



'I feel the weather and you just know'. Narrating the dynamics of commuter mobility choices

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ABSTRACT

Efforts to promote travel behaviour change have frequently deployed social marketing strategies that are based on characterising populations into discrete target groups through quantitative segmentation techniques. Such techniques provide an important basis for understanding behavioural choices and motivations, frequently using psychological constructs that can be used for planning interventions. However, there are limitations to what a solely quantitative approach can offer practitioners in terms of understanding the dynamics of travel behaviour and the meanings associated with personal mobility that can be used to design appropriate interventions. In this paper we provide evidence to argue for a mixed-methods approach, where insights from quantitative segmentation and qualitative data can be used to reveal the experiential nature of factors that influence travel decision making. To pursue this argument we present findings from research with commuters in the city of Exeter, South West England. Using data from five workshops, we illustrate the ways in which participants articulated and gave meaning to a series of travel mode influences identified using quantitative segmentation techniques for specific commuter groups (private car, public transport, walking, cycling and a combination of modes). We demonstrate how both understanding the dynamism of travel behaviour and revealing its meanings can present opportunities for designing interventions, offering pathways to promote shifts away from carbon intensive transport.

1. Introduction

Concerns about the long-term impacts of climate change and the recent emergence of Covid-19 have focused attention on the urgent need to encourage forms of low-carbon and active travel as ways of generating the co-benefits associated with less polluting and physically active travel (such as walking, cycling and running) (Department for Transport, 2020). The political mechanism for delivering these co-benefits has largely been through the use of behavioural change, facilitated in the UK through the establishment of the Behavioural Insights Team (2021) and the popularisation of Nudge Theory (Thaler and Sunstein, 2008). Nudge, as a theory of how choice architectures can be adjusted to promote particular behavioural outcomes, is one of a range of behavioural theories that have been adopted to explore how travel decision making might be influenced (Barr, 2018), but one of its core principles connects with a widely and internationally recognised policy mechanism for encouraging change: social marketing (French et al., 2009). Formerly

adopted as part of the UK's *Framework for Pro-environmental Behaviours* (Department of Environment, Food and Rural Affairs DEFRA, 2008), social marketing emphasises the importance of specifying behavioural goals and creating appropriate marketing mixes on the basis of audience segmentation (Dietrich et al., 2017). As we will go on to show, segmentation can be undertaken on a range of criteria, such as reported behaviour, attitudes or other theoretically-informed factors (Haustein and Hunecke, 2013). The principle, however, is that discrete groups of individuals can be identified that share specific characteristics and that these can be mobilised for targeting interventions, for example through designing messaging that connects with attitudes of a given segment.

Quantitative segmentation research, which has formed the basis for behavioural change policy making in the UK, has been able to provide a generalised basis for understanding the attitudes and behaviours of participants and in so doing to give a sense of how different groups may respond to interventions. However, we argue that the full potential for applying this approach requires a mixed-methods approach where the

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experiential nature of the factors that influence travel decision making can be fully understood and interventions framed through the meanings associated with quantitatively-defined influences (Jensen, 1999; Gateleben and Appleton, 2007). In other words, even if we might be able to quantify the factors that influence segment membership and the probability of changing to other travel, developing meaningful interventions requires qualitative understandings that can be used alongside such insights to design messages grounded in specific contexts (e.g. Galway et al., 2021; Jain et al., 2020).

In this paper we use data from five workshops with commuters in the city of Exeter, South West England, to demonstrate the value of a mixed-methods approach through arguing that qualitative understandings of travel behaviour can significantly enhance the applicability of quantitative modelling of travel decision making. The paper begins with an overview of two epistemologically distinct approaches in travel research, focusing on quantitative understandings of behaviour (for example, explanatory models of behaviour and segmentation) and then exploring research from a mobilities perspective that has emphasised the role of the everyday and embodiment in understanding mobility practice. We argue that utilising insights from both of these approaches provides critical and operable insights into travel decision making. We then go on to explain our methodological approach, in which empirical results from a statistical model of commuter decision making using a Bayesian approach were used to develop a series of workshop discussions that explored the meanings and experiences of participants' travel behaviour. We present our findings with reference to five travel mode groupings used in the research, exploring the ways in which the mode 'influencers' for each group were characterised and experienced by participants. Finally, we consider the implications of these findings for research and policy, and argue that campaigns to promote travel behaviour change need to use insights from combining extensive and intensive forms of research to target interventions.

1.1. Segmenting travel behaviour

Travel behaviour research has a long-established tradition of exploring the factors that influence modal choice for both commuting and leisure purposes (Bamberg et al., 2011; Barr and Preston, 2019). Rooted within a quantitative methodological tradition, research has frequently deployed insights from the positivist social sciences, most notably psychology but also behavioural economics (Young and Caisey, 2010). Within these fields, two broad types of scholarship can be identified. First, considerable interest has focused on the deployment of long-standing psychological frameworks of behaviours that attempt to describe the process of decision making relevant to a given behavioural outcome. Of note, the Theory of Planned Behaviour (TPB) (Ajzen, 1991) and Norm Activation Theory (NAT) (Schwartz, 1977) have been extensively used to examine the role that attitudes, subjective norms perceived behavioural control play in shaping intention to undertake specific travel behaviours (Chen et al., 2019; Forward, 2004; Fu, 2021; Lo et al., 2016; Xin et al., 2019). In both of these cases, processes of decision-making are based on the interaction between key variables, such as attitudes, subjective norms, perceived behavioural control and intentions to act. Accordingly, critical to this set of research has been an attempt to examine how policy makers might seek to intervene to use, for example, social norms as a way of promoting shifts in behaviour (Kroesen and Chorus, 2018; Peng et al., 2014). Indeed, other variables have been integrated into specific quantitative frameworks to test their influences (Dijst et al., 2008), such as the combined role of attitudes and values (Bohte et al., 2009; Paulssen et al., 2014), the influence of travel information on behavioural response (Ben-Elia and Avineri, 2015), and the relationships between attitudes and behaviours (Kroesen et al., 2017).

Related to this research trajectory has been a second set of research focusing on how such theories might be applied through the lens of segmentation to target particular groups with attitudinal or behavioural

attributes (Anable, 2005; Barr and Prillwitz, 2012; Hunecke et al., 2010). The assumption underlying this approach is that segmentation may reveal specific differences in the attributes of groups, which can be used through policy to promote behavioural change, for example through identifying demographic or attitudinal characteristics of carbon-intensive travellers (Shaw et al., 2014; Smith and O'Sullivan, 2012). Crucially, the translation of such analytical approaches into policy and practice has largely been achieved through major investments in social marketing (French et al., 2009), which has been widely used in health settings to promote shifts in diet, lifestyle and exercise (Dietrich et al., 2017). Social marketing aims to utilise the principles of commercial marketing but for social or environmental good and focuses on three components to deliver change, namely consumer segmentation, setting behavioural goals and designing appropriate marketing mixes (French et al., 2009). In particular, social marketing seeks to actively engage with the 'internal incentives' on which individuals act (from a behavioural economics perspective) and the lifestyle choices that are made to achieve positive outcomes (Young and Caisey, 2010). In this way, social marketing approaches attempt to exhort the positives about behavioural change, bringing incentives into line with lifestyle aspirations.

In the UK, social marketing was utilised as the basis for a national *Framework for Pro-environmental Behaviours* (Department of Environment, Food and Rural Affairs DEFRA, 2008), through which seven UK population segments were defined and described in terms of their willingness and ability to engage in twelve key behaviours (such as reducing car travel and short-haul flights). This represented an increased interest in the ways marketing techniques can be mobilised to tackle issues such as climate change (Peattie and Peattie, 2009) and develop lifestyle changes that result in greener consumer practices (Axon, 2017). Within travel behaviour research specifically, social marketing and its central role in segmenting populations has become increasingly popular in promoting pro-environmental travel mode use (Anable et al., 2006; Haq et al., 2008; Thøgersen, 2014) and has focused on a range of discriminating variables, such as demographic distinctions (Bicikova, 2014), attitudinal factors (Collum and Daigle, 2015; Shiftan et al., 2008), motivations (Bieger and Laesser, 2002) and psychographic variables, such as subjective norms and perceived behavioural control (Haustein et al., 2018; Zhu et al., 2019). Indeed, social marketing has been used as the basis for co-production approaches to campaign development, for example to reduce reliance on short-haul flights from the UK by key market segments (Shaw et al., 2014).

As Haustein and Hunecke (2013) point out, quantitative segmentation approaches have followed two main analytical trajectories. First, a priori techniques create fixed groups based on the variables outlined above, such as travel behaviour or socio-demographic status. Second, post-hoc methods group individuals based on their similarity on one or more variables, such as their travel and environmental attitudes, enabling detailed group narratives to be developed. Indeed, more recently researchers have experimented with Bayesian statistical methods to examine the potential for change within and between segments, offering the possibility of examining the factors that may influence members of an a priori group deciding to travel by another mode on occasions, and in so doing providing an evidence basis for how such factors could be used to promote further behavioural change (Dawkins et al., 2020; Dawkins et al., 2018).

2. Mobilising segmentation through qualitative insights

Quantitative segmentation research evidently offers major opportunities to identify key travel behaviour groupings and to use various techniques to understand segment membership and the factors that may lead to shifts in behaviour within or between groups. These are based on the logical positivist application of verifiable constructs (such as attitudes and values), the use of extant theories to understand decision making, and the utilisation of numerical analysis to plot relationships

and infer causality (Spaargaren and Mol, 2008). However, evidence from travel behaviour research has highlighted the importance of understanding and incorporating alternative epistemological and methodological understandings that reveal a range of qualitatively defined factors that may influence travel behaviour (e.g. Galway et al., 2021; Grischkat et al., 2014; Marquart et al., 2020; Sarrica et al., 2019) and which present opportunities to consider forms of qualitative segmentation of travel behaviour groups through the use of interviews, focus groups and diary methods (e.g. Beirão and Cabral, 2007; Jain et al., 2020).

These studies have broadly applied what (Sheller and Urry, 2016) described as the new mobilities paradigm, which has raised questions about the assumptions and prescriptions of logical positivist understandings of travel behaviour. Taking a sociological perspective, the mobilities paradigm highlights the ways in which travel is imbued with subjective meaning and is formed through the interaction of economic, social and cultural processes (Urry, 2016). Critically, Urry (2016) contended that mobility is ever changing through the interaction of physical infrastructures, social relations and the corporeality of movement. Epistemologically, mobilities research utilises interpretivist understandings to focus on the ways in which meaning is constructed through movement and the intertwined role of corporealities, emotions, social relations, technologies and histories (Adey et al., 2014). In this way, mobilities research has deployed a range of qualitative methods to understand movement from a sociological perspective (Cairns et al., 2014a, 2014b), from narrative interviews to visual and video analysis (Spinney, 2009).

In considering the utility of mobilities research in adding to insights on travel behaviour, we argue that the formulation provided by Cresswell and Merriman (2011) is useful in defining three analytical lenses for transport researchers. First, they argued that spaces were important in the ways in which mobility was governed and managed, and the connections that could be discerned between design, architecture and movement. Writing specifically on spatial aspects of mobility, (Kraftl and Adey, 2008), p. 2280 noted that space denoted:

“...the importance of a variety of architectural designs, forms, and inhabitations that try to embrace, manipulate, entrain, channel, push, pull, and create different capacities and collectivities”.

Second, Cresswell and Merriman (2011) highlight the role of practices: the routinized daily activities that are shared amongst people and which are connected to the historical, infrastructural, economic and material elements of everyday life (Strengers and Maller, 2014). Within social science, there has been increasing interest in the role of practices as a way of connecting the notion of individual behaviour (manifested through reports or observation of personal actions) with how these are representative of broader socio-economic processes (Greene and Rau, 2018; Watson, 2012). Shove et al. (2012) have paid particular attention to the ways in which practices emerge and can also be abandoned with reference to three concepts: meanings, materials and competencies. Cass and Faulconbridge (2016) illustrated these with reference to daily commuting by arguing that meanings were associated with, for example, the car as a private and individualised space of free movements; materials involved the necessities of driving, such as a vehicle, roads, traffic signals and fuel; whereas competencies were associated with driving capability, passing a test, spatial awareness and so on.

Third, subjects, or subject positions, have been the focus of considerable attention in mobilities research (Adey et al., 2014; Cresswell and Merriman, 2011). These refer to the ways in which mobile subjects hold particular associations and identities, such as commuter, tourist, shopper, leisure walker and so on, and in so doing uphold the role of these as cultural associated (Aldred and Jungnickel, 2014). Attention has been paid to the ways in which such subject positions are constructed and Edensor (2010, 2011) has demonstrated how the popularly held view that the commuter as a banal subject can be challenged through illustrating the synchronicity, consistency, disruption and sensation experienced by commuters and the meaning this brings to their journey. This is

also emphasised in Spinney's research on cycling (Spinney, 2009), which argued for a dynamic understanding of how people experience travel through the use of mobile methods that capture the kinaesthetic experiences of travellers.

Mobilities research therefore offers an apparently sharp distinction to quantitatively-derived segmentation approaches, emphasising the role of subjectivities, constructed and evolving meanings, alongside the role of the corporeal and emotional. Critically, mobilities research is concerned with the social as a unit of analysis rather than the individual cognitions that may drive behaviour. Shaw and Hesse (2010) have noted this division through the distinction drawn between conventional forms of travel behaviour research and the new mobilities paradigm, with the inevitable intellectual tensions that this brings. However, they also argued that the pragmatics of trying to deliver research that can be impactful necessitates ways of both negotiating and appreciating intellectual space for each approach in ways that can be complementary. It is this task that we seek to undertake in this paper, as we aim to explore ways of utilising the results from quantitative segmentation techniques so that these can be enhanced in policy contexts and in so doing elaborate on both individual decision making and the broader structural conditions in which commuting occurs through spaces, practices and subject positions. In so doing, we draw on mixed methods research from travel behaviour studies (e.g. Jensen, 1999; Gatersleben and Appleton, 2007) to explore the ways in which quantitative segmentation can be combined with qualitative insights. This requires a pragmatic approach (Wilson and Chatterton, 2011), focused on population scale understandings of travel behaviours that are contextualised through everyday understandings, meanings, practices and materialities that are the necessary building blocks of policy formulation (Galway et al., 2021; Marquart et al., 2020). In other words, what we seek to achieve in the rest of this paper is to show how quantitative segmentation can work with the expressions, voice and experiences of publics to develop fuller understandings of travel decision making and the development of behaviour change interventions. In so doing, this paper focuses on how qualitative data can provide enhanced insights to data provided from quantitative segmentation research.

3. Methodology

The research reported in this paper was part of a two year project on *Engaged Smart Transport*, which aimed to examine the ways in which a combination of digital technologies and public engagement could be used to reduce commuting congestion and increase active travel in the city of Exeter in South West England. The project was a collaboration between four commercial organisations (NTT Data UK, Black Swan, Dynniq and Vaisala), Devon County Council, Exeter City Council and the University of Exeter. The role of the University team was to develop the evidence base for behavioural interventions for specific commuter groups and to test digital messaging to encourage modal shift.

The city of Exeter was selected as the study site because of its chronic problems with commuting congestion, with INRIX (2017) reporting that drivers spending 25% of their time sitting in congestion during peak hours, with an average speed of just 4.6 miles an hour. Indeed, Exeter City Council's (2019a) Air Quality Action Plan demonstrated that several points across the city's road network are at or just below the UK Government's target for nitrogen dioxide. On the city's main arterial routes, the majority of vehicle traffic comprises private cars. The city itself is largely a low-density, suburban settlement with a population of 128,900 but has a very wide travel to work area of 470,000 (Exeter City Council, 2019b). Despite these structural and environmental challenges, the city has also served as a UK Cycling Demonstration City (Solman et al., 2017) and is working with Sport England on an integrated *Live Better and Move More* physical activity strategy (Exeter City Council, 2019c). Finally, the city has established a Community Interest Company (CIC) in the form of Exeter City Futures, which has the ambition of making Exeter carbon neutral by 2030 and specifically to reduce the dominance of cars in the

city.

The behavioural research deployed a two-stage strategy involving a large-scale online survey of commuters into and within Exeter, which was followed by five discussion-based workshops with individuals representative of behavioural mobility segments. The survey was hosted on SurveyMonkey and contained a series of questions to explore commuter behaviour dynamics, including the number of days in a working month individuals commuted by specific travel modes (private car, train, bus, bicycle, walking and running) and also included an option to identify if they combined modes on journeys, such as ‘park and ride’. The survey also posed a series of demographic, attitudinal and contextual questions on which to base the segmentation analysis. The survey was launched for a three week period in the early summer, away from school holiday periods. In so doing, and without the privilege of a longitudinal survey, it was anticipated that seasonal variations would be present for some respondents to the survey. The survey was widely promoted through employers in the city and through a widespread media advertising campaign, achieving 3050 responses.

Analysis of the survey data combined a priori and post-hoc segmentation techniques (Haustein and Hunecke, 2013) to understand the factors that influenced the adoption of one of five a priori travel modes on a daily basis (private car, public transport, bicycle, walking and running, and a combination of modes) and applied Bayesian statistical techniques to determine the factors that influenced the probability of a given individual being a member of a behavioural segment (see Dawkins et al., 2018, 2020). Table 1 provides a summary of the mode influencers for each of the five travel mode groups, and as an example, we may have an individual who, based on the majority of their commuting behaviour, we would classify as a car driver because they drive to work for 18 out of 20 working days in a month. Using our Bayesian-based model, we could then understand what factors (mode influencers) are associated with this individual being more or less likely to reduce their car use (such as the role of weather conditions or importance of personal fitness).

On the basis of the survey analysis, five workshops were convened with individuals who had completed the survey. One workshop was held for each of five a priori commuting segments: private car (30 attendees; 18 women, 12 men), public transport (12 attendees; 8 women, 4 men), walking (23 attendees; 13 women, 10 men), cycling (18 attendees; 8 women, 10 men) and a combination of travel modes (13 attendees; 9 women, 10 men). The workshops were held for 3 h each and attendees worked in small groups on discussion tasks arising directly from the quantitative analysis. At each workshop, participants were given a series of discussion prompts based on understanding the mode influencers identified in the third column of Table 1, with small groups working together (three to five participants around a table) to spend around 30 to 40 min on each theme. Discussions were lightly moderated by researchers to ensure they were addressing the prompt, but the emphasis was on capturing the lived experience of participants. All discussions were audio recorded and transcribed. The research was subject to a full ethics review and all participants in the research opted-in and gave written consent for their data to be used, unattributed and anonymously. As part of the feedback process, a website was created for the project, which hosted the key results by project stage: www.commute-exeter.com. The workshop data were analysed through Thematic Analysis (Kiger and Varpio, 2020), using a staged process of data familiarisation, initial code generation and consequent theme development and characterisation within the context of participants’ experiences of urban mobility for commuting

The empirical data reported in this paper initially provide an overview of the travel mode influences identified by our segmentation analysis and in subsequent sections we focus on how the key influencers for each travel mode were discussed and explored in the workshops. We explore, in each case, the ways in which particular quantitatively-defined constructs were interpreted and discussed, and the different forms of experience that brought meaning to daily commuting. Accordingly, through our workshop data we aim to demonstrate the

Table 1
Summary of factors characterising and influencing travel mode choices amongst members of each travel mode group.

Travel mode group	Factor (used for discussion topics in each workshop)	Influence on members of each travel mode group
Walking group	Commute time flexibility	Higher probability of an individual being in the walking group if their commute time was more flexible
	Weather information	More likely to use motor vehicle if weather information was ‘often’ or ‘always’ influential
	Importance of fitness	More likely to walk if fitness was important during the commute experience
Cycling group	Mode decision time	Higher probability of an individual being in the cycling group if decision was made earlier (i.e. previous evening or weekend)
	Weather information	More likely to use motor vehicle if weather information was ‘often’ or ‘always’ influential
	Traffic information	More likely to use motor vehicle if traffic information was ‘often’ or ‘always’ influential
Public transport group	Importance of fitness	More likely to cycle if fitness was important
	Work parking	Lower probability of an individual being in the public transport group if work parking was ‘good’ or ‘excellent’
	Weather information	More likely to use motor vehicle if weather information was ‘often’ or ‘always’ influential
Combination group	Important of environment	More likely to use public transport and less likely to use motor vehicle if environment is important
	Work parking	Lower probability of an individual being in the combination group if work parking was ‘good’ or ‘excellent’
	Importance of cost	More likely to use public transport if ‘agree’ or ‘strongly agree’ that cost is important
Motor vehicle group	Mode decision time	Higher probability of an individual being in the motor vehicle group if decision taken later
	Avoid peak times	Higher probability of an individual being in the motor vehicle group if tried to avoid peak times
	Work parking	Higher probability of an individual being in the motor vehicle group if working parking was ‘good’ or ‘excellent’
	Weather information	More likely to cycle and less likely to drive if weather information was ‘often’ or ‘always’ influential
	Traffic information	More likely to use public transport and less likely to use motor vehicle if traffic information was ‘often’ or ‘always’ influential

importance of recognising the dynamic nature of commuting behaviour through the lived experiences of participants that researchers need to consider when using segmentation techniques to develop interventions.

4. Understanding the factors influencing commuter decision making

To provide context for the forthcoming discussion of qualitative data from the five workshops, Table 1 provides an overview of the key mode characteristics and influencers for members of each of the five travel groups explored in the research. For example, Table 1 demonstrates that for those allocated to the walking group, they were more likely to walk to work if fitness was an important consideration, whilst if they were

influenced by weather information, there was a higher probability that they would drive for some of the time. In the sections which follow, we use these findings from our quantitative analysis as the basis for exploring the experiences of our participants on their daily commute and revealing the ways meaning is brought to the factors that influence travel mode choice and highlight broader structural conditions.

4.1. Walking to work: flexing the commute experience

Table 1 demonstrates that for those in the walking group, three major factors were identified in the survey that either influenced group membership of mode choice within this groups: the degree of commute time flexibility, the importance of fitness in the commute experience and the influence of relying on weather information. As we will demonstrate, the role and composition of these factors was diverse and our workshop data revealed the ways in which these influencers acted as proxies for underlying experiences of walking to work. Beginning with the role of commute time flexibility, we initially began by asking participants to express what 'flexibility' meant to them:

"I quite like the control that walking gives you... even when you're driving you don't know what else is going to be happening on the roads. Whereas walking, you know that you can just leave at one time and get there" (Male, walker).

As noted in this quotation, flexibility was expressed more as a form of personal control: a sense that using public transport or the car would mean ceding control to the road conditions of the day:

"The thing I think that I do enjoy about walking, whether it's a commute or whatever, is you get a sense of freedom about walking, as in you're completely in charge of your own destiny, and you don't get that at all when you're driving, or certainly not when you're on public transport" (Female, walker).

These initial reactions were instructive because in our survey, commute time flexibility was framed more around the structural elasticity of when participants could travel to work. However, the discussions highlighted that flexibility was something that had important affordances well beyond the efficient use of time; flexibility offered a level of certainty and self-efficacy. Moreover, a further revealing characteristic of flexibility was manifested in the personal wellbeing benefits walking afforded through enabling a time of preparation or reflection on the working day:

"I love my walk to work. It clears away the cobwebs, puts me in a great mood and sets me up for the day as I enjoy the world around me. I feel the same whether I'm striding out to get some exercise or taking my time. I can't think of anything worse than having to be stuck in a car, fighting with all that traffic" (Female, walker).

Walking was therefore an activity that was highly valued and what our quantitative research had highlighted as flexibility and fitness in instrumental terms was much more deeply associated with emotional wellbeing, connection to nature and sociability:

"It is nice saying hello to people. You do feel more sociable, don't you? You're just walking; they're walking" (Male, walker).

These findings indicate that some instrumental interpretations of walking (how structurally flexible someone's commute is or the role of physical fitness) can overlook the engaged nature of walking through the experience of the journey itself. This may be associated with the liminality of the commute: a transition from a domestic to professional and back to domestic setting, holding value for some participants as a time for relaxation and reflection. In a similar way, the apparent influence of using weather information to determine travel mode choice, as demonstrated by the quantitative research, revealed how walkers frequently based their decisions on whether to walk and what to take based on personal interpretation of the conditions rather than formal information provision:

"I think because it's quite short [my commute], I do... I look out the window, and if it looks okay, I'll chance it. I won't carry anything" (Male, walker).

As our quantitative data had suggested, for those most committed to walking to work the role of formal information about the weather was therefore limited, with decision making much more about a personal judgement regarding the likely conditions discernible from a relatively short period outside and the impact on comfort throughout the rest of the day. As such, reliance on external data sources was frequently relegated beneath a personal understanding of conditions:

"The Met Office app, I think I normally use. But it's so seldom accurate that I sort of look at it but don't really believe it" (Male, walker).

Our workshop data therefore provided an understanding of walking as one that was frequently expressed through the lens of personal wellbeing and an engagement with other people and nature through an emotional connection to the physical environment, especially when 'reading' the weather and maintaining levels of thermal comfort for a commute. Indeed, walking was narrated as fundamentally sensorial, encompassing reactions to sound, smell and sight that contribute to daily experience. Rather than being objectified, flexibility, fitness and understandings of the weather were personally meaningful and worked into everyday practices.

4.2. Cycling to work: experiencing the elements

Table 1 indicates similar influences on decisions to cycle for work that were identified for the walking group, although rather than flexibility in commute time, the role of 'mode decision time' was significant in determining group membership, where there was a higher probability of an individual being in the cycling group if a decision was made earlier (i.e. previous evening or weekend). As with the walking group, the most striking initial narrative from the workshop data demonstrated the close connections between commute timings and personal wellbeing:

"Sometimes it's just nice to see what's going on in town as you go by, there's that food market, isn't there? Various on the Quay or in Southernhay, so you might call in there...rather than trying to plough up Heavitree Road, it's nicer" (Male, cyclist).

"It depends on the schedule with drop-off because my wife and I, one of us will drop the kids off in the morning and the other one will pick them up. So, if she's dropping the kids off, then I can get out the door at 7.00 and ride for a couple of hours and get to work" (Male, cyclist).

In discussing their routines and the way cycling was built into everyday life, cyclists frequently articulated the benefits they felt from both varying their routes and the affordances of the freedom that cycling provides. Moreover, they were able to articulate the embodied experience of cycling and one intimately connected to nature, both in terms of the experience of landscape but also the ever changing weather conditions that governed decisions about travel times and clothing. In a similar way to the walking group, this was articulated by one cyclist as 'the sniff test':

"And you've always got the sniff test. I don't know about you, but in the morning when I get up I open the window and stick my arm out, I feel the weather and you can sometimes just know, like oh, they've got it wrong this morning. And you know which way to look in the sky, don't you? Just get used to it" (Female, cyclist).

Yet more than the walking group, cyclists frequently wanted to gain a sense of certainty about the weather conditions, given that for many it was possible to vary their timings and it had a significant bearing on both carrying equipment and wearing specific clothing for the work day:

"Because the bold words and the little pictures of raindrops [on a forecast] don't really tell you anything about the truth, but watching that rain map I find really empowering. I find that very, very helpful. We talked about how the weather might shift the time we do something, so if we see weather is coming in at 9.00 we might go in at 8.00, or if the weather is coming at 8.00 but it's going to be clear by 9.00 we might go in later and we all could flex at work so that was quite helpful" (Female, cyclist).

Forms of structured and quantified weather information did therefore play a part in the way cyclists adjusted their practice for their work

commute and this became a key concern when more adverse weather conditions were discussed, in particular ice. Although not a substantial problem in the South West of England, icy conditions can often be unexpected and unfamiliar to cyclists more used to damp and mild conditions:

“But I take routes that are cycle paths and they're not gritted... whereas you go on the road and they're gritted and it's safer than the pavement, so actually that's quite a no-brainer really, isn't it? Why would you walk on an icy pavement when you could cycle on the road that's gritted?” (Male, cyclist).

This discussion of road conditions in relation to the weather was also connected with a broader narrative concerning traffic conditions. Whilst the survey data had demonstrated a higher degree of car usage amongst members of the cycling group if traffic information was important, discussions in the workshops became concerned with traffic ‘intelligence’ and a detailed understanding of the ways in which the road system prioritised some users over others:

“It's an interesting thing I think, what you're saying about the fact that cycle paths have got the lowest priority over everyone, so side roads have got a higher priority than you've got on the main road. You've got no priority on the main road or rather you're being relegated on the main road, you're on a cycle path and yet you're having to wait for side traffic to come through” (Male, cyclist).

These concerns are perhaps particularly notable for cyclists who commute – who may have limited time and want to proceed along a direct route with as few interruptions as possible. However, it was notable that frustration at the ways in which motor vehicle users were prioritised was also articulated as a direct opposition to the level of car use on the city' roads:

“Drivers get very aggressive, they close pass you, they'll wind down their windows and shout at you, when they feel you should be on that cycle path even though that cycle path is inconvenient and constantly interrupted or icy. And that's not pleasant. Sometimes I let them win, sometimes I don't” (Male, cyclist).

For those most likely to cycle in the cycling group the quantitatively defined notions of mode decision time and fitness were expressed through a deep emotional connection and passion with the urban streetscape, other road users and the shifting sensations associated with riding. Accordingly, as with the walking group, a personal wellbeing narrative was woven through the workshop discussions. Indeed, the sensorial nature of cycling was recognised in the ways that weather, road and traffic conditions were understood through personal experience and a recognition of personal competencies for different situations.

4.3. Public transport users: committed users, despite the service

Table 1 demonstrates that the quantitative data highlighted the role of three factors in influencing behaviour in this group. The availability and quality of work parking had a negative impact on public transport use, as did the influence of weather information (both serving to increase motor vehicle usage), whilst attributing a higher importance to environmental concerns raised the probability of using public transport. In the case of participants in our workshops, these three variables were represented in a series of narratives that demonstrated the positive role of environmental concern for some who were committed to reducing car use, whilst for others the challenges perceived of using public transport were hard to overcome, such as the relative costs associated with opting to use buses or trains compared to the flexibility and comfort of a car.

A clear expression of the influence that environmental concern held for some of our participants focused on the localised impacts of congestion on urban areas. Indeed, it was notable that much of the discourse surrounding environmental responsibility lay not within the field of climate change and carbon emissions, but a sense that there was a collective need to reduce congestion through observations made in everyday life, such as a full car park and getting stuck in traffic queues:

“So I changed from driving to using the bus because I was

contributing to the whinging at work about the lack of space in the car park and adding to the congestion of the people going home and being stuck waiting to get out, for the traffic lights to change and things” (Male, public transport user)

However, as with the walking and cycling groups, prompts to discuss forms of environmentally responsible actions (which have often been framed negatively as forms of sacrifice) were set within a broader context of the benefits that could be accrued from public transport use:

“I spend most of the time staring out the window, but I could do something useful. But I can't even do that in the car, I can't stare out sideways and see bits of the street that you just don't see and you just don't notice otherwise” (Female, public transport user).

Public transport was something that, for some of our participants at least, could be relaxing and enabled a different kind of productivity to that afforded by private transport. Indeed, one participant argued that: “[Y]ou could maybe promote public transport in conjunction with mindfulness” (Female, public transport user). As such, this group were convinced that efficient public transport could provide significant benefits over the private car, such as the lack of maintenance or preparation required:

“...looked at my car which sits on the drive...covered in ice. I'm like yes I'm going over there for the bus, it will be here in a minute, you'll still be there scraping off your car” (Female, public transport user).

Yet despite the clear benefits articulated, other public transport users also expressed much of their behaviour as a form of sacrifice – a form of practice undertaken in adversity and contrary to the perceived social norm. For those without accessible and affordable work parking, the frustrations were clear:

“There were times where I couldn't sit, where it was so jam-packed and that train only has two carriages” (Female, public transport user).

However, it was clear that many elements of the public transport offering were problematic for workshops participants. These included frustrations with the frequency of service, the quality of experience and the roadside infrastructure for those waiting to catch buses: “Exeter bus station is awful. I use the train late at night because the bus station is really rough” (Female, public transport user). Participants also noted the perceived low social status of bus travel amongst their peers and drew comparisons from other cultural contexts, for example:

“Going back to the point about the drivers, in China it's a privilege if you are a train driver or a bus driver. They have white gloves and a proper uniform and it's a really respected job” (Female, public transport user).

Those using public transport participating in our workshops were therefore either ‘principled riders’ who recognised some of the well-being and environmental benefits and were making principled choices to use buses or trains. But other participants, compelled to use buses and trains through the circumstances they found themselves in, were frustrated at the lack of investment, poor infrastructure and low levels of service quality. In this way and unlike the preceding groups, the public transport group represented those who used buses and trains both through choice and necessity.

4.4. Combination commuters: costs are too high

The quantitative survey identified that two key factors that determined membership and mode choice for the combination group, who mostly used park and ride services to access workplaces in the city centre (Table 1). These were once again the lack of availability of workplace parking and the role of the cost of commuting. In the workshops, the narrative surrounding these factors revolved around a much more assertive critique of public transport provision and the argument that public transport use was differentiated by gender, alongside specific discussions about cost. To build on the (softer) narratives of those in the public transport group, combination commuters commented that:

“It just seems really unprofessional, there's no customer service, they don't really seem to care whether you get anywhere at any time. They

[park and ride drivers] get on at the last minute; there's no pride in the brand. They're always chatting to their mates, they ignore you, there's no rush, there's no sense of any customer service" (Female, combination commuter).

Examples abounded of irritations with service levels, infrastructure and a lack of service-orientated culture towards paying customers, for instance:

"Oh, my shelter in fact [laughs]... I thought my shelter in Exmouth was actually going to fall down because it was so rusted and I popped along and I thought oh, they've re-done it. No, no. They've just repainted it. They've just hidden everything that was falling down. It's going to blow down in the next... [laughs] And it's so dark. You stand in there and there are no lights and there's a massive safety issue" (Female, combination commuter).

Yet for this group, the major issue revolved around value for money – the cost of using park and ride or a combination of public transport options to commute compared to workplace parking options. However, the issue of cost was expressed in several ways, revealing that it was not a singular issue. To start with, there were frustrations from those who wanted to use public transport for all or part of their journey but for whom the cost differential made a major difference:

"Adding to that, one of Emma's biggest frustrations is the discrepancy in the cost again of public transport versus parking at the university. She can pay £1 to park at St Luke's versus... was it £9 a journey or something for the bus?" (Female, combination commuter)

For others, the difference in cost was more subtle and generated narratives around the benefits of taking public transport and driving in specific conditions, such as bad weather:

"Yes, one of the things I said was that I said it will cost me £5.50 to come from Exmouth on a return, it costs £6 for me to park in the Triangle car park. So, for 50p more on a day that's raining or cold, yes, well it's so much easier for me to just drive in and park, knowing my car's there" (Female, combination commuter).

What the workshops revealed was that cost appeared to be a much more sensitive issue for the perceived majority of combination commuters, who the participants argued were mostly women and older age groups. For example:

"And I work with a few people who are under-30 and oh god, it's not cool to use the bus. I listened to a woman the other day, she said I'd rather pay £11.70 to park in town than use a skanky bus. She hasn't got kids or a mortgage. It's gender and slightly age" (Female, combination commuter).

The combination group represented a group of people who were frequently compelled to commute by public transport for part of their journey because work parking wasn't available or they took the view that it was more cost effective to use public transport options. Yet there was clearly frustration that because they needed to make these choices (frequently because of cost), they were being penalised through poor levels of service. There was a widely accepted narrative that public transport, especially park and ride commuting, was highly gendered and that both men and younger people regarded bus travel (less so rail travel) as lower status and something to be actively avoided.

4.5. Motor vehicle group: weather, information and the private travel experience

As [Table 1](#) illustrates, the quantitative data demonstrated that several key factors influenced membership of and mode choice within the motor vehicle group, associated with the timing of commuting, availability of work parking and the use of information. Once again, the workshop data revealed the associations between these factors in the way decisions were made. For example, there was a clear association between understandings of likely weather conditions and decision making time that influenced a decision to cycle to work:

"I do sometimes cycle or run to work but I don't make my mind up on the morning because I need to plan ahead and know what time to get

up... If I'm going to cycle to work, I'm not going to do it if I know the weather's going to be wet. I don't get up in the morning and think, 'Oh, I'm going to cycle in.' I go to bed the night before knowing I'm going to cycle in" (Male, car driver).

It was notable once again that this group did pay attention to weather conditions and narratives emerged concerning the challenges of accurately predicting and describing the likely road conditions:

"We have a thing that basically, when my wife gets up in the morning, she can see the neighbour's across the road's car and if that's iced, then she knows, 'Right, okay, we've got to leave early because we've got to de-ice the car'" (Female, car driver).

Indeed, just as weather 'information' was harnessed through a range of sensorial methods, understandings of the role of traffic information were interpreted in a broader sense by participants, who articulated the ways in which their intimate knowledge of routes and bottlenecks was influential in their decision making and their experience of commuting:

"My main bug bear is the Honiton Road Roundabout, just below the park and ride place. If I can avoid that roundabout, and I can now because I can cut through, because I come in from Whimple so I come pass Cranbrook, so I can turn right into the Science Park before I get down to the motorway and go through the new road and then come out halfway down" (Female, car driver).

Accordingly, 'travel information' is perhaps better described as 'travel intelligence' – a collection of knowledges accumulated from personal experience, knowledge of road systems, pinch points, timings and occasional information from external sources:

"Yes. I think the other thing as well is because there are only essentially three, four routes into the city centre, it only needs one of those to be snarled up or have a bit of trouble, traffic lights being dug up and you've suddenly got 25% of all the other routes in" (Female, car driver).

Yet the main topic for discussion amongst this group was the way in which many participants felt compelled to drive by the lack of alternatives, including the role of information:

"Yes. 'In what way does any subsequent or new contradictory information affect that choice?' If I knew that there were going to be more buses at the time I need them, and that I could do it economically, I'd do it tomorrow, no problem, but until they make it affordable for me, I really, really can't" (Female, car driver).

Public transport, as for the combination group, was critiqued because of both its prohibitive cost and also its poor quality of service:

"The thing about buses, they do run on time most of the time but they can get stuck in traffic like everyone else and occasionally they don't turn up at all" (Male, car driver).

For drivers, therefore, there was a clear sense that their commutes by vehicle were frequently frustrating and that they had 'no options' to vary their commute. Their circumstances, residential location, family routine or job role meant that driving was essential given the inflexibility or unreliability of public transport. For some, cycling was an option, but this was weather dependent. Indeed, given the wide scope of Exeter's travel to work area, active travel modes are mostly unrealistic and so in the absence of public transport that is perceived to be of good quality, car driving in the grudging norm.

5. Discussion and conclusions: segmenting the commuter experience

In this paper we have sought to demonstrate the role that applying qualitative insights to quantitative understandings of travel behaviour can offer for enhancing our knowledge of travel decision making through a mixed-methods approach ([Jensen, 1999](#); [Gatersleben and Appleton, 2007](#)); in particular how qualitative insights can deepen knowledge about individual and structural factors influencing behaviour ([Galway et al., 2021](#); [Grischkat et al., 2014](#); [Marquart et al., 2020](#); [Sarrica et al., 2019](#)). In this final section of the paper we explore two key intellectual and pragmatic implications of our research for travel

behaviour researchers and policy makers.

First, we argue that it is critical to understand the signals emerging from quantitative segmentation analyses in a way that can lead to effective policy making to promote behavioural shifts. Our research highlights the value of adopting a mixed-methods approach for adding context to quantitative understandings of behaviour (Gatersleben and Appleton, 2007). through demonstrating the role of subjectivity and lived experience. As research from the new mobilities paradigm has demonstrated, mobility is imbued with cultural meaning (Scheller and Urry, 2006; Scheller and Urry, 2006) and revolves around interactions with spatial configurations (Kraftl and Adey, 2008) alongside the corporeal and affective experiences of movement (Edensor, 2010; Spinney, 2009). Critically, meaning is also constructed through shared practices, such as car-based commuting or cycling to work, which involve acquiring a set of competencies and working with required materials (Cass and Faulconbridge, 2016). Our research has demonstrated the importance of these critical subjectivities in interpreting and bringing to life the findings from our quantitative research. For example, our quantitative analysis identified that walking and cycling were more likely amongst those who had commute time flexibility. Our workshop data revealed how such flexibility was constructed and utilised by commuters; for walkers, flexibility was associated with the emotional benefits of being in the open air, appreciating nature, being able to experience social contact, and creating a buffer between working and home contexts; for cyclists, similar expressions of 'joy' at being able to alter return commutes to take exercise and experience different landscapes was important. In both cases, our explicit question to participants about flexibility revealed a much broader association with wellbeing and the benefits this could afford. In this way, our qualitative data were able to challenge the notion that a simple time-based calculation about work start and finish times dictated commuting choice.

Second, the richness revealed in our workshop data provides valuable ways to translate the findings of quantitative segmentation analyses into policy interventions. As research in social marketing has argued, developing appropriate marketing mixes and messages on the basis of understanding consumer segments is critical (Axon, 2017; Haq et al., 2008; Thøgersen, 2014). Interventions based solely on quantifiable constructs lack the context and understanding that we have been able to reveal in our data. For example, our research has revealed the practices associated with understanding likely weather conditions, how participants prepared for potentially inclement weather and the kinds of interpretations they had of meteorological information. Whilst having a sense of certainty was important, reliability and trust in information sources was also critical. Indeed, our data revealed the apparently systematic and underlying gendered nature of bus use, highlighting the links between service quality, status and identity construction in travel mode decision making. In turn, these two examples provide differently scaled implications for policy. At the micro scale, adjustments in how weather information and recommendations are tailored for particular types of commuters could realise increases in the frequency of walking and cycling amongst those who are conservative about travelling in inclement weather. In contrast, at the macro scale, it is clear that bus travel outside of major metropolitan areas requires major investment to raise levels of service, quality and reliability, and that this needs to tackle the gendered nature of public transit use.

To conclude, in this paper we have added to the evidence base that highlights how a mixed methods approach towards understanding travel behaviour can provide valuable insights for improving the use and application of quantitative segmentation techniques for developing behavioural change interventions. In addition to the importance of being able to identify the probability of individuals adopting alternative travel modes, understanding the ways in which influencing factors are experienced in everyday life is critical for developing effective messaging. On a broader level, our research illustrates the importance of finding the common ground that Shaw and Hesse (2010) talked of in efforts to mobilise the power of different epistemological traditions, and

demonstrates the value of mixed-methods approaches (Gatersleben and Appleton, 2007; Jensen, 1999). There are of course philosophical differences in how travel behaviour is understood and the political framework within which behavioural change policies operate (Marsden et al., 2014), but from a pragmatic perspective, we argue that a great deal can be added to quantitative segmentation techniques and their application through social marketing policies by harnessing the power of human expression and experience, and becoming familiar with the lived reality of the joys and many frustrations of daily commuting.

CRediT authorship contribution statement

Stewart Barr: Conceptualization, Methodology, Investigation, Resources, Data curation, Formal analysis, Writing – original draft, Supervision, Funding acquisition, Project administration. **Sal Lampkin:** Methodology, Investigation, Resources, Writing – review & editing. **Laura Dawkins:** Methodology, Writing – review & editing. **Daniel Williamson:** Conceptualization, Methodology, Writing – review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

None.

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