going. So you still have that final bit of legwork to do. You are definitely more flexible with the car. Particularly with time. I mean there is a lot of PT that shuts down after 6 o'clock. Particularly in rural areas. If you are going into rural areas without a car, your day is very short.

Plus you have to put up with the car having priority everywhere.

If you've got the car its great but at the same time you have to park it, and you've got to put up with other motorists and all the rest of it.
(P22, non-car user)

I mean when you are driving in a car you want to know what the traffic is doing if there's been an accident on the motorway. But most of the time you don't think about it you just get in your car when you want and go. So possibly this type of forward planning. Although you do have to be aware of the route you are driving and concentrate on the route and make sure you are going the right way whereas you don't have to worry if you get on the train. It's going to take you wherever you want to go.

It is important sometimes, it's more just when I have a time limit to get somewhere. Work or when I made a time to meet somebody or do something. Then I know I can leave this amount of time before I will get there. So it's the time management of it. Just so I am not spending too much time getting between places. On the other hand I do like walking and it being more leisurely and not rushing to get somewhere.
(P21, non-car user)

Well with the car you are much more independent which is bad and good really.

Or maybe trains because there is no way to escape the timetable. Sometimes you have to wait hours and that can be annoying. You've got to be organised. And that's a bit more stressful. And the very fact that you just sit there.

you can feel free and you can do whatever you want really. Its like, it's a bit strange, and you might say im crazy but, you are inside the car and you are almost like the car… so it's like augmented reality.

when you take the bus or the train there is no surprise. Except if there is a problem, that's a problem but you know where you are going nothing can change. But if you take the car, it can just stop for no reason.
(P2, non-car user)

Really frustrating. Being stuck on a national express bus and missing my flight home. That was the biggest frustration ever. I mean that is true for getting stuck in traffic in a car as well so maybe its not fair to use that. Whether im in a car or bus or train, that is the most frustrating moment.
(P17, non-car user)

Well it adds limits. The car gives me greater flexibility and better use of time.

I was going to say you don't have delays on trains but that is not true. But generally I think they are more reliable and you don't have the random problems you have with traffic.

my car is getting pretty old so I don't know how long its gonna be reliable for in the future. Whereas trains are being maintained by the staff or whatever and at least you know that this is going to be fine. Well a bit scary, it has happened to me a couple of times. I went through a big puddle once and it drowned my electrics and I had to push the car out of the water. But at the same time, it doesn't bother me, I called for a lift and came back to fix it later.
(P30, car user)

But they are both sort of bound by where they go and sort of at set times. Whereas the car, you can kind of go when you want.

With the bus and the tram, again, although they have set routes they kind of get priority in a lot of places so they can go on bus lanes and obviously the tram goes on things… so you are not so affected by traffic.

I think with the flexibility of the car, you can kind of jump in whenever you want to and its not sort of bound by a specific time. Erm, then I think that suits me that I can get up you know 20 minutes later. yeah it's sort of that lack of control that you don't know when the bus is gonna be late and you don't even know whether you in the right place to catch the bus. Yeah the buses and trams only go to certain places. PT doesn't necessarily go to exactly where you want to and it doesn't necessarily go direct. Especially buses. It may go to where you want to go but you got to go somewhere else first. But supposedly you have some sort of control over, you know… But then Im not sure whether in the car you are fully in control because of traffic and lights and everything. So there probably nothing where you are fully in control. I think walking is probably the closest you can get in some ways. But then you are reliant on knowing where you are going and it takes longer. I think if I've skated to work and I've done the whole 8 miles then I feel kind of proud of it at the end of the day. Because I feel like I kind of achieved something because it is a big hill and its really kind of scary so it's kind of a good feeling and a bit of an adrenaline rush as well. So that maybe is the control in some ways. (P4, non-car user)
Yeah with the car I guess its just that sort of freedom, you know, you go the routes that you have selected. Obviously with the number of roads there are you can go kind of very direct. Although, saying that, it all depends on the area and where you want to go. Very remote places may not be so easily accessible by car, neither by train to be honest though. Or in city centres, for example, that's where your sort of freedom of movement in the car is quite restricted. (P9, car user)
well car and bike are means by which you can travel somewhere quicker than if you were walking. In case you are in a traffic jam with a car that won't always be the case. That would be sort of a natural thought but then actually I have realised that you could have bicycle and walking together because they facilitate a way of getting around some of the problems that you would have with a car. I think if I go somewhere and there is nowhere that I can lock my bike and there is a difficult route, like lots of inclines or if it's a very busy road, very narrow and its quite dangerous, those things stop. That feels like there are constraints and its limiting so there are certain places where you think I just can't go there or I don't want to go there because it's not safe. It makes me very uncomfortable. So that's for me the opposite of travelling when you want, how you want because I can't travel where I want. (P23, non-car user)

Table C.3 Coded quotes to support 'Attitufinal ambivalence'

C.1.2 Context-dependent attitude variability

The table below show all quotes used to support findings for the overarching theme 'context-dependent attitude variability'.

Cost & Time
I'm going to a conference in Sheffield and work is going to pay for the train for me so I'd probably go by train because I'm by myself and get a taxi from the train station rather than navigate myself to Sheffield on my own by car because work are paying. whereas if I was having to pay for myself to go to Sheffield then I drive. (P19, car user)
when it comes to long distances, I've done both. I've used the car and I've used public transport. It's a question of what's more convenient plus what's cheaper, especially airport things. You have to park the car which costs you, so is it cheaper to drive and park or is it cheaper to get a bus and a train? But again that depends on the time of day, the availability of the trains and all of that stuff.

I think I am quite stuck as in a car person, I think, which I know I probably shouldn't be, but I like having my freedom and having my own car. Not that I suppose I wouldn't have to give it up, but then I guess there's, like I said before, there's a sort of economical aspect of it that I would want to keep a car. (P3, car user)
Cost is another factor, but it's not going to influence the way I come to work, because it's the time that is more important to me. The time and the convenience. (P9, car user)
well I try and live within a certain amount of money every week and I take a lump of cash out and I have it in my purse and I spend it. And when its spent, its spent sort of thing. And I try not to go to the bank until next Friday and obviously sometimes that doesn't work. But 10 pounds for the car would be coming out of that amount of money and wipe it completely. So my psychology I suppose. It's just the least efficient thing to do. It might be the fastest and it might feel nice and enclosed and I get into my warm environment when it's only me. But its just so inefficient…yeah… It's much quicker, it's much more convenient, it's safer and when I get to the other end in London trying to park is it depends where I'm going obviously but often we're going into the centre, we're staying somewhere and its stupid expensive and actually when I add all of that up the train is a far better option. Not really cost no it's speed, convenience all of those. There might be but you know 'cos even when we're travelling even when we're on holiday you know the time is quite limited so knowing that you'll get to wherever you get to would mean an hour of saying this is where we should be and when we should be there I think would be quite important to me. (P12, non-car user)
Usually costs. Like compare what a trains and a bus is going to cost to get me to london. And I am ok with the extra time on my mode, so like the bus is going to be a bit longer, if I can manage the extra time, then I'll do that. Or if just wanna get there as quickly as possible then I will pay extra and just get on the train. So it's kind of weigh up the pros and cons and having more time there. (P21, non-car user)
I suppose expense would be a more important factor whether or not I feel sick or not on the bus. But I think it's a relative thing, if its 50% cheaper to go on the bus than it is to go on the train then I would go on the bus. Because I rather spend my money going out for a nice meal or going to the theatre or going to the cinema or something. well because it would be quicker to get there by car and then I would have more time to spend with visiting the family. (P13, non-car user)
It would be my least favourite mode of transport, so I tend to restrict, and it's only if it's the most convenient. So for example, if I'm going to Heathrow airport by public transport, it's by far the most cost effective, time efficient way to go to Reading and get the rail-air bus to Heathrow, so I'll do that.

if you are just doing a long journey, you are going up the evening before a meeting, erm, you don't need to.. it doesn't matter if you arrive at the hotel at 8 or 20 oclock. Then its not a problem. And then, I chose the train rather than the car because I can work on the train. Whereas the car is dead time. You cant actually do anything useful while you are driving. (P8, car user)
Generally, it is more important to be on time than to have to relaxed journey. But I also go through phases, like, sometimes I will be like "no, actually I really like cycling, it's so much quicker" and then I will be like "I am sick of using my bike, I just want to walk". I just go through phases. I tend to cycle more when I am rushing and in a hurry to get somewhere, but do actually prefer to walk. And when I do walk I think "this is much nicer" because it is more relaxing and I am not on the road and I can take my time. I try and do allow myself enough time so that I can walk. But sometimes I need to cycle to get there on time. So yeah it's about managing my time and that dictates which of those two modes of transport I will using. (P21, non-car user)
Generally I would rather drive even if it was the longer journey than the train because its more comfortable. I'm thinking, well yes just generally if it is more affordable then it makes sense to take the cheapest form of transport. But like I said that just depends on how much money is the difference. And I personally find most forms of transport...well rail is more expensive than the petrol. Coaches are cheaper if it is just you, but if there is someone else in your car, it is cheaper to drive with the petrol. Because there is usually [partner] and me, I don't often travel alone. But that said, when I go home on my own I will still drive. And that is because at home they have got quite a poor public transport system. So when I get there I still need to have my car. (P27, car user)
To a certain extent, depends if its private or work. if I can save money when I am travelling myself, I am willing to spend more time. If its for work, I would reduce reasonable amount of time for reasonable amount of cost. Only saving 10 pounds for an extra half an hour is not worth it. I think the primary thing is time and convenience to a certain extent. (P30, car user)
I think time is the main thing. And cost as well. I obviously had to pay to get bus. I think it depends on the distance. Yeah because I mean journeys are so variable in terms of if you catch the train it can be you can get a ticket to London for anywhere between you know five and five hundred pounds it's stupid how much it varies and it depends on whether you are going you know first class when you travel. Yeah so cost I wouldn't go because it's only a journey I'd rather you know spend the money when I got there ((laughs)) it's not it's mot massively if it was a really difficult journey I wouldn't you know catch the mega bus to London I don't think 'cos coaches make me feel sick but I wouldn't I'd just get the train 'cos it's not substantially more and it's much nicer but yeah costs will come into it if it's any kind of a Bristol journey you know only a hundred miles or so I'd probably get the coach. (P10, car user)

Well we quite often use them for our roller derby bouts. So we played Leicester in the summer and because it would have involved quite a few of the players having to drive, even if we were sharing lifts… and then they would have to play a game… and you know you get quite a lot of knocks and bruises and things like that. And then having to drive back again, is not that appealing. You know coaches are quite expensive. very expensive to hire, but it meant that we had a driver and were able to all relax and all have fun on the coach and sleep in the morning and stuff like that. Then we were all ready to play and none of us had to drive.

Yeah I suppose if we are looking at costs and things like that. Looking at where… you know if you are going somewhere, can you park there? Does it cost any money? Is a train station nearby? And is that gonna be a better option? I think costs comes into it when working out whats gonna be the quickest and cheapest option.

(P4, non-car user)

Well it is an issue if im losing too much time. Bike is the fastest. If I take the bus, compared to walking, it's a 10 minute difference and that is worth the fun, its much cheaper so actually very expensive for a single ticket. So I am willing to pay 10 minutes of my time for exercise, not paying for the bus.

well, it's a moderate value. Unless its more than two times the time, I am not bothered.

But that's not a serious one, I am loosing probably a few minutes. I do that in order to have a convenient ride and a nice way, road. I have to do that for my kid as well because I don't want him to be inbetween cars on a busy road. So we are going on quiet roads and it may take a few minutes longer but I am willing to pay this price. Especially because cycling is not wasted time, its still useful.

(P15, non-car user)

for me, where I live, car is the cheapest form of transport. If I was to get a train into London its 44 pound absolute minimum plus taxi. And I can drive in and out of London probably 4 times for the same amount of money. Even though I would do it, once in London, not trying to find parking and congestion charges. So its expensive in cost but not necessarily in time. Its probably time cheap. So its sort of balancing time vs actual costing.

Car offers me the best flexibility. It's the cheapest for me where I live but its not necessarily the most cost effective in time. Obviously its more likely to be held up in traffic jams, especially going into London.

Yes. As I said, if I go to London, because I don't want to drive in London. I hate driving in London. I've done it too many times in the past. It's a nightmare so I will actually just pay the premium to go into London on the train rather than drive.

It's stressful which is why I am prepared to pay the extra to avoid it. So in London I'm quite happy to get a train up there, use the tube, use buses, use taxis, whatever works but also there is actually sufficient public transport in London to make that practical

(P5, car user)

well its difficult to judge. It's a combination of the convenience and the cost. I don't think the costs are excessive using a car. Its putting multiple factors together rather than just one factor outweighs the other.

I go on a train not because I enjoy riding a train but because I need to get to London and I know if I try and drive itll take me 3 hours and if I take the train itll rake me an 1 hour and 30 min or so.

(P6, car user)

That's the way my mind works. I always think how much is this costing. Mostly in terms of money, quite often in terms of money as well. And to a certain extent in convenience. I prefer to take a 1h15 min journey with no changes rather than a 1 h journey with 1 or 2 changes. Just for lack of hassle. You can sit down, get to the end. So a reduction in complexity I look at as well.

So If im travelling on holiday or if im on my own and lets say going to see my sister in [city name], I know its going to take me the whole day to get there so it doesn't matter if it takes a couple of hours if I get a very simple journey at a cheaper cost. If I was going there for work, I would definitely look at shortening the time because its much more costly than the flight for the business. There is a certain amount of my own convenience. But the primary considerations are time and cost and it depends on what im doing as to which is the more important.

And usually the cost of travelling distances by car is still cheaper than going by train unless you can time it very precisely. But often there are restrictions with the advanced tickets and all that. Often those will be cheaper.

If it's the business money it makes sense because its my time, its wasting if I take half an hour to walk to somewhere its probably cheaper to take a taxi overall. So that's the mentality.

(P7, car user)

I'd say cost is important. But cost tied in with feasibility really because I could pay more to get on the train to come in, but then that's not as practically easy. And again, that comes back to taking up more time.

(P1, car user)

you know, I don't actually think that this is the most important thing [getting there as fast as possible]. This is going to sound counterintuitive. It is just a question of waiting or disruption. If I had the option between an hours journey where I was constantly waiting and an hours journey where I either walked or cycled and it was the exact same distance, I think I prefer whatever it was that required the least hanging around and "eergh, I don't know what's going on".

(P14, non-car user)

Well I think it's striking a balance between wanting or needing to be at a particular location at a particular time and the time it might take to get there via a particular means; and if I had to be somewhere at a particular time then I might be less concerned about cost if it was cheaper to take a particular route then I would do that. So I think probably that when you've got a family particularly – If I didn't have a family, if it was just me then I don't think I would use my car, or I would use it very rarely because you don't need to do that living in a city; or I might have a car that I would use only at weekends for example. But when you have a family there are lots of different places that you need to be at.

(P24, car user)

And then of course I am trying to use my time efficiently so I wouldn't want to leave an hour earlier just in case. I want to leave at an appropriate time but you are at the mercy of the buses running on time and being too full.

(P17, non-car user)
I'd say, probably, if I'm travelling for work, and they're going to pay, I mean, in all honesty, I can't pretend that – so, I go to London a few times per year for work. But I would always go the Paddington line, which is an hour or an hour and a half quicker than the Waterloo line. But the tickets are a lot more expensive. It's like, "Well, work are paying for that, and I'm going for their benefit." So, the cost to me becomes far less important, because it's not cost that I bear myself. (P23, non-car user)
Train over long distances can be a lot quicker but it isnt always as comfortable or as cheap if you are travelling with a family. (P11, car user)
Physical activity & Pro-environment
When we hire one from the car club they have the hybrid ones and the normal ones. Usually, the normal ones are discounted. Don't ask me why. But sometimes I hired the more expensive hybrid version just to have fun and being environmentally better. At some occasions, I was willing to pay more money for it. Sometimes I am willing to pay higher prices and take detours to have a more interesting journey and greener transport options. When I used to commute in [city], there were two options. One option was the bus with moderate walking and the other option was the train with a large amount of walking. Time wise it was probably the same. But walking wise it was different. So I did decide to take the route with the longer walk and I needed good shoes for that. And it turned out that my cost for shoes were about the same per mile than owning a car. But two pairs of shoes a year are better for the environment than fuel. (P15, non-car)
I actually like being a single person in my car. I love driving. I didn't learn to drive until my mid-20ies and it felt like a very liberating experience. However, I am very conscience when im alone in my car that that's the least efficient way to travel for the environment. I've had a lifelong a lifelong commitment to living in a way that creates a small an impact as possible. That being said yes of course I take aeroplanes because I also like to travel and I do own a car and I drive my car so you know I'm not a saint. So there's a balance there to be to have between absolutely being very puritanical and losing out on the pleasure and enjoyment I can have in life and combined with in the area within which I can make a difference I will do my best to make that difference. Believe it or not for someone who's just said all those green things I genuinely like cars I think they're fun.

Bikes and walking are pretty efficient, they are not fast necessarily, or well… bikes can be quite fast but… its efficient, there is nothing extra burnt as a result of doing it. They are both burning calories as opposed to sitting in the car rather than if you are in a fury. (P12, non-car user)
Well I, I kind of have but it's been it's been swayed by pragmatism so where I lived in Dorset the buses stopped at five o'clock, the last train from Exeter home was at nine so if you are going to go out for the evening just as it was you know getting going you'd got to go and get the train. So I had to have a car where I lived but but I bought the car that was the most environmentally friendly car I could get. Better for the environment it could also cost less money. I think at that point that's probably was the most important. She had quite a disrupted, basically I split up with my wife about five or six years ago, my daughter came to live with me that was quite disruptive. School was stable we wanted to keep that stable. Removing her from school would I think would have been a bad idea. So all I've said about how important environment is. Actually it came second for her stability in school and everything. (P18, non-car user)
It depends on the situation, as I said if I had all the time in the world. Maybe if I was retired I would definitely travel by train. So I don't care when I reach I just...I care that I can reach the destination, I don't care when. Now there are options so I need to reach the destination as fast as I can, as easy as I can. So planes are...I know their impact on...the ecological footprint is higher than a train and then a bus a coach and a car. (P25, non-car user)
I see it as useful, I see it as beneficial and it's good to kind of help the environment. But I think it can be difficult. They don't always make it easy. So its sometimes seen as sort of… I've lived in [city] for seven years and I still don't know any of the bus timetables. And even when I try to work it out in [city]… there are so many buses its just almost impossible and they are always late. And the train is always delayed and its always.. you know.. as good as it is, you kind of cant help but see the drawbacks as well at the same time. (P2, non-car user)
erm, yeah, definitely, because I like to travel a lot. So I fly on planes sort of thing. So they have a large environmental impact. But I wouldn't want to stop doing it so it a way it's hypocritical. On a small scale, I don't want to use harmful transport but on a larger scale I do. Because I don't want to sacrifice my travel and my enjoyment. That is a hard one. Holidays and just travelling to explore and get to know new cultures. But there are other forms of transport, lets say Europe you can catch the train, you have other options. But I have family in new Zealand and Australia and I obviously chose to fly back and forth from there. But that's something I wouldn't sacrifice. yeah, it's more important to enjoy the time with my friends I think [than environmental considerations]. I'm not totally against cars. I do drive other people's cars, my parent's car if I needed to. And I do like going away in a car with people. Just think for my own personal use I don't really consider it. It's just more with other people. (P21, non-car user)
I'm not sure really. I feel quite bad I suppose about the amount of environmental problems it might be causing but at the same time I'm also a bit… It sounds bad actually, but I'm a bit proud that I've… Being quite young and done the amount of experience of driving I have because I doubt there's many people as me that have

done quite as much driving as I have for my age. So in terms of an experienced driver and the safety aspect and things like that as well, relatively pleased I suppose. But it's only when I think about the environmental things that I think "Oh, actually that's not a good thing."

(P26, car user)

Well it's for short distances, unless you've a very long time to go places. Walking and cycling are causing no pollution, so preferable to a car especially distances where you would walk or cycle. Using a car is probably a bit lazy. Well especially in this country, the weather is not particularly good for cycling and walking. You can get in the car and not get wet and cold. Cycling and walking in the winter is cold and wet and unpleasant. Whereas you can get a car which has heating and you are dry and warm. There are certainly downsides to walking and cycling in the winter time, especially in this country.

Well generally when im tired after work, after a long day at work. You just don't really have the energy to do anything that's only vaguely active. And Saturday mornings I feel particularly lazy. Probably because of the same reason. You are winding down from work, let the weekend begin slowly….

What I'd really like to do is cycle so that I could get some exercise and some fresh air on the way, but if only there was some decent changing facilities at [name of University] I might do it and if only it was easy to get a bicycle on the train to get her I would do it. But its just not feasible. It's just unpleasant and it takes time. So I think stay at home longer, get on the bus and I won't get all sweaty and filthy but you don't get the exercise.

(P22, car user)

I suppose sometimes that it can be annoying and erm your not always guaranteed a seat and eerm you know if you've got quite a lot of stuff with you. You know either your annoying people or.. you know it's difficult to sometimes… erm... But obviously you know I think with them… It makes it more environmentally friendly and sort of erm you know. Because you know sort of it's sort of saving energy and things like that by using public transport and… eerm… yeah I think you just never really know who you sit next to and whether that's gonna be a pleasant experience or not.

It uses a lot of petrol. Wastes a lot… of things on the environment. For example, the meeting we have got in Durham next week and we have to go by plane which is obviously not the most environmentally friendly but it costs 60 pounds to go by plane and it takes an hour either way. The other option is a train that would cost 160 pound if not 200 and we would have to pay an extra one or two nights in the hotel because of how much that would add on to the journey. So you know its things like that, you obviously know when you are getting a plane up to the other side of the country that it's not great for the environment, but when it's the kind easiest and the most affordable, it seems like it takes the decision out of it.

I don't like sort of yeah time being sort of wasted where I am not… doing something. Id rather walk if it takes a bit longer. Just because then I know that I am kind of doing something productive rather than waiting for a bus that might not turn up.

(P4, non-car user)

I know for certain journeys, I know that I am not going to walk, I am going to take the bus. If Im thinking about living in [UK city], Im not gonna walk, Im gonna take the bus because there are far to walk. They are walkable, they could be walked but there seem to far. And some of those journeys I could very easily do those journeys much much quicker than I could with public transport. I mean getting to the mall it would take an hour on the

bus, once you actually get to the bus stop and get on the bus. It would take 20 min in the car so I suppose its a calculation of time and the exercise you dont get.

(P20, non-car user)

So that's quite important to me, walking and cycling are environmental. They are not just environmental, they are… erm, on the danger of contradicting myself here because there is a time and a place for a drive, definitely. But for me, more often than not, I feel bad for getting into my car in many respects. Unless it's that scenario of a nice sunny day and you want to go for a drive. But for commuting to work and for sort of "lets go to the swimming pool" I would feel bad to drive because I would say that's a waste. And fitness as well. Probably to be honest its just as important as the environmental thing for me is the fitness. Like I could have driven here for example but I would have felt bad and would have felt like "No, actually, I can do more exercise, that would be better for me if I take my bike".

(P26, non-car user)

having witnessed my new neighbours who have a little baby and it involves carrying one of the children and holding hands with the toddler. And they have bags and bags of nappies or whatever and having to wait for a bus suddenly becomes a burden. I can see a lot of situations in which quite realistically, having a car… and it is something I have considered but never really had the need to. Or if it's a situation where its, you either have to get the bus or car then I would definitely choose to get the car. But I think very soon I would get frustrated with congestion, with parking and the costs of it and I would really miss the independence, the freedom and the exercise.

(P17, non-car user)

in a sense that I am just aware that I am physically able to walk. And I feel like it's a bit of a luxury to just spend a pound getting the bus to bring me up [name] street. There's a little bit of thinking "hmmm really, if im physically able to do this then…" im not someone who goes to the gym, likes going to the gym, being inside and exercising. I sort of feel that I should be using that…. Its something I can do and I should do it. I should be thinking of it as a way to get exercise, a way to actually engage into some physical activity. You know. My job is a very sedentary job. Well, I feel like if I don't feel right then I shouldn't, you know, expose myself to bad weather conditions as ultimately I don't want to be ill. Who wants to get ill? I always feel like I shouldn't sometimes I just feel tired or not well, especially in the winters when you feel a bit drowsy in the mornings.

I know for certain journeys, I know that I am not going to walk, I am going to take the bus. They are walkable, they could be walked but there seem to far. And some of those journeys I could very easily do those journeys much much quicker than I could with public transport. I mean getting to the mall it would take an hour on the bus, once you actually get to the bus stop and get on the bus. It would take 20 min in the car so I suppose its a calculation of time and the exercise you dont get.

(P20, non-car user)

Yes, I think it's important. Your physical health has much more impact on your mental health than people might necessarily think, and your immune system, and your general wellbeing. It's important, as a relatively physically active person across my life, to be that way. Actually, what I realised about cycling is that it's a good way to increase your activity level without saying, "Oh, God. Now I've got to go and spend an extra hour in the gym." You're getting that activity just from your daily routine, that you would be doing anyway. So, it's almost like a bonus, because you're like, "Oh, it's a workout, but I didn't have to put in any extra time. I was going to do this anyway." Oh, and it's quicker than walking or whatever, so…

I think it's just – there's no way around it. For those types of journeys, it's not going to happen, and you sort of accept that for these infrequent journeys. But I think there is, for me, the difference between the commuting and the travelling that you do every day, or very frequently, and the commuting that you do very irregularly. I

think, for me, I'll do different things in the infrequent commuting. But in my regular, day-to-day travelling, different things are important to me. For me, personally, anyway. Maybe it's similar things to those that are important for longer commuting, like cost, time, convenience, with the added bonus of sustainability, health benefits, things like that. I think maybe the circumstances are – because I live so close.

If I have to carry something heavy I might walk or if Im not feeling very well I might walk, so then I notice quite quickly a change in activity level. So it's quite, even though, you feel like you are taking your life into your hands every time you are getting on a bicycle in a city and you get battered by the rain and those sort of things. I still keep coming back to it because of the exercise benefit that is quite immediate.

(P23, non-car user)

Freedom

In the context of train or bus its just like a feeling of being constrained, or like being trapped, trapped in the system, trapped in the tube. Im not saying that a car gives you ultimate freedom. When I drive a car, especially into a city centre and I have to leave it somewhere and have to worry about where its going to be parked. That diminishes the freedom element really when you are hunting around for parking space and hoping it will be there when you get back. So then it becomes a sort of a pendage. And of course the bus and then train don't because you get off them and they go off somewhere else and you don't car. So that's a restraint from the car.

(P22, non-car user)

So the car gives more freedom. Unless its very very heavily congested through traffic jams. Especially on the weekends when literally everyone is driving.

(P15, non-car use)

Again, its a bit like when you are driving and suddenly there's a big traffic jam, that there's an alternative that you can do in order to still get somewhere on time. That you feel a bit helpless if you don't have any idea about where you are going. And then you get stuck and you are not sure how to rectify that situation.

(P4, non-car)

That's something that obviously is if you took the train it wouldn't be as much of a problem and obviously you've still got a bit of a journey to the train station. It's obviously a lot faster getting into [city]. So yes that would be obviously a benefit of travelling by train, but not enough of a benefit to make up for the amount of time you'd take getting there.

(P1, car user)

The thing about going to Cambridge is its very pleasurable because I know that the person I love the most in the whole world is at the other end so when those things happen I guess it's outweighed a bit by you know this is seeing the most important person to me. It can feel frustrating of course and then I am able to kind of consciously intervene in that frustration and say and it's worth it and it will all be fine and when you get to the other end you can have a glass of wine and can sit down and you know have a gossip and catch up.

I think it's a car offers complete flexibility. I can put anything in it and take it with me so there are times when I've got golf clubs and cart, I've got you know weekend luggage, I've got a present, I've got walking boots 'cos we might go walking etc. etc. etc. so it is utterly convenient. I've got a little a big suitcase full of stuff that I am just moving from one place to another so that totally flexible. I haven't got to decide what we will do at the weekend I can make a plan for all eventualities and it doesn't matter if none of them happen because I haven't lugged something across the centre of London ((laughs)).

And maybe some of those things offset the you know insecurity or unknown-ness of what time will I arrive, what traffic might I hit, this is in fact expensive even if it feels cheap and it just offsets that.

So if I've got a deadline to meet, im a person that comes to work early, intentionally so I get about an hour before things really get going and on the bus I absolutely cannot guarantee I will get here and it gets earlier and earlier and earlier in order to get through traffic. A slow moving bus… so the main thing is, I guess I get quite frustrated so being in control is very important.

(P12, non-car user)

Well that's an interesting question, because I never had my own car so Ive never had this experience of … I am well aware of people saying "oh its lovely, you can get into your own car, you can turn on the radio, you can listen to the news, or discussing things". In many ways, because I never had this experience, it wouldn't be any different for me driving a car from A to B or sitting on a bus, going from A to B. As long as there are no major issues, like big delays or getting harassed by another passenger.

For all the reasons, you can go where you want, you can pick people up, and do everything you need to do. It is absolutely something I would considers.

But it would not go from enjoying to cycle to enjoy driving a car. I think very soon I would get frustrated with congestion, with parking and the costs of it and I would really miss the independence, the freedom and the exercise.

No, and I think simply because you cant park it anywhere. I would have to pay for parking and I have no guarantee of finding a space and when I drive home at the end of the day I wouldn't be bale to find parkig on my road either. Buut then again, if I was visiting my friend who just moved to wales, its whether I cycle to the station catch the train and cycle at the other end or get in the car and drive there, I know what id rather do. But id feel better at the end of the day if id done the cycle and the train ride because ive done some exercise and managed to do it without the car but if someone said it doesn't matter which mode, then I would take the car because its comfortable, its easy

Because its just nice to be able to get in the car. I do enjoy driving, I actually really like driving so… Every opportunity I would jump at it, to drive. I think it's the. I love to watch those HTV drivers monuevre those vehicles because im so impressed with their skill. There is this sort of, I try and drive well as much as I can. I suppose it's the sense of confidence in handling the vehicle. It's a sort of "I know what im doing". Theres something about driving and you know that you've got all this power to move this thing at great speed.

I guess I don't even have to think about it when im cycling because I can go whenever. It is the fact that I don't have to think about things and I can just go about do what I am doing. And it means I can for whatever reason, work late or something else comes up and I need to take a detour. And its nice to know I can do that without having to make other plans and consult timetables or anything like that. So it is that absence of having to think about other things and it is that independence.

(P17, non-car user)

When you plan a journey I don't think, that's very difficult actually because you can just get in it and go whenever. it's getting the route, making sure you've got petrol in the car you know deciding who's doing the driving and who's reading the map it's you know that's what you do isn't it.

I hate sitting in traffic queues I just it just frustrates me really and it means that you know as a family you're stuck in a situation where you know you that you can't get out of really so I find that deeply depressing and also you when you're in a queue you don't know when it's going to end and you don't know how long you're going to be sat there and you don't know what's caused it you know. Often there are no possibilities to actually get out of it and avoid things further on. So that really does you know that will make a difference to the whole journey really to the feeling of the whole journey.

Being able to get into it straightaway, being able to get out of it and being where you are that's the easy part. I think that the in between bits you tend to forget about unless you're stuck in traffic.

(P11, car user)

It kind of gives you a bit of time to think in the morning on the way to work, but then coming from [town] to here it's fine until you get to [city] and then there's the sitting in traffic thing, which is always annoying. If you come in a little bit earlier it's not so bad, but generally the times that you come in to work, you're wasting time I suppose.

(P3, car user)

I think it would always come back to that flexibility and I do enjoy being on the road, I do enjoy driving, I always have done. Its just one of those things I like doing. From my perspective, the benefits, the flexibility, and the convenience tend to outweigh the potential for traffic jams.

I would still say that you haven't got full control in the car because there are still factors that influence your ability to going around in the car, like traffic, but certainly more control.

(P6, car user)

You can plan your own journey, you don't have to wait for the train or the bus. You just make your own timetables, when you want to get out. And it does matter as well. But there is always. if it was an ideal world it would awesome to take the car and to drive but I know that it is going to be stressful and it's going to be tiring as well.

(P2, non-car user)

Thinking in some instances it can be practicality of parking, if I go to our local community centre hall and there's no parking, or very little parking, so I tend to walk or take the bike. Because then you can actually park, if you're taking a car you might end up parking quite a way away, and then not necessarily in a particularly safe place to park.

(P8, car user)

Sometimes, it's like I said before about you can make sure that you leave on time and you're not going to miss connections and things like that. As long as you don't break down along the way, then you will get there and you'll be there early except when there's traffic. It can be unpredictable.

We went away recently. We went from Gatwick and there was a big crash on the M25. We made it in time but we were a bit close, sitting in traffic for two hours on the M25 just stationary. I suppose we should have

allowed ourselves a bit more, but you never know. If there hadn't been a crash, we would have been three hours early. (P3, car user)
It depends where Im going. If Im going up to work in [UK city].. erm… if I can leave later in the car but I am gonna hit more traffic then. It probably end up leaving a similar sort of time for going to work. Just because I.. yeah.. because if I go later in the car its gonna take me a lot longer to get there. So you go slightly earlier and you get to work a lot earlier but then you haven't hit so much traffic. I think for going anywhere else, you can leave a lot later in the car. Usually. (P25, non-car user)
Just trying to get out of my front door with the bicycle can be really difficult because the cars are parked that much apart from each other. It's just really crowded; the parking is kind of in demand and I would worry about getting my car out of these spaces. And even when they redo the lines, they don't consider cyclists at all. But I am not limited because I either get on a bicycle or my feet. It feels liberating, free and empowered. (P16, non-car user)
I guess with a car its frustrating in the sense that often you may think that you could have done something to avoid the problem because its in your control. So in that particular case I thought, I could have left earlier or I could have taken a slightly different route I think then I would have been ok. It was frustrating and I think I was late for it because I got stuck in traffic but I got stuck in traffic because I took a route into [town] which I would have been advised to have taken a different route and I think that probably cost me fifteen minutes or twenty minutes or something like that. So, by the time I'd parked I was already behind schedule and in hindsight – and I said this to the organiser – in hindsight, if I'm needed in [the same town] on a day when I'm doing the school run then I won't be going to [the same town] because actually it wasn't a pleasant experience at all. The thought of being late, I find it quite stressful. I need to be here, I should be here but I'm not and I can't do anything about it. (P24, car user)
I suppose they are more direct. Cause you can go directly to a place on the road. Whereas obviously on the line they only go to certain places, so you don't necessarily go directly to somewhere instead of close to and then you still got to get to the destination at the other end. Obviously, the road you have to deal with other cars, traffic, traffic cars, roundabouts. Lots of other different things like roadworks and that kind of influence. But then Im not sure whether in the car you are fully in control because of traffic and lights and everything. So there probably nothing where you are fully in control. I think walking is probably the closest you can get in some ways. But then you are reliant on knowing where you are going and it takes longer. Unless there are more direct routes that cars can't go down. (P4, non-car user)
So thinking about the shortcuts and cut throughs, you've got a lot more freedom with walking. But cars got loads more freedom. But I guess cars need to go on the road as well. Although I got lost in my car once and I had to go through a field and I thought it was a road.

(P19, car user)
Yeah with the car I guess its just that sort of freedom, you know, you go the routes that you have selected. Obviously with the number of roads there are you can go kind of very direct. Without sort of… And you can go to exactly your destination. Although it then depends on things like parking… whether you can actually park there. Its just that directness. (P9, car user)
The good thing about the car is you can just hop in, you can go whenever, wherever, without thinking about it much. Well, you need to know where you are going obviously and need to have a satnav or something to not end up in a ditch. You are very restricted in that sense. I mean it's far worse when you have made plans to see a friend, and you cannot get there because the motorway is shut. It doesn't happen very often but it can happen any time. And because you expect to get there just fine, because you are driving. Whereas with trains and buses, it's kind of always at the back of your mind "there is a possibility it gets cancelled or delayed". So I feel its more of an excuse. But yeah, (P23, car user)
when you take the bus or the train there is no surprise. Except if there is a problem, that's a problem but you know where you are going nothing can change. But if you take the car, it can just stop for no reason. (P2, non-car user)
I am very used to using PT so I will take that into consideration when I am planning a journey. So I will try and not do that on a Sunday where there is no bus. So it's not that important because I can be flexible and I can fit in with the constraints of PT as opposed to it being the other way around. Yeah if I had to get somewhere for a specific time like a job interview or a trip to a theatre. So if I had to be somewhere at a specific time and I couldn't control that starting time then yes I suppose if I couldn't get the bus or train on time that would be a bit of an issue. Being stuck in traffic jams is really really frustrating. I mean I could be on the bus and stuck in traffic jams and yeah it is a bit frustrating. Especially if you do need to be somewhere at a particular time. Like with PT it can be completely frequent or infrequent when you do use them. They only take you to certain places so you don't have as much freedom as using a car. I don't have a car but if I did I think it would give me more freedom and I would be able to go wherever and whenever I wanted. That sort of freedom. But at the same time not having one makes me think about transport and places I go in a different way and find alternative ways of getting there. And its fine but I think a car is ultimately freedom but then there is lot of responsibility with that. Owning it and paying for it. Making sure it doesn't get stolen. You have to maintain it, you have to park it somewhere and have to pay for it. With PT you just get on and off and you don't have to worry about it after that. But then sort of conversely to what I said, there is also freedom in travelling by public transport in the way that you don't have to, you are not actually the one driving and you can relax and like enjoy the commute more than you might if you were driving. So there is that sort of freedom. Less stressful I guess unless trains are running late and things like that. (P21, non-car user)
Its kind of contradictive because on the one hand, taking a car out on a sunny day, when the roads are empty and you can have a little drive and you think about things, that's great. That's freedom. But on the other hand,

driving in the same car on a rainy day, at 5 o clock after work where there is 5 roundabouts and 50 lanes of traffic, don't know what's going on. That's horrible. I think the train gets away from that.

Well actually, id like to retract one of my answers now actually. Well we talked about feeling that sense of freedom. Well for me, very much on the bike as well. I don't know how that slipped my mind. Probably we had the three pictures of the motorised transport options. But cycling on a nice sunny day can be very much of a release as well.

well I don't know why I didn't think of this but I think the cycling and the car is actually the most similarity because they are both modes of transport and you can both get to places with them. The great thing about this is that you can just go off and that is very similar to a car. Perhaps you can argue that a car has a bit more freedom because there is not many limitation to how far you can go whereas after 5 minutes on the bike, I get tired.

well yeah absolutely, I mean environmental issues.. its now very fashionable to say "I am environmental" until it gets in the way of your life. And unfortunately that's the case. Now I don't necessarily think that but what I just said there with the car thing is a perfect example. So let's be honest, a car is a luxury, no one needs to have a car. But sometimes that luxury can be a big benefit. There are other things to be taken into account, like your health. Yes, it would be more environmentally friendly from me to pick up all these tennis guys from their place and drive them there. But if I had a really busy day at work, where is me, so where do I fit into this? Yes, it is environmentally worse, but it's better for me.

In this particular case, again time, was an issue and it would have taken a long time to cycle there. Weather was nice but it wasn't so nice. So honestly I think in that particular case, the person I was with was quite important to me and she didn't want to cycle and it was quite important to me that she had a nice time. And also because we left it quite late and we wanted to have a nice time before everything shuts up. So weighing up all those considerations driving was the only plausible option. In order to best maximise our time at this nice place and also have the freedom to come back when we wanted to and to ensure that the person I was with had a nice time.

(P26, non-car user)

the cost and the convenience are both really important, and I was just trying to work out whether I thought they were on an equal balance. I think, if the train journey was the same cost as the car, we would probably still go by car, because there's a certain convenience. […] So, it's actually a car, front door, front door, and then between front doors. Yes, the convenience, therefore, is also really important.

Yes. I guess, on balance. The reason I paused is because I think, for us, the cost and the convenience are both really important, and I was just trying to work out whether I thought they were on an equal balance. I think, if the train journey was the same cost as the car, we would probably still go by car, because there's a certain convenience. In [city], we'd have to get to St David's, which is 35 minutes' walk. We'd then have to change in Birmingham to get to [town] for my husband, also [city], for my family. Then, we'd have to get buses from the railway station to our parents' houses, and then, if we wanted to travel between the two, that would be more buses and trains. So, it's actually a car, front door, front door, and then between front doors. Yes, the convenience, therefore, is also really important.

The car is something that you make a choice about owning it, you make the choice about what you spend on it or how you maintain or what routes you travel in it. You have got a lot of individual choices whereas buses and trains, you are not in charge of them, you are not in charge of maintaining them. But you also can't control their routes. So unfortunately, the buses don't run to my own timetable, there is a certain amount of compromise that comes with PT, that you don't get in the same… you get different compromises with the car . So if I get the bus from [university campus] to here, it can take an hour because you are winding around or if you are driving in a car, you can say "no, im going the direct route".

well I think it makes a car very appealing and it makes the decision not to have a car and use other forms of transport, or the bicycle. You know that you have got to leave yourself more time to travel. You know that you have to got to take a change of clothes. So these things are that sort of comprise rather than just getting into the car like other colleagues do and just go straight.

So its just that "I want the bus to be here when it suits me and I want the train to come when it suits me" and that's when you maybe pile a little bit for the freedom of the car when you think "argh its sitting outside my house and I choose to go when I want". Especially because I have had cars in the past so you remember the difference. So now you have to travel to the timetables the providers give you.

I mean one of the compromises with the car as well is that the impacts of road works and external factors affect buses and cars equally. Although with buses this is mediated by bus lanes. I think of going to [city name] and some colleagues go by train and some go by car and sometimes you are no worse off going by train because the cars been stuck on the A38.

You might be stuck in a never ending traffic jam down [city name] or [street name] but actually if you are on your bike or walking, you are not constrained by that. So I guess the flick of that is actually that walking and cycling allow a different kind of freedom.

I think freedom for me means to do things when you want or as you choose. The bicycle gives me freedom, especially in the city, I feel that where the bike comes into its own. Because I can get up here and need exactly the same amount of time as a colleague who is stuck in traffic. I think the longer distances, I think that's what it was with the train example. I think of the train as a long distance form of transport. But in the city, where I do most of my travelling, I find bicycle gives you that freedom to avoid traffic

(P23, non-car user)

I suppose the timetable things as well. With public transport, you are locked to the timetable that they have which you are not with the car.

last year in the summer when we just wanted to drive to [county] and we knew the weather was going to be nice so really wanted to seize the day. So we said we would get up really early and drive down really early to also avoid traffic. Obviously, we didn't get up early enough, I still hadn't packed my stuff so it took forever to pack the car, then realised we had to get petrol, and by the time we hit the A road it was midday and that was really annoying. And I was really angry the whole way down and it just wasn't really a good start to the journey.

(P29, car user)

Like in summer, to be able to just go away and leave whenever you want. To go and visit family, if I could just hop in the car and like drive to Dorset where I've got family rather than be like “urgh, see if I can get a train”. Again actually, I think if I thought about it seriously I would be like “No, it’s not the better option because it is more relaxing [on the train]” and its so easy to get to Dorset from [city name]. I mean going there is a pretty easy thing to do with PT. Just the connection are really good, where the train goes, like the bus connection. It’s quite direct and quite quick and you don’t have to worry about anything really. (P21, non-car user)

Table C.4 Coded quotes to support ‘Context-dependent attitude variability’

C.2 Multi-facetedness of convenience

Twenty-seven participants (15 car users, 12 non-car users) expressed a large variety of different perceptions of (in)convenience in relation to a range of travel modes. Table C.5 presents an overview of different aspects of (in)convenience elicited during the interviews. All perceptions were derived from quotes explicitly referring to (in)convenience.

ID	Group	General	Car	Public transport	Active modes
P27	CAR	Accessibility, time efficiency,	door-to-door, go where you want inconvenience: parking difficulties, safety	frequent services, reliability Inconvenient: delays, low accessibility of stops	
P24	CAR	accessibility, time efficiency, suitable timetable	time flexibility,	for longer journeys inconvenient: crowded, lots of people	
P6	CAR	flexibility, no planning	able to transport things, go straight to destinations, flexibility, journey chaining inconvenient: traffic	easily accessible stops, quicker	
P1	CAR		journey chaining	accessibility	
P10	CAR			Inconvenient: inflexible route, added time	
P11	CAR	go where you want	transport goods, transport family members, door-to-door,	being driven Inconvenient: inflexible route, stick to set times, planning, lack of control over where to sit/not able to sit down,	stop where you need to go, predictability
P19	CAR	journey chaining			
P3	CAR			Inconvenient: low accessibility of stops	
P5	CAR	no planning needed	door-to-door inconvenient: stuck in traffic,	accessibility	
P7	CAR	no hassle inconvenience: unpredictability	carrying lots of people and goods, change of plan, door-to-door, go when you want, long distance inconvenience: parking, congestion, run out of fuel	No changes, predictable, Inconvenient: bound by where they go, planning needed, infrequency of service, cost, stick to times	inconvenience: weather, what to wear
P8	CAR	everything running smoothly inconvenience: unpredictability	carry large items,	no changes, go direct, cost-effective, time-efficient, WIFI inconvenient: when you can't work	
P9	CAR	time efficiency, safety	go when you want, carry items, time efficient, speed inconvenient: parking, in cities, congestion,	accessibility of stops inconvenient: not door-to-door, crowded, stick to set times,	inconvenience: have to plan (weather, what to wear)
P28	CAR	no hassle, easy, no planning	stress free	able to work, being driven inconvenient: stick to set times, fixed routes, transportability	

ID	Group	General	Car	Public transport	Active modes
P29	CAR	speed, time efficiency,	carry a group of ppl, door-to-door, transport goods (locked storage)		
P30	CAR		go to places PT doesn't take you, inconvenient: congestion	inconvenient: stations not accessible, not door-to-door	
P25	NON-CAR	cheap	carry items,	limited number of changes, Inconvenient: not direct, stick to timetable,	go when you want to
P2	NON-CAR	time efficiency, car parking difficulties, safety and costs, minimal train delays, no strikes, car in busy cities stressful, frequency of services	inconvenient: parking (security, duration, cost), congestion in cities	frequent services, being driven inconvenient: delays, strikes	
P4	NON-CAR		inconvenient: get petrol as its not accessible, parking		go where you want, no planning
P12	NON-CAR	under own control, reasonably fast, reliability	time flexibility, transportability, safe at night, inconvenient: having to find parking, not door-to-door	inconvenient: waiting times, exposed to weather, not finding a seat and compromises on comfort, unreliable timetable, not door-to-door	time flexibility, door-to-door, reliable,
P13	NON-CAR	be on time, quick, no planning	transporting heavy loads, inconvenient to have it in London	more relaxed, read a book inconvenient: stuck to timetable, multiple stops & modes	no preparation, go when you want
P14	NON-CAR	no traffic, door-to-door (no multiple stops & modes), easy		frequency of service, on time, inconvenient: capacity and getting a seat	predictable, no planning, go when you want
P15	NON-CAR	relative journey time,	inconvenient: responsibility, driving when tired	few changes, frequent services, take as many people as you want inconvenient: detours, waiting time, carrying shopping	
P17	NON-CAR	predictable, in control	Inconvenience: parking, financial responsibility (maintenance), no parking	no maintenance, no responsibility, inconvenience: waiting time	speed, control inconvenient: exposed to elements
P18	NON-CAR	times that suit you			

ID	Group	General	Car	Public transport	Active modes
P20	NON-CAR		Inconvenience: break down, maintenance		
P22	NON-CAR			inconvenient: not reliable	
P23	NON-CAR	time efficiency	door-to-door, go when you want, journey chaining	accessibility of stops, number of changes,	

Table C.5 Multiple aspects of (in)convenience

C.3 Reflection of questionnaire responses

Two weeks prior to the interview, participants were asked to complete a questionnaire that contained 30 questions assessing their opinion on transport and environmental issues. Table C.6 displays means of all responses and separately for non-car users (*n*=15) and car users (*n*=15).

Question		Mean Ratings*		
		All (*N*=30)	Non-car	Car
Q1	Changing travel habits is a great way of helping the environment	4.30	4.53	4.07
Q2	It is easy for me to change mode of transport for daily travel	2.50	3.47	1.53
Q3	We need more public transport services	4.13	4.33	3.93
Q4	Car driving is affordable and good value for money	2.90	2.47	3.33
Q5	Increased walking and cycling will help to tackle climate change	4.37	4.73	4.00
Q6	I like travelling in a car	3.63	3.20	4.07
Q7	The government should take more of a lead in protecting the environment, even if people don't like it	4.23	4.47	4.00
Q8	Using public transport is convenient	2.37	3.00	1.73
Q9	Using a car is the safest way to travel	2.28	1.79	2.73
Q10	I am quite flexible about what types of transport I use	3.33	3.87	2.80
Q11	When I am getting ready to go out, I usually don't think about how I am going to travel, I just get in my car	2.20	1.07	3.33
Q12	We should increase prices of petrol to reduce congestion and air pollution	2.53	3.00	2.07
Q13	Using public transport is a satisfying experience	2.45	3.07	1.79
Q14	The car I own says a lot about the kind of person I am	1.86	1.29	2.40
Q15	People should be allowed to use their cars as much as they like, even if it causes damage to the environment	2.27	2.20	2.33
Q16	I find travelling by car can be stressful sometimes	4.37	4.60	4.13
Q17	Being environmentally responsible is important to me as a person	4.27	4.67	3.87
Q18	For the sake of the environment, car users should pay higher taxes	3.03	3.67	2.40
Q19	Environmental threats, such as global warming, have been over exaggerated	1.43	1.33	1.53
Q20	It is important to build more roads to reduce congestion	2.30	1.53	3.07
Q21	I like travelling by bus	2.37	2.80	1.93
Q22	I would like to travel by car more often	2.03	1.80	2.27
Q23	The way I drive says a lot about the kind of person I am	2.80	2.80	2.80
Q24	I am actively trying to use my car less	2.55	2.07	3.00
Q25	Reducing my car use would make me feel good	2.97	2.71	3.20
Q26	There are no practical alternatives to most of the car trips I make	3.17	2.07	4.27
Q27	I would be willing to pay higher taxes on car use if I knew that the revenue would be used to support public transport	3.10	3.20	3.00
Q28	I would only travel by bus if I had no other choice	3.07	2.73	3.40
Q29	I am not interested in reducing my car use	1.70	0.87	2.53
Q30	It would be easy for me to reduce some of my car use	2.20	2.67	1.73

*5-point Likert scale (1=strongly disagree, 5=strongly agree)

Table C.6 Mean ratings of questionnaire responses

At the end of the interview, respondents were invited to reflect on their responses to the questions below. Participants often reconsidered responses or justified their answers using a range of strategies. Some respondents acknowledged they would have responded differently in different situations or contexts. Table C.7 shows all quotes to derive the selection of ambiguous questionnaire items.

Items relating to public transport
So well I had a bit of a, well that a sub-story now. I used to go by bus quite regularly to college when I was younger. the buses where I lived were really old things and not really reliable. 90% of all times I was standing up and with bus drivers doing emergency stops, so it was really a pleasant journey. and I was a good 20 - 30-minute journey so that put me off buses. (P1, car user) Were you thinking about this experience when you answered the question? (Interviewer) I did actually, yeah. (P1, car user)
Yeah I mean. I feel a little bit ambivalent about being on the bus. Partly because being in a car sometimes makes me feel sick like travel sick. Buses and coaches and cars are quite bad for me from that point of view. I do go on the bus sometimes. I often go to London on the bus instead of the train because it's cheaper. (P13, non-car)
If that's come up, that would definitely be because I have recently been on a bus with [name] of he last dog I had and he was a bit naughty on the bus. So it was always having to wrangled with him on the bus and because everybody is watching you on the bus and being critical about what you are doing. That adds to my stress level because "I know I don't want to be here but I am." (P17, non-car)
I mean, occasionally if there's a nice day i actually quite enjoy it. I live in [town] so if I caught the bus to [town] it goes via [seaside town] so it's nice if it's a nice sunny day and it's quite pretty views. It goes all the back way and all over the sea front and everything and that I mean that can be quite nice occasionally. but I wouldn't want to have to do it every day. That's more of an event rather than a commute. If I had to get somewhere for a specific time, I can drive it in twenty minutes, it's so much longer on the bus. […] It's just a nice view looking, at the sea it's nice to be near the sea it's calming I think. […] Not being in a rush, definitely. Not being in a rush and not having to go anywhere. Just killing time it's quite nice doing that. […] But if I'm trying to get anywhere… I think if you have to wait for a bus it's always.. you know, never on time and always a bit, you know, stressful. (P10, car user)
I think perhaps I hadn't really thought about it terribly much. The particular question on a what comes to mind straightaway and I think you sort of feel when you're well you know you just sort of hit it and think ok right pretty neutral as far as that's concerned but actually then when you come to think about it and ask more detailed questions actually you find that your view is not what you expect it to have been. (P11, car user)
Oh I'm sure I feel very ambivalent about bus travel. Satisfied in some moments, frustrated in others. Yeah, I think, I suppose my response to that question related to my general feeling about bus travel and yeah, it is

fairly enjoyable. You sort of sit in your little space, read a book, be on the phone. So in that sense I think its good in general. I dont dislike it. But in terms of being satisfying it always has a lot to do with how it is organised in a specific way and a specific place. I always feel that particularly in [city] I have been frequently dissatisfied with bus travel experience in the city. partly because when you are new to the city, it is impossible to work out where you are going and what bus you need to take and when. you could make more money if you make this more user friendly. More accessible. I mean all these things you could do, provide maps on the bus shelters or racks for your bikes. and I feel [city] bus services which I had most contact with I found dissatisfying. so its not the bus travel in general which is fine, but I think how user unfriendly the service is. it's shocking. and expensive. I just feel like it's such poor value for money. […]

It's difficult because you are asking questions on a general level you know. "how do you feel about a certain form of transport" and my responses reflect sort of the accumulation of experience rather. its not... I think when I thought about what bus travel could be right when I landed in [city] and had no real experience of the network in the city. I think in terms of train travel, I think I have a more holistic picture. yes, I have experiences delays but I think its a very efficient way of travelling in terms of time. it's costsly in this country with certain journeys.
(P20, non-car user)

It can be convenient if you need to travel, let's say on a train, when it's rush hour and when it arrives at a time you need to arrive. Where it gets you where you need to be on time. My experience is that it is not always like that. and for the journeys I do, its perhaps too far to cycle and I could take the bus, my journey would be considerably longer on a bus or a train because it all adds time, going to and from the station. It is not convenient when you have to be somehwere at a specific time, like child care or something like that.
(P24, car user)

Obviously, in London, the tube is fantastic isnt it. So yeah I think in London PT is a must. So yeah in big cities… there really isnt any other alternative really. Every main area you want to go to has a tube stop. Obviously if you want to go out for a meal and drinks, that rules out the car. Usually the rail lines around the cities are good. But here, we don't have that. weve got a much more infrequent bus service, much more infrequent train service and we have train stations that aren't particularly close to where I live. And there is the accessibility of it. In London, you just have to use the tube because there aren't any other convenient options. So you have to learn to read the map and timetable. Here there are so many options, you don't know where and when the buses are goin to stop. Because you don't really need to use it. […]

On the rare occasions that I have commuted by public transport. The satisfying part of this is that you can take your laptop and then you've got an hour to actually do some work. and that's actually quite satisfying. You can answer emails, etc, all those things you feel like you don't actually have time to when you are at work. but the unsatisfying part is, I don't travel well. I usually get very sick. And especially on buses. So for example, buses into London are so much cheaper than trains but there is no way I would do it. Satisfying is you can get some work done, which is quite nice especially when you are commuting. And obviously you have to get to the station and deal with delays. Whereas with the car you can get from A to B without issues.
(P26, non-car user)

I think that's my recent experience with getting the bus. Because I have just gone on the bus once and its just that whole.. I think it's the not knowing whether you just missed the bus or whether its really late. Because when you get there at roughly the time it is supposed to come you don't whether you have missed it and whether its late. And you don't know whether you are gonna be waiting there 1 minute, 5 minutes, 20 minutes, half an hour. And again, it's that sat out in the cold and rain. […] I think I would have responded differently had I not had a recent bus journey that was a bit of a nightmare. And I still would have been a bit unsure about buses because I never found it that easy to learn the system and the timetables. So I still would have felt the same about that but maybe slightly less negative.
(P4, non-car user)

I think the problem is, I think when I answered that it was related to how would you make it work. so whats the point of putting more on, but you never gonna cover all the areas to meet everyones needs. so you can put more and more bus lines in but you will still have somebody who will say "it doesnt work for me". so you can triple the number of buses and there will still be somebody. in the meantime, you have increased congestion

and whether there would be enough people to make it worthwhile, it doesnt quite seem to make sense at the moment. […]

Yeah pretty much, unless I have planned a journey. Or on occasions when I go into [city] for example, that's when I know the bus times. I know exactly when it leaves and I know the trains are at quarter past and a quarter to. so I dont need to plan that. I just go "what time is it? yeah, I can now go outside and take the bus". […]

I mean I cant remember what I said but I dont normally travel by bus when weve done a weekly shop, when you have to carry suitcases, when we went to london with a single suitcase, that's not so bad. It was a day suitcase so it was easy to move on and off the bus. but when you are away for a 3 week holiday it wouldn't necessarily do that.
(P6, car user)

Items relating to environmental protection

I don't know I think, I think I like I said earlier I think it's, it's one of those things that it has to be a global change rather than just a one person not using their car and because and I know global changes start small and that's the wrong thing I know it's the wrong opinion but kind of you do kind of think well I'm going to be walking along if I drastically changed everything that I did and kind of worked it out so I could be particularly green and friendly and then my walk would be along the Alphington Corridor and I'd be like looking at everybody in their cars like 'you need to do this not just me' do you know what I mean. So I think it's kind of, I think bigger changes might have to happen and if bigger changes did happen then I think, I think it would be good and I do think it is important to be kind of environmentally friendly but then people who do like you know journeys to Australia four or five times a year and you think hm ((laughter)) you think I wonder big your carbon footprint is compared to mine. […]

Ok yeah I think it just I've always yeah I think it's an important thing particularly living in the countryside you are like aware of how important kind of open spaces are compared with the kind of cities where you go there and there's smog everywhere and it's like you know smoke and car fumes and everything I think it's important to kind of savour the kind of the nice the good bits and I'm big on global more on a global scale to save the planet.[…]

No although I don't do anything particularly environmentally unfriendly I mean I my car is the, I wouldn't, I wouldn't have a 4- wheel drive diesel car and things like that. So it does to a certain extent but only to the extent that it doesn't put me out (laughs).[…]

It's not that important for me if it was you know if it became kind of a global thing and everybody was reducing their carbon footprint and things like that then I would think about it or think about moving her closer.
(P10, car user)

I find it very frustrating and I... it doesn't make me happy let's put it like that is probably the best way I can put it. And it is a frustration I think.
(P11, car user)

Hmm, yes, that is really interesting. That is really interesting because that does not come into my reasoning for why I chose the bike because all the other reasons we have discussed. But when I participated in things like the [city] travel challenge. I cant remember the name but its an annual event and the council run it and they encourage you to sign up and you record your miles and how travel to work. And those are the kind of things that make me aware of the fact that walking and cycling are obviously kind of environmentally friendly way of commuting or using public transport. But its not a big factor in my decision making. Its something I like about it and I acknowledge. But I wouldn't for example say "im not gonna buy a car because it pollutes the environment". If there was a reason why I felt having a car was a useful thing and practical, then I would buy a car. I might consider things like using a car that has a minimal impact in terms of exhaust fumes and carbon footprint but it wouldn't discourage me from having a car. It is absolutely the practical control, the decision making, the convenience, the speed.[…]

I suppose I think it's a matter, it's a nice thing about it but its not the reason why I do it. If it was the other way around, if cycling was bad for the environment. I don't even know, having said that out loud I don't know whether it would discourage me from cycling. If I felt I would be contributing to polluting, it would sit very uncomfortable with me and I guess that could then suddenly become a real deal breaker but the fact that it is a positive just reinforces everything else. […]

I wonder with environmental concerns, we should all be taking it much more seriously but because we are so used to the things the way things are. So used to everyone pretty much hop in the car or fly off if we want to go somewhere. We don't challenge the impact of it or maybe its because we don't feel the impact of it immediately or significantly enough to really realise "this is contributing this much Co2 to our environment" And is suppose it sounds like an excuse, but im not one of those ppl who feels…
(P17, non-car user)

Yes (laughs). It's not something I think about. At all. For me it's time and cost are more important to me than environmental friendliness. No I don't think about it. Yes it's good to be but that isn't a reason why I would choose to travel in a certain way.
(P19, car user)

Well I dont do many miles in my car. So, Ive got quite a big car actually. but I dont worry about my car's impact impact on the environment. because I dont drive very far in a year. And so for me something like cycling. Yes, I can save a little bit of money by not driving. I do have a parking permit which I could give back to [employer], but that is not about the environmental aspect. My environmental contribution might be in other ways, so like, how much water I am using at home or electricity and gas. I dont travel enough I feel, that not using the car would make a difference. So whilst I have a concern about the environment and what we do, I dont see that my car use makes a bit difference.
(P24, car user)

I don't think I drive as much as some other people, but also I'm not a saint and don't try everything to inconvenience myself by not taking a car. I do other things that are pro-environmentally friendly, that most other people probably wouldn't do. […] I think I'm just about average when it comes to that sort of thing.
(P28, car user)

I suppose maybe. I dont know. It is possible, I dont know how much. It comes back to that point, I think maybe I owuld score a few things slightly different. I remember going through the questions and especially with the environmental questions I was sort of in the middle. Yes, I think its important, but personally I dont know how much I can do. I mean maybe I would have scored it slightly different after weve talked about it.
(P3, car user)

Well, I am pro-enviornmental but I am also practical about the realities of living in this society and as you may have gathered from the beginning of it I am not convinced how environmental electric cars and all these things are. And I think, sometimes, I question how environmetally friendly public transport actually is when, for example, buses are running virtually empty most of the time. and a car does 60 to the gallon and a bus does twice that. so I am not necessarily convinced by that and in that respect, equally I am not convinved about rail transport either. maybe at peak commuter hours but again, I am not convinced about non-peak hours. and one of the things to try and reduce my environmentally footprint is driving less and not travelling at all. but in the society you live in I am not convinced any of the options that we are being told are as pro-enviornmentally friendly.
(P5, car user)

I think it's all relative. Yes, I might be driving my car a lot more than others, but there are also people who drive a lot more than I do. I do care about the environment in that I make sure I recycle and dont throw, e.g. batteries in landfill. I don't shower for ages, I dont leave the engine on unnecessarily. So I feel like I do my bit. And I am sure its more than others. But it has to be within reason. When it comes to driving or not driving, I just feel that it won't make such a big difference when you have diesel lorries crossing the whole of Europe on a daily basis. There are easier and more effective ways of helping the environment.
(P30, car user)

Items relating to car use
So that it is value for money against public transport costs. So I think the car is cheaper than what you pay I am thinking London times so I think my season ticket to London and what my friends are paying about £1,500 a year is that right well that's ridiculous and then they have cars on top of that and that's ridiculous it's a lot of money to use a train that doesn't come on time whereas the car you still need to pay petrol and tax and things like that so it is expensive which is why I was neutral because it's cheaper than using public transport but it's still not cost free like walking is. (P19, car user)
In principle yes, I mean it is good value for money if you think that you can share a car. In that sense I put that answer when I was thinking about in terms of car sharing or car pooling. You have a colleague or a couple of colleagues to go to work with, so you can share the costs. As a single person, it is more expensive. In the long run, it is more expensive, definitely. Single occupancy, I would disagree, yes, maybe put a note on that (laughs). Because thinking about, for example, in Switzerland you pay 3000 francs and you can take ANY transport across the whole country. Often your employer even pays for it. So with the car you have insurance, tax, the car itself, depreciation so its going to be much more expensive. (P25, non-car user)
Well, thinking about it, yes, it probably is not the best value for money. I think when I answered it I just wasn't thinking about all the things you normally not think about when you drive, like MOT, insurance, maintenance. You just tend to think "What does this journey cost me in terms of fuel". (P30, car user)
Yes I do because of the number of road accidents that there are really accidents on public transport are much fewer or seem to hit the headlines less whereas you road transport is actually quite a dangerous occupation.[…] Yeah true but that was you know a one-off when I was when that happened, but I used to travel to school an awful lot you know by bus in fact I did nothing else for seven years as perhaps you may have done as well and that was just a one-off accident in the course of many, many journeys. You know yes I've done many, many journeys in a car but also you know I've had two accidents and I've seen numbers of others so you know deep down that road transport is actually quite a dangerous means of transport simply because of the number of variables involved. Public transport especially trains, aeroplanes that sort of thing remove a lot of the variables so intrinsically they're safer. (P11, car user)
Its because of all the safety precautions youve got installed in cars now. youve got seatbelts, airbags. yeah and the fact that theyve got a roll cage. there are people who have horrendous accidents and they come out completely safe. cars are very safe. they are built to be safe. which is not something I can say about the bike. Even though you have a helmet, that is not going to safe you when you are going 15 miles an hour down a hill. you are going to scrape you knees whereas in the car you probably wont feel anything actually. same with being a pedestrian. I am not sure what the record on buses and trains are but you havent even got seatbelts. and while safety on bus and trains is not something I think about generally. generally. but you can imagine, you are at the mercy of whatever momentum is carrying you. but in the car, yeah great. you have your own little metal shell which protects you and all the little bits inside that protect you. (P14, non-car user)
I am trying to remember the statistics. I believe that per mile, driving is much more dangerous. Every time I get into the car I got reminded that a small move can have very serious consequences. Not only for myself but for the family or other family as well. The danger of being involved in an accident is always there. (P15, non-car user)
Ah, yeah I think it depends a little bit on the context. I mean you hear so much about terrible car crashed and of courses. And often someone else causes a nasty incident. So for all of those reasons, it kind of feels that in

the car there's always something that can happen. (P17, non-car user) Did you think of those incidents when you filled out the questionnaire? (Interviewer) Yes, I must have. I can't think of anything else why I would have said it. (P17, non-car user)
In terms of what's safer, yes a car is a lot safer than the bike but you are also going a lot quicker and longer journeys and journeys you don't know so much. So that is also something to consider. (P26, non-car user)
In the moment that I'm stressed because of driving, I keep thinking there must be a better way of doing this. but when the driving is ok and there is no traffic or whatever I do enjoy it and it makes up for the stress. […] Although I don't mind driving by car I would prefer not to, so increasing driving wouldn't be a positive for me. (P1, car user)
Being held up. It annoys me as I travel a lot of like you know not in rush hour so if I'm driving to work if I go along the Alphington Corridor I get stopped at every set of traffic lights. I'm the only car on the road and I have to stop at every set of traffic lights it's just it's nothing it's like minutes on my journey but it's you know it's just annoying and if you're yeah if you're in a rush and I have to do a workshop not that long ago and it's frustrating I think if you're the only car on the road and kind of nobody around and the road is clear and perfectly fine and you know you've got speed restrictions or something and you've got to drive at 50 between and there's nothing there you don't see the point of this. (P10, car user)
I answered that question as a way of car sharing. so my partner driving and me not being the responsible one for the vehicle. I like it because I get to spend time with my partner, I dont need to worry about other people, I can listen to the music and its door-to-door. thats really comfortable. its really comfortable being a passenger in a car. and I can even have a snooze if im that way inclined. so its convenient, its comfortable. you have a certain amount of control despite not being responsible for the vehicle. (P14, non-car user)
Well depends if I'm driving or not. Sometimes, when I am a passenger in a car, it can be horrible. If I'm with other people… if I'm driving its 50/50 because obviously if I'm stuck in a horrendous traffic queue and I need to get somewhere then it's not so pleasant. If im driving round and round a car park, trying to find a space, its not so pleasant. But if I'm on an open road and nothing is getting in my way and I'm getting to where I need to be and ive got the radio I like to listen to on, and the temperature is just right, and the weather is good. Its lovely, its freedom isnt it. Go fast, go slow. Certainly haven't go to worry about the elements. (P22, non-car user)
Its stressful on the narrow roads. You always have to be careful with your mirrors and the oncoming traffic and make sure you don't hit each other. so far I managed to avoid all collisions but sometimes there are cars on the other side that are pretty close. So that's stressful and its also stressful if I don't find my way. I usually plan very carefully, and google street view is excellent. I know my way around te city very much now but when we go out of the city its new ways every time. And I plan carefully every time and try to be careful not to get lost. But still sometimes I do and that's what I don't like. And then you don't know where you are and you cant stop. You are in the middle of the road and you cant stop, you are in the way, you are driving, you cant look at the map. And then you have to park, where do you find a parking, how much does it cost, how do you pay, how long do you park there and by what time will I be back and how long shall I get the ticket for and will I be back in time? Its all stressful. If I have to I do it. If it's a lot cheaper to rent a car then I will do it. (P15, non-car user)
For all the reasons, you can go where you want, you can pick people up, and do everything you need to do. [Buying a car] is absolutely something I would consider. […] but it would not go from enjoying to cycle to enjoy

driving a car. I think very soon I would get frustrated with congestion, with parking and the costs of it and I would really miss the independence, the freedom and the exercise. […]

Because it's just nice to be able to get in the car. I do enjoy driving, I actually really like driving. […]

It's parking, volume of traffic, those are the issues.
(P17, non-car user)

Well I like travelling in a car when there aren't many cars on the road. So when it is not rush hour. I like travelling in a car when I don't have to go across certain parts of [city] because there is a lot of traffic. and if I'm driving, let's say to Dartmoor or something. you might see some things whilst driving. that's enjoyable. plus, its enjoyable if it's a nice car, you've got music on and that's enjoyable. or you are in good company, that's an enjoyable driving experience. The flipside is, there are lots of people doing that and that's not so enjoyable because you have to think very hard. […]

Yeah, well I think. well, partly because... well for a number of reasons. I bought my bike years ago on the cycle to work scheme. I am aware that competition for parking spaces in enormous and said to increase over the next year. and I dont want to be part of that competition. so I want to use my bike as often as possible to get into work. so that's one motivation. and all the reasons I said earlier why I cycle. Freedom is a motivator for me not to use the car. I don't have ant intentions to change the way I drive outside of work. It's mostly about how I get to work and the enjoyment of being on a decent bike with good clothing. That really adds to the benefits and enjoyment of cycling over the car.
(P24, car user)

Oh well, that's only when I am sort of the tourist and go around, see places that I cannot reach easily with public transportation. Once, for example, If I want to go to Stonehenge there might be buses but I have to take 1,2,3, 4, 5 changes… No, id rather take a car. But I will not go there alone. I would go with people. So I would rent a car with other people, my girlfriend or friends.

It is stressful, in general because you are surrounded by other people driving and you have to pay attention. It is stressful in that sense. And it becomes even more stressful when there are more people in the car and you are responsible for not just yourself. You cannot be relaxed. I have to say, I do enjoy driving. I like driving. I like driving and the car as well. But its stressful. I like to go in general…. And I like to travel. Car, it is stressful because of that, because you have to concentrate.
(P25, non-car user)

I don't think so. Maybe actually. I mean there are more times when I dislike travelling in a car than when I do like it. Its interesting because when you showed me that picture I was thinking of freedom and all the rest of it and there are times when that is good. And you know when you are driving to the beach with a surf board in the back, that's pretty good. Well so I would say by and large I stand to the fact that I don't like travelling by car. Because that weekend trip we were talking about was a means to an end. we wanted to spend as much time as possible in a town etc etc. the car was the best option to do that. had there been other viable options and would I have chosen them? Yes! Did I like driving back in the dark not really knowing where I was going? No. To me, the car is very much a means to an end. There are a few occasions when you go out in the car individually and you can think. But I don't go out for rides, what im talking about is going home to see my parents and actually bizarrely those are the situations in which I can think. I haven't got to answer my phone… it's a means to an end.
(P26, non-car user)

Yeah, it very much depends on the journey. I think I GENERALLY quite like driving and like being in my car and things like that but you sort of only need one incident where someone changes lanes and kind of into your lane where it changes the journey into quite a stressful one. It can be quite scary, and you don't always know what other people are going to do and the car starts making noises. Yeah, it can be quite stressful. And there's so many cars on the road and I think with the extremes that people drive. There's people on the motorway going 55 miles an hour and there's others driving over 100 and you are kind of in the middle. You kind of often end up with.. you are either getting stuck behind people and have to pull out, so it's not always safe to do so. I think it's just sort of not knowing what other people are doing and you always have to second guess. "Are they

in the right lane? No I don't think they are.. they are going to come across in a minute…" People don't indicate and things like that… But still, I wouldn't want to give up my car. I like my car, its useful. "I think the car can be quite cost effective when you split the costs. Some journeys are so expensive by train and you can't always get a group discount. So it makes sense to car share. (P4, non-car user)
I think its the freedom of choice. you don't know when you step out. you may just go for a walk, for lunch or window shopping. But there might be a time when I see something and I go "oh, that's exactly what I want" so knowing you have got that freedom with the car, that's quite important. you don't want to be like " oh no we cant get it because we are on a bus we have to come back tomorrow" and then actually you might not bother and loose the opportunity because it might be the only one there. so having the freedom of making you own choices and leading your own decisions is the most beneficial. It's the freedom of choice and that flexibility. (P6, car user)
"Do you think you would have responded differently to some of the questions in different situations?"
Possibly. Yeah, possibly I suppose. (P1, car user)
Yeah, probably if I'd just been delayed (laughs) […] I would probably be less positive about public transport I think I was fairly negative about public transport anyway but even more. Yeah maybe I had just come back from Sheffield or something I think I had... after spending four hours on the train no I hate them. […] So infrequent that you know it's really kind of you know once or twice a year that that happens so kind of it's not really worth mentioning but yeah I might have been slightly more positive. (P10, car user)
So if you gave me the questionnaire again and said think about it, think about the questions you might well get different answers.[…] That's a good question you'd have to give it to me and I'd find out. You know it would be you know whether I thought ah yes we've discussed that and this is what I think this time and then I'd put the answer down so it would be almost like that but you know with just a little bit more thought behind it on the basis of what we'd actually talked about. Several things that we haven't talked about made me think about my responses to particular things and I would have to go away and have a sort of think about that because… […] Well yeah it's an interesting idea I think if you do think you know if you already very, very convinced of the responses your giving then you probably wouldn't make a lot of difference but if you reflect on the answers or the questions that you've done I think it gives you the capacity to actually reform what you think which after all is what interaction with anybody should be you know you reflect on what you've heard. You learn from what you've heard and hopefully that changes you a little bit as a person. […] So another unconsidered response that I may regret (laughs). (P11, car user)
Yeah I think it was a less busy day at work and I was in a good mood. So, I was more inclined to answer positively and not be so strict. (P13, non-car user)
probably yeah, erm, but considering Australia is 3 years ago and since then I have changed my perceptions of car use. I mean it is definitely non-pro-car comes with hindsight. so I think from where I am now it would have been an ignorant response. (P14, non-car user)

I mean, I don't tend to think that my opinion about travel changes a lot. Generally speaking. Obviously, there are pros and cons about every mode. And yes, I guess if you had given me 5 different questionnaires on 5 different days, I think you would have received 5 slightly different answers. (P16, non-car user)
May be but I can't imagine myself sitting on a bus at the moment. (P19, car user)
Maybe, maybe (smiles) (P24, car user)
I think that's hard to say and I would like to say no, but I have a feeling that I would. Just because there are always two sides to it. Not all of them, but some of them. There is no black or white answer for, for example, do I enjoy driving?. Yes I do. And I don't. Do I enjoy driving on an open road in a fast car? Yes I do. Do I enjoy driving in the city with all that traffic? No! So depending on how you see it, what angle you are looking at it, it will probably change. (P29, car user)
Erm, I don't think so. Maybe actually. […] I don't think I would have in the questionnaire because I have always felt the same. I certainly think in terms of what I have done there is been a big shift in the last year, probably two years. So the questionnaire would have been the same, but probably the reality would have been different. (P26, non-car user)
Quite possibly, yes. (P28, car user)
I suppose maybe. I don't know. It is possible, I don't know how much. It comes back to that point, I think maybe I would score a few things slightly different. I remember going through the questions and especially with the environmental questions I was sort of in the middle. Yes, I think it's important, but personally I don't know how much I can do. I mean maybe I would have scored it slightly different after we've talked about it. (P3, car user)
Possibly to a few, yes. Having thought about it, the value-for-money aspect certainly. And perhaps, I would have not been so harsh on public transport in hindsight. I don't know why, maybe I just had a bad day (laughs). (P30, car user)
I think I would have responded differently had I not had a recent bus journey that was a bit of a nightmare. And I still would have been a bit unsure about buses because I never found it that easy to learn the system and the timetables. So, I still would have felt the same about that but maybe slightly less negative. (P4, non-car user)
Yeah quite possibly, I answered it relatively quickly so it's entirely possible that if I was in a different environment and in a different frame, in a tropical bar with a Pina Colada, then I might have been slightly more chilled about some things. (P5, car user)
I think, on reflection, I probably should have not been so harsh on public transport as it can be quite good. (P9, car user)

Table C.7 Coded quotes to support selection of ambiguous questionnaire items

C.4 Goals in personal travel

Investigating a comprehensive map of goal relationships is beyond the scope of this study. Thus, goals and their associations depicted in the map below remain explorative results. Non-car users' and car users' goals, either complementary or conflicting, can give an underlying explanation to the attitudinal ambivalence identified in this study. During the interview, laddering questions allowed to explore deeper meanings of reasons behind selecting travel modes. The structure, which sees attributes and functional consequences at the lowest level, are reasons for (non-)car use frequently elicited during interviews. By using follow-up questions such as "Why is it important to…?" and "What is the reason for…?" the interviewee disclosed values that underpin their travel decisions.

Figure C.1 Map of interrelated goals and transport-relevant attributes

Appendix D Supplementary material for Chapter 5

The following pages contain supplementary files for Chapter 5 ‘Can different goals change willingness to use and attitudes towards non-car use? An implicit priming experiment’.

D.1 Questionnaire

Table D.1 presents all covariates measured in Study 1 and Study 2 and corresponding questionnaire items.

Variable	Question and options (if applicable)
Age*	What is your age, in years?
Gender*	What is your gender? • Female • Male
Living Area	Which of the following best describes the area you live in? • In a rural area or farm • In a small town or village • In the suburb of a large city • In a large city
Ethnicity	What is your race? • White or Caucasian • Black or African American • Asian • Native Hawaiian or other Pacific Islander • American Indian or Alaskan Native • Other (please specify)
Income	Which of the following best represents your total household income per year (before tax)? • < $5,000 • $7,000 to $7,499 • $7,500 to $9,999 • $10,000 to $12,499 • $12,500 to $14,999 • $15,000 to $19,999 • $20,000 to $24,999 • $25,000 to $29,999 • $30,000 to $34,999 • $40,000 to $49,999 • $50,000 to $59,999 • $60,000 to $74,999 • $75,000 to $84,999 • $85,000 to $99,999 • $100,000 to $124,999 • $125,000 to $149,999 • $150,000 to $174,999 • $175,000 or more

	• $35,000 to $39,999
Children	My household consists of how many children?
Education	What is your highest level of education? • Less than a high school degree • High school degree • Some college (no degree) • 2-year college degree • 4-year college degree • Masters level degree (for example M.S. or M.A.) • Doctorate level degree (for example PhD, MD, JDS)
Mileage	My annual driven mileage is approximately ____ miles. (Include private journeys, as well as your commute).
Exercise level	How many times per week do you usually do 30 minutes of moderate physical activity/walking that increases your heart rate or makes you breathe harden than normal? • None • 1-2 times/week • 3-4 times/week • >5 times/week
Stages of Change	Please indicate which ONE statement best represents you. • Don't use other forms of transport, not thinking about doing so... • Don't use other forms of transport, but thinking about doing so (not within next month)... • Don't use other forms of transport, but planning to in next 6 months... • Sometimes use other forms of transport, but doing so for less than 6 months... • Have been using other forms of transport, and doing so for >6 months on regular basis...
Awareness of influence	My answers were entirely my own and I was in no way influenced to give particular answers (-3, strongly disagree – +3, strongly agree)
*variables measured in Study 2	

Table D.1 Questionnaire items and variables

D.2 ANCOVA results

D.2.1 Willingness

Table D.2 below shows the full ANCOVA model for non-car use willingness including all covariates and Table D.3 presents ANCOVA model for non-car use willingness excluding age, gender, ethnicity and education due to high number of missing data.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1411.385[a]	19	74.283	51.268	.000	.625
Intercept	7.468	1	7.468	5.154	.024	.009
PBC	237.079	1	237.079	163.626	.000	.219
Age_Coded	.451	1	.451	.311	.577	.001
Gender	1.944	1	1.944	1.342	.247	.002
Living_Area	6.164	1	6.164	4.254	.040	.007
Ethnicity_binary	.142	1	.142	.098	.754	.000
Income_Coded	.298	1	.298	.206	.650	.000
Children_Coded	1.722	1	1.722	1.189	.276	.002
Education_Coded	3.054	1	3.054	2.108	.147	.004
Mileage_Coded	9.793	1	9.793	6.759	.010	.011
Exercise_level	3.874	1	3.874	2.674	.103	.005
Disability	1.054	1	1.054	.727	.394	.001
Stages_of_Change_Coded	219.874	2	109.937	75.875	.000	.206
Condition	8.340	2	4.170	2.878	.057	.010
Stages_of_Change_Coded * Condition	2.840	4	.710	.490	.743	.003
Error	846.164	584	1.449			
Total	2301.000	604				
Corrected Total	2257.550	603				

R Squared = .625 (Adjusted R Squared = .613)$_a$

Table D.2 Fully adjusted ANCOVA for non-car use willingness

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2036.102[a]	15	135.740	94.115	.000	.621
Intercept	17.454	1	17.454	12.102	.001	.014
PBC	374.448	1	374.448	259.621	.000	.231
Living_Area	7.571	1	7.571	5.250	.022	.006
Income_Coded	1.133	1	1.133	.786	.376	.001
Children_Coded	3.779	1	3.779	2.620	.106	.003
Mileage_Coded	11.719	1	11.719	8.125	.004	.009
Exercise_level	4.178	1	4.178	2.897	.089	.003
Disability	1.376	1	1.376	.954	.329	.001
Stages_of_Change_Coded	259.657	2	129.829	90.016	.000	.173
Condition	9.695	2	4.847	3.361	.035	.008
Stages_of_Change_Coded * Condition	2.686	4	.671	.465	.761	.002
Error	1244.691	863	1.442			
Total	3341.500	879				
Corrected Total	3280.794	878				

R Squared = .621 (Adjusted R Squared = .614)[a]

Table D.3 ANCOVA for non-car use willingness excluding age, gender, ethnicity and education

D.2.2 Attitudes

Table D.4 below shows the full ANCOVA model for non-car use attitudes including all covariates and Table D.5 presents ANCOVA model for non-car use attitudes excluding age, gender, ethnicity and education due to high number of missing data

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	818.183[a]	19	43.062	24.452	.000	.443
Intercept	12.612	1	12.612	7.162	.008	.012
PBC	304.252	1	304.252	172.764	.000	.228

Age_Coded	1.350	1	1.350	.766	.382	.001
Gender	1.552	1	1.552	.881	.348	.002
Living_Area	2.579	1	2.579	1.464	.227	.003
Ethnicity_binary	6.499	1	6.499	3.690	.055	.006
Income_Coded	1.266	1	1.266	.719	.397	.001
Children_Coded	2.307	1	2.307	1.310	.253	.002
Education_Coded	.622	1	.622	.353	.553	.001
Mileage_Coded	.344	1	.344	.196	.659	.000
Exercise_level	1.488	1	1.488	.845	.358	.001
Disability	.076	1	.076	.043	.836	.000
Stages_of_Change_Coded	34.094	2	17.047	9.680	.000	.032
Condition	.718	2	.359	.204	.816	.001
Stages_of_Change_Coded * Condition	8.134	4	2.033	1.155	.330	.008
Error	1028.474	584	1.761			
Total	2465.750	604				
Corrected Total	1846.657	603				

R Squared = .443 (Adjusted R Squared = .425)[a]

Table D.4 Fully adjusted ANCOVA for non-car use attitudes

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1150.760[a]	15	76.717	42.662	.000	.426
Intercept	42.298	1	42.298	23.521	.000	.027
PBC	450.117	1	450.117	250.305	.000	.225
Living_Area	19.876	1	19.876	11.053	.001	.013
Income_Coded	1.750	1	1.750	.973	.324	.001
Children_Coded	6.443	1	6.443	3.583	.059	.004
Mileage_Coded	.179	1	.179	.100	.752	.000
Exercise_level	1.944	1	1.944	1.081	.299	.001
Disability	1.861	1	1.861	1.035	.309	.001
Stages_of_Change_Coded	30.974	2	15.487	8.612	.000	.020
Condition	1.892	2	.946	.526	.591	.001

Stages_of_Change_Coded * Condition	8.806	4	2.201	1.224	.299	.006
Error	1551.907	863	1.798			
Total	3564.750	879				
Corrected Total	2702.668	878				

R Squared = .426 (Adjusted R Squared = .416)[a]

Table D.5 ANCOVA for non-car use attitudes excluding age, gender, ethnicity and education