

**Title:** Habit Discontinuity and Travel Choices

**Degree Award:** Doctor of Philosophy (PhD).

**Year of Presentation:** 2016

**Candidate:** Paul Haggar

## SUMMARY OF THESIS: POSTGRADUATE RESEARCH DEGREES

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### SECTION A: TO BE COMPLETED BY THE CANDIDATE AND SUBMITTED WITH THE THESIS

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| <p><b>Summary of Thesis:</b> If travel choices are made habitually in specific contexts, rather than deliberately, then, when these contexts change (e.g. with moving house), do travellers deliberate over travel choices and, perhaps, make changes? This thesis investigates this idea (the Habit Discontinuity Hypothesis: Verplanken, Walker, Davis, &amp; Jurasek, 2008). Key literature was reviewed and some important research questions identified. To obtain rich, descriptive information about these experiences, a purposive sample (<math>N = 29</math>) of commuters were interviewed. Thematic analysis of these accounts identified two principal themes: <i>choice factors</i> (reasons for travel choices) and <i>experience of travel</i>. Neither habitual travel-choices nor habit discontinuities were described. Instead, participants identified <i>familiar</i> journeys (on frequently-travelled routes) as habitual and life-events as leading to travel-choice change only when impacting travel goals. Two studies investigated university-student travel-mode choice before and after they moved from one term-time accommodation to another. In each study, a group whose accommodation changed was compared to another group whose accommodation didn't change. Both studies showed a small association between moving accommodation and changing travel behaviour (to or from walking to the university). This association was statistically mediated by (a) prior planning and (b) living with new housemates. Automaticity also changed amongst movers as anticipated. However, evidence with respect to the role of values, ease/difficulty of change and self-regulation failure/ competing priorities with change was inconclusive. There was also no clear evidence that changes in walking distance with residential relocation accounted for change in walking behaviour with residential relocation. These findings are discussed with respect to the habit discontinuity hypothesis, as well as other interpretations.</p> |         |

### DECLARATION

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I acknowledge the invaluable advice and encouragement provided by my academic supervisors, Professor Lorraine Whitmarsh and Doctor Steven Skippon. I'd like to acknowledge the kind help of Professor Greg Maio and Doctor Nick Nash for providing supervision during the absence of my primary supervisors and for their help at different stages of the research process. I'd also like to thank Doctor Dimitrios Xenias for the opportunity to work on ongoing related projects in the department. I'd like to express my gratitude to the participants and gatekeepers who helped me with my research. Finally, I'd like to gratefully acknowledge those organisations that funded my research (the ESRC, Cardiff University and Shell Global Solutions), without whose contribution this research, and the learning I've acquired in its pursuit, would not be possible.

# Habit Discontinuity and Travel Choices

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# 1. General Introduction

Habit, as a social psychological concept, has important applications to the maintenance and change of human behaviour (Bargh & Ferguson, 2000; Graybiel, 2008; Barandiaran & DiPaolo, 2014; Wood & Runger, 2016). This significance lies in the idea of a *fixation* of behaviour with habit (Friedrichsmeier, Matthies & Klockner, 2013). William James (1890) described habits, metaphorically, as setting like plaster to fix a person's character and, therefore, as the flywheel that drives society: for societal change, the 'plaster' (habits) must be 'broken' and then recast in a better mould (Jager, 2003; Lally & Gardner, 2011). So habit, and particularly its power to *fix* behaviour, becomes an important factor in addressing social problems (Maio, Verplanken, Manstead, Stroebe, Abraham, Sheeran & Conner, 2007; Gifford, 2011; Darnton, Verplanken, White, & Whitmarsh, 2011; Riet, Sijtsema, Dagevos & De Bruijn, 2011), including the problem of the negative impacts of human actions upon the environment (Verplanken, 2011; Dunlap & Jorgenson, 2012).

There are reasons to believe that individuals may need assistance in breaking their own 'bad' habits, even when they are motivated to do so (Polivy & Herman, 2002; Heatherton & Nichols, 1994). However, to provide effective assistance, a better understanding of habit-breaking is necessary. To make an action impossible is effective, but may simply not be practicable or socially acceptable in most circumstances (Jager, 2003; Verplanken, 2011). Another approach, arising from psychological theory, is that habits might break, by themselves, when contexts change. This is founded on the idea that habitual action is triggered by features (*cues*) in the context and how they are perceived (Bargh, 1997; Ouellette & Wood, 1998; Verplanken & Aarts, 1999). If contexts change, cues also change (or disappear) and so habitual actions never come to be triggered. A person under these circumstances, therefore, ceases to act habitually and so, perhaps, acts *intentionally* instead (Jager, 2003; Verplanken & Wood, 2006; Verplanken, Walker, Davis, & Jurasek, 2008), and so, perhaps, may be more responsive to interventions designed to change behaviour (regarding *interventions*, see: Abraham & Michie, 2008) or to their own individual motivations to make a change. Several empirical studies have presented evidence in favour of this approach (e.g. Wood, Tam & Guerrero Witt, 2005; Verplanken et al. 2008), along with converging evidence from other studies (e.g. Fujii, Garling & Kitamura, 2001; Schafer, Erben & Bamberg, 2012). The *Habit Discontinuity*

*Hypothesis* (HDH: Verplanken et al. 2008) encapsulates this idea as a formal proposition.

The habit concept is often employed as part of applied research of travel behaviour (Aarts, Verplanken & Van Knippenberg, 1998; Verplanken & Aarts, 1999; Gardner, 2009; Klöckner & Matthies, 2012), particularly travel mode choices (Gardner & Abraham, 2008; Graham-Rowe, Skippon, Gardner & Abraham, 2011), research which is motivated, amongst other public considerations, by the environmental significance of travel behaviour (Steg & Tertoolen, 1999; Gatersleben, Steg & Vlek, 2002; Whitmarsh, 2009). *Travel mode choice* is simply the mode of transport that is chosen when making a day-to-day journey. Travel mode choice contributes to global climate change made by motorised travel (Ribeiro, Kobayashi, Beuthe, Gasca, Greene, Lee, Muromachi, Newton, Plotkin, Sperling, Wit & Zhou, 2007): as more day-to-day travel is undertaken using motorised transport, especially the motorcar, so the combustion releases green house gasses into the Earth's atmosphere contributing to changes in global climate that will have devastating consequences (Stern, Young & Druckman, 1992; McMichael, Woodruff & Hales, 2006). Most empirical studies of the HDH have considered travel mode choice behaviour in particular (e.g. Verplanken et al. 2008; Walker, Thomas & Verplanken, 2014; Thomas, Poortinga & Sautkina, 2016).

In the present thesis, pertinent literature is reviewed (Chapter 2) to introduce three empirical studies (Chapters 3, 4 and 5), the findings of which are discussed (Chapter 6). The HDH is aptly termed a 'hypothesis', as verifying or falsifying the underlying explanation (the discontinuity of habit) is less feasible in comparison to the more realistic aim of demonstrating an effect consistent (or not) with the hypothesis (an association between a change in overall context, and a subsequent change in behaviour). Much of the empirical research has concentrated on demonstrating these associations, and has done so successfully.

One question that has received less attention is the question of whether habit discontinuity (or, indeed, habit) is part of everyday experience and, if so, what sort of experience this experience might be. This question is addressed in the first empirical study (Chapter 3). Another family of questions that has received less attention, compared to the question of the existence of a HDH effect, are questions concerning the

role of other factors during context changes (e.g. planned behaviour change, different motives for change, and ease or difficulty of making a change). These questions are addressed in the second and third empirical studies (Chapters 4 and 5, respectively). Importantly, these questions are *specific* to the HDH effect; they are not general questions about the effect of these factors upon travel mode choice (e.g. it is clear that perceived difficulty of travel mode choices will be associated with travel mode choice (see Gardner & Abraham, 2008), but it is less clear whether perceived difficulty of travel mode choice is associated with the changes in modes choices with context changes).

## **2. The Habit Discontinuity Hypothesis: A Literature Review**

### **2.1. Abstract**

*Literature pertaining to the Habit Discontinuity Hypothesis (HDH: Verplanken, Walker, Davis & Jurasek, 2008) was reviewed with a view to identifying useful research questions. After a survey of the literature on habit, the literature pertaining to three foundational ideas for the HDH was reviewed: (a) that habits are context-cued, (b) that habit surpasses motive and (c) that habit leads to inattention to relevant information. The empirical literature testing the HDH was also assessed. After briefly considering the literature on habit and travel mode choice, qualitative methodological approaches to the study of habit, and different possibilities for other factors that might be involved in the habit discontinuity effect during life events, were discussed. Conclusions were presented and the research questions addressed in this thesis identified.*

### **2.2. Introduction**

#### **2.2.1. Why are habits, and the Habit Discontinuity Hypothesis, Important?**

*Habits* (Wood & Neal, 2007; Verplanken & Aarts, 1999; Gardner, 2012) are a form of non-declarative memory (Squire, Knowlton & Musen, 1993) that activates either a goal or an action *automatically* (Bargh, 1997; Moors & De Houwer, 2006) in response to an environmental stimulus (a *cue*).<sup>1</sup> Habits have been described as "acquiring associations between environmental cues, individuals' responses, and experienced consequences" (Verplanken & Aarts, 1999: p. 105). Habits, because they are automatic responses to the environment, attenuate conscious control over actions

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<sup>1</sup> See Barandiaran and DiPaolo (2014) and Camic (1986) for some alternative concepts of 'habit'.

(Bargh & Chartrand, 1999; Web & Sheeran, 2006), as well as attenuating attention given to relevant information, including behavioural alternatives, affecting choices (Dahlstrand & Biel, 1997; Verplanken, Aarts & Van Knippenberg, 1997). Social psychologists are beginning to consider habit to be a means by which behaviour becomes *fixed* (Friedrichsmeier, Matthies & Klöckner, 2013) and resistant to change (Maio, Verplanken, Manstead, Stroebe, Abraham, Sheeran & Conner, 2007; Darnton, Verplanken, White & Whitmarsh, 2011). Given that habits resist change, it is important to know how and why habits change when they do change. This knowledge is useful in addressing *social dilemmas* (Dawes, 1980): stark choices between 'defecting' (acting for personal over social reward) and 'cooperating' (acting for social over personal reward). Through personal reward habits for defecting become established; habit will then allow them to persist, though the actor may be more or less aware of the social harm to which they are often contributing.<sup>2</sup> Environmentally significant behaviours (Gifford, 2014) like travel-mode choice (Van Vugt, Van Lange & Meertens, 1996) often constitute social dilemmas, which are potentially less easily addressed to the extent that they are habitual.

The *Habit Discontinuity Hypothesis* (HDH: Verplanken, et al. 2008) proposes that naturally occurring changes in a person's context temporarily disrupt the cues of habitual behaviour in the environment, resulting in a *habit discontinuity*. During a habit discontinuity, a person acts in accordance with their own intent (overall motivation) and attends to available information in doing so, because they do not act habitually. Verplanken and Wood (2006) proposed that habit discontinuities would increase the effectiveness of behaviour change interventions (see Abraham & Michie, 2008) employed at the same time - a form of collective intervention they term *down-stream plus [context change]*.<sup>3</sup> The practical implication is that a habit discontinuity might be sufficient to allow old habits to be broken or to be replaced by new habits.

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<sup>2</sup> Considering this with respect to self regulation through goal pursuit, perhaps within a hierarchy of goals or needs (e.g. Carver & Scheier, 2003; Deci & Ryan, 2000), adds an additional dimension, and is discussed by Jager (2003). For example, one might have learnt, early in life, a habit of snacking (it is nutritionally rewarding), and, later in life, these nutritional goals being met, one consciously seeks self-esteem through dieting, bringing a conscious, higher-order, goal into conflict with a habitual (less conscious) lower-order goal/action.

<sup>3</sup> *Upstream* and *downstream* refer to the ideas of addressing the causes of a problem and redressing the problem once caused, respectively. However, the emphasis could be said to be on the passage of time (the *stream*). Thus, Verplanken and Wood (2006) emphasise that the role of habit discontinuity is to

### 2.2.2. Conceptual Distinctions

To say (above) that "naturally occurring changes in a person's context temporarily disrupted the cues of habitual behaviour in the environment" is an abstraction: what are 'contexts' and what are 'cues' and what is it to say that a 'context changes' or that 'cues are disrupted'? Addressing such questions helps to clarify important conceptual, or definitional, distinctions at the outset. (These questions are also empirical, and are discussed more empirically in Section 2.4). A useful definition of context is "the circumstances that form the setting for an event, statement, or idea, and in terms of which it can be fully understood" (OED, 2016). Therefore, the 'context' of a habitual behaviour may be thought of as the setting in which it is understood to occur. Drinking coffee in a coffee shop, or in a particular coffee shop, or at a particular time of day, might, perhaps, be examples of coffee-drinking contexts. Wood and colleagues (Oullette & Wood, 1998; Wood & Neal, 2007; Wood & R niger, 2016) introduced the useful concept of a *stable context* to clarify 'context' with respect to habit.

A 'stable context' is both constant (unchanging) *and* recurring (e.g. a particular coffee shop may remain unchanged, and may recur as one walks past it on the way to work each day). These two properties allow habits (association between cues, acts and their consequences) to form: each time the context (e.g. coffee shop) is encountered, the action (buying coffee) is practiced, making the habit (morning coffee drinking before work) stronger (see also Section 2.3.2) and leading to mental association with constant features (cues) within the context (perhaps the smell of coffee). Importantly, these features (cues) may *or may not* be those features that *specify* the context (Godden & Baddeley, 1980). For instance, the coffee shop at 7am is the specified context, but it may be the smell of the freshly ground coffee and the cool ambient temperature of the morning that, together, trigger this coffee-drinking habit.

What, then, is a *cue*? Most often the concept of a habit cue is given by examples of types of cues, such as describing cues as: "aspects of physical environments, other people, and preceding actions in a sequence" (Wood & R niger, 2016, p. 292). Two

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enhance attempts to change existing, often entrenched, behaviours, rather than to cultivate certain behaviours in the first instance.

more-general definitions of 'cue' seem to be in use within the discipline of psychology.<sup>4</sup> A cue is both "an attribute of an object or event to which an organism responds" (Colman, 2015) and also a "feature of something perceived that is used in the brain's interpretation of the perception" (OED, 2015). These concepts appear to differ only between 'cue' applied to behaviour and perception, respectively. With respect to the question of the contextual cuing of habits, however, the latter concept makes an *implicit* claim about the former: that habitual responses to stimuli are *perceptually mediated*. Elaborating this distinction through example, one can distinguish between a habitual coffee drinker in a cafe responding to the smell of coffee by ordering themselves a cup of coffee (cuing in the first sense) and a habitual coffee drinking, perceiving they are in a coffee-drinking situation (which involves smelling coffee), responding *to this perception* by ordering themselves a cup of coffee (see also Section 2.4.3). This is related to a distinction Verplanken and Aarts (1999) draw between more or less *specific* habits (Verplanken & Aarts, 1999). A more 'specific' habit is contingent on a set of specific cues and is, therefore, less applicable across different contexts; for non-specific habits, fewer cues are necessary to trigger a habit - perhaps, too, because situation is less important in these cases than cues themselves. So this idea of perception in cuing seems to involve more than the integration of multiple cues: their collective interpretation through perception. If all the cues for a specific habit were met (e.g. for the coffee-drinker: the smell of coffee, the time of day, the ambient temperature, etc.), but in an incongruous setting (e.g. a psychological laboratory), would a habitual coffee drinker try to order a coffee? In this thesis, this question, and other fundamental questions of context cuing in habit are, for the most part, not addressed. They are discussed in this chapter so as to provide a better understand of both how these words are used later in thesis (in phrases such as 'cues to habit being absent from the context' or 'cues disrupted with a life event') and of some of the concepts in the literature.

Taking the concepts above together, 'context' and 'cue' can be understood as 'cues in a context', with respect to habits: as sets of (specified or unspecified: Godden & Baddeley, 1975; 1980) aspects or features of a situation. This is an important preliminary in moving to assessing changes in context *through* the events thought to

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<sup>4</sup> The necessary work to establish definitions of a concept across an entire discipline is beyond the author's resources and, in the absence of an authoritative treatment (though see Drummond, 2000), this claim is offered as reasonable supposition.

change contexts. An important study by Wood et al. (2005) illustrates this approach. In this study, residentially-relocating students were studied with respect to the relationships between changes in aspects of performance contexts of domestic behaviours and changes in the frequency of performance of these behaviours (this study is outlined further in Section 2.7.1).<sup>5</sup> Residential relocation (a life event) is studied as an event that precipitates changes in contexts (their cues), rather than a change in context (as location). This is evident when one of the aspects of context change assessed is *performance location*, assessed not as specific (geographical) location, but as *type* of location (e.g. in one's own home or in a friend's home). Thus, for instance, to continue to watch television in your home is to continue to watch television in the same *type of* location, though the student is in a different house to the one they were living in before. In future studies of habits with context changes (e.g. Verplanken et al. 2008), context changes are not considered as changes in the aspects of contexts (cues) but are operationalised as *life events* (particularly residential relocation) on the basis that such life events would entail such context (cue) changes (see Thompson, et al. 2011 for a review of this literature). Verplanken and Wood (2006) describe this move in discussing the timing behaviour-change interventions to coincide with context changes.

Downstream-plus-context-change interventions can be implemented at many of the significant life changes that people experience naturally across their life course. Targets for such interventions include residents who relocate to new homes and employees who move jobs or experience mergers in their work organizations. Such changes occur with some regularity across the life span. [...] Aging across the developmental stages of the life span also yields relevant lifestyle changes. Changes in performance environments often coincide with people's movement into another life phase, such as adolescents leaving their parents' home, couples starting a family, and older people entering retirement. Downstream-plus-context change interventions are especially efficient options when environmental changes apply to groups of people, for example, when new

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<sup>5</sup> *Residential relocation* is used in this thesis to describe moving from one accommodation to another. In other studies, where only moving to a new residence in a new city was considered, 'residential relocation' is used to refer only to this. The term is used, here, for brevity: in the case of the study considered, the students had *transferred* from one university to another, which more often than not implied residential relocation, but did not guarantee it (Wood et al. 2005, p. 921, footnote 5).



residential areas are built or organizations merge (Verplanken & Wood, 2006, p. 97).

They, earlier, described the way in which these changes would function to promote behaviour change.

[...] environmental changes that disrupt habits also challenge habitual mind-sets and thus increase openness to new information and experiences. Furthermore, because these environmental changes impair the automatic cuing of wellpracticed responses, they enable performance of new actions (p.96).

As well as outlining the way in which life events are understood to be context changes, these quotations aptly capture some important conceptual distinctions directly relevant to how *habit discontinuity* is understood. In the first of these two quotations, Verplanken and Wood appear to distinguish between life events and transitions. A 'significance life change' may be termed a *life event*; 'people's movement into a different life phase' may be termed a *life transition*. In the second of these two quotations, there would appear to be a further distinction between an 'impairment of well practiced responses' enabling 'performance of new actions' (this can be termed *discontinuity*) and a 'challenge to habitual mindsets' through 'openness to new information and experiences' (which may be termed *disruption*). Taken as a whole, these quotations depart from a description of changes in context as only discontinuities (changes in context features or aspects (cues), leading to deliberate (non-habitual) action), developing, also, a description of life events, either *as* life events or *as* transitions, *tending to* lead to behavioural change through *both* discontinuity *and* disruption. Thus, a life event is both a change in the physical, social, temporal (etc.) features of situations that cue prior habits, leading habits to discontinue, and a challenge to former patterns of behaviour with changing identities, values and meanings associated with these biographical changes (e.g. the differences between residential relocation as 'leaving the nest' and as 'building a nest'). There are important parallels, here, perhaps, with the two earlier definitions of context cues as *behavioural* or *perceptual*? As well as as *moments of change* (Thompson, et al. 2011) - "times in a person's life where existing habits and behavioural patterns are disrupted"(p. 6) - or *key life events* (Müggenburg, Busch-Geertsema & Lanzendorf, 2015) - "a life event turns into a key event if it has significant

meaning for the individual and activates a re-evaluation of mobility behaviour, which might result in a behavioural change" (p. 153) - 'life events' can also be thought of as being *windows of opportunity* for behaviour change (e.g. Verplanken & Roy, 2016). These are periods of time, in or around the event itself, where one becomes open to new ideas and less liable to act habitually (see also Verplanken, et al. 2008; Thomas et al. 2016). These variations, as well as Verplanken and Wood (2006), above, capture the practical benefits of considering events and transitions together.

*Life transitions*, from a biographical perspective, are changes (usually gradual) between one stage in life and another (George, 1993). As the earlier example of the study of Wood and colleagues (2005) was informative with respect to 'contexts' and 'cues', so a study by Schäfer, Jaeger-Erben and Bamberg (2012) can be informative with respect to 'life transitions' and 'life events' (see also Section 2.7.5). The processes underlying how consumption patterns changed with two life events (residential relocation and first-time parenthood) was studied by analysing interviews with participants who had recently experienced either of these events. Importantly, accounts tended to differ between events.

- New parents undertook an extensive period of preparation and planning for parenthood, involving substantial changes in consumption patterns to fulfil new parental roles, some of which the authors identify as being symbolic and "not entirely grounded in scientific facts" (p. 77). After the birth event, a phase of specific adaptation to parenthood (implementing and refining these plans) and a process of 'balancing' - returning to a new, but stable, set of routines - was described.
- Relocators were more diverse; relocation represented an event within different (important) life changes (e.g. moving in with a partner, beginning higher education, starting a new job). Preparations emphasised pragmatic considerations (e.g. costs) rather than the symbolic. A process of gaining familiarity with the local area and of 'social negotiation' with new co-habitants was experienced immediately after moving in, but life quickly became routine.

As the authors identified, in each case a qualitative process of change through different planning, adaptation and routinization stages is identifiable (see Bamberg, 2013). However, becoming a parent for the first time appears to be the beginning of a process of transition to a new role in life (as a parent) in which birth is a defining event, as moving house appears to be a life event within, but not defining, a number of *different* life transitions (e.g. to new jobs, into higher education, or to moving in with one's partner).

In the studies reported in this thesis, a strong practical (operational) distinction is *not* made between 'life events' and 'life transitions', though it is acknowledged that many of the background, or other, factors investigated in the context of habit discontinuity will be indirectly related to ongoing life changes associated with one, the other or both (see Section 2.10). The preceding discussion does illustrate that such a distinction is important: on this basis, it was useful to collect descriptive information about on-going life events/ transitions for the quantitative component of this thesis (Chapters 4 and 5) to be re-assured that different life events/ transitions did not appear to be confounded with the principle event considered - residential relocation (see Section 5.4.1.8); transitions and events, in the qualitative study (Chapter 3) were not pre-defined and so the question of conceptual distinction is less applicable *a priori*.

Another conceptual distinction exists within the literature between two forms of *disruption*: the disruptive influence of new information (or attention to new information) and the disruptive influence of challenges to one's own values in changing situations. In the remainder of the thesis, 'disruption' mostly refers to the first kind of influence, and *value activation* (Schwartz, 2010; Verplanken, et al. 2008; Dahlstrand & Biel, 1997) to the second. 'Disruption', in this sense, is when, due to changes in the decision environment, attention is given to new information *without changing the actor's motivation*. For instance, when the transport infrastructure changes, such as the extended closure of a freeway (Fuji, Garling & Kitamura, 2001) or disruptions in the road/rail network in London during the 2012 Olympic games (Parkes, Jopson & Marsden, 2016), one may notice new possibilities in the travel environment, or have one's preconceptions challenged (e.g. that, having had to take the train, it is not as bad as one thought it would be). 'Value activation', broadly conceived, is a similar disruption that also changes the actor's motivation (values): one's own core values

becoming salient to the situation and so *challenge habitual mindsets*. Schwartz (1977: p. 241; 2010: p.230) describes the process of value activation as a "conscious awareness of need" followed by "awareness of viable actions that can relieve the need" before "perceiving one's self as able to help" and, finally, "sensing some responsibility to become involved" (see also Dahlstrand & Biel, 1997; see also Section 2.10.2.1). The Self Activation Hypothesis (Verplanken et al. 2008), by contrast, states that: "values influence choices and behavior only when two conditions are met; a value should be part of a person's self-concept, and a value should be cognitively activated" (p. 122).

### **2.2.3. Overview**

This chapter is an evaluation of the status of the HDH through a selective review of the existent literature. This review identified a number of different opportunities for future research with respect to habit discontinuity and travel mode choice. Many of the unanswered questions and doubts identified in the process of compiling this review were not subsequently addressed with empirical research, but have been retained so as to provide the reader with useful information concerning the field of study.

First, the literature on habit was reviewed (Section 2.3). The HDH was then considered through three foundational assumptions (Verplanken et al. 2008; foundational assumptions - see Chalmers, 2006: chapter 9). These are: (a) that habit is triggered by context-cues in the environment (Section 2.4), (b) that habit attenuates the link between intention and action (Section 2.5) and (c) that habit reduces the search for and attention to relevant information (Section 2.6). A review was then made of the empirical literature testing the HDH (Section 2.7). Habit was considered in the behavioural domain of travel mode choice (Section 2.8) prior to several sections considering the more specific questions, and literature, pertinent to this thesis in particular. These consisted of a discussion of the methodological choices that informed the qualitative investigation of habits undertaken in this thesis (Section 2.9), a discussion of questions regarding the role of background factors in the habit discontinuity effect (Section 2.10) and, finally, conclusions to the review as well as an outline of the questions addressed (and not addressed) in this thesis (Section 2.11).

## **2.3 A Survey of Habit in Theory**

**2.3.1 What is 'habit' and how is it measured?** While there is agreement between theorists concerning properties of habit, such as that it is automatic and cued in context (Wood & R nger, 2016; Orbell & Verplanken, 2015; Gardner, 2014), certain differences remain between different concepts of habit and, therefore, how, ultimately, habit is to be measured (Kl ckner & Matthies, 2012). Habits are considered to be (a) enacted frequently; (b) automatic; (c) triggered by stable (unchanging) contexts.<sup>6</sup> Early research conceived of habit principally through the first characteristic, and so measured habit as frequent behaviour or as past behavioural frequency (e.g. Landis, Triandis & Adamopoulos, 1978; Gregory & Leo, 2003; Dahlstrand & Biel, 1997; Ouellette & Wood, 1998). Doubt exists as to the efficacy of this approach (Ajzen, 1991; Verplanken & Aarts, 1999; Knussen & Yule, 2008; Gardner, 2012).<sup>7</sup> Some researchers (Wood & Neal, 2007; Wood & R nger, 2016) conceive of habit principally through the first and third characteristics, and so consider habit to be present when behaviours are frequently enacted within stable contexts (e.g. Wood, Quinn & Kashy, 2002; Ji & Wood, 2007). In contrast, other researchers (Verplanken & Aarts, 1999; Verplanken, 2006; Orbell & Verplanken, 2015; Gardner, 2012) conceive of habit principally through the second characteristic, and so consider habits to be present when a measure designed to capture automaticity (Self Report Habit Index, SRHI: Verplanken & Orbell, 2003) produces a high score. This latter approach has also been applied to thought-patterns (Verplanken, Friborg, Wang, Trafimow, & Woolf, 2007) as distinct from actions.

To say that habit is *automatic* is to say that it is: (1) efficient to enact (little attention is necessary); (2) enacted with little awareness; (3) enacted without strong intentions to do so; (4) difficult for an actor to control (Bargh, 1992; 1994; 1997). When conceptualised as a species of automaticity (Bargh, 1997; Bargh & Chartrand,

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<sup>6</sup> These have been referred to as '3 pillars' of habit e.g. Kurz, Gardner, Verplanken & Abraham, 2015. By contrast to assessing habit by these '3 pillars', some research has treated habit subjectively e.g. Saba & Natale, 1999; Knussen & Yule, 2008.

<sup>7</sup> Here are some examples of these doubts. If habit and frequent behaviour are equated, then it follows that the two are *identical* and so the unique properties of habit (e.g. automatic performance, cue-dependency) would fall upon any frequent behaviour, which is not a very defensible argument (Gardner, 2012). If this non-equivalence is accepted, and it is acknowledged that frequent behaviour is a useful associated property of habits (which it probably is), then a further problem arises in the *usefulness* of considering only this property and not others (Ajzen, 2002). Past behaviour does not provide information on what habits *is* psychologically. It also cannot be demonstrated that habit causes frequent behaviour, because it is *defined* as frequent behaviour, thus not permitting useful investigation of perhaps the most important aspect of habits in their application to real-world problems.

1999; Moors & De Houwer, 2006), habit is considered to be a context-cued and goal-directed automaticity (e.g. Verplanken & Aarts, 1999). This is related to the distinction between automatic (fast) and deliberate (slow) processes underlying dual-process theories of decision making (Smith & DeCoster, 2000; Kahneman, 2011; see also Section 2.5). While there is general agreement concerning habits as (often) frequently enacted, automatic and cued by contexts, there is less agreement concerning how habits are goal-directed. For some theorists goals are cued automatically, and can be pursued, thereafter, more or less deliberately (Aarts & Dijksterhuis, 2000a, 2000b; Verplanken & Aarts, 1999) and for others habitual actions are enacted automatically, without the mediation of goals, though goals are important in habit formation (Wood & Neal, 2007; Wood & Runger, 2016). Both theories of habit, however, acknowledge an important role for *goals* (Carver & Scheier, 2002; 2003; Austin & Vancouver, 1996) in understanding habit alongside automaticity.

As well as associations with goals and automaticity (Bargh & Chartrand, 1999), habits have also been linked to theories of skill (Anderson, 1982; Squire, et al. 2003; see also Logan, 1985; Graybiel, 2008), theories of action sequencing and scripts (Verplanken, Aarts, Van Knippenberg & Van Knippenberg, 1994; Betsch, Haberstroh, Glockner, Haar & Fiedler, 2001; Klockner & Matthies, 2012; Judah, Gardner & Aunger, 2012, cf. Abelson, 1981) and theories of ritual, custom or tradition (Graybiel, 2008; Stigler & Becker, 1977; Schwanen, Banister & Anable, 2012; see also Davidov, 2007). These associations introduce uncertainties as to the underlying psychological mechanism of habit (Seger & Spiering, 2011; Sniehotta & Pesseau, 2012; Loft, 2012; Gardner, 2014; Hagger, Rebar, Mullan, Lipp, Chatzisarantis, 2015; Orbell & Verplanken, 2015). While some acknowledge (Gardner, Abraham, Lally & De Bruijn, 2012a; 2012b) and most cite (Wood & Neal, 2007; Verplanken & Orbell, 2003; Aarts & Dijksterhuis, 2000a) the growing body of evidence for automatic cognitive processes underlying everyday action (for reviews see Bargh, 1997; Bargh, 2006; Bargh, Schwader, Hailey, Dyer & Boothby, 2012), and regard these as underlying mechanisms of habit (Aarts & Dijksterhuis, 2000a; Neal, Wood, Labrecque & Lally, 2011) it may be argued that there is also little consensus as to the underlying mechanism for automaticity (Bargh, 2006; Moors & De Houwer, 2006), and so this approach is not an ultimate solution.

In summary, researchers agree on several characteristics of habit in human action, such as habit's automaticity, its cuing by context and its association with frequent, over infrequent, behaviour to the extent that the cuing context is stable and recurring. What is also revealed in this brief consideration of habit is its conceptual diversity, which perhaps reflects its long history as a concept, its use both within and beyond scholarly discourse, and the lack of introspective insight one generally has into the subjective experience of habit. This means that, on the one hand, habit has been associated with a number of similar concepts and, on the other hand, requires further empirical research to demarcate its boundaries: what it is and what it is not.

With this uncertainty, care must be taken in selecting measures of habit appropriate to the field of research and to the matter in question. The experimental paradigms assessing habit within cognitive neuroscience and comparative psychology are a good example of an approach to habit that is beneficial *within* its field but quite practically and conceptually difficult when used *outside of it* (Dickinson, 1985; Yin & Knowlton, 2006; cf. Schwabe & Wolf, 2009).<sup>8</sup> In the meantime, two considerations apply. (a) In selecting a measure of habit that focuses on some quality of habit, it becomes less valid to measure *that* quality through use of this measure alone, as this may result in circular reasoning (Ajzen, 2002; Gardner, 2012; 2014 see also footnote 3 on page 6) - that is to say, if habits are measured as automaticity or as behavioural frequency, then automaticity or behavioural frequency (respectively) cannot be assessed in relation to habit unless habit is assessed in some other way. (b) One measure of habit may have differing diagnosticity from another (Moors & De Houwer, 2006; Seger & Spiering, 2011; Ashby, Turner & Horvitz, 2011 (box 1); Ashby & Crossley, 2012), leading to problems of comparison between studies.

In the present research, the question of the measurement of habit has been given some consideration. In this thesis, the automaticity sub-scale of the Self-Report Habit Index (SRHI: Verplanken & Orbell, 2003) is used to assess habit (as behavioural automaticity) quantitatively (see Gardner, Abraham, Lally & de Bruijn, 2012b). Thus, keeping in mind the previous paragraph, a conscious decision has been made to equate habit to automaticity, which is a decision that impacts the questions asked of habit in the research (section 2.10.3 returns to this topic). This decision was taken on the basis of

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<sup>8</sup> 'Conceptually' difficult due to the behaviourism (see Bargh & Ferguson, 2000).

the methodological caution of assessing automaticity in the absence of other conceptual elements represented in the SRHI (e.g. identity, behavioural frequency), that may or may not be essential to habit, as well as the practical advantages of reducing the task for participants in completing questionnaires in which multiple habit strengths are assessed.

**2.3.2 Habit acquisition.** It is generally agreed that habits are established through behavioural repetition (Wood & Neal, 2007; Judah, et al. 2012; Verplanken & Wood, 2006). While this is a *necessary* condition, it may not be a *sufficient* condition (Lally, Van Jaarsveld, Potts & Wardle, 2010; Lally & Gardner, 2011; Lally, Wardle & Gardner, 2011; Gardner & Lally, 2013; Judah, et al. 2012; cf. Weston, 2000). Lally et al. (2010) found, in studying the acquisition of habit, that strong habits were acquired over markedly different durations of practice, which is suggestive of additional factors being involved. Judah, et al. (2012) found, in studying the acquisition and survival of tooth-flossing habits, that instructing participants to floss before or after brushing their teeth (i.e. whether or not cued by a similar behaviour in sequence) had consequences for the formation, and survival, of habit; in this respect, it would seem to be similar to the way in which skills are acquired (see Logan, 1985). Another proposal is that habits crystallise socialised learning acquired early in the life-course (Klöckner & Matthies, 2012; Haustein, Klöckner & Blöbaum, 2009; see also Elder, 1994); socialisation can be described as "the process by which social structure transmits to individuals the skills and attitudes compatible with the roles that they enact" (George, 1993, p.354) and, Klöckner and colleagues propose that social norms are, thus, the content of many habits. Klöckner and colleagues have provided some evidence that habits mediate the association between indicators of socialisation in travel-mode choice (such as the mobility of peers, family and the experience of becoming a licensed motorist) and current transport-mode choice.

Theories of action sequences and skill acquisition may provide more particular ideas about how habits are learnt. From these perspectives, between lower-order actions (simple movements) and higher-order actions (e.g. going to the cinema - see section 2.4.1; see also Section 2.5) there are strata of well-learnt behaviours that, through repetition, have become discrete units, but units that lack the flexibility of a script (Cooper & Shallice, 2000; cf. Klöckner & Matthies, 2012, study 2). This is best understood by considering the twin processes of *compilation* and *strengthening* in



learning skills (Anderson, 1982; Anderson, 1992; see also Jager, 2003).<sup>9</sup> Through compilation, subtasks of a skill are brought together as a single, task-specific unit. For example, when making tea or coffee, retrieving the tea or coffee may become a single unit with putting some in one's cup to the extent that, without thought, one does the second after the first automatically. Through strengthening, the enactment of a skill, or action sequence, becomes automated to a stimulus. For example, on first entering the kitchen in the morning, one might put the kettle on and begin to make a cup of tea or coffee automatically, having done so many times before. The decomposition of these processes implies that they may occur separately - that actions may be 'semi-automatic' (Bargh, 1989).

Habits are acquired by repetition, but this may not be sufficient for habit acquisition. Continued attention to script concepts in studying habit acquisition is warranted (Verplanken, Aarts, Van Knippenberg & Van Knippenberg, 1994; Klöckner & Matthies, 2012; Judah, Gardner & Aunger, 2012). With regard to the HDH, it is implicit in the hypothesis that an opportunity is afforded for long-term changes in behaviour through the learning of new habits. Therefore it is important to assess whether new habits, as well as behaviours, develop with a habit discontinuity and to consider whether, in assessing habit, the automaticity of the *act* has been differentiated from the automaticity of the *decision*.

**2.3.3. Loss of habits.** The psychological literature contains less information about how habits are lost (e.g. Verplanken & Aarts, 1999; Jager, 2003) than about how habits are formed. It seems reasonable to assume that if the adaptive purpose of habit is to retain useful (i.e. generally rewarding) behaviours in the face of changing circumstances over long periods of time then habits are likely to be lost only after a long period of isolation from the triggering-circumstances as the habit decays in memory (Dunlap, McLinn, MacCormick, Scott, & Kerr, 2009; Rosas, Todd & Bouton, 2013; see also Todd & Gigerenzer, 2007), but this is not well understood and so it is not clear under what circumstances a cue to habit may continue to be effective if re-encountered (a 'dormant habit': Gardner, 2012; 2014; for some relevant evidence see also Walker et al. 2014; also discussed in Section 2.10.3). For instance, if one learns useful travel habits in another country (e.g. a driving style) it is not unreasonable that these could be

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<sup>9</sup> I have simplified Anderson's ACT-R theory, here, for purposes of illustration.

refreshed if one returns to that country after an extended period elsewhere. An analogue from the study of skill retention may ~~can~~ also be instructive (see Logan, 1985): a meta-analysis of factors affecting skill retention (Arthur, Bennett, Stanush & McNelly, 1998) provided evidence that the increasing length of skill retention lead task performance to decay to a greater extent where (a) a skill was accuracy-related (rather than speed-related) and (b) where a skill was cognitive (rather than physical). These qualities mirror those identified by Wood and colleagues (2002) as differentiating more and less habitual actions. So, it is possible that actions with different qualities (e.g. physical, less-thoughtful) may form stronger habits that decay more slowly. However, skill retention, in this research tradition, does not necessarily provide more than an analogue for habit, to the extent that the two differ: for instance, Arthur et al. (1998) acknowledge that their meta-analysis included few studies that had been practiced to the point of being over-learnt, *qua* habitual (Dickinson, 1985).<sup>10</sup> Therefore it could simply be that actions with certain qualities are more prone to habit formation, and thus become fixed, in comparison to others. Prior to further dedicated research into the loss of habit, it is necessary to at least measure the weakening of habit when studying habit breaking, such as habit breaking with habit discontinuity; it is also important to consider the possibility that habit discontinuity itself may be part of the process by which habits are normally broken and, hence, to consider habit discontinuity in the absence of behaviour-change interventions. Questions of habit loss with habit discontinuity are considered further in section 2.10.3.

#### **2.4. Contextual Triggering of Habit**

That habitual behaviours are triggered by features of the environment (Verplanken & Aarts, 1999; Wood & Neal, 2007) is the first of the foundational assumptions behind the HDH. If cues in the environment do *not* trigger habitual behaviour, then there is no reason to suppose that their absence will discontinue habit (see also Wood et al. 2005, also section 2.7.1). One difficulty in evaluating this assumption is that the concept of *context* can be indistinct (see also Section 2.2.2).

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<sup>10</sup> *Over-learning* occurs when a learning procedure (e.g. operant conditioning) continues beyond the moment of acquisition of the learning (Dickinson, 1985). It was relevant to skill retention (to Arthur et al. 1998) to the extent that occupation skills can become similarly overlearnt when a worker must continue to work their hours despite having fully mastered their working skills. In the laboratory, overlearning is used to establish a habit in neuroscientific studies of habit (here a *habit* is a behaviour performed to the neglect of rewards and punishments). (For a review, see Yin & Knowlton, 2006).

While evidence that context is important in human behaviour and cognition is various (e.g. Wansink, 2004; Kerr, Eves & Carroll, 2001; Payne, Schare, Levis & Colletti, 1991; Sahakyan & Kelley, 2002; Unsworth, Spillers & Brewer, 2012; Barnett & Ceci, 2002; Stefanidis, Korndorffer, Sierra, Touchard, Dunne & Scott, 2012, see also Rosas, et al. 2013) defining what *context* is is a difficulty acknowledged by a number of those researching context-dependent psychology (Unsworth, et al. 2012; Barnett & Ceci, 2002; Bouton, 2002; Wood et al. 2005) and has sometimes constituted a point of theoretical divergence within the discipline (Nardi, 1996; Cahan & White, 1992; Yeh & Barsalou, 2005). Hence *context* is approached from various directions.

Sometimes the context is not analysed - either on the basis that it changes very generally with certain life events (Verplanken & Wood, 2006; Thompson et al. 2011) or that a particular type of place or situation constitutes a context (e.g. Neal, Wood, Wu & Kurlander, 2011; see sections 2.4.1 and 2.4.2). Sometimes the context is considered to be an interpretation of the overall situation from available information (Bargh, 1997; Bargh, Schwader, Hailey, Dyer & Boothby, 2012; see also Vallacher & Wenger, 1987), for instance how a boardroom table and a briefcase can cue a competitive perception of the situation as a whole (Kay, Wheeler, Bargh & Ross, 2004). Sometimes these cues are studied more explicitly as guides to heuristic behaviour (Sobal & Wansink, 2007; Wansink, 2004; Bouton, 2002), such as the sizes of ice cream bowls and spoons as guides to normative ice cream consumption (Wansink, Ittersum & Painter, 2006). Within these differing approaches to contexts are differing ideas about cues. Cues have been variously identified as specific manipulations of contextual features (e.g. spoon and bowl sizes: Wansink et al. 2006), general circumstantial construals of particular features (e.g. of other people as less competitive within more competitive situations: Kay & Ross, 2003; Kay, Wheeler, Bargh & Ross, 2004; Kay, Wheeler & Smeesters, 2008; for a review: Smeesters, Wheeler & Kay, 2010), the location (e.g. a cinema: Neal, Wood, Wu & Kurlander, 2011; differing decor: Unsworth, et al. 2012), self-report of life events (e.g. Verplanken, et al. 2008) or context similarities with a life event (Wood, et al. 2005), the task being performed (e.g. Sahakyan & Kelley, 2002), the chemical environment (e.g. Eich, 1980), and the temporal environment (Rosas, et al. 2013; see also Dunlap, et al. 2009). It is also important to recognise that while cues could function singly, they may also combine in cuing certain behaviours (e.g. Niaura, Shadel,

Adrams, Monti, Rohsenow & Sirota, 1998). Given this variety, to state that habits are triggered by contextual cues is a vague proposition, and vague propositions are problematic until clarified (cf. Weston, 2000; Chalmers, 2006, p. 65; see also Section 2.9.3). While this ~~the~~ lack of knowledge concerning context cuing of habit has been identified by theorists (Orbell & Verplanken, 2015), the lack of *conceptual* clarity is likely to be a barrier to identifying specific links between cues and habits within populations. To this extent, the pragmatic response of avoiding an analysis of cues in studying contexts and how they change, which is to treat contexts as molar (either through the idea of moments of changing circumstances (Thompson et al. 2011) or through the idea of stable contexts (Wood & Neal, 2007)), is useful until research can specifically address the question of habit cuing (Orbell & Verplanken, 2015; see Section 2.2.2, above). This is the approach adopted in this thesis.

This present lack of clarity also affects how the concept of *habit* is understood. There is the idea of a *general habit*: that while some habits are context *specific* (e.g. a weekly cup of tea with one's favourite weekly radio programme) others are cued by a very general cue that appears across contexts (e.g. making tea when thirsty: Verplanken & Aarts, 1999; see Section 2.2.2). To the extent that the quality of *specificity* is not understood, one can ask how far a general habit could be changed through habit discontinuity, because if a *general* habit is *generally* cued, what order of context-change is necessary to disrupt these cued sufficiently? (This is also considered by Walker et al. 2014; see Section 2.10.3). There is also the idea that habits become *generalised* (see Bouton, Nelson & Rosas, 1999), that is move from being specific to being general as new cue-habit links are established with repetition across a variety of contexts. Wood et al. (2005) considered these questions to a certain extent, evidencing the idea that some habits can be triggered by cues in the *physical* environment, whereas others are triggered by cues in the *social* environment (see Sections 2.7.1 and 5.2.1.4). Basic differentiations of these kinds constitute a 'first step' in identifying the specific cues to habitual actions, and research in this thesis has made some basic distinctions. The important question of habit specificity, and how habits may become more generalised, and so (in principle) more difficult to break, remains to be addressed.

With respect to habits, contexts and cues remain largely to be explored. While many cues to habit are *possible*, there is little information concerning which cues to

habit are *probable*, and which could be implicated and altered in habitual behaviour outside the laboratory. The HDH, therefore, becomes a less clearly specified hypothesis than it might appear at first. The rest of this section will consider specific studies of relevance to the context-cuing of habit.

#### **2.4.1. The pull of the past - popcorn consumption in the cinema context.**

Neal, Wood, Wu and Kurlander (2011, experiment 1), informed by Wansink and Kim (2005), tested the role of the cinema context as a cue to habitual popcorn consumption. Student volunteers ( $N = 158$ ) participated in one of two groups: one group watched movie trailers in a cinema during a scheduled screening, whereas the other (control) group watched music videos in a meeting room (otherwise features were matched). Participants in both groups were given portions of popcorn to eat during the experiment: some fresh, some stale. Hunger ratings and frequency of past popcorn eating in cinemas (popcorn eating habit) were recorded. After the study, change in popcorn weight and participant ratings of popcorn quality were recorded. Popcorn consumption was positively associated with popcorn quality and hunger, except for habitual popcorn eaters in the cinema group, who ate without regard to either quality ~~taste~~ or hunger. Though their taste ratings identified the stale popcorn, popcorn freshness was also unrelated to consumption in this group. So one might infer that the cinema context alone was responsible for habitual action in those with prior habit and that this habitual action was not influenced by the most obvious goals driving popcorn consumption: taste and hunger. In moving from the cue of bucket-size (Wansink & Kim, 2005) to place, the link between context, habit and action is demonstrated, but *not* the link between *cue*, habit and action: a place is less specific than a bucket-size, and so it is less clear *how* being in a cinema could have this effect. For instance, the cinema *script* may have been involved (Abelson, 1981; Cooper & Shallice, 2010; see section 2.3.2).

#### **2.4.2. Smoking when drinking alcohol in a licensed public house ("pub").**

Orbell and Verplanken (2010, study 2), with a smoking ban in pubs in the UK, hypothesised that existing habits for smoking while drinking would lead habitual smokers to make more action-slips (Norman, 1981; Cooper & Shallice, 2000) than non-habitual smokers, with respect to smoking, after the ban came into force.<sup>11</sup> Sixty-five

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<sup>11</sup> An *action slip* is defined by Norman (1981) simply as an action that was not intended (as distinct from a *verbal slip* i.e. a 'slip of the tongue').

smokers, recruited in pubs, were assessed for habit strength (using the SRHI, Verplanken & Orbell, 2003) of smoking *when drinking* and this was used to predict their probability of at least one smoking-related action-slips three months after the smoking-ban. Strong habits increased the probability of having experienced a smoking-related action slip, as did drinking more alcohol in pubs; years of smoking and number of cigarettes smoked in the pub (prior to ban) did not. So stronger habits and greater exposure to the cue (alcohol) were both indicative of those who had automatically caught themselves beginning to smoke illegally.

Comparing this study (Orbell & Verplanken, 2010) and the study introduced in the previous section (Neal, Wood, Wu & Kurlander, 2011) shows the differing approaches to be complementary. Both studies assess different (hence converging) aspects of habit/automaticity as markers of habitual behaviour (unintentional action and uncontrolled action). The study of smokers goes beyond the context (cinema or pub) to the cue (drinking), establishing that a *specific* cue is linked to the habitual behaviour, as well as separating the *extent* of the behaviour from the *automaticity* of the behaviour (action-slips were not related to indicators of smoking history or frequency). However, being a field experiment, rather than a prospective (hence correlational) study, the study of habitual popcorn consumption had advantages of control. For instance, whilst the association between habit-strength and action-slipping was established, the role of drinking is less clear, as (a) it isn't established to what extent this link is moderated by habit-strength and (b) alternative explanations (e.g. a loss of control with increased alcohol consumption) are plausible. Also, whilst the context of a public ban on smoking in pubs plausibly generated the action-slip experiences, there is no reason to suppose that this does not always occur for smokers in pubs (a comparison-group or repeated measures design may have clarified this point). Both studies have external validity for being field-based studies, they both suffer from the lack of conceptual clarity that might have improved the precision of tests through identifying clear links between cue, context, habit and action (cf. Wansink, 2004).

**2.4.3. Habits as associations in mind: the attractiveness of the underling and the case of travel habit.** The automaticity theories of John Bargh (see Bargh, Schwader, Hailey, Dyer & Boothby, 2012) have been particularly influential in theorising about the nature of cuing in habitual behaviour (e.g. Wood & Neal, 2007;

Aarts & Dijsterhuis, 2000a). A useful example is a set of studies conducted by Bargh, Raymond, Pryor and Strack (1995) to examine how tendency towards sexual harassment and sexual aggression can be linked to automatic associations between 'power' and 'sex' in a male sample. Participants completed questionnaire instruments assessing tendencies to sexually harass and to sexual aggression, respectively. They also completed a sequential priming task (for 'priming' see Squire et al. 1993), where response latencies to word stimuli were compared with different word primes. Compared to controls, participants scoring highly on either questionnaire instrument responded more quickly to sex-word stimuli when they had been primed with power-word stimuli. Importantly, however, only participants scoring highly on the sexual-harassment questionnaire instrument responded more quickly to power-words when they had been primed with sex-words. From this it can be inferred, that whereas those men showing the tendency to sexually *harass* associate both concepts, one with another (power-with-sex, sex-with-power), men showing more sexually *aggressive* tendencies would seem to have a one-way association, power-with-sex, indicative of the necessity of power-cues to perceive a target as sexually attractive. In another experiment, male participants were individually primed, using a word completion task, with stimuli semantically related either to power, or with a neutral prime. Also present was the same female confederate (posing as a fellow participant). After the priming task, participants rated the attractiveness of the confederate (as one of a number of other, unrelated, questions so as to disguise the purpose of the study). All participants had found the confederate attractive, *except* those who scored highly on the sexual-aggression instrument and who had received the *neutral* (not the power) prime, confirming the finding of the first experiment in a simulated situation. This study, and a progression of similar research (e.g. Kay, Wheeler, Bargh & Ross, 2004; Bartholow, Anderson, Carnagey & Benjamin, 2005; Rutchick, Slepian & Ferris, 2010; Todorov & Bargh, 2002) demonstrate a possible mechanism whereby contexts cue habitual thoughts, perceptions and behaviours. Thus, for instance, when considering habitual popcorn consumption in the cinema or habitually smoking whilst drinking, one might hypothesise that the habit would correspond to strong associations in mind between the cue (cinemas, drinking) and the behaviour (eating, smoking).

Aarts and Dijksterhuis (2000a; 2000b) applied this insight to habitual travel mode choice. They hypothesised that the goal of travel and the choice of travel mode become associated such that generating the goal will lead to a habitual travel mode choice. Using a similar methodology to Bargh and colleagues (1995, experiments 1), Aarts and Dijksterhuis (2000a) demonstrated this association: priming a travel goal resulted in shorter response-latencies for habitual travel mode choices compared to non-habitual travel mode choices (habit was assessed as past behavioural frequency across different destinations). In a further experiment (Aarts & Dijksterhuis, 2000b), employing the process dissociation framework (Jacoby, 1991) to assess automaticity, they demonstrated that those with this association in mind between travel-goal and a travel mode (cycling) tended to have difficulty suppressing automatic actions, resulting in action-slips in much the same way as was to be demonstrated for habitual smokers (Orbell & Verplanken, 2010; see section 2.4.2).

On the face of it, these studies provide evidence of a link between habit and associations in mind. However, this line of research is, by its nature, difficult to demonstrate beyond the laboratory. Visual primes have been employed in place of conceptual primes so as to increase the correspondence between the prime and its target outside the laboratory (Aarts & Dijksterhuis, 2003; Aarts, Dijksterhuis & Custers, 2003; Joly, Stapel & Lindenburg, 2008; Neal, Wood, Labrecque and Lally, 2011). The former studies (Aarts & Dijksterhuis, 2003; Aarts, et al. 2003) demonstrated that a picture of a location presented as a prime and a goal prime (for visiting the same location - see Aarts & Dijksterhuis, 2000b) would together activate the norms of behaviour in that location (silence in a library, table manners in a restaurant).<sup>12</sup> Neal and colleagues (2011, experiment 2) demonstrated that a similar prime, in conjunction with a strong habit (assessed by past behaviour and context stability), activated a habitual behavioural response (speaking loudly in a sports stadium). These demonstrations are not convincing with respect to this being the contextual-cuing of habits *in particular contexts* due to the clear differences between a *place* and a *picture of a place*. The next step might be to use laboratory demonstrations of mental-association (e.g. from

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<sup>12</sup> Though these studies concern automatic associations between norms and behaviours, they may be applicable for habit research because: (i) the findings may be interpretable in terms of norms or habits, and the study did not exclude one or the other possibility; (ii) habits and norms are phenomena not without interest when considered together (see Schwanen, Banister & Anable, 2012; Klöckner & Matthies, 2012). This is developed further in Section 6.4.4.



restaurants to table manners, compared to canteens to table manners) to differentially predict the extent to which the idea of a context (e.g. a restaurant or a canteen) leads to an action (e.g. table manners), and to correlate results with existing measures of habit.<sup>13</sup>

**2.4.4. Summary.** The concept of *context* raises difficult questions in regard to how the contextual cuing of habit is to be explained. While there is evidence to suggest that contexts can cue habitual behaviour in the field, and there is evidence that automatic associations in mind may be a mediating mechanism, these lines of investigation have yet to converge. In the meantime, a better understanding of the *probable* cues for habitual behaviours in particular contexts would be of benefit as a prelude to inferential study, both so as to explore different possibilities regarding cues, context, habits and actions and so as to better understand how individuals make sense of their own habits. For instance, those who habitually smoke while drinking (see Orbell & Verplanken, 2010; section 2.4.2), if asked, could offer insights into smoking in the pub, and whether they're aware of a difference between their addiction to smoking and their habit of smoking whilst drinking (for example).

## **2.5. Habit surpassing motive**

The second fundamental assumption upon which the HDH is founded is that habit surpasses motive. This is described by Verplanken and colleagues (2008): "A[n] [...] implication of frequent performance of behavior relates to the degree to which behavior is driven by conscious intent [...] when behaviours are well-practiced and repeatedly performed, frequency of past behaviour reflects habit strength and ha[s] a direct effect on future performance, whereas intentions have a much lower impact" (p. 122). By contrast: "when behaviors are performed in unstable or difficult (e.g., new) contexts, past behavior relates to future behavior through behavioral intentions, thus following the social cognitive models" (p. 122). Verplanken and colleagues cite the meta analysis of Oullette and Wood (1998), which showed association between frequency of past behaviour and the stability of contexts (see section 2.2.2) within which behaviours were performed. That actions are unintentional in this way is also one of the facets of automaticity, described earlier (section 2.3.1.), and therefore is part

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<sup>13</sup> Beyond this specific issue, much about the nature of priming associations in mind remains unknown and uncertain (Bargh, 2006; Locke, 2015) and so to equate these to habits may be to replace one uncertainty with another.

of the definition of habit as a form of automaticity amongst others. To propose that when habits are *strong*, they *surpass* motive in explaining behaviour is to take a *dual-process* perspective upon habit, that habit and intentional behaviour constitute two distinct processing modes, rather than being different aspects of the same mode (Smith & DeCoster, 2000; Evans 2008; Kahneman, 2011). Much of this thesis, including this section, accepts a dual processing perspective without criticism. In this section, therefore, the importance of this assumption to the HDH is described before its role in socio-cognitive action models is very briefly outlined.

Conceiving of *semi-automatic* behaviour allows a scenario in which habit and automaticity occur without motive being surpassed by them.<sup>14</sup> Both Oullette and Wood (1998: pp. 55-56) and Bamberg, Ajzen and Schmidt (2003: p.185) describe the concept of *semi-automatic response patterns* with respect to habits (see also Bargh, 1989: pp.24-28). These form because "as behaviors are repeated in daily life, separate responses and the intentions controlling them are likely to be chunked into large, efficient units that include multiple behaviors" (Oullette & Wood, 1998: p. 55). These large units (such as driving from home to the cinema, or buying tickets when one gets there) are automated; between and amongst these units, important decisions are made deliberately (such as deciding to go to the cinema, choosing which film to see and whether-or-not to buy pop-corn) (Bamberg et al. 2003). Context-cued automaticity (habits) might function, in these units, to maintain choices that have not needed deliberation (e.g. having bought one's tickets, one habitually queues for popcorn, because this is next in the learnt sequence), but, beyond some slips, could be corrected with monitoring under most circumstances (e.g. deciding not to buy popcorn today; see also Quinn, Pascoe, Wood & Neal, 2010).

This description of habit does not make the assumption that habit surpasses motive, and so can be compared to descriptions of habit doing so. If this description is entertained, then a habit discontinuity (the absence of context cues to automatic actions) would result in little more than greater attention being necessary to perform the routine elements of actions, such as going to the cinema. At most, the result would be some temporary disruptions to the automatic routines one has developed (e.g. forgetting to

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<sup>14</sup> This *semi-automatic* concept of actions is not, here, proposed as an alternative theory. Crucially, the *semi-automatic* concept has been employed descriptively both on the assumption that intention is the prime source of control (Bamberg et al. 2003) and on the opposite assumption (Oullette & Wood, 1998), because such a description does not entail either assumption.

buy popcorn if, instead of going to the cinema with others, one has gone alone and, usually, talking to others before the film cues the goal to buying popcorn). Thus, if, as with this account, the assumption that habits surpass motives is *not* made, there is no reason to suppose that discontinuities in habit should lead to more deliberate actions than would normally occur. Therefore, this assumption is fundamental to the HDH. It has also been useful in modelling the way in which habit can improve models of human social action.

An *action model* is, after Klöckner and Blöbaum (2010), the term used in this thesis to refer to socio-cognitive models that explain the social behaviour of individuals through psychological *constructs* (MacCorquodale & Meehl, 1948); "a hypothetical construct is: a conjectured entity, process, or event that is not observed directly but is assumed to explain an observable phenomenon. It is not merely a summary of the relationships between observable variables but contains surplus meaning over and above such relationships" (Colman, 2015). For instance, there has been much research upon models of action from *attitudes* (Ajzen & Fishbein, 2005); attitudes are "tendencies to evaluate objects favourably or unfavourably" (Olson & Maio, 2003, p. 299; see also Olsen & Zanna, 1993). Perhaps the most widely used action model is the Theory of Planned Behaviour (TPB: Ajzen, 1991; see Armitage & Conner, 2001). In this theory, a person's actions are directly associated with their *intent* to act. A *behavioural intention* (Sheeran, 2002) "indexes a person's motivation to perform a behavior. That is, behavioral intentions encompass both the direction (to do X vs. not to do X) and the intensity (e.g., how much time and effort the person is prepared to expend in order to do X) of a decision" (p. 2). In the TPB, intentions are associated with three prior constructs: attitude towards the action, *subjective norm* for the action and *Perceived Behaviour Control* (PBC) over the action. These three constructs are informed by the individual's beliefs. The subjective norm is "the perceived social pressure to perform or not to perform the behavior"; the PBC is "the perceived ease or difficulty of performing the behavior" (Ajzen, 1991: p. 10). Ajzen (1991) put forward the possibility that the TPB, when adopted as a framework, permits the use of additional constructs to the extent that they are useful in explaining additional variation in human behaviour that is not explained by the TPB. It is in this way that habit (as a construct) has been used within the TPB framework to explain habitual aspects of behaviour (e.g. Verplanken, Aarts, Van Knippenberg & Moonen, 1998; Bamberg et al. 2003). Triandis

(Landis, Triandis & Adamopoulos, 1978; see also Ji & Wood, 2005, p. 262; Verplanken et al. 1998), proposed two statistical associations between habit and behaviour. First, habit strength could be associated directly with frequency of behaviour; second, habit strength could be associated indirectly with frequency of behaviour through a (negative) moderation of the association between behavioural intentions and behaviour. The second association was hypothesised to the extent that, when an intention to act is *contrary* to a strong habit for not acting (or doing the opposite), then, as well as the habit explaining behaviour directly, intention explains behaviour less well than it ordinarily might. While both associations were originally used when introducing habit to action models (Verplanken & Aarts, 1999), evidence for a moderation effect (of habit upon intention-behaviour association) has been inconsistent and the proposal has been criticised (Friedrichsmeier, Matthies & Klöckner, 2013; Gardner, 2014).<sup>15</sup>

Perhaps the most effective criticism of this is that habits and intentions will very often be in accord, rather than contrary. Habits are learnt from deliberate, goal pursuing, behaviour, and are sustained by stable contexts where circumstances are mostly unchanging, so habits and intentions, all things being equal, could often be in accord (see, for instance, Aunger, Schmidt, Ranpura, Coombes, Maina, Matiko & Curtis, 2009; Brug, Vet, Nooijer & Verplanken, 2006). Moreover, the mechanisms described by self-perception theory (e.g. Bem, 1967; see also Fazio, Zanna & Cooper, 1977) have been cited (Wood & Neal, 2007) as a means by which habitual actions would come to be deliberate and intentional as one's motives form by perception of one's own actions. If, for these reasons, habits and intentions are often in accord, then a moderation association would not be anticipated (Verplanken & Aarts, 1999), and thus would only apply in a small set of domains where one might expect this to occur more often than not, such as where intentions to diet conflict with habits of snacking (Verhoeven, Adriaanse, Evers & Ridder, 2012; De Bruijn, Kremers, Vet, Nooijer, Mechelen & Brug, 2007; cf. Gardner, Corbridge & McGowan, 2015; see also Neal, Wood, Wu & Kurlander, 2011).

It is strange to say that habits and intentions can be 'in accord' and both associated with behaviour when the fundamental assumption being discussed is that

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<sup>15</sup> Studies that do not evidence such an association include: Jorgensen, Martin, Pearce & Willis, 2013; Norman, 2011; Norman & Cooper, 2011 (note 4); Verplanken & Faes, 1999; Murtagh, Rowe, Elliott, McMinn & Nelson, 2012; Gardner, Abraham, Lally & De Bruijn, 2012b; Gardner, Corbridge & McGowan, 2015.

habits *surpass* intent in causing behaviour. This is a difference between *association* and *cause*. Associations (correlations) are necessary, *but not sufficient* for there to be an underlying causal connection (Wooldridge, 2008). In the case of habits and intentions, habitual mechanisms are hypothesised to cause behaviour, but intentions can remain associated with both habits and behaviour for the reasons outlined in the previous paragraph.<sup>16</sup> This difference between cause and association can be augmented to the extent that intentions alter in their dimensions, and intentions assessed prior to an event will differ in their qualities from those measured at the very moment of action (Sheeran, 2002).

In this section, the importance of habit as surpassing motive with respect to the HDH has been emphasised and the role of this assumption in introducing a dual-processing element to action models introduced. That only one action model (the TPB) has been mentioned is because: (a) action models are not addressed in this thesis empirically; (b) another action model (the Norm Activation Model: Schwartz, 1977 is discussed in a later section in a different context (Section 2.10.2.1).

## 2.6. 'Tunnel Vision' and Information-Based Interventions

A key assumption of the HDH is that habits attenuate attention to, or search for, new information in decision contexts; that habitual choices are less well informed, particularly to the extent that the circumstances that informed the formation of the habit may no longer apply. This idea is also termed a *tunnel vision* effect (e.g. Verplanken & Aarts, 1999; cf. Dahlstrand & Biel, 1997) and is of particular importance to the idea that information based interventions can be more effective when habits discontinue with context changes (Verplanken & Wood, 2006). Specific evidence for this tunnel vision proposition has employed the Frequent Response Measure (FRM) of habit in the context of transport-mode choice (Verplanken, Aarts, Van Knippenberg & Van Knippenberg, 1994; Verplanken, Aarts & Van Knippenberg, 1997; Aarts, Verplanken & Van Knippenberg, 1997), which was devised to capture script-based choice habits,

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<sup>16</sup> Indeed, the association (not the causal connection) is interesting in two further respects. First, in as far as intentions are measured prior to the action, and not close on the performance of the action, they differ in their nature and, thus, as accurate measures of intention in the sense discussed, being indices of one's future plans (Sheeran, 2002). Second, the association between intention and action could *improve* with stronger habits to the extent that habits protect against failures in self regulation (Hagger, Wood, Stiff & Chatzisarantis, 2010; Neal, Wood & Drolet, 2013).

particularly the choice of travel mode in making a journey. Verplanken, Aarts and Van Knippenberg (1997) adopted a process-tracing methodology (Payne, 1976). Participants completed a number of hypothetical travel-mode choices with the option to acquire information concerning aspects of each journey that might be relevant to the choice situation (weather, distance, time of departure, weight of luggage and time available). FRM was used to assess travel-mode habit. In addition, attention to the information was manipulated by either using a relevant probe question in-between trials or not doing so. There was a clear difference in information-use between habitual and not-habitual participants: habitual participants gathered a minimal quantity of information unless their attention was drawn to the information, in which case they would gather more information but then slowly return to a minimal quantity with repeated trials; less-habitual participants gathered more information initially and would begin to gather less information unless their attention was drawn to the information by the probe question. So, allowing for repeated trials, habitual participants gathered less information than did non-habitual participants before making hypothetical choices of travel mode (see also Aarts, Verplanken & Van Knippenberg, 1997). While habit was a differentiating factor in these studies, there is some evidence to indicate that this occurs when new laboratory tasks are learnt and, presumably, prior to the activity being performed to automaticity (Betsch, Haberstroh, Glöckner, Haar & Fiedler, 2001), which is consistent with theories of heuristic decision making (e.g. Todd & Gigerenzer, 2007). These results provide internally reliable evidence that (at least for travel mode choice and FRM measures of habit) habitual participants will likely acquire less relevant-information than those without habits. The proposition is also acceptable within the structure of automaticity theory (Bargh & Chartrand, 1999). Two further studies are important in demonstrating 'tunnel vision' outside the laboratory, and how it might be addressed through a disruptive event (see Section 2.2.2).

Fuji, Gärling and Kitamura (2001), investigating the effect of an eight-day closure of a freeway in Japan upon a sample of the motorists who used it ( $N = 335$ ). They found that the more frequently these motorists used the freeway (prior to its closure), the less likely they were to switch to using public transport when it was closed. Moreover, prior to the closure, these participants tended to overestimate the duration of the same journey by public transport, a trend that corrected itself for those participants

who began to use public transport. These findings may be interpreted as suggesting that prior to the freeway closure, habitual drivers (drivers who drove more frequently) were less informed concerning the utility of public transport (over-estimating journey times), a gap in their knowledge that some drivers corrected through experimenting with public transport with the freeway closure (see also Dahlstrand & Biel, 1997). However, because habit and other psychological variables were not assessed, these findings cannot be more than tentatively attributed to an attenuation of attention to, and search for, information.

Parkes, Jopson and Marsden (2016) applied the Trans-Theoretical Model (TTM: Prochaska, Dicelemente & Norcross, 1992) as an explanation of changing workplace travel behaviour during London's hosting of the 2012 Olympic games - which also entailed a travel behaviour-change programme of travel advice services and information provision to circumvent the disruptions to the transport network - and found the model to provide a poor explanation for changes in travel during the event. A sample of transport users in London ( $N = 1132$ ) completed three questionnaires (in the nine days prior to the event, in the eighteen days in-between the Olympic and Paralympic games and between approximately one and two months after the games were over, respectively). Re-scheduling, re-moding, re-timing and reducing were considered as separate travel-change responses.

Briefly, the trans-theoretical model (Prochaska, Dicelemente & Norcross, 1992) proposes a recursive change process through qualitative *stages* of change by means of experienced change *processes*. Stages of change begin prior to any intention to change and proceed from *contemplating* change, through to *preparing*, *enacting* and finally *maintaining* behaviour change. Processes of change are broad and various, including (for example) a process of personal commitment to act for one's own personal improvement (a 'self-liberation' process) and a process of receiving encouragement and support from others (a 'helping relationship' process). Importantly, stages and processes are anticipated to correspond where successful behaviour change occurs (e.g. whereas self-liberation is considered most effective when preparing to make a change, a helping

relationship is considered most effective in the maintenance of a behaviour change once a change is made).<sup>17</sup>

Contrary to expectations, given the TTM, Parkes et al. (2016) found little to suggest that participants at different stages of change also differed in whether or not they successfully changed their travel or the ways in which they did so. The most important finding in this respect was that while the majority (around 70%) of participants were identified, immediately prior to the games, as being 'pre-contemplators' (i.e. "not considering changing the way [they] normally travel to work") around 55% of these participants made at least one travel change during the games. On the face of it, this is contrary to the idea of pre-contemplation as a stage in which "many individuals are unaware or underaware of their problems", or as a stage at which individuals do not intend to change, but it is not contrary to the idea that, lacking a realisation of problems, and individual will not be 'coerced' into change by their circumstances: "they may even demonstrate change as long as the pressure is on [...] often quick[ly] returning to their old ways" (Prochaska, Dicelemente & Norcross, 1992, p.1103).

When this study is considered, not as a critical study of the TTM, but of forced travel-change in response to a disruptive event (e.g. Fuji et al. 2001), the implication is that many individuals seem, prior to the event, to have a minimal engagement with relevant transport information and, during the event, are forced to confront alternatives, which may act to disrupt existing habits or routines (or at least produce a switch to an alternative travel-plan), but may not necessarily result in the provocation of true reflection on the nature of their travel choices and the implications (e.g. the environmental consequences). Therefore, to briefly conclude this section, there is some evidence that habit can lead to tunnel vision under control conditions, and some field evidence that disruptive events may lead to attention being given to the wider travel environment, however the latter has yet to be shown, conclusively, to lead relief from the former.

## **2.7. Empirical Evidence for the Habit Discontinuity Hypothesis**

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<sup>17</sup> When contrasted with the HDH, the TTM can be interpreted (see Thompson et al. 2011, pp. 25-26) as emphasising a conscious motivation for behaviour change that may or may not be related to a moment of change (see section 2.10). Another way in which the TTM might be considered is as a way of capturing different stages of change that either may occur once habits discontinue (Dahlstrand & Biel, 1997) or with the knowing or unknowing application of other (more conscious) habit-changing strategies (e.g. implementation-intentions: Verplanken & Faes, 1999; monitoring: Quinn, Pascoe, Wood & Neal, 2010).



Having considered the three foundational assumptions of the HDH, it is useful to move on to consider empirical evidence for the HDH. A few key studies will be considered (e.g. Wood, Tam & Guerrero Witt, 2005; Verplanken, Walker, Davis & Jurasek, 2008; Walker, Thomas & Verplanken, 2014; Bamberg, 2006; Schäfer, Jaeger-Erben & Bamberg, 2012; Verplanken & Roy, 2016). In the process of reviewing empirical evidence, related theories will also be introduced.

**2.7.1. Changing circumstances, disrupting habits.** Wood, Tam and Guerrero Witt (2005) published research testing the idea that habits are context-cued and that disruption of these cues leads to less habitual behaviour. A study was made of students' exercising, newspaper-reading and television-viewing behaviour one month before and again one month after they transferred to a university (a residential relocation). Regression models predicted frequency of behaviour at time two. The basic predictors in these models were habit at time one, performance-context change, intention, and all possible interactions. Two effects were anticipated: a negative moderation of intentional behaviour by habit and a moderation effect whereby only habitual participants in stable contexts would show no association between intention and behaviour (see Section 2.5). Several of these effects were found for various combinations of behaviour and context-change. However, it is unclear to what extent a study of context-change and behaviour that employed a measure of habit as the interaction between context change and behaviour can avoid circularity (Ajzen, 2002; see also footnote 7 on page 14). This study established several useful features of study-design for investigating the HDH: (a) self-reported measurement of context-change as a variable; (b) stratifying context-change into different aspects (physical location, presence of others, temporal aspects, etc.), particularly contrasting physical and social aspects; (c) repeated measures *before* and *after* a change in context. Wood and colleagues reported several of the anticipated interaction effects, particularly with respect to social aspects of the context and newspaper-reading.

**2.7.2. Context change and travel mode choice.** By contrast, Verplanken et al. (2008) used a cross-sectional design to test the idea that people with strong pro-environmental values will drive to a destination *less* if they have recently moved house than if they have not recently moved house. The hypothesis tested was that not only would the context-change of moving house have disrupted habits and established a

period of intentional behaviour (as Wood et al. (2005) had also predicted) but that the same event would 'activate' pro-environmental values (when part of a person's self-identity) and, together, intentional behaviour and pro-environmental values would lead to pro-environmental behaviour change (reduced driving). This is, indeed, what they found: in a sample of the staff of a particular university in the United Kingdom, those participants who scored highly on a measure of environmental concern used their car less often to commute to the university *if* they had moved house in the last year. This effect was found when controlling for several demographic covariates (age, gender and the combination of commuting with school-run).

Recently, Thomas, Poortinga and Sautkina (2016) have replicated this finding using a large, general sample of the UK population (N = 18,053), an approach that serves to address the specificity of the sample (university staff) and the specificity of the geography (at a particular university) limiting the conclusions of Verplanken et al. (2008). The analysis was focused upon the workplace commute and only participants who worked and did not work from home were considered. Taking into account, statistically, gender, age, income, Socio Economic Status (SES) and whether participants living in a rural area, results indicated that participants who had lived at their current residence longer were also more likely to drive as a primary travel-mode. The probability of commuting to work by car, holding covariates constant, having lived in one's current residence for one month was estimated at 54%, which was estimated to increase to 60% if one had lived in one's residence for 12 months. The function approached an asymptote at a probability of just under 70% with increasing length of residence. In a second model, in line with Verplanken et al. (2008), environmental attitudes (controlling for other covariates) interacted with length of residency in such a way that those with strong pro-environmental attitudes showed a stronger effect of residency-length on probability of car use than those whose environmental attitudes were weaker: a simple effects plot estimated that after one month participants who had higher pro-environmental attitude scores were less likely to travel by car to work (a 47% probability of driving) than participants who had lower pro-environmental attitude scores (a 60% probability of driving). With greater length of residence, however, these differences lessened and probabilities of driving to work were shown to be similar: a residency of ten years was estimated to yield only a five percentage-point difference in

the probability of driving to work between those with low and high scores on pro-environmental attitudes.

The second study outlined in this section provides a strong evidential basis from which to generalise the findings of the first: a relationship between length of residence and travel-mode choice to a workplace that had been demonstrated in a relatively small sample of employees at a particular university was demonstrable in a larger sample of participants representative of the UK population. The most important limitation of these studies (and acknowledged by their authors) is their correlational designs. Environmental attitudes/values and travel-mode choice are assessed, therefore, only at one point in time, necessarily after the moment at which participants moved house (the habit discontinuity). While current attitudes/values, and length of residence are demonstrated to be related to *current* choice to drive to the workplace, there is less information concerning whether or not this choice constitutes a change and whether this change is or is not related to habit. This question is addressed, to some extent, by the study reported in the next section.

**2.7.3. Old habits die hard.** Walker, Thomas and Verplanken (2014) sought to test the HDH for travel-mode choice for a sample of workers ( $N = 70$ ) at an environmental charity as their workplace relocated and thus, reasonably, the context of their workplace commute changed. The theoretical rationale of the study (as well as testing the HDH) was to determine to what extent habit discontinued at, or near, the moment of context change, and how habits were learnt or forgotten subsequently. The environmental charity took several steps to encourage employees to maintain or adopt sustainable travel choices with the workplace relocation (including some remuneration). Initial measurements were made 19 months prior to relocation; environmental attitudes and habit strength for their travel mode were measured, amongst other variables. Follow-up measurements were taken both one week and again four weeks after the relocation. Habit-strength was measured for both old and new modes and specifically in terms of travel mode habit to and from the workplace. The sample was generally concerned about the environment, as might be expect for employees of an environmental charity. The largest overall change in transport-mode choice was from car-use to the use of the train (which was attributed to superior train-connections to the new workplace). Those who changed transport mode, and those who didn't, exhibited a

mean-average dip in transport-mode habit for their previous, or unchanging, transport mode, indicating that all participants experienced a temporary weakening in habit soon after the relocation; testing showed habit-strength to be statically significantly less than the baseline measurement at both one-week and four-weeks after the relocation. This is an important finding, as it identifies not a consequence of the HDH, but a habit-discontinuity itself. Graphically, those who changed their transport mode showed a reciprocal change in habit strengths: as old habits weakened, new habits strengthened. However, only slow progress in learning new habits and forgetting old ones was detected, indicating the seeming resilience of old habits to habit discontinuity and behavioural change, at least over the four week period. Both these graphical trends were confirmed statistically.

Though there seemed to be evidence for a habit discontinuity and for changes in transport-mode choice and the habits of transport-mode use, there was no statistical evidence (a) that these changes were due to environmental concern of participants and (b) that the reduction in habit strength with the relocation was associated with the probability of changing travel-mode with the relocation. In short, this study evidenced the discontinuity of travel mode choice habit with workplace relocation but not that this discontinuity was involved in behaviour or habit changes or that behaviour change had been value led. This is not to say that this disconfirms the HDH: it is plausible, as the authors suggest, that features of the built environment (e.g. changes in relative distances and transport links) might have been more important in determining behaviour change. It is also plausible that once travel modes had been reconsidered with habit discontinuity they were not found wanting (perhaps due to motives not assessed).

**2.7.4. "Sensible phases": is a residential relocation a good opportunity to change people's travel behaviour?** A selection of articles published by Bamberg and colleagues, amounting to evidence from three studies<sup>18</sup>, provide further useful evidence. All studies used the Response Frequency Measure of habit (RFM: Verplanken et al. 1994). (1) Bamberg and Schmidt (2003; see also Bamberg & Schmidt, 2001), in a prospective study modelling student driving behaviour after a three week interval, found a contributory role for habit within their expectancy-value models, evidencing a role for

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<sup>18</sup> This is not made explicit, but may be inferred from the same details being reported across different journal articles.

habit in student travel-mode choice. (2) Bamberg, Ajzen and Schmidt (2003), tested the efficacy of an intervention to encourage public transport use (information, publicity and a pre-paid travel pass) amongst students. They did not evidence a role for habit in determining behaviour. Habit was only measured at follow-up, but this measurement did not directly predict behaviour or mediate the effect of past behaviour onto current behaviour - it was not a useful explanatory variable once other factors were taken into account. Bamberg, Rölle and Webber (2003; see also Bamberg, 2006; cf. Davidov, 2007) tested the efficacy of information and a pre-paid public-transport ticket (see Davidov, 2007) as an intervention to encourage public transport use for participants *who had recently relocated* to Stuttgart. They found that the intervention was particularly effective within this group of new-arrivals in the city, compared to a comparison group who did not receive the intervention, but, importantly, a comparison group of long-term residents was *not* recruited, which would have permitted inference to the effectiveness *of the relocation itself*, rather than only the intervention within the relocating population (Bamberg, Rölle & Webber, 2003, p. 106; Bamberg, 2006, p. 838). Importantly, there was no evidence for habit in explanatory models once other factors had been taken into account. That is, changes were mediated by factors in the Theory of Planned Behaviour (TPB: Ajzen, 1991; see Section 2.5). These studies evidence the idea that residential relocation could enhance information-based interventions, but find no clear role for habit discontinuity in this process, though it is telling that while the two studies in which residential relocation was considered found no role for habit, the study in which (presumably) the context was stable did identify a role for habit: could the *absence* of a role for habit indicate habit discontinuity?

Bamberg, Rölle and Webber (2003; cf. Davidov, 2007) attributed the observed effect to a "sensible phase" (p. 105) in which attention to new information and its processing is improved, leading to informed decisions. This is not unlike the disruption element in habit discontinuity, but attributed to the TPB (see Sections 2.2.2 and 2.6). Another important finding from this study was reported by Davidov (2007). Davidov analysed the study from the perspective of an economic theory of habit as heuristic (Stigler & Becker, 1977; see also Begg, Fischer & Dornbusch, 2002). That is, travel mode habits were conceived to be a heuristic adopted in the face of the cost of information acquisition; if information was provided freely, therefore, use of alternative

modes would increase. Although little evidence supported this theory, Davidov also makes mention of the effect of the intervention upon behaviour not being statistically significant in the final wave of measurement (Davidov, 2007: p.329), which would seem to indicate that the observed changes did not last in the longer term (more than a few weeks). If this is a valid reading of the report, then this could indicate that while behaviours had changed, habits had not. As Davidov (2007) commented, another plausible explanation might be that the welcome pack lead to participants looking more favourably on the public transport provider (i.e. attitudes improved).

In short, while this line of research evidences recently arrived residents as more open to reconsider their travel-mode choices when provided with information about public transport than when not provided with information, it does not evidence the idea that such an intervention would not have also been effective for residents of the city who had not recently arrived. There is also a suggestion that while the intervention was initially effective, its effect did not persist in the long-run.

**2.7.5. Life events as windows of opportunity.** Following on from the work of Bamberg and colleagues (e.g. Bamberg, Ajzen & Schmidt, 2003; Bamberg, Rölle & Weber, 2003), Schäfer, Jaeger-Erben and Bamberg (2012) tested the "sensible phases" or "windows of opportunity" idea (rather than the HDH) with a more ambitious study. A controlled longitudinal design was used to compare three groups of participants in Berlin ( $N = 1031$ ), (a) those who had experienced residential relocation up to six months previously (b) those who became a new parent up to six months previously and (c) a control group who did not experience either event in the previous six months (a 'stable condition'). Participant behaviour was first assessed for one of three behavioural domains (assigned randomly): travel-mode choice, energy-saving in the home or buying regional and/or organic food. They were then re-assessed after a period of time<sup>19</sup>, during which some participants experienced a behaviour change intervention (either information or information and one-to-one tailored advice) and some, control, participants did not.

The full intervention was shown to reduce unsustainable behaviour across life-event groups (a principal finding). However, it was also shown to be more effective in

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<sup>19</sup> The report does not appear to state this duration.

the 'stable' group than in either life-event group, which is contrary to the 'window of opportunity' idea. This unexpected finding was attributed, on qualitative evidence, to the timing of the intervention (that it had arrived outside the window of opportunity) and evidences a stage-theory of behaviour change, that life-events are associated with transitional behaviour changes by individuals (Bamberg, 2013; qualitative findings are also considered in section 2.2.2, above). However, it is also possible that in selecting a 'stable condition' comparison group simply by the absence of two particular life events, this may have concentrated the incidence in that group of other life-events more effective in facilitating behaviour change. The comparison group was shown to be significantly older than the other two groups, suggestive of later-life events such as retirement, grown-up children leaving the family home and health problems (see Klöckner, 2004; Thompson et al. 2011: chapter 6). There is also the possibility that moving house or having a child involved both planning specifically for this event and a prioritising of changes around this event (see Section 2.10), whereas the 'stable condition' had no such conflicts, and so, with the behaviour-change intervention, were encouraged to implement behaviour change in line with the motivation generated by ongoing life transitions (see Section 2.2.2).

#### **2.7.6. Empowering interventions to promote sustainable lifestyles.**

Verplanken and Roy (2016) tested the effect of a pro-environmental behaviour-change intervention upon changing a range of environmentally important behaviours for participants who had recently moved house. Of 521 participants sampled, half of the participants lived in households that had moved within the last six months, whereas the others had been in residence for longer. These groups were matched on several household characteristics and geographically clustered by condition. Two sets of measurements were taken, the first eight weeks before the second. Participants within each group were randomly assigned to an intervention or control condition. The intervention consisted of information - an interview and some small gifts - all directed to the purpose of encouraging sustainable behaviour and provided by a local pro-environmental organisation. Aspects of the intervention were tailored to the individual by means of answers to the baseline questionnaire. After taking account of a number of psychological predictors of behaviour (such as TPB (Ajzen, 1991) constructs and biospheric values) a small positive effect was found, showing that the intervention was

effective in increasing pro-environmental behaviour for participants who had recently moved house. Further analysis suggested that the intervention was effective only for participants who had moved within the last three months. Given the methodological quality of the design, the findings of this study are encouraging (see also Gillson, Standage & Verplanken, 2014), particularly when it is considered that the facilitation of the behaviour change intervention attributed to habit discontinuity due to residential relocation is *additional* to a number of strong explanatory variables for pro-environmental behaviour, which were controlled statistically.

**2.7.7. Habit 'unfreezing': can an incentive to change behaviour also break habits?** The thought of Kurt Lewin is drawn upon by Dahlstrand and Biel (1997) to explain how habits ('frozen' behaviours) may be broken ('unfrozen') and changed ('re-frozen') in different circumstances. Dahlstrand and Biel theorise a framework with several steps (stages) that represent qualitative changes in the way in which an individual comes to perceive the situation, from an initial *activation* of existing values, through attending to current behaviour, considering alternatives, planning their implementation, experimenting with alternatives and finally establishing new habits as the behaviour is practiced and found to be beneficial. Two important points to bear in mind in evaluating this theory are (a) Lewin's emphasis on the group, and group norms, in driving the change process and (b) the profound and unsettling nature of 'unfreezing' as a personal experience (Darnton, Verplanken, White, & Whitmarsh, 2011; Burnes, 2004; for Lewin's Change theory in organisations, see Burnes, 2007).

Researchers building upon the 'unfreezing' approach to habit change have considered the efficacy of highway closures (Fujii, Gärling & Kitamura, 2001), discussing and planning behaviour in advance (Eriksson, Garville & Nordlund, 2008) and providing free public travel passes (Fujii & Kitamura, 2003; Thøgersen & Møller, 2008), the latter in combination with other approaches (plea for commitment: Matthies, Klöckner & Preißner, 2006; travel information and planning: Thøgersen, 2009; residential relocation: Thøgersen, 2012), upon public transport-mode choice and reduced car use. When compared and contrasted with the work of Bamberg and colleagues (Bamberg & Schmidt, 2001; Bamberg & Schmidt, 2003; Bamberg, Ajzen & Schmidt, 2003; Bamberg, Rölle & Weber, 2003; Bamberg, 2006; Davidov, 2007; Schäfer et al. 2012) there can be a certain ambiguity concerning when a habit-



unfreezing intervention is or is not equivalent to an information/incentive intervention (cf. Hunecke, Blobaum, Matthies & Hoyer, 2001; concerning behaviour change interventions see: Maio, Verplanken, Manstead, Stroebe, Abraham, Sheeran & Conner, 2007; Abraham & Michie, 2008; Graham-Rowe, Skippon, Gardner & Abraham, 2011).

This is illustrated by briefly considering Thøgersen (2012), where both residential relocation and a one-month public transport pass are considered together as habit-breaking interventions, on the logic that habit is disrupted *in two different ways*. Interestingly, there is evidence that the incentive (the free travel pass) is effective only with residential relocation (Thøgersen & Møller, 2008; Thøgersen, 2012), indicating that, as Dahlstrand and Biel (1997) theorised, 'un-freezing' involves the effectiveness of differing interventions at differing levels of existing habit.

In the context of this review of literature, two considerations are essential with respect to this line of theory and investigation: (a) while empirical outcomes are often the same, the theoretical antecedents of choices are quite different, particularly because the HDH (Verplanken et al. 2008) and habit 'unfreezing' offer quite different mechanisms for habit breaking, (b) activation of values (Dahlstrand & Biel, 1997) and the Self Activation Hypothesis (SAH: Verplanken et al. 2008) bear some similarity, but differ in how they are described, which is important to how the role of values is understood in this thesis.

**2.7.8. Other studies.** The studies surveyed in this section, 2.7, are not exhaustive of research that provides evidence concerning habit discontinuity in its widest sense. Other studies exist offering consistent or inconsistent evidence, but the evidence is less useful either because the research was conducted to investigate a quite different phenomenon (e.g. 'habit' in addiction: Witkiewitz & Marlatt, 2004; Zhu, Nguyen, White, Edland & Al-Delaimy, 2012; see also Wood & Runger, 2016), because the hypothesis that was tested differed from the HDH in important respects (e.g. Wood, 2010; Kerr, et al. 2001) or because the evidence, though theoretically important, was from non-human subjects (Thrailkill & Bouton, 2014: experiment 4).

**2.7.9. Summary.** A number of studies bear upon the question of habit discontinuity, and together provide sufficient evidence to indicate that there may be such an effect, although there is less evidence than one would wish concerning whether

or not this effect is due to a discontinuity of habits and not some other set of changes that take place with the life events studied. Some recent studies in particular (Verplanken & Roy, 2016; Thomas et al. 2016) show with sufficient external validity and power that such an effect is present with respect to environmentally significant behaviour both with the provision of behaviour change interventions and with existing motivations alone. There are, though, one or two important observations to make with respect to the empirical literature reviewed in this section (2.7).

- Almost all approaches to the HDH have been quantitative in nature. This need not necessarily be a point of criticism - not every research question benefits from the use of a range of methods (Bryman, 2012). However, where the phenomenon is social, qualitative methods may be of benefit, for instance in allowing for the discovery of new ideas, and some sights into why changes may or may not occur, rather than only the verification of existing ideas. Whether a qualitative approach to the HDH might yield useful insights into the phenomena is considered further in section 2.9, and such a study is presented in this thesis (Chapter 3).
- While some of the evidence comes from tests of the HDH in particular, other evidence comes from tests of similar, but not identical, hypotheses. The extent of the similarity gives the extent to which inference to the HDH is sound. For instance few of the studies considered address the important question of whether habit (or automaticity, at least) changes with behaviour change, either through discontinuity or through habit-learning (Walker, et al. 2014).
- With the exceptions of Wood et al. (2005), Verplanken et al. (2008) and Thomas et al. (2016), research interest generally focuses upon the effectiveness of information-based behaviour change interventions with habit discontinuity. The question of naturally occurring habit discontinuity is important in understanding whether the effect is part of the ecology of everyday life and how habits normally are broken (see Section 2.3.3); similarly, naturally occurring habit discontinuity has interest with respect to individuals' attempts to change their own behaviour autonomously.
- With a few exceptions (Wood, et al. 2005; Walker et al. 2014), studies are of individuals who have already experienced a life event and do not consider

changes with the event from a baseline established prior to the event. This is an important limitation. For instance, the lack of baseline measurements in intervention studies, where measurements are taken before and after an *intervention* that was implemented *after* participants experienced a life event (see sections 2.7.4, 2.7.5 and 2.7.6), permits inference only to the efficacy of the intervention for those who have *already* experienced the life event. It is not easy to anticipate life events in the future, particularly of large samples of people (see Ampt, Stopher & Wundke, 2005), and so it is understandable that fewer studies take this into account, but it remains true that to draw inferences concerning the event, measurements prior to the event are necessary.

- A number of studies do not compare participants who experienced a life event/habit discontinuity to participants who did not. If such a comparison is not made, then one can infer a change in the group (e.g. that those who move house change travel mode), but this cannot be attributed to the life event/habit discontinuity because it was not established that comparable individuals who did *not* experience a life event/habit discontinuity, at the same time, *did not* experience similar changes.
- Most studies have sought to test the HDH (or similar hypotheses) in particular. Fewer studies have been made of how different additional 'background' factors may influence the habit discontinuity (or similar) effect, beyond their role as covariates. These are considered further in section 2.10 and are the focus of much of the empirical work presented in this thesis (Chapters 4 and 5).

## **2.8. Habit and Transport-Mode Choice**

As much of the research of the HDH has considered travel mode choice behaviour in particular, it is useful to briefly summarise some of the literature linking habits and travel mode choices. Travel-mode choice is the means of transport selected for a particular journey, usually considered in terms of whether or not driving is chosen. Travel-mode choice is fairly stable over time (Huff & Hanson, 1986; Thørgersen, 2006) and this is thought to be because it is habitual (Gärling & Axhausen, 2003; Gardner & Abrahams, 2008): one survey study of commuters ( $N = 1609$ ) has found that a range of travel modes are all engaged in habitually (Thomas & Walker, 2015). Although much of the research concerning the habitual nature of transport-mode choice has employed

the script concept (Aarts, Verplanken & Van Knippenberg, 1997; Verplanken & Aarts, 1999; Aarts & Dijsterhuis, 2000a; 2000b), general habit that is goal directed (Verplanken & Aarts, 1999; Bargh & Chartrand, 1999), other approaches confirm travel-mode choice habits (Friedrichsmeier, Matthies & Klöckner, 2012; Gardner, 2009) with newer studies adopting the SRHI (Verplanken & Orbell, 2003) approach (Gardner, 2009; Walker et al. 2014). The question of which concept best captures habitual travel-mode choice, while investigated (Klöckner, Matthies & Hunecke, 2003; Friedrichsmeier, Matthies & Klöckner, 2012; Klöckner & Matthies, 2012), has not been resolved (see also Bamberg, Ajzen & Schmidt, 2003; see also 2.3.2). With respect to travel-mode choice and life-events, research evidence suggests that the two are linked (Klöckner, 2004; Beige & Axhausen, 2012; Clark, Chatterjee, Melia, Knies & Laurie, 2014; Scheiner & Holz-Rau, 2013), which could be on account of habit discontinuity but might also be on account of biographical or life-course changes (George, 1993; Elder, 1994) that may have more fundamental psychological antecedents (Baltes, Staudinger & Lindenberger, 1999).

## **2.9. Preparing a Qualitative study of habit and habit discontinuity**

In section 2.7.9 it was observed that little qualitative research has been conducted with respect to the HDH or habits. Qualitative methodology is ostensibly an approach that collects and analyses textual (or visual), as opposed to numerical (quantitative) data. However, this is a superficial distinction: "stipulating what [qualitative research] is and is not as a distinct research strategy is by no means straightforward" (Bryman, 2012: p. 380). Bryman (2012: p.380) went on to summarised a few "particularly noteworthy" features of qualitative research: (a) an *inductive* approach to theory (evidence is used to generate new theory, not to test existing theory); (b) an *interpretivist* epistemology (finding knowledge through interpretation(s), rather than an 'objective' knowledge separate from them); (c) a *constructionist* ontology (social phenomena are created (constructed) through the interaction of individuals and cannot be separated from this process - see also Gergen, 1985). If these are its features, then what is its purpose?

- By interpreting textual data, the qualitative researcher can seek a more empathic understanding of participants' points of view.

- Textual data allow for rich descriptions that can help to identify what aspects of the situation or context are important.
- Qualitative studies are often flexible (open-ended/ minimally structured), allowing for the possibility (though not the certainty) of unanticipated discovery.

In these respects, the purpose of qualitative, as opposed to quantitative approaches in the social sciences (see Denzin & Ryan, 2007), is as a range of tools for use when traditional methods are either not amenable to the phenomena under study (because the phenomena are rare or socially complex, for instance) or, more radically, as an admission that, even with sufficient means and effort, traditional approaches do not produce useful knowledge about these phenomena, but are, instead, problematic (Flick, 2009).

In the next part of this section (2.9.1), habits will be considered with respect to whether or not qualitative approaches are possible or appropriate. In the following section (2.9.2), more specific information about different qualitative approaches will be considered. Finally, Section 2.9.3. addresses the questions that arise when qualitative and quantitative approaches are considered together ('mixed methods'). Much of this section addresses the process of selecting an appropriate approach to studying habit discontinuity qualitatively, but it is useful to begin by outlining how this question arose and stating the research question with which this line of inquiry began.

In reviewing the literature relating to habits and habit discontinuity, the observation that little qualitative research has been conducted (see Section 2.7.9) lead the author to consider different questions and possibilities. For instance, was it possible that, during life events, individuals experienced the discontinuity of habit in such a way that they could communicate this experience? If so, how might it be understood, or made sense of? If habit discontinuity was *not* something consciously experienced, it could mark a period of particularly careful consideration, when contrasted with the routine, habitual experiences of periods of stability. There was also the question of which factors might be important in behaviour changes with life events (Thompson et al. 2011), and of whether changes in one's goals or values with the life events themselves might be involved (Bardi, Buchanan, Goodwin, Slabu & Robinson, 2014;

see also Section 2.2.2: para. 3-4). From these different questions and possibilities, a primary research question and two secondary sub-questions was formulated.

(A) "What accounts do people give of change *and* continuity in their day-to-day travelling over time?"

(A1) "To what extent are continuities described as routine or habitual?"

(A2) "To what extent are changes described as being part of moments of changing circumstances?"

Could, or should, such questions be addressed qualitatively? If so, how might this best be implemented - what considerations must be taken into account? In producing the qualitative research presented in Chapter 3, these questions have arisen periodically and, each time, the author has improved his understanding of their import.

### **2.9.1. Qualitative Study of Habit**

Can habits be studied using qualitative methodology? Qualitative methodology has been used to study the experiences of participants in changing their habits using habit-learning interventions in the health behaviour domain (Lally, Wardle & Gardner, 2011; Gardner, Sheals, Wardle & McGowan, 2014), but the focus in these cases is upon the function and acceptability of the intervention, rather than habits or how they change: these are addressed using the quantitative components of these studies. There would seem to be a demarcation between entities that the participants will be aware of (i.e. the intervention) and mental processes (i.e. habit) that the participants may not be aware of. Another way of putting this is that conscious behaviour change attempts can be reported verbally, but unconscious changes in habit, as non-declarative memory (see Section 2.3.1), may not be reported on directly (Bargh, 1989: pp. 31-32). Moreover, with this lack of conscious memory for habits, there is the strong suspicion that individuals *misattribute* causes or motives to their habitual actions so as to explain them (Wood & Runger, 2016). This class of mental process was discussed by Nisbett and Wilson (1977), who, from their review of the literature on subjective accounts of mental processes, propose that:

When subjects were asked about their cognitive processes [...] they did something that may have felt like introspection but which in fact may have been only a simple judgment of the extent to which input was a representative or plausible cause of output [...] they may resort, in the first instance, to a pool of culturally supplied explanations for behaviour of the sort in question, or, failing that, begin to search through a network of connotative relations until they find an explanation that may be adduced as psychologically implying the behaviour. (Nisbett & Wilson, 1977: p. 249)

They do not propose that such verbal reports will always be wrong. Verbal reports based on implicit causal theories, they suggest, "will typically be wrong not because the theories are in error in every case but merely because they are incorrectly applied in the particular case" (p. 248). This perspective informs the idea of *implicit social cognition* (Greenwald & Banaji, 1995), where past experience influences the social behaviour of the actor unconsciously (see also Section 2.5). Similar suspicion with respect to verbal reports has been voiced by Steg and colleagues (2001; Steg, 2005; Lindenberg & Steg, 2007; see also Schuitema, Anable, Skippon & Kinnear, 2013) in understanding why individuals drive cars.

For some time now there has been a lurking suspicion that the answers that people give when they are asked about their car preferences may be nothing more than their theories about how they perceive cars, and their responses may have very little to do with how they actually perceive cars, or with their real motives for choosing a particular model (Steg, et al. 2001: p.153).

This mistrust of self-reports can lead not only to the conclusion that habits (themselves) cannot be studied qualitatively, but also to the conclusion that evidence from self-report measures of habit can be similarly misleading (Sniehotta & Pesseau, 2012; Hagger, et al. 2015). Orbell and Verplanken (2015) defend Self-Report Habit Index measurement of habit (SRHI: Verplanken & Orbell, 2003) as a measure of "the experience of habit" that assesses "the strength of the cognitive association" using items that assess different facets of automaticity (see Section 2.3.1).

Reporting on automaticity is not the same as asking an individual to provide insight into how an automatic process works [...] we contend that people are able

to provide valid information on their habits using the items of the SRHI (Orbell & Verplanken, 2015: pp. 2-3).

If such an argument can apply to a self-report measure (though see also Gardner & Tang, 2013), it follows that it can also apply within a qualitative approach to studying habit. So long as one is honest about interpreting those aspects of automaticity that are reportable in terms of habit (or automaticity), it would seem to be acceptable that the experiences that mark habit, features of automaticity, can be recalled and reported as part of a qualitative study of habit. This, however, must be done both with the consciousness that asking people about mental processes can reveal only a person's beliefs about these processes and that asking people about motivations or reasons for actions (in the absence of habit) may, similarly, reveal only a person's own (public) beliefs about their own motives.

### **2.9.2. Methodological Choices**

Having identified a useful question for research and a means by which habit as a mental process could be approached, different methodologies were considered. Willig (2013) was consulted, in the first instance, with respect to the range of methodologies available and several possible methodologies were identified and considered with respect to the research question. In particular, three methodologies seemed most appropriate: Interpretative Phenomenological Analysis (IPA), Grounded Theory (GT) and Thematic Analysis (TA).<sup>20</sup> From these, TA was chosen; this choice is discussed in Section 2.9.2.2.

#### **2.9.2.1. Three Methodologies**

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<sup>20</sup> Approaches with a strong tradition of social constructionism were judged less promising. Discourse Analysis (DA) favours the use of conversation or written texts that occur naturally, rather than being elicited (Potter & Hepburn, 2008), and it did not seem likely, *a priori*, that people would talk about habits or their discontinuity as part of everyday conversation. Narrative approaches, while their focus upon the life course would be a useful attribute, involve extensive data collection from a few well-chosen participants, and, at the time, the author was not confident that such individuals could be found with respect to the research question, but that a wider sampling was necessary in order to find individuals who had experienced habit discontinuity in a way that could be communicated.



IPA (e.g. Smith & Osborn, 2003) is a qualitative methodology applied to gain insight into the experiences of people: a better understanding of the meaning of things for different individuals themselves, or an 'insider perspective'.

IPA has a theoretical commitment to the person as a cognitive, linguistic, affective and physical being and assumes a chain of connection between people's talk and their thinking and emotional state. At the same time, IPA researchers realize this chain of connection is complicated – people struggle to express what they are thinking and feeling, there may be reasons why they do not wish to self-disclose, and the researcher has to interpret people's mental and emotional state from what they say. (Smith & Osborn, 2003: p.54).

Thus IPA and cognitive psychology both focus upon the inner life of the individual, but from diverging epistemological and methodological perspectives, though the use of prior psychological concepts in the analytic process is a key feature of IPA (Smith, 2004), in contrast to many GT approaches. Equally, IPA is considered particularly useful as an approach in health psychology - of finding the *subjective* experiences of individuals with *objective* health conditions of body or mind (Smith, Jarman & Osborn, 1999; see also Broki & Wearden, 2006). IPA based research involves the semi-structured interviewing of smaller, homogeneous samples representative not of the wider population but of those typical of the group of interest (e.g. people with a particular illness). This is with a view to, first, in depth ideographic analysis of individual cases, before comparing individual experiences between cases. One can briefly sketch the course of IPA analysis. It begins with a process of familiarisation with the text data and initial *coding* (assigning descriptive labels to parts of the text). This is followed by a process of clustering codes into more abstract or theoretical groups (themes), and then reviewing these against the data (iteratively). This process is repeated for each individual (case), either with respect to accumulating themes from previous cases, or as case studies. A final table of overall themes is assembled to represent the important themes within the data and with respect to the research question, and this is elaborated through the report writing process (Smith, et al. 1999; Smith & Osborn, 2003). However, what makes IPA unique is not this process of inductive coding, which is neither proscriptive nor inflexible, but the epistemological

position that informs the interpretative work of the researcher during the analysis and the form of knowledge produced (Smith, 2004).

GT is both an end-product (a theory grounded in data) and the name of a methodology by which it is obtained. GT originated with Glaser and Strauss (1967) as a reaction to 'grand' theoretical accounts in sociology: a method by which new theory could be generated by an engagement with unstructured data in the absence of presuppositions from established theory (Pidgeon, 1996). Such an approach is informed by symbolic interactionism and pragmatist philosophies, which broadly emphasise the interpretive nature of social reality (Cuff, Sharrock & Francis, 1998; Corbin & Strauss, 2008). The essence of symbolic interactionism is the emphasis on (social) processes: (subjective) reality is created and recreated through interpretation of situations by individuals. This is done through the symbols (meanings) in one's culture and through exchanges of symbols (meanings) with others, and the creation of new symbols (meanings) in the process. Individuals create their self-identity in this way and, importantly, it is also the basis for their actions (Cuff et al. 1998). GT is, thus, an attempt to gain insight into these meanings by interpreting what individuals say and write, and using these insights to generate new theories about society. To avoid the trap of merely summarising what people have said and written (content analysis), GT has several key features (Pidgeon, 1996; Walsh, Holton, Bailyn, Fernandez, Levina & Glaser, 2015), especially *constant comparison* and *theoretical sampling*. *Constant comparison* is the way in which identifying similarities and differences in the data allows the researcher to create codes, categories and, eventually, theories that describe these patterns; this process is *constant* in the sense that it continues throughout the analysis so that all lower level codes and higher level categories or theories are consistent with the data (Corbin & Strauss, 2008). *Theoretical sampling* is the gathering of data (sampling new cases) as the analysis proceeds and guided by the analysis (Corbin & Strauss, 2008). Thus, if a new concept (e.g. 'care') is identified in analysing an interview with the first participant (e.g. a nurse) then one may wish to develop this concept by talking to doctors, or patients, or by talking to nurses in different wards, to hear what they have to say about 'care' (Pidgeon & Henwood, 1996). This covers returning to previous data later in the analysis, or collecting more data from

the same participants, but with respect to new questions arising from the analysis (Corbin & Strauss, 2008).

One can briefly sketch the course of GT analysis (Pidgeon & Henwood, 1997), and appreciate its similarities to IPA with respect to coding. With the first interview transcribed, initial coding (labelling) can begin in a most flexible and creative way, though interpretation of the data must 'fit' (describe) the data itself in order to remain 'grounded'. As this process continues, a core analysis occurs, in parallel to coding, whereby new ideas are refined, developed and organised, and accounts of the analytic process are recorded in memos, the writing of which also stimulates analysis and reflection. During these analyses, new data are collected (sampled theoretically) and analysed. The analysis continues until a point of 'saturation' is reached, where, in coding new data, the researcher no longer identifies new codes or ideas. At this point, the structure of ideas created through the analytic process is fixed by defining concepts clearly and explicitly and link them together into an overall theory - a theory developed and supported by an organised record of analysis from beginning to end. Importantly, the development of a complete grounded theory may not be possible - the resources necessary for such a task are considerable - and so a more realistic analytic goal (e.g. a useful taxonomy, the development of particular concepts, or a theoretical comparison between emerging concepts and existing theories) may be pursued (Pidgeon & Henwood, 1996).

TA, Braun and Clarke (2006) argue, rather than being a qualitative skillset or toolbox, is a qualitative methodology "in its own right" (if used correctly), though one that, at the time, had "no particular kudos" (p. 97; see also Willig, 2013). An important part of understanding TA as a qualitative methodology, as opposed to only a method, is the distinction between *flexibility* and *coherence (consistency)*, as developed by Holloway and Todres (2003). *Flexibility* is the extent to which elements from one methodology may be useful within another methodology, and is demonstrated by the extent to which methodologies share common elements (e.g. inductive inference, being person-centred, analysis through coding). *Coherence* is the value of a methodology used consistently: the extent they produce "the kind of knowledge" that best fits "the aims of the project" (Holloway & Todres, 2003: p. 347). Through their exploration of this distinction, Holloway and Todres (2003) argued that "[...] unreflexive and

undisciplined eclecticism might be avoided, not necessarily by settling on one approach as an exclusive commitment but by applying and making explicit an epistemological position that can coherently underpin its empirical claims." (p. 355).

For Braun and Clarke (2006), TA is a method that offers flexibility to the researcher through providing a method "essentially independent of theory and epistemology" where "researchers make their epistemological (and other) assumptions explicit" (p. 78). They argue that many qualitative studies already, in fact, covertly employ TA - that it is "poorly demarcated and rarely acknowledged, yet widely used" (p. 101).<sup>21</sup> Hence Braun and Clarke (2006) are concerned with making the use of TA explicit and so improving the quality of TA studies. They advise full acknowledgement of the use of TA and the parameters of its use.

If we do not know how people went about analysing their data, or what assumptions informed their analysis, it is difficult to evaluate their research [...] what is important is that the theoretical framework and methods match what the researcher wants to know, and that they acknowledge these decisions, and recognize them *as* decisions (p. 80).

Thus, TA begins with a process of setting the parameters of the study with "a number of decisions" (p. 79). Perhaps the most important of these decisions is the theoretical approach (e.g. epistemology, ontology), but there are others, such as what will constitute a 'theme', the scope and focus of the analysis, whether the study will proceed inductively or deductively, and how the data is to be interpreted (see Willig, 2008; Smith, 2004). The method of analysis itself can be sketched as a six-stage recursive coding process: (a) becoming familiar with the data and (b) generating initial codes; (c) searching for themes across codes; (d) reviewing these themes (first against coded extracts and second against the dataset); (e) defining and naming themes before (f) producing the report. Whereas the decisional aspects of TA are its flexible element, the analytic process is the systematic core of TA.

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<sup>21</sup> This includes those that use of the coding procedure of GT in the absence of its theoretical commitments or full set of methods (e.g. theoretical sampling), which is sometimes termed 'GT 'lite' (Braun & Clarke, 2006: see also Walsh et al. 2015). It is *very* important to distinguish between this GT 'lite' and the 'abbreviated' GT outlined by Pidgeon and Henwood (1997). This latter approach involves setting modest research goals and concentrating on those elements most applicable to these goals (e.g. 'fit' is most important in developing a taxonomy) but this is *not* at the expense of the theoretical commitments of GT: its special procedures and the philosophical pragmatism that informs them.

Amongst the advice offered by Braun and Clarke (2006) is the caution that the cost of flexibility - having a "wide range of analytic options" - is that "it makes developing specific guidelines for higher-phase analysis difficult, and can be potentially paralysing to the researcher trying to decide what aspects of their data to focus on" (p. 97). Holloway and Todres (2003) describe too much flexibility (a lack of coherence) as risking to "dilute the value of consistently pursuing the integrity of a particular approach from beginning to end – from its philosophical underpinnings to the specificity of the subtle nuances that it may adopt in its methodological procedures" (p. 346). These cautions are similar to those discussed in Section 2.9.3. in the context of mixed methodology.

### **2.9.2.2. Selecting a Methodology**

This particular section (2.9.2.2) concerns the fit between the qualitative research question (Section 2.9: para. 3) and the choice of research methodology. Of the methodologies outlined above, TA was selected, and this selection was made for several different reasons. To reiterate, this was the primary research question.

(A) "What accounts do people give of change *and* continuity in their day-to-day travelling over time?"

This question was developed from the literature, rather than with a particular qualitative methodology in mind, which is appropriate. To say that "a judicious choice of method guides the research toward the intended aims and helps ensure that its products are useful and well received" (Starks & Trinidad, 2007: p. 1372) is not to say that one begins with a method and then finds questions to fit the method, because it is ultimately the answer to the question that one seeks and the method is the means to that end and, this quotation advises, methods should be appropriate to these ends. Willig (2013) counsels that: "*qualitative research questions* identify the phenomenon (i.e. the process, object or entity) that the researcher wants to investigate" and "point in a direction without predicting what we may find" (pp. 27-28). These features are only true of the research question above if particular words taken from the literature - such as 'change', 'continuity', 'routine', 'habitual' and 'moments of changing circumstances' - are read as only 'pointing in a direction' and so their use as terminology is not retained. Willig (2013) identifies a circumstance under which a researcher may legitimately change their

research question, if "the very concepts and terminology used in the research question are, in fact, not appropriate or relevant to the participants' experiences" (pp. 27-28). It is in *this* sense that these words are employed - the absence of the concepts of the participants themselves.

In considering the three methodologies outlined in the previous Section (2.9.2.1), and which was most appropriate for this qualitative research question, TA was chosen. It was chosen for its flexibility. It was necessary to be flexible because the question is not directed towards either highly experiential knowledge (using IPA) or more social knowledge (using GT), and so it seemed premature to exclude either possibility from the outset in an open-ended study. Such a choice of flexibility has led to some cost of coherence, which is discussed elsewhere (Sections 3.5.2 and 6.4.6).

### **2.9.3. Using both quantitative and qualitative methods together**

Johnson and Onwuegbuzie described a situation in the recent past.

The quantitative versus qualitative debate has been so divisive that some graduate students who graduate from educational institutions with an aspiration to gain employment in the world of academia or research are left with the impression that they have to pledge allegiance to one research school of thought or the other (Johnson & Onwuegbuzie, 2004: p. 14).

Qualitative ('QUAL') and quantitative ('QUAN') approaches were considered to be incommensurable (Howe, 1988). Smith and Heshusius (1986) put this case well, arguing that using QUAL and QUAN in parallel had a tendency to lead to the strong philosophical differences that underwrite the different methods to be neglected, which "closes down an important and interesting conversation" (p. 4) between the two. Smith and Heshusius concede the point that the methods (techniques) of QUAL and QUAN may be blended (see also Howe, 1988; Michell, 2003), but they argue that this is usually done *within* a single paradigm (e.g. positivism, post-positivism, social constructivism: see Guba & Lincoln, 1994; see also Lincoln, Lynham & Guba, 2011), with its own epistemology, ontology and criteria of quality in research. They warn that it is mistaken to "be epistemologically ecumenical and leave the larger debate to those who are interested in it" (Smith & Heshusius, 1986: pp. 7). Denzin (2010) characterised the

tendency for those in one paradigm (post-positivism) to use (qualitative) methods developed within other paradigms, applying their own implicit standards, as "methodological poaching". Such perspectives characterise what has been termed the *purist* position on mixed methods, which emphasises differences between methodologies rather than commonalities (Sparkes, 2015).

In opposition to the purist position is the compatibilist position, which forms the basis of mixed-methods as a methodology or as a method. To be clear, *mixed methods* research can be generally defined as:

[...] the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration (Johnson, Onwuegbuzie & Turner, 2007: p. 123).

As this thesis has, to a limited extent, mixed methods, it is important to consider the compatibilist position. This position begins with the observation that almost all research has a common aim: "all research in the social sciences represents an attempt to provide warranted assertions about human beings (or specific groups of human beings) and the environments in which they live and evolve" (Johnson & Onwuegbuzie, 2004: p. 15). The compatibilist argument begins with this agreed-upon position that methods (techniques) are not prescribed by paradigms, or do not entail logics of justification (Johnson & Onwuegbuzie, 2004; Bryman, 2012). The compatibilist goes further, arguing that the contrast between paradigms does not hold (see Bryman, 2012: 619-622) and a set of post-positivist (pragmatist or pluralist) assumptions can be agreed between paradigms (Johnson & Onwuegbuzie, 2004: p. 16). For instance (as an illustrative example), claims to objectivity in positivism (e.g. controlled experiments) are rendered subjective through their many decisions (e.g. selecting of topics for scientific study, setting statistical criteria, interpreting outcomes) and social constructivism has its own implicit standards of quality that would seem to undermine the idea that knowledge is entirely subjective (Johnson & Onwuegbuzie, 2004). Importantly, at the theoretical level, mixed methods are often conducted within a single philosophical tradition that can support compatibilism, such as philosophical pragmatism (Johnson &

Onwuegbuzie, 2004; Johnson, Onwuegbuzie & Turner, 2007) or critical realism (McEvoy & Richards, 2006; Zachariadis, Scott & Barrett, 2013), rather than attempting to work within two different paradigms at once.

Perhaps the most important points to take from this outline with respect to the use of mixed methods in this thesis are these. (a) Whether or not one is explicit about one's philosophical assumptions (epistemological, ontological, etc.), one will be employing assumptions through the conduct of research (Mertens, 2010). (b) In mixing methods there can be a *tendency* towards divesting methodologies of the theoretical assumptions *that make them useful* resulting in a compatibilism through the minimal pragmatism of: "an uncritical dependence on the idea that inquiry is a matter of 'what works'" (Smith & Heshusius, 1986: pp. 8; see also Howe, 1988; Johnson & Onwuegbuzie, 2004: p. 19). (c) To adopt mixed methods and retain different theoretical perspectives, a superordinate compatibilism is necessary, e.g. philosophical pragmatism, within which multiple perspectives can be applied as methodologies, and not merely methods (techniques).

This brief outline leads to the question of how using qualitative and quantitative research methods together applies within this thesis. At the practical level, it is useful to begin with the purpose for mixing methods in this thesis, which was to address *different* research questions pertained to the same topic (rather than, for example, to seek converging/diverging or more complete evidence concerning the same set of research questions - see Bryman, 2012). At the theoretical level, I will follow Mertens' (2010) criteria: "All I ask is that [my students] are able to articulate both the meaning of the assumptions associated with the paradigm of their choice, as well as their reasons for situating themselves in that paradigm." It is pragmatism of a general form, described by Johnson and Onwuegbuzie (2004), that seems to best fit the author's approach to the research in this thesis. Therefore, before continuing to the next section (2.10), there is an articulation of the meaning of the basic tenets of pragmatism and an articulation of why the author situates himself within this paradigm.

'Philosophical pragmatism' is not one single philosophy so much as a set of core ideas of themes across a number of different philosophies (Bacon, 2012). Two core



principles are described here, mostly with reference to the work of their originator (C. S. Peirce).

- *The Pragmatic Principle.* Perhaps the first principle of Pragmatism is given in C. S. Peirce's essay *How to Make Our Ideas Clear* (1878). From an appreciation of Cartesian epistemology (Descartes, 1641: 1911), Peirce develops his own epistemology as a means to attain clarity of thought ("there can be no question that a few clear ideas are worth more than many confused ones"). For Peirce, thought is directed at producing belief, *not* truth. 'Belief', for Peirce, has three properties: the believer is aware of it, it stops the believer doubting, and it informs the believer's actions in the manner of a rule. Its function as a rule for action is the essential characteristic of belief. This leads to the *pragmatic principle*: "Consider what effects, that might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object." Thus to say an object is 'hard' is to say *only* that few other objects can scratch it. Another example from W. James (1907: 2004) is instructive. One sees a squirrel on a tree in the woods, it moves to the opposite side of the tree-trunk, where one cannot see it. One moves round the tree, and the squirrel moves too, always on the opposite side of the tree. Having moved around the tree, has one moved around the squirrel? The pragmatic answer is that: (a) one has gone round the squirrel on the surface of the Earth but (b) one has not faced all sides of the squirrel. The two understandings of 'moving around' have different practical bearings on the situation and it is through these that the situation is understood and so clarified.
- *Fallibilism, not scepticism or dogma.* Fallibilism, generally, is the position that belief does not have to be true to be called 'knowledge' (Fantl & McGrath, 2009). Pragmatic fallibilism arises from a critique Cartesian philosophy. First, Peirce (1868) argues that, contrary to the Cartesian position (Descartes, 1641: 1911), the burden of proof is upon the sceptic to justify their doubts, and not on the believer to justify their prejudices - one begins with prejudices (such as a belief in one's senses) and comes to doubt them when they are brought into question (e.g. through optical illusions) and not before. Second, Peirce (1868)

argues that Cartesianism places the final warrant for knowledge with the individual, rather than the community, which is an over-reaction (by Cartesians) to the Scholastic tradition of finding justification *only* in authority (e.g. religious dogma). Later (1878), Peirce puts this point well in a defence of Descartes' epistemology (but not rationalism).

[...] I suppose, seeing men, who seemed to be quite clear and positive, holding opposite opinions upon fundamental principles, [Descartes] was further led to say that clearness of ideas is not sufficient, but that they need also to be distinct, i.e., to have nothing unclear about them. What he probably meant by this (for he did not explain himself with precision) was, that they must sustain the test of dialectical examination; that they must not only seem clear at the outset, but that discussion must never be able to bring to light points of obscurity connected with them.

Third, Cartesianism begins from an introspective foundational proposition (e.g. "I am, I exist, is necessarily true each time that I pronounce it, or that I mentally conceive it" (Descartes, 1641: 1911: p. 9), but: "to suppose the fact absolutely inexplicable, is not to explain it, and hence this supposition is never allowable" (Peirce, 1868). Rather, Peirce argues that a chain of reasoned propositions from a foundational belief (see Everitt & Fisher, 1995: Chapter 6) is weaker than it is to, like the natural sciences, "proceed only from tangible premises which can be subjected to careful scrutiny, and to trust rather to the multitude and variety of its arguments than to the conclusiveness of any one".

It is some of the consequences of these principles (Johnson & Onwuegbuzie, 2004) that appeal to the author, and inform the decision to work in this paradigm, namely: (a) an emphasis upon doubt and revision without recourse to scepticism; (b) an appreciation for conceptual clarity; (c) realism; (d) incorporation of subjective experience in method (particularly with W. James, e.g. James; 1907: 2004; see also Hookway, 2013: 3.2).

## **2.10. The HDH in a Framework of Life-Change**

This review has considered habits (section 2.3.), important assumptions of the HDH (sections 2.4., 2.5., and 2.6.) as well as the empirical evidence for the hypothesis (section 2.7.). In this section, the HDH has been considered within the context of life

events, which builds upon the conceptual distinctions drawn in the introduction to this chapter (section 2.2.2). The material in this section informs the majority of the research questions addressed in this thesis. In section 2.2.2. *life events* and *habit discontinuities* were contrasted, the former being a class of events during which the latter event occurs but, also, other factors come into play that are not related to habit discontinuity necessarily. It is useful, in considering these other factors, to draw upon a conceptual framework: such a framework was composed as part of a review of life events as moments of changing behaviour for the UK Department of Environment, Food and Rural Affairs (DEFRA) (i.e. Thompson et al, 2011). This framework consisted of the following factors.<sup>22</sup>

1. Conscious motivation to change behaviour.
  - Degree of (existing) motivation to change behaviour.
  - Extent of pre-planning to change behaviour with the life event.
2. Motivational Precursors to behavioural change.
  - Attitudes/beliefs about the new behaviour.
  - Ease (perceived and actual) of adopting the new behaviour.
3. Environmental control of behaviour.
  - Change in performance context.
  - Habit strength and conscious awareness.
4. Self-regulation and relative priorities.

Some features of this framework should be noted. Firstly, different factors draw upon different existing theories of behaviour change: *conscious motivation* draws upon the TransTheoretical Model (TTM: Prochaska, Dicelemente & Norcross, 1992; see section 2.6); *motivational precursors* draws upon the Theory of Planned Behaviour (TPB: Ajzen, 1991; see section 2.5); *environmental control* draws upon the habit theory including the Habit Discontinuity Hypothesis (HDH: Verplanken et al. 2008); *self regulation and relative priority* draws upon several different theories, most particularly the strength model of control and ego-depletion (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Baumeister, Vohs & Tice, 2007). Secondly, this framework considers these

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<sup>22</sup> I have paraphrased these factors from the original source, rather than stating them verbatim, for (a) compatability with the discussion in this chapter and to (b) better capture the idea that these factors are derived from other theories.

factors as separate dimensions, not with respect to how they relate to one another. Thirdly, as each dimension is considered individually, their exact role in the process of habit discontinuity is not specified, and questions of whether factors interact in producing (or preventing) behaviour change with life events have still to be addressed.

### **2.10.1. Conscious motivation to change behaviour.**

Thompson and colleagues (2011) distinguished, in the context of the TTM, between the conscious motivation to change *irrespective of the life event* and *in anticipation of the life event*, which sub-divides the two aspects of motivation to change in the framework above. As they point out, however, this distinction is broad, and hypothetical in being more or less counterfactual: one cannot know if a change in behaviour would be undertaken if an event had *not* occurred. In the study of 'green' consumption changes with two life events (Schäfer, et al. 2012; discussed in sections 2.2.2 and 2.7.5) many of the changes in consumption with the life event were reported to have taken place before the event itself, with only a refinement of prior plans taking place directly after the event. When considered in the context of habit discontinuity this is important for several reasons. First, the habit discontinuity is hypothesised to occur *after* the event (as the event leads to context changes), whereas this study reports changes *prior to the event* and so these are less easily attributed to habit discontinuity due to the event itself, or to the 'window of opportunity' discussed and recorded in these studies (Verplanken et al 2008; Walker et al. 2014; Verplanken & Roy, 2016; Thomas et al. 2016). Second, one might ask how far the anticipation and preparation for change with an event strengthens the motivation that habit discontinuity facilitates into behaviour change. For example, one might plan to implement a diet and exercise regime upon moving to a new city to begin a new job (to 'turn over a new leaf') and the absence of the old cues to snacking or sedentary behaviour in the new location facilitates the implementation of these plans.

### **2.10.2. Motivational precursors to behavioural change.**

*Motivational precursors* are the individual motivations that inform an overall motivation to change behaviour or, perhaps, the reasons for taking action. In the framework (Thompson, et al. 2011), two elements are the attitudes/beliefs about the behaviour and the ease or difficulty (actual or perceived), the second of which is

informed by subjective norms and perceived behavioural control (Ajzen, 1991: see section 2.5.).

### **2.10.2.1. Value Motivations**

While the TPB informed the formulation of these factors in this framework, it is important to recognise that, to the extent that values become activated and motivate behavioural change with habit discontinuity/life events, it will be a person's values that inform motivations to change behaviour with habit discontinuity/life events. For environmentally significant behaviours, the importance of pro-environmental value is their potential general applicability across behavioural domains: pro-environmental values would apply across behaviours such as recycling, travel mode choice, meat consumption and domestic energy saving, motivating changes in these with discontinuities in these habits; by contrast, more specific goals, such as getting to one's destination comfortably, on time and without spending too much money in doing so, probably do not generalise to other behavioural domains and would not be expected to drive change in these behaviours with habit discontinuities. Two important further considerations are necessary with respect to values as motivations when habits discontinue. The first is that the self activation hypothesis (Verplanken et al. 2008) states not only that value activation must occur for values to influence behavioural change with habit discontinuity but also that the value must be self central: part of one's identity or self-concept (see also Verplanken & Holland, 2002). This can also be thought of in terms of action models in which altruism or environmental values are associated with pro-social or pro-environmental behaviour (respectively).

In the norm activation model (Schwartz, 1977), pro-social behaviour is used to model altruism. Here, intensity of moral obligation is the immediate precursor to altruism. This intensity is informed by one's internalised personal norms for moral action and how they are applied to the situation: motivation is in living up to, or not living up to, these standards. This begins with the activation of values: an awareness of the needs of others in the situation, an awareness of the consequences of one's actions in this situation, a perception of the extent of one's own ability to make a difference and a perception that one has a moral responsibility. This initiates a process whereby a moral norm is generated (or recalled) with respect to the situation and one begins to feel, as

well as realise, one's obligation. A defence process follows whereby the situation, and one's action in the situation, is evaluated with respect to the costs and consequences of actions, which may lead to one's denial of responsibility, or redefinition of the situation, on different grounds (the need is not serious, it is not my responsibility, it does not violate my personal norms, there is not much I can do). To the extent that re-evaluation and denial have not either modified or removed the obligation to act, one behaves in a pro-social way. The Value-Belief-Norm model of pro-environmental behaviour (VBN: Stern, 2000) is similar. Higher-order values inform a specific environmental value or concern. This concern is mediated into action by means of beliefs about the needs (adverse consequences) in the situation and beliefs about the extent of one's abilities to make a difference. From this awareness, a sense of obligation is generated, leading to pro-environmental behaviour.

Returning once again to the self-activation hypothesis in the light of these value-models of action, context changes can not only be thought of as a process that discontinues habits but also as a process that activates values and leads to specific pro-social or pro-environmental precursors to motivated behaviour that would not otherwise occur in stable contexts. Therefore, it is pertinent to consider whether or not behaviour change with life events is driven by value motives. However, to say 'value motives' is to belie the existence of different values, not only the pro-social and the pro-environmental. Schwartz (1992; 1994; 2010) has provided a comprehensive, cross-culturally validated theory of the structure of human values. This theory proposes a system of mutually compatible and incompatible specific values (ten values) arranged within two overall value dimensions that are orthogonal. The first value-dimension represents the dichotomy between helping one's self to improve and thrive (*self-enhancement*) and helping others to do so (*self-transcendence*); the second represents the dichotomy between seeking out new experiences as an individual (*openness to change*) and finding value in one's background, tradition and group culture (*conservation*).<sup>23</sup> These general values, particularly self-transcendence, have been shown to be associated with more specific, pro-environmental values (Schultz & Zelezny, 1999; Nordlund & Garville, 2002; Schultz, Gouveia, Cameron, Tankha,

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<sup>23</sup> Sometimes 'conservation' is termed 'traditionalism' in environmental psychology to avoid confusion (Dietz, et al. 2005; Steg, et al. 2014). As nature conservation isn't focal in this thesis, I have not adopted this convention.

Schmuck & Franěk, 2005). It is reasonable to suppose that some pro-environmental behaviours are more manifestly acts of environmentalism (Stern, 2000) than others: some acts of environmentalism in private life are manifestly the acts of concerned consumers (e.g. recycling rubbish) and some actions are not manifestly acts of environmentalism only but other goals (e.g. vegetarianism, walking and cycling), but can have more or less environmental significance than those that are (Whitmarsh, 2009). Similarly, it is possible that when an action is not manifestly of significance to the environment, other values may be activated with habit discontinuity to guide behaviour change. It is possible, for example, that habit discontinuity may activate self-enhancement values with respect to motorised travel and lead to becoming a motorist or driving more. Thus, while pro-environmental and pro-social values may be desirable in the context of travel behaviour, it may be other values that determine travel behaviour when habits discontinue.

#### **2.10.2.2. Perceived and actual ease of change<sup>24</sup>**

Behavioural control is an important factor within the TPB (Ajzen, 1991) as well as the value-models outlined in the previous section. Its measurement through Perceived Behavioural Control (PBC) is predicated upon an accurate perception of behavioural control on the part of the participant, so it may be argued that PBC can show discrepancy from *actual* behavioural control, perhaps all the more so with life events, when circumstances are unstable or when one's life is less predictable (Sheeran, 2002; Sheeran, Trafimow & Armitage, 2003; see also Klöckner & Blöbaum, 2010). Indeed, when (briefly) considered from other perspectives, such as a social practices perspective (Shove, Pantzar & Watson, 2012; see also Kurz, Gardner, Verplanken & Abraham, 2015) the individual is less important in determining their behavioural pattern than other factors, particularly material circumstances, and so a person's perception of an action's ease or difficulty becomes less important than the real barriers in the environment. A further consideration with respect to perceived and actual ease of behaviour change is that this is the conduit by means of which disruptive events (as

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<sup>24</sup> Subjective norms are also part of Thompson and colleague's (2011) conceptual framework, as both subjective norms and PBC represent factors other than attitudinal evaluation within the TPB (see Section 2.5). The discussion here focuses upon PBC, as this better reflects the content of this thesis; the role of norms is discussed in Section 6.4.4. In retrospect, it would have been useful to consider the role of subjective norms more closely from the outset - this is discussed in Section 6.4.6.

disruptive events; see section 2.2.2.) are likely to influence behaviour, because a disruption will lead to changes in the relative ease and difficulty of different alternative courses of action.

### **2.10.3. Environmental control of behaviour**

When habit discontinuity takes place, do habits strengthen or weaken? In the absence of contextual-cues to habitual action, they should first *weaken*. However, after this weakening, as new habits are learnt (or old habits stabilise), habits should *strengthen* (see section 2.3.2). Provisionally, therefore, one can say that *first* habits weaken and, then, habits strengthen. However, there is an important distinction to be drawn between *changing habits* (associations between cues and behaviour in mind) and *changing habitual behaviour* (behaviour cued by these associations). The idea of *dormant habits* (Gardner, 2012; introduced briefly in section 2.3.3) is the idea that if the contextual cues to habitual behaviour (by means of habit) are absent from the context, then habit will not lead to habitual behaviour - conscious behaviour may replace habitual behaviour - but the habit itself remains 'dormant'. Thus, when the original cues are, once again, encountered, these trigger the habit, and habitual behaviour once again occurs. The implication of this is that habits develop specifically for different contexts, and the best habit discontinuity can achieve is to establish a new habit specifically for the new context. One may, thus, have different habits in different contexts. Finally, from this 'dormant habit' idea, it follows that habit discontinuity changes *habitual behaviour* (which first weakens and then strengthens), but habits (in mind) are learnt, but are not lost. Manifest changes, then, will be in the *automaticity* of actions, under either perspective.

These changes in the automaticity of behaviour with a relocation event (as a habit discontinuity) were investigated by Walker and colleagues (2014; see Section 2.7.3). They asked this question.

*Is a habit broken completely by the change in circumstances or merely suppressed [...] If habits are weakened, rather than totally broken, such that some residual level of behavioral automaticity remains, there would be a stronger likelihood of people reverting to their old behaviors if the novelty of the new context were not maintained (p.4).*



That is, the question of whether there are *degrees* of habit discontinuity, rather than a complete severance of former habit-cues. They assessed two forms of habit (automaticity) change: they conducted tests of changes in primary travel mode habit *generally* (i.e. was travel enacted more or less automatically after relocation) and then tests of changes in primary travel mode habits *specifically* (e.g. did taking the train become more automatic when a participant begins to take the train to work, rather than driving, after relocation). To facilitate these two types of comparison, it was necessary to measure habit (automaticity) at three moments in time: before relocation, immediately after relocation and some time after that. This is because the best time to measure habit discontinuity *itself* (weakening habit) is immediately after the event but before habits strengthen through subsequent practice (or stabilising). In this thesis, it is mostly this latter process that is considered: general change (weakening) in automaticity with the life event/habit discontinuity has not been assessed so much as the specific change (strengthening) in automaticity with practice. This is mostly to demonstrate that when travel behaviour changes with a life event/ habit discontinuity, there is a reciprocal change in automaticity (new behaviour becomes more automatic and old behaviour less automatic), which is a first step to showing change in the underlying habit, though it cannot dispel the possibility of dormant habit.

#### **2.10.4. Self-regulation and relative priorities**

Thompson and colleagues (2011) identified that life events bring with them their own challenges: they may be stressful, they may generate goals that take priority over particular behaviour-changes, and they may lead to failures of self-regulation; these conditions may also favour habitual behaviour. Stress (Ursin & Eriksen, 2004; Ganzel, Morris & Wethington, 2010), and the plausibly related theory of self-regulation failure (Baumeister & Heatherton, 1996; cf. Glass, Singer & Friedman, 1969) with ego depletion (Baumeister & Heatherton, 1996; Baumeister, Bratslavsky, Muraven, & Tice, 1998; Baumeister, Vohs & Tice, 2007), are, together, a factor to consider when life events occur. Briefly, according to the strength model of self control (Baumeister, Vohs & Tice, 2007), self control (willpower) is a general resource applied across different self-control tasks and which can be depleted if drawn upon repeatedly without sufficient means of recovery (Hagger, Wood, Stiff & Chatzisarantis, 2010; but see Lange & Eggert, 2014) resulting in self-control failure. Therefore, to the extent that life events

that cause habit discontinuity are also stressful (Holmes & Rahe, 1967), and ego-depleting, these effects may preserve habitual behaviour, contrary to habit discontinuity predictions of behaviour change (see also Allam & Mullan, 2011; Wood, 2010).

In the laboratory, stress has been linked to habitual action in humans using a comparative paradigm (Schwabe & Wolf, 2009) and there is some indication that less stress is experienced when performing habitual compared to non-habitual actions (Wood, Quinn & Kashy, 2002). Neal, Wood and Drolet (2013) studied the adherence of participants to goal-pursuit under ego-depletion, predicting that habitual behaviour would be independent of ego-depletion. The important implication of this prediction is that habit is independent of the goal that is *not* attained due to ego-depletion, meaning that habit can sustain 'good' behaviour in the face of 'bad' goals, as well as 'bad' behaviour in the face of 'good' goals. In a study of the morning routines of students sitting their examinations (experiment one;  $N = 65$ ), habits (*qua* past behaviour) predicted future behaviour more accurately when participants were sitting exams than when they were not sitting exams, the inference being that habits stabilised behaviour from self-regulation failure at stressful times. This basic finding was replicated across several different studies, with variations to account for some alternative explanations, including desirability of outcomes.

**2.10.5. Summary of additional factors.** Several additional factors were identified as being potentially influential during life-events, with habit discontinuity:

- Prior anticipation and planning for behaviour change;
- Value motives
- Behavioural Control; ~~practical~~ actual opportunities and constraints;
- Strengthening and weakening of behavioural automaticities
- Stress (and ego depletion) leading to self-regulation failure.

Study of how these factors are involved in behaviour change on experiencing a life event can provide further information about how the HDH can be understood in the context of a life event, including the lead up to the event itself and the period of adjustment afterwards.

## **2.11. Conclusions and Research Focus**

### 2.11.1. Conclusions

After an introduction, including a discussion of concepts (or terminology) (section 2.2), this review of literature began by considering what habits are, how they are learnt and how they might be forgotten (section 2.3). This identified some consensus, but also some disagreement, as to what habits are and how they can be measured; while most agree that habits form through practice, less evidence was available concerning how habits are lost.

From this basis, three aspects of habit (in theory) were considered with respect to being necessary to the HDH. In Section 2.4. that 'contexts cue habits' was considered (somewhat critically), building on the discussion in section 2.2.2. A lack of conceptual clarity was identified, and it was noted that this is a theme in ongoing debates concerning approaches to studying habit; illustrative empirical evidence was discussed. In section 2.5. that 'habits surpass motives' was considered. This theme was discussed with respect to habit as a construct in a dual-processing account of social behaviour; the differences between associations between constructs, and the underlying mechanisms, that link habit, motive and behaviour were highlighted. In section 2.6 that 'habits attenuate attention to, or search for, new information in decision contexts' was considered. Both laboratory and field studies seem to broadly support this theme however there seemed to be a difference of emphasis between laboratory work (where habits are most important) and field-work (where the disruptive nature of events is most important).

Empirical studies of the HDH were then reviewed (section 2.7) and observations made concerning the pattern of evidence. While there was sufficient evidence to support the HDH, it was noted in particular that: (a) much of the evidence arises in studies conducted to test similar hypotheses, and, thus, this limits inferences made concerning the HDH, mostly through features of study design; (b) almost all the evidence was quantitative in nature, which may have overlooked the advantages of a qualitative approach e.g. capacity for discovery, as opposed to only verification. The role of habit is travel mode choice, and change in travel mode with life events, was considered briefly (section 2.8.).

Having considered both theoretical background and the empirical evidence concerning the HDH, two particular themes were developed, which constitute main elements focused upon in this thesis. First, the lack of qualitative evidence concerning habit or the HDH was considered, and qualitative methodology and mixed-methods introduced with a view to their use in this thesis (section 2.9). Some cautions with respect to studying habit as a cognitive process were identified, but a means for study through more manifest aspects of automaticity was found. Qualitative methodology, and some particular qualitative methodologies were introduced, and this section concluded with an outline of some of the issues inherent in mixing methodologies derived from different research paradigms ('mixed methods') and how the author reconciles the use of mixed methods. Second, the role of additional factors within the HDH process during life events was considered (section 2.10), focusing in particular on factors that are explored in this thesis, rather than providing a comprehensive account. This discussion was founded upon the theoretical framework assembled by Thompson et al. (2011) of factors of importance to behaviour change with key life events, but considered these less in terms of their individual influence, but in terms of their function within the process of habit discontinuity. Briefly, these included: (1) the role of pre-planning or anticipation; (2) values (once activated) as motivations for change; (3) the ease (perceived or actual) of making a change in the situation; (4) distinctions between behaviour becoming less habitual (automatic) and habits themselves changing; (5) failure of behaviour change with habit discontinuity due to self-regulation (its failure, or prioritising of other changes).

Very broadly, this review found that while current research concerning the role of habit in social behaviour is productive, there is much conceptual work to be done with respect to resolving different concepts of habit and understanding habits over time, beyond their characteristic fixation of behaviour. While there is agreement that habits are defined as context-cued automaticity, the mechanism of context cuing is, as yet, not well understood, though there is evidence to suggest that it does take place. The empirical evidence with respect to the HDH is sufficient to entertain the hypothesis - there is evidence that either behaviour change interventions or existing pro-environmental motives can lead to behaviour change to a greater extent when a life change (mostly residential relocation) has occurred in the recent past. However, given

the necessity of relatively uncontrolled designs and the existence of many possible confounding factors, the HDH remains a hypothesis. Perhaps the most important overall message to be retained from this review of literature (in itself) is that while much work continues to be done, and well done, in applied science with respect to habit, there are theoretical issues to address that, once addressed, may provide insights into how best habits and habit discontinuities may be utilised.

### **2.11.2. Research Focus**

A number of the questions raised in this thesis were by way of introducing the topic and the field to the reader and were not introduced as a prelude to an empirical investigation; other questions were introduced with this intent. This section briefly identifies questions raised during the review, those not addressed, and those addressed, in the thesis, before briefly outlining how they were addressed and where in the thesis they have been addressed.

- Any questions with respect to the nature of habits (section 2.3) are not addressed in this thesis, but have been important in understanding how to approach habit qualitatively (section 2.9.1) and operationally defining habit (sections 2.3.1 and 2.10.3).
- Most important questions with respect to context-cuing of habits (section 2.4) are not addressed in this thesis, beyond verbal accounts given for the context of driving habits in the first empirical study (Chapter 3) and the role of household composition as mediating factor in changes in travel behaviour with residential relocation (Chapter 5: section 5.2.1.4; see also sections 2.4 (para. 3) and 2.7.1, above).
- Any questions with respect either to habit as surpassing motive (section 2.5) or to the role of information in habit discontinuity (2.6) are not addressed in this thesis.
- While reviewing the empirical evidence relating to the HDH (section 2.7) informed the development of more specific research questions, and provided a starting point for the development of the empirical work in this thesis, specific questions that were addressed in these studies, the different theories upon which

these are founded, or any questions raised with respect to particular studies are not explicitly pursued in the empirical work presented in this thesis.

- Travel mode choice (section 2.8) is the behavioural domain, and decision context, within which research was made, but is not the source of research questions deliberately assessed in this thesis. Having said this, the findings of the first empirical study (Chapter 3) are more broadly useful with respect to accounts of travel behaviour, and so go beyond the specific topic at which the thesis is directed (the HDH).
- The discussion of qualitative methodology in the context of studying the HDH (section 2.9), while largely hypothetical and confined to considerations of methodology, involve the formulation of a specific qualitative research question which guided the empirical study reported in Chapter 3, namely the open ended question: "what accounts do people give of change and continuity in their day-to-day travelling over time?"
- The quantitative research presented in this thesis largely begins with the questions arising from the discussion in section 2.10, concerning the role of additional factors in the habit discontinuity process. Specific research questions are put in sections 4.2.2. and 5.2.2. These questions, in their general form, can be summarised. (1) To what extent does anticipation/planning lead to travel behaviour change with habit discontinuity (residential relocation); (2) to what extent do existing values motivate travel behaviour change with habit discontinuity (residential relocation); (3) to what extent does relative ease/difficulty of change (actual or perceived) impact change in travel behaviour with residential relocation; (4) to what extent does self-control failure (assessed as stress and as life-event importance) or do other priorities (assessed as travel goals) impact change in travel behaviour with residential relocation; (5) are changes in travel behaviour with residential relocation associated with strengthening of habit (automaticity) for new behaviours, and weakening of habit (automaticity) for old behaviours? These questions rest upon a prior question: (6) to what extent does travel behaviour change with habit discontinuity (residential relocation)?

With the exception of the qualitative research question (bullet-point number six, above), all research questions identified in the bullet-points above are addressed using two similar questionnaire studies of changes in the travel behaviour of university students when they experience residential relocation from one term-time accommodation to another. These two studies differ in several important respects. The second study (chapter 5) addresses several limitations in the previous study (chapter 4), as well as addressing questions not addressed in the previous study. The qualitative research question was addressed in a qualitative study reported in chapter 3 in which a purposive sample of commuters were interviewed with respect to their experiences of day-to-day travel over time.

## **Chapter 3: Everyday Travel under Stable and Changing Life Circumstances - Commuter Accounts**

### **3.1. Abstract**

*Commuter's accounts of day-to-day travel, during stable and changing periods of life, were studied qualitatively. Twenty-nine participants were interviewed, their answers recorded, transcribed and analysed thematically (Braun & Clarke, 2006). Two themes were identified. Choice factors were the reasons participants gave for their travel choices e.g. convenience, or a sense of autonomy. Second, experience of travel represented the experiences of travel in the moment, such as experiencing concentration, automatic travel of familiar journeys and interpreted travel situations. Participants described being aware of their travel habits at the level of action, but travel choices were described through antecedent decision-making. There were no thematic differences between accounts of travel during periods of stability and during periods of life change.*

### **3.2. Introduction**

#### **3.2.1. Driving habits, environmental harm and habit discontinuity.**

Motorised transport is unsustainable (Kahn Ribeiro et al. 2007) and is a key contributor to air pollution and its health costs (Delucchi, 2000). To encourage the use of sustainable modes of travel is, therefore, beneficial to the natural environment and, with it, human health and survival (Chapman, 2007; WHO, 2013; Delucchi, 2000; Woodcock et al. 2009) and psychology plays an important role in this endeavour (Graham-Rowe, Skippon, Gardner & Abraham, 2011).

Habitual travel mode choices (Gärling & Axhausen, 2003; Gardner & Abraham, 2008; cf. Darnton, Verplanken, White & Whitmarsh, 2011; see also section 2.9) may be difficult to change, because they have become automated responses (Bargh & Chartrand, 1999; see section 2.3.1) to environmental stimuli (Verplanken & Wood, 2006; see section 2.4), rather than intentional choice (Verplanken, Aarts, Van Knippenberg & Moonen, 1998; Gardner, 2009; see section 2.5), and, hence, commuters are no longer influenced by new information pertaining to intentional choices (Aarts, Verplanken & Van Knippenberg, 1998; see section 2.6). A substantial context change (such as a residential relocation or a large-scale road closure) may be necessary to sufficiently remove or disrupt the environmental triggers of habitual choices in order to re-establish a connection between commuter's pro-environmental values and how they choose to travel on a day-to-day basis (Fujii, Gärling & Kitamura, 2001; Verplanken, Walker, Davis & Jurasek, 2008; see chapter 2).

**3.2.2. A qualitative approach to habit and habit discontinuity.** Little study has been made of habit, or its discontinuity, from participants' own accounts: almost all prior work has employed quantitative methods to test ideas, rather than to develop new ideas from verbal data. In Section 2.9, some consideration was made of the use of qualitative methodology to study these phenomena. It was recognised, first, that there was a set of useful questions concerning the HDH to which quantitative methods were not best suited. These were summarised in these primary and secondary (sub-) research questions.

(A) "What accounts do people give of change *and* continuity in their day-to-day travelling over time?"

(A1) "To what extent are continuities described as routine or habitual?"

(A2) "To what extent are changes described as being part of moments of changing circumstances?"

Thus, rather than the nature of habits themselves, this study is directed towards individual's own understandings of experiences of habit, or lack thereof, at different times in their lives.



**3.2.3. Self-reported motives for travel-mode choice.** Given the subject matter of this study, it is useful, beforehand, to introduce some of the previous empirical evidence concerning the accounts travellers give of their own travel choices, which are mostly with respect to the reasons for their choices. In their meta-analytic review of questionnaire evidence, Gardner and Abraham (2008) found evidence across sampled studies that the TPB (Ajzen, 1991; see also Section 2.5) variables and habits (RF measured: Verplanken, et al. 1994) influenced car-choice, indicating the potential of both more and less automatic antecedents informing the choice. In contrast, there was less evidence for the influence of pro-environmental cognitions as influential in car-choice. Several motives for transport-choices have been found in qualitative studies. (1) Personal autonomy (control, flexibility) over one's actions (Gardner & Abraham, 2007; Beirão and Cabral, 2007; Mann & Abraham, 2006; Thomas, et al., 2014; Graham-Rowe et al. 2012; Simons, et al. 2014); (2) an attachment to, and perceived dependency on, one's own transport-mode, particularly for drivers (Beirão and Cabral, 2007; Thomas, Walker & Musselwhite, 2014; see also Cairns, Harmer, Hopkin & Skippon, 2014); (3) instrumental concerns (e.g. cost and travel-time) (Gardner & Abraham, 2007; Beirão and Cabral, 2007; Mann & Abraham, 2006; Thomas, et al., 2014; Simons, et al. 2014), with reasoned and affective aspects (Mann & Abraham, 2006; Gardner & Abraham, 2007). As with the results considered by Gardner and Abraham (2008), pro-environmental motives, and the health benefits of physically-active transport, are often secondary considerations (Beirão and Cabral, 2007; Thomas, Walker & Musselwhite, 2014; Jones & Ogilvie, 2012; Simons, et al. 2014; see also Thomas & Walker, 2015).

**3.2.4. The present study.** To address the research question (3.2.2, above), a number of commuters were interviewed on the subject of their transport experiences day-to-day. The interview transcripts were analysed to identify overall themes, which are reported alongside supporting quotations from participants, and which are discussed in closing. The qualitative method chosen in this study to analyse the data was Thematic Analysis (TA: Braun & Clarke, 2006). Braun and Clarke (2006) specify that the use of TA, in not committing the researcher to a particular theoretical framework, involves making one's own theoretical framework explicit. The theoretical framework has been outlined in Section 2.9 of the previous chapter.

### 3.3.2. Method

**3.3.2.1. Participants.** Individuals from a community research panel, based at Cardiff University in the UK, were invited to participate. Basic demographic information (age, gender, occupation) was collected from the research panel's data-base and guided the recruitment of a purposive sample of transport users from the local area (Table 1). Participants who were not current, past or prospective motorists were excluded, ensuring that no participant was unacquainted with driving, though participants differed in the extent to which they drove on a day-to-day basis.

**Table 1: Participant Demographics**

| Participant | Sex | Age | Employment Status |
|-------------|-----|-----|-------------------|
| 1           | M   | 65  | Retired           |
| 2           | F   | 55  | Home Maker        |
| 3           | M   | 29  | Employed          |
| 4           | F   | 57  | Employed          |
| 5           | F   | 49  | Unemployed        |
| 6           | M   | 67  | Retired           |
| 7           | M   | 34  | Employed          |
| 8           | M   | 41  | Employed          |
| 9           | M   | 55  | Unemployed        |
| 10          | F   | 21  | Student           |
| 11          | M   | 49  | Unemployed        |
| 12          | F   | 71  | Retired           |
| 13          | F   | 65  | Retired           |
| 14          | F   | 34  | Unemployed        |
| 15          | F   | 30  | Employed          |
| 16          | F   | 35  | Employed          |
| 17          | F   | 53  | Unemployed        |
| 18          | F   | 31  | Employed          |
| 19          | M   | 34  | Employed          |
| 20          | F   | 25  | On Leave          |
| 21          | F   | 39  | Employed          |
| 22          | M   | 60  | Employed          |
| 23          | F   | 61  | Retired           |
| 24          | M   | 31  | Unemployed        |
| 25          | F   | 35  | Employed          |
| 26          | F   | 67  | Semi-Retired      |
| 27          | M   | 33  | On Leave          |
| 28          | M   | 60  | Employed          |

**3.3.2.2. Materials.** In order to guide the course of the interview, a discussion guide was written (Appendix A), which was structured in the following way. To address the two subordinate research questions, two lists of questions were included in the guide, each being used in one half of the interview. Each list began with a primary question: this was the first question asked in each half of the interview and also guided the interviewer in framing unprepared follow-up questions. Within each set of questions, questions were listed from most open to most specific (theory-driven), with no closed questions, so as to encourage participants to answer the question fully and in their own way (Flick, 2009).

**3.3.2.3. Procedure.** Semi-structured interviews lasted between 40 and 55 minutes; each interview was recorded using a digital voice recorder. To meet the University's health and safety requirements, interviews were conducted at the university during normal office hours and in the presence of an observer, who took no active part in the interview. Interviewees received a brief verbal briefing concerning the topic of the interview (in general terms) before providing their informed consent. At the conclusion of each interview, the interviewee was debriefed, remunerated and thanked for their participation.

**3.3.2.4. Data analysis.** Interview recordings were transcribed as a written record of what was said: verbatim language and other (informative) auditory information (e.g. laughter, pauses - see Potter & Hepburn, 2005). Transcripts then constituted the data. Data analysis was implemented using both InVivo and written notes. Data were analysed qualitatively using thematic analysis (Braun & Clarke, 2006). Analysis began with a process of becoming familiar with the data through data collection and transcription, culminating in the creation of a set of notes and memos (see Bryman, 2012: p. 581; Corbin & Strauss, 2008: chapter 6). The transcribed data, notes and memos informed a coding process. Data were coded and extracts collated for each code. The consistency of data within each code, and each code across data, was examined iteratively, with on-going descriptions of codes recorded in appended memos. During this process, codes were assigned to broader themes (that categorised codes or

expanded the role of an existing code to that of a wider theme) to form a thematic hierarchy. Finally, this hierarchy was reviewed in relation to its component codes and data for consistency, before the themes themselves were finally labelled and clarified during the process of report writing, including writing this chapter.

### 3.4. Findings

Overall, the data, once analysed, was best-represented by two themes. A thematic map of these two themes, and their sub-themes, as well as the sections within the chapter where they are reported, is presented in Table 2. In Section 3.4.3, these findings are considered together with respect to the research question. In this section (3.4), the abbreviation 'PP#' indicates a particular participant and otherwise conveys no information.

**Table 2: Themes and Subordinate Themes**

| Themes               | Subordinate Themes                         | Findings sub-Section |
|----------------------|--|----------------------|
| Choice Factors       | <i>"It's convenience"</i>                  | 3.4.1.1              |
|                      | <i>"A Reason to Leave the House"</i>       | 3.4.1.2              |
|                      | <i>"Can we afford it?"</i>                 | 3.4.1.3              |
|                      | <i>Feeling Comfortable</i>                 | 3.4.1.4              |
|                      | <i>'It Runs in the Family'</i>             | 3.4.1.5              |
|                      | <i>Autonomy</i>                            | 3.4.1.6              |
| Experience of Travel | <i>Concentrating and Not Concentrating</i> | 3.4.2.1              |
|                      | <i>Familiarity</i>                         | 3.4.2.2              |
|                      | <i>Interpreting the Situation</i>          | 3.4.2.3              |

**3.4.1.Choice factors.** In answer to quite general questions, about day-to-day transport, participants quickly offered *reasoned* explanations for their travel choices for different journeys and purposes, sometimes preceded by general statements of preference for or against particular travel modes e.g. *"I'm not keen on public transport [...]"* (PP#26), *"I prefer the train [...] that's my favourite form of transport"* (PP#1). These were important to how participants understood their own travel. The content of these reasoned explanations is identified through the theme of *choice factors*, or the theme of the integration of different reasons and justifications within participant accounts of travel. For example, participant sixteen (PP#16) answers the question "[what] other ways do you get about during the week":

*"I go on the bus because I go on- that's how I travel to work, I go on the bus. And I cycle as well sometimes. I don't cycle as much as I used to now. [...] it's*

*um alright, gets you from A to B without, the hassle of, if you've got a bike and it's raining then the bus is more convenient 'cause you don't get wet but then you're going to have to wait for the bus and there 're always delays you can't guarantee that you're going to get there on time so you have to factor in leaving early um usually it depends what time you go if you go in peak time there's overcrowding you might not get a seat um [pause] yeah. [...] It depends where you're going but generally it's cheaper than taking the car 'cause I work in the city centre so you have to factor in where to park and getting you know you have to find a space and the expense so the bus is cheaper um the bus is handy like if you're going for drinks and you don't drink drive obviously so the bus is handy then, um, yeah."*

Here PP#16 has identified eight particular factors that inform or justify their travel choice: (i) getting to the destination; (ii) the need to transport items; (iii) the weather; (iv) the uncertainty of arrival timing and delays; (v) rhythms of transport demand and crowding; (vi) expense; (vii) finding parking spaces; (viii) avoiding drink-driving. *Choice factors* such as these were grouped thematically, yielding six sub-themes.

#### **3.4.1.1. "It's convenience".**

*"Yeah I think I think mostly it's like convenience [...]" (PP#24)*

This is how one participant explained people's travel-mode choices in general. *Convenience* was most often the reason behind participant travel choices. *Convenience* is the extent that one can, on the basis of readily-available information, travel freely to the places one wishes to go to, be they near or far, in a suitable amount of time, to arrive at the desired time, with those objects and people one wants to transport. In short, *convenience* is transport that meets the goals people have for their transport *as* transport. The most important component of convenience is minimising time spent travelling so this time can be used for other activities. For example, PP8 described the long commute he makes to work and back:

*"[...] when I get off the train at [place] I just want to get home, I don't want to be... If I can walk home in fourteen [or] fifteen minutes, drive home or, you*

*know, it's um, it just reduces the amount of time you're out of the house [...] I've got three kids [...] I'm working in Cardiff, but, for the amount of hours I'm spending down here, I may as well be doing forty hours a week, you know."*

Beyond temporal economies, convenience was also found in the capability of (realistically) accessing desired locations by different modes of transport. Often this was a matter of relative distance ("*We used to walk to work there and walk most places there 'cause we lived in the city centre so everything was close*", PP#16; "*It was just the distances involved so I would have liked to have carried on using my bike but [...]*", PP#29), and the provision of public transport ("*there's a lot of places you want to be going which the bus doesn't go so it's easier just to drive*", PP#24; "*we have offices, um, in, [local road] [...] try and get there by bus, is virtually impossible, [...] whereas in the car it's literally ten fifteen minutes [...]*" PP#7). This also entailed being able to transport materials and people by this mode. Similarly, convenient transport (most often the automobile) was also flexible; it made journey planning unnecessary:

*"[...] I've got to get this bus to here and this bus to here and you know you probably have to plan your journey out and the times and it would take a very long time [...] if I had the car [you could get up] in the morning to go somewhere, I could get up a lot later, and just go straight there." (PP#15).*

Participants differed in the extent to which convenience was necessary. For some, it was an expression of personal identity:

*"I don't want to waste an hour and a half getting from A to B in order to start work. I know lots of my friends have done that over the years um that's fine for them but it was never fine for me" (PP#22).*

For others, it was something they sacrificed in favour of alternative outcomes. Reflecting on the reasons why she no longer drives, PP5 said:

*"[...] you've gotta be happy, though it is slightly less convenient and less flexible. [...] That would always be the main reason."*

**3.4.1.2. "A reason to leave the house".** Sometimes participants just didn't need to travel. This was usually due to a participant's own circumstances. Having been made redundant, PP#9 did not travel as regularly as he used to:

*"[...] having moved from the situation where I left my house each weekday to do a specific set of tasks and returned uh early that same evening, um I was now in a, period, um, where, there was no certainty that I would have that reason to leave the house and certainly not on a, set and regular basis [...]"*

Similar circumstances were described by some participants on account of having had a baby (PP#13; PP#20) and being retired (PP#1; PP#6; PP#12; PP#23; PP#26), but the change in the need to travel was almost always predicated on not having to commute to work.<sup>25</sup> Similarly, some participants indicated that changes in the need to travel also lead them to economise on the number of cars they owned in the household (PP#18 because husband became a home-maker; PP#19 because wife changed jobs).

**3.4.1.3. "Can we afford it?".** Such was the thought of PP#19 regarding long car journeys to visit family:

*"It was um consideration of cost which is quite a large factor in I suppose travelling at the minute because things are tighter uh than they have been in the past [...] it does have quite a big affect on how we do our travelling [...] one major factor is, money how you know often want to go places the cheapest way."*

Other participants, finding themselves living on limited budgets for one reason or another (PP#10, PP#24, PP#25), expressed similar deliberate consideration over car use, for instance:

*"I think it's 'cause I've been out of work for for a year and a half [uhm] as um I mean I've had to think I've been literally borrowing money from friends and family um so the cost of travelling to different places [uhm] is a must for me at*

---

<sup>25</sup> Where participants have been listed in this way, this has been done only with a view to being transparent, in several respects, and not as an attempt to quantify the content in the data by counting extracts or participants. This transparency is important to assuring the reader that the findings are not always being produced from only interesting single cases (see Braun & Clarke, 2006: p. 95). This transparency is also a way of conveying heterogeneous examples of a homogeneous theme, and thus preserving diversity of experiences, e.g. the many different ways in which different participants use travel for leisure (3.4.1.4).

*the moment [uhm] maybe if I when I get back to full time work um it won't be so important the cost you just sort of jump in a car and just go to wherever you want [uhm] but at the moment I can't do that (PP#25)."*

So, alongside convenience, *cost* was also an important reason given for particular travel choices. 'Cost' might be the relative costs of travel modes, the potential to save money, or the cost barrier of car ownership (purchasing, maintaining, parking and re-sale value of automobiles). For some older, retired, participants, cost was less important than it had been previously. For instance:

*"You know whereas up to this period, up to my retirement, and certainly when you know my thirties and forties we didn't have any money really and anything that saved money was what we did but now the boot's on the other foot [...] So certainly for me I would now go for convenience and pleasantness of travel and what-have-you, over cost or and yes so timing what I how I decide to do a journey is very much convenient hours [hm] first, and then by booking ahead and senior pass and all this stuff you know you whittle it down as best you can on the cost." (PP#12)*

**3.4.1.4. Feeling comfortable.** Whether or not participants had 'comfortable' travel experiences was an important reason for travel choices, manifesting in different ways for different participants. The weather ("*the only thing that puts me off is the weather*", PP#16), including temperature and humidity ("*I prefer being in the car [...] if it's a very wet day it's normally quite soggy and steamy on the bus*", PP#14), preservation of personal space ("*on the train there's plenty of other people on there you know it's not not private*", PP#18), and the stress when driving ("*Yes, somebody else has got the responsibility of driving so I'm free to do whatever I want to do. Read or have a think or look out the window*", PP#1) were all identified by multiple participants. A few participants described health problems (PP#6 - type 2 diabetes; PP#4 - back pain; PP#23 - knee injury) that became particularly discomfoting, and hence an important motivating factor in travel choices e.g. "*I had an operation on my left foot three years ago and prior to that I often walked um purely to keep fit I suppose really um, but then I didn't walk as well as I used to [...] so [...] I always travel by public transport*", (PP#22). What did, or did not, lead to participant discomfort tended to differ between



participants. However, when Participants *do* feel comfortable, travel can be a positive experience, a form of leisure, be it relaxing on trains (PP#1, PP#4, PP#7, PP#10), driving (or riding motorcycles) for fun (PP#4, PP#15, PP#27), or enjoying the outdoors and exercise through walking or cycling:

*"[...] I very much enjoy cycling it's uh good exercise um I do the uh just the fresh air in your face and the freedom to pretty much- if you're not going anywhere in particular you're just going for a cycle you can go down any routes you see really so uh it's very nice [...]"* (PP#24).

**3.4.1.5. 'It runs in the family'.** One's family is an important reason for travel. First, the participant's family background was cited as an influence in current travel choices. While PP#3 described a *reaction* away from family tradition, PP#10 and PP#25 described having learnt driving safety from their parents, PP#4 and PP#15 adopted family traditions in terms of how they travel for holidays and leisure with their own families, and PP#27 considered family a strong influence on their travel:

*"When I was born [my old man] was a bus driver now he's a lorry driver [...] so my old man's always been driving I've always driven with my mum my grandparents drive minibuses so it's like I've got driving in my family so I'm always like I've been teaching my wife now to drive but without it's watching I learnt by so she's looking at everything I'm doing that's how I learnt."*

The second way in which family is important is that having a family of one's own entails responsibilities: family outings, teaching of skills (driving, riding a bicycle), access to grandparents and other family members, lifts to and from children's activities and pursuits ('school-runs' and 'chauffeur duty'), and financially contributing towards a child's first motorcar are cited as examples by participants. Several participants talked about becoming more responsible with parenthood so as to provide these things for their children (PP#6, PP#13, PP#18, PP#19, PP#26). For instance, PP#6 said that: *"You're having children means your whole outlook changes, on that sort of thing, on the sort of car you have, how you, how you drive, if you've got a precious little bundle in the back [... chauffeur duties were] a pain in the arse [...]* But it was our way of sort of, *obliquely, trying to keep [the children] safe"*. However, participants who were parents

more often talked about the practical aspects of transport with becoming a parent; more acute awareness of responsibilities may become a matter of routine, for instance:

*"I did think about [the responsibilities of driving safely] before she was born uh and I suppose for the first couple of weeks I may have been a little more cautious and then I just kind of slipped back into my old casual ways [both laugh] it didn't last very long [laughs]," (PP#15).*

**3.4.1.6. Autonomy.** Autonomy was an important psychological factor across participants' choice factors: its realisation through convenience (often of being a motorist) and having enough money; its loss through life's responsibilities and hardships. Synonyms participants used were 'flexibility/convenience', 'freedom', 'control', 'independence', or not having to be 'reliant' on other people. One particular life-event that marked transitions to autonomy for participants was learning to drive ("*it was like learning to fly*", PP#12). This event often marked a transition between being reliant on parents for transport to being self-reliant. For instance:

*"I mean when I was young, I was brought up in [the countryside] and before I was seventeen, um, I was very, I felt very trapped, because I couldn't, go anywhere [...] I went to school by train, but I couldn't go anywhere without getting a lift from my parents. So the minute I learnt to drive, at seventeen, I drove, and I remember the feeling of freedom, you know, I could just go anywhere. I could leave a party immediately I didn't like it, you know, I didn't have to rely on waiting for lifts or anything like that, and so that, that's going back a long time, but it was a big thing for me." (PP#4)*

For a few participants, this property of travel situations was particularly important in their travel choices, important beyond its apparent utility (PP#3, PP#11, PP#27). For instance, PP#3 described not having a motorbike as "*almost like I'm trapped [...] it's almost like there's been a cage put around me, if you like, because I can't do the distance I can on a bike*", whereas PP#11 talked about finding being stuck in traffic on a bus as "*incredibly frustrating [...] I really do start getting um uh anxious [...] I will sit there and seethe*". One participant emphasised the importance of this self-reliant in their travel ("*[...] years ago I didn't have any money no car no nothing I'd*

walk everywhere [...] I'm used to walking I don't mind walking everywhere [...] if I want to get somewhere I'll get somewhere no matter what I need to use to get there", PP#27).

**3.4.2. Experience of travel.** Choice factors were *reasons* for travel patterns during episodes in life ('while I was learning to drive', 'before I got married', 'since I got my job', 'when I lived in London'), but *experiences of travel* were descriptions of thoughts while travelling. An extract from the transcript of PP#2 illustrates the theme of *experiences of travel* more generally. PP#2 remarked, in talking about taking the bus, that, when on the bus, she was "*oblivious unless there's something big going on outside*" - when asked about this remark, she answered:

*"Um, I think I can be in autopilot driving as well, and which doesn't sound very safe, but I am watching what I'm doing, I... you reminded me of an incident a few years ago, um, coming down over the bridge near the castle, I was going to turn right into [a particular street], I was in the lane of traffic, ar, at the lights, and the two cars in front of me, and I was just waiting for the lights to change, and wasn't particularly thinking about anything important, certainly not noticing the journey, and something happened between the two drivers and the next thing they were both out of their cars having fisty-cuffs - and that woke me up [laughing] blimey, how am I going to get out of this? I don't know what happened between them, but, you can get jolted back into paying attention sometimes, especially coming up to lights, if you're, yeah. [...] I'm very used to this route I'm [sic] done it so many times and, about a year ago, maybe a little bit less, I just noticed my light was red - just noticed, 'cause I wasn't concentrating: that's autopilot, and that's complacency and habit and, you know, just not paying attention. Yeah. I bet accidents happen that way all the time."*

**3.4.2.1. Concentrating and not concentrating.** Participants gave clear accounts of a contrast between a focus on the task of travelling and focusing on other things. (Most often, the task of travelling was that of driving an automobile or riding a bicycle: almost all accounts of using public transport or walking tended to give accounts of a freedom from having to focus on the task of travel, for instance: "*I'd make sure it's the correct bus um and then I'd get on the bus look for somewhere to sit of course um and then that's pretty much it really- just gaze out the window until uh you reach your*

*destination," PP#24).*

In giving an account of the way in which they did or did not concentrate on the task of driving (or riding a bicycle), one or two participants did not describe themselves as anything less than completely focused on the task. For example, on being asked how far driving was an 'autopilot' experience, PP#8 replied:

*"Um, I've heard people mention this to me in work as well, that they've driven past traffic lights and not even remembered going through them, but, I've never experienced that, so, I don't think I go on autopilot, no."*

For the rest of the participants, driving with less than full attention was normal. Participants often described this aspect of driving using a range of metaphors, such as being: 'awake/asleep', 'switched-on/switched-off', on 'automatic' or 'automatic pilot'<sup>26</sup>, or as 'coasting', doing things 'subconsciously', the mind 'wandering', one's 'body taking over' or one's 'minding splitting into two halves'. However, the use of these terms seems to overlap in describing something useful and potentially unsafe (e.g. *"I have driven to London, and, almost been on autopilot [...] sometimes, obviously you still need to be aware of what's, around you, so you can't go off day dreaming"*, PP#7).

This 'autopilot' experience is a functional one, where not attending to the task of driving, and so driving automatically, is functional, and somewhat necessary - PP#9 describes it as:

*"[...] a parallel mindset that never quite gets switched off because, uh, it's on the basis of that that, uh, one is reacting to, uh, other vehicles, pedestrians, cyclists and is being a, um, considerate, transport user."*

Part of this is automatically becoming conscious when it is necessary (*"Well certain situations you get more aware [...] you flip back on onto the driving itself rather than the other thoughts"*, PP#23; *"So half of me is very aware of [hazards], but the other half is probably thinking about something completely other [...] I think you, you've learnt over the years to be aware of, like bicycles and people, children on the*

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<sup>26</sup> Though 'autopilot' was used in questioning, and was adopted by participant and interviewer as a common label for the experience to the extent that participants didn't identify their own label, participants often described such an experience, or used the term itself, prior to the question that introduced the term being asked.

*side of the road"*, PP#4). Another part of this is being able to drive and think about other things at the same time (e.g. talking to a passenger: "*When I'm in the car] Generally I will be concentrating on the road [...] sometimes I'll be talking to my wife while subconsciously doing all that [...]*", PP#19; "*it's automatic isn't it it comes automatic so your mind is just sort of free to wonder and think about things or not whatever you feel like doing at the time really"*", PP#23).

Most participants considered this aspect of driving to be also *dysfunctional*, because it is potentially unsafe ("*Autopilot's something that I know causes a lot of accidents"*, PP#25) and so is something to be vigilant *against*. However, for some participants (e.g. PP#3, PP#10, PP#11, PP#25), this was of particular concern. These participants cited experiences of accidents or 'near misses' as particularly influential - as PP#10 put it: "*[...] the horror stories [i.e. of road traffic accidents] do shape people and their ideas of travel [...] you make mistakes I mean I make mistakes when I'm driving all the time as well so... it's yeah it's, really worrying the whole safety aspect of it"*. Similarly, PP#25 reflected on how completing a speed awareness course following a minor traffic violation, despite her best efforts, did not impact her driving:

*"[...]I think after seventeen eighteen years of driving [...] I think people get flippant over years and years they develop one bad habit maybe going five miles an hour over the speed limit or maybe talking on the phone [...] and they get away with it for so long that it does become habit and then they'll develop another bad habit [...] and then that'll become normal and then they'll develop another bad habit and so [...] you're a completely different driver [...] I'm sure I have developed bad habits um I've wanted to get rid of the bad habits and be like as good as I could again."*

**3.4.2.2. Familiarity.** PP#17, at the time of interview, was in the process of relocating from her home in London to a cottage in rural Wales. Her account of the 'autopilot' experience described above is illustrative of the theme of *familiarity*:

*"If I was doing a day-to-day commute [...] I'd be on autopilot then, I think, but at the moment it's not really like that so um I don't think I'm on autopilot at the moment [...] I might be more in London 'cause I'm just- I think the more familiar you are the um the greater chance you are of uh of being on uh autopilot I think*

*[...]". When asked to elaborate, she went on to describe 'familiarity': "[...] familiar with all the roads and the decisions you've got to make you know [...] those decisions that you've made hundreds of times before so you've got that knowledge you've got kind of knowledge and you have um it's all programmed in there [...] 'cause you've done it all before a hundred times you know you can just just go on autopilot 'cause you know what you're up against really."*

As this account emphasises, familiarity with the route or journey seems to bring about a different experience of travel compared to a lack of familiarity. This is, in many accounts, a qualitative difference between 'automatic pilot' and other travel experiences. For instance, when asked *"to what extent would you say that [...] your familiarity with the route matters in that respect?"*, PP#15 answered:

*"What autopilot? Oh yeah it's crucial [...] obviously if you know where you need to go that's when I suppose autopilot kicks in and you're able to drift off and you don't necessarily have to pay attention to which left turning you need to go to and which direction you're going in."*

This *familiarity* aspect of travel without awareness was attributed to journeys undertaken *regularly over a long period of time* (PP#2, PP#5, PP#9, PP#10, PP#12, PP#15, PP#16, PP#17, PP#21, PP#23, PP#24, PP#29); the word 'familiar' recurred, but descriptions of having a very good 'knowledge' of the road were as common. Sometimes, where the journeys talked about were regular commutes, it was also characterised as a matter of 'habit' or part of a 'routine'. A common experience linked to *familiarity* (as opposed to just 'autopilot', see 3.2.1) in participant accounts was a notable absence of memory immediately after completing familiar journeys, for instance:

*"Have you you had the experience where you get from A to B and you can't remember doing it? And I mean that that happens [...] when I used to drive to work you just- if it's a regular route it's just (you know) 'how did I get here' you know it's just it's just gone isn't it because it's automatic I think though yeah you are aware of it but you're not you're not you don't seem to be that aware of it on a conscious level really- unless something happens [...] but otherwise you don't seem to be that aware of it really." (PP#23)*

While most participants who reported not remembering a familiar journey afterwards considered this to be a normal feature of travel, one or two found it disconcerting ("*[It] worries me sometimes because sometimes I'll get somewhere and I'll have no recollection of the last few minutes*", PP#14). Sometimes what participants said about familiar journeys was suggestive of familiar journeys being relatively *easy* to make ("*it was what I did every day, I didn't have to think about it*", PP#12; "*It's just something that you're comfortable and competent in*", PP#21) but few made an explicit link between the *ease* of familiar journeys and their being less *stressful*. In most cases, when this link was cited, it was in terms of not having to navigate as well as drive (e.g. "*I don't like driving to strange places where I don't know where I'm going*", PP#14). Interestingly, one participant, who was a nervous motorist who found driving stressful in itself, did describe driving familiar routes as "[...] *easier, yes, yeah, I mean I still didn't like the actual driving, really, I still found it a bit stressful, [...] but, yeah, it's easier if it was somewhere that I knew the route. I'd feel a lot more able to just relax then*" (PP#5).

Some reported taking more-familiar routes by mistake when in this mode of thought (PP#10, PP#29), but this was less common than the experience of absent memory or the comparative ease of familiar journeys. As an example, when asked about their journey to the interview, PP#29 (a university student at the university where the interviews took place) reported that she had initially gone in the wrong direction when driving to the interview. On being asked if this happened often, she replied:

*"Not too often. I think it can happen sometimes when I'm on autopilot in terms of I have a route that I drive more frequently [...] this year so far I remember one other incident of it happening when I suddenly realised I'd gone I think I was driving towards work and I needed to go [somewhere else]"*

Some described the experience of being on 'autopilot' on familiar routes as being 'deep in thought', particularly the few participants who described this experience while walking ("*I do just completely switch off and just walk and think about other things*", PP#10; "*you think 'oh I got home quickly and I don't remember crossing that street today' when you're deep in thought*", PP#16). Participants, reflecting on these experiences as part of the interview, found them strange and difficult to explain ("*I*

*don't honestly know, why it happens or what, brings me round"*, PP#14) and often, when asked, explained them in relation to what was *absent* (e.g. awareness, thought, memory, difficulty, surprise): "*[...] you're almost not, you're not even completely conscious [...] I'm not having to think [...] I almost don't have to think about which way I'm turning I know which way I'm turning I know which lane I need to be in [...] I'm not so aware of what I'm doing and sometimes I think it does sort of jolt you if something's happened [...] something you sort of think 'oh right okay right I need to concentrate now' [...]*", (PP#29). Another participant was puzzled by being both vigilant and unaware at the same time while driving: "*There's a way you do both you kind of switch off and, you're just focusing on the road so, it's really hard to describe [...] You know the route so well that you're you're focussing - if something changes you notice it straight away [...] yes you'd notice but it is kind of switching off as well"*, (PP#10).

Familiarity, being described as a quality of particular journeys, was not often accounted for through life changes or transitions, except to the extent that one becomes familiar with a new route by travelling along it repeatedly, perhaps as a result of workplace commuting. Thus, for example, PP#2 describes commuting a new route after a residential relocation within London as: "*quite similar to the old journey, it was just the very short tube stop, one tube stop, I did, yeah, I was going to the same place, autopilot kicked in very quickly, I think"*. One notable exception was PP#4, who described *unfamiliarity* experienced on moving to China (she had not described a previous move to Germany in this fashion):

*"We were [living in China] two and a half years altogether, and I would say for the first six months, for lots of reasons, to do with traffic, not necessarily travelling, you... just leaving the apartment, actually required a mental, effort, because, you had to cross the road, just to get anywhere, and that would probably be ten lanes [interviewer: "ten lanes"] and... well, there would be five and five and there would be just bicycles and cars and buses, nobody obeying any rules and, the only way to get across was to get yourself the middle of a crowd of Chinese people who knew what they were doing and hurry across and hope that you didn't all get mown down so, um, so did that, that effort of going out was, always there, probably after a year, I felt more confident it wasn't just the language it was the, understanding of how to cross these roads we were*



*trapped, I mean, there was just always these massive roads everywhere, so... I do remember, just, you know, worrying about having to, get across the road."*

**3.4.2.3. Interpreting the situation.** One theme of note, but open to interpretation and infrequently identified in participants accounts, was the way in which accounts of travel experiences seemed to differ depending on the *interpretation of the situation*. A few participants (PP#2, PP#11, PP#22) identified this aspect of travel explicitly ("*... your perception and your way of managing a journey completely changes depending on the time of day, the weather, what's going on around you, you know, it doesn't, you don't always approach the same journey with the same mindset,*" PP#2). Most often, this was a matter of whether the journey was is an extension of 'work', for instance:

*"I suppose particularly on longer journeys you can relax a little bit more you don't have to think about traffic so much [...] perhaps something that's been playing on your mind you need to solve problems or generally - if I'm around-driving around town it tends to be 'right what's the quickest way I can get to somewhere, right I'm getting to work so what do I need to do when I'm first at work' just- it tends to be more immediate things if I'm driving around town,"* (PP#15).

However, the most striking examples of different modes of interpretation were accounts of interpreting the situation as threatening ("*I just start to panic a little bit and start thinking 'oh something could happen' or this person I don't know who they are [...] I don't know what they're capable of [...] I will either let them pass or speed up faster to walk faster to where I'm getting to,*" PP#10). These accounts seem to be linked to taking public transport, or walking, in the evening or at night - for instance one participant described using a particular local railway station:

*"It's in a it's in an urban area [...] but it's down from the road, it's just very isolated it's just uh surrounded by greenery and it's not manned there's no ticket office there and often you can be the only person there and it gets very dark and you can't be seen from the street so I don't think it's safe [...]it's it's better in the mornings 'cause there's more people around on the way home particularly in the winter I don't like it at all so I usually ask my husband to meet me and he'll come*

*and meet me,"* (PP#21).

**3.4.3. The research question and the research findings.** It is useful to consider the findings as a whole and in what ways they answer the research question. (a discussion of this as a limitation is made in Section 3.5.2). With respect to the question "What accounts do people give of change and continuity in their day-to-day travelling over time": (a) the majority of accounts were in terms of the reasons for travel choices, and the factors important in these; (b) with respect to these accounts there were few differences between times of change and continuity. Stated differently, participants in this study gave an account of their day-to-day travel over time as a reasoned process of making decisions, taking into account a number of different factors, these factors changing little in themselves, but being given different priorities during different times in their lives, usually in consequence of the circumstances these entailed.

Participants did, also, describe automaticity as an experiential quality of their travel, and in such a way that, to a limited extent, a thematic distinction could be drawn between travelling automatically as an experience (e.g. driving a car, or riding on the train, without being particularly aware of the experience), and certain conditions (frequent journeys along similar routes, often workplace commutes, practiced over longer periods of time) that become familiar and promote, or possibly deepen, these experiences. Therefore, with respect to the question "to what extent are continuities described as routine or habitual", 'continuities' are described as routine or habitual *only* to the extent that they refer to particular travel routines, and *not* to the extent that they refer to stability in the wider circumstances of participant's lives: though the latter may have been true, this did not feature in participant's descriptions.

Participants rarely described particular moments when life changed. More commonly, a description of different sets of circumstances before and after a particular change was described. Where the change was in travel behaviour, this very often was described in terms of different choice factors within the different circumstances before and after the change. To take an example, PP#16 (cited in Section 3.4.1.1) had found it 'convenient' to walk to city-centre destinations when she lived in the city centre of a New Zealand city (where the weather is clement), but, at the time of interview, lived beyond the city centre of Cardiff in the UK (where the weather is less clement), and so

cited the differences in distance and weather as *factors* in her *choice* to take the bus to work. Where the change was *not* related to travel or transport (such as a key life event), participants rarely made a link to any accompanying changes in travel unless it was by means of some choice factors in the circumstances; similarly, changes in choice factors leading to travel changes were often described without reference to any ongoing life events or transitions. So, with respect to the question "to what extent are changes described as being part of moments of changing circumstances", this was only to the extent that *travel* changes involved changes in *travel* relevant circumstances.

### 3.5. Discussion

**3.5.1. Choice Factors.** Participants described travel as being a matter of choices between alternatives that are made consciously, reasonably and optimally with respect to a range of different *choice factors*. Thus, travel is described as an *instrument*, a means to an end. This is not unlike the rational maximising agent in economic theory (Begg, Fischer & Dornbusch, 2002; cf. Sen, 1977; see also Payne, Bettman, Coupey & Johnson, 1992). This largely reasoned account of travel mode choice is also somewhat at odds with the theme of *autonomy* (3.4.1.6) as a choice factor, which is more *affective* (participants describe feeling empowered or disempowered). When previous qualitative studies of travel mode choice are considered, these themes do not seem to have broken any new ground, because emphasis on practical utilities and upon personal autonomy have been identified as important in traveller's understandings of their travel mode choices (see Section 3.2.3). Perhaps what is most interesting is that the present study did not explicitly seek out this information, but that the 'accounts' given by participants were in the form of reasoned justifications for travel choices, and these cover the present situation for participants as well as past episodes in their lives.

With respect to habits, accounts of travel choices as being justified and reasoned would seem to indicate that if travel mode choices are made habitually, or automatically, participants are not aware of this (unless they are reluctant to report this, which is possible). This would seem to favour a form of automaticity of which individuals are entirely unaware (Bargh, 1989; Bargh & Chartrand, 1999) or, in addition, one which we misattribute to our own judgement after the fact (Bem, 1967; Wood & Neal, 2007). Alternatively, it is possible that decision-making informed the

*original* decision to travel in a certain way, and this is the reference in memory for *why* travel routines are enacted, but that the actual *enactment* of travel is habitual: it is interesting that the present study was able to identify some thematic distinctions between the two (for a similar conclusion from a different methodological perspective, see Middleton, 2011). The reasoned travel *choices* described by participants contrasted with descriptions of the experiences of travel, which reflected different degrees of conscious awareness and other features of automaticity (Bargh, 1992; Moors & De Houwer, 2006; see Sections 2.3.1 and 2.9.1).

### **3.5.2. Experiences of Travel**

Participants described experiences of travelling with varying degrees of *concentration*. When concentrating, participants were aware of their actions, and able to respond to the environment. They recognised that when not concentrating, an 'autopilot' took control, with which participants described a somewhat uncomfortable relationship because, on the one hand, automatic piloting, particularly for drivers, was mostly regarded as necessary, and would usually alert the traveller to discrepancies in the environment that might need active attention, but, on the other hand, autopilot could graduate to a complete absence of concentration, to 'falling asleep', which threatened personal safety. Similarly, *familiarity* with regular journeys was identified as a principle source of automatic experiences when travelling (a lack of conscious awareness, a lack of memory, concurrent thinking) but found these experiences were difficult to explain or relate, they were outlined more as 'non-experiences', perhaps because absent memory was a particular feature of familiar journeys, and not only being on 'autopilot'. Participants also described experiences of travel as dependent upon situational factors: particularly with respect to public or physically active travel situations becoming threatening at night or when alone and with respect to a contrast between having a working mindset, or being more relaxed. The contrasts between familiarity and concentration as themes, in familiarity with particular journeys and associated absence of memory, would seem to mark a distinction between a more general automaticity, often of skilled action, and a deeper automaticity tied to a very particular set of routine actions. Important is that the key characteristics would appear to be repetition and a stable performance context (the journey), which supports the case that these two qualities closely mark habitual *experiences*, as well as only habitual

*behaviours* (Wood, Quinn & Kashy, 2002). This is not to say that these are the only kinds of habits (see Danner, Aarts & De Vries, 2007; Neal et al. 2011; see also Section 2.3.1), but that these are the habits people experience and remember when travelling.

### **3.5.2. Limitations.**

Perhaps the most important limitation to this study has been the research question, and the subsequent flexible, but less consistent, approach to qualitative analysis. Willig (2013) describes qualitative research as sometimes being a way to find out "what would have been an appropriate question to ask in the first place" (p.28), and this would seem to apply. Flick (2009) writes that in many cases the origin of the research question "lies in the researchers' personal biographies and their social contexts [...] the researchers' practical interests and their involvement in certain social and historical contexts", however these insights were not available to the author at the outset; the research question was derived directly from the psychological literature, which posed the risk that, in some or all respects, the aim of the study would be at odds with the experiences of the participants, either because the experience would not be accessible to memory or because the subject of the question would not be the most important aspect of the topic for the participants. So, as a first qualitative study of experiences of habit discontinuity, it has been valuable only in so far as no such experience was interpretable. On a more mundane level, much of the data collected in this study concerns the retrospective reporting of events after-the-fact; while care was taken to facilitate the recollection of these accounts (Thomson & Brinkman, 2009), it would be useful to find out if the experiences of people undergoing particular life changes are concordant with the findings of this study.

**3.5.3. Further Research.** The findings in this study could be developed in several ways. A grounded theory investigation (Corbin & Strauss, 2008; Henwood & Pidgeon, 1992) could investigate (i) fully employed commuters, and those who travel for a living, as they are likely to be most exposed to familiar travel, and (ii) participants currently experiencing life changes and/or changes in the way they travel, as these people are most likely to have access to experiences of habit discontinuity, if such a phenomenon is experienced. Such research might profitably consider both the experiential aspects of habit and its discontinuity, but it may be that the effects of

disruption and attention to new information are an aspect of this that participants may be particularly aware of (see Section 2.6).

**3.5.4. Reflexivity analysis.** The idea of studying social questions from a value-neutral perspective is increasingly questioned (Bryman, 2012; Guba & Lincoln, 1994; Hollis, 1994: chapter 10). Therefore, it is necessary for the author to be suitably reflexive concerning the role of values in the research presented. *Reflexivity* is a difficult and contested concept (Lynch, 2000; Finlay, 2002) that it hasn't always been easy for researchers to successfully articulate and then practice (Mauthner & Doucet, 2003). Therefore, *reflexivity* is identified, here, as making explicit researcher-bias in the research process, rather than the embracing of this bias as subjectivity (a 'passive' reflexivity: Finley, 2002, p. 536; a 'methodological self-consciousness and self-criticism': Lynch, 2000). This is in the spirit of Elliott, Fischer and Rennie (1999) in identifying the importance of 'owning one's perspective': that for good practice in qualitative research:

"[...] authors attempt to recognize their values, interests and assumptions and the role that these play in the understanding. This disclosure of values and assumptions helps readers to interpret the researchers' data and understanding of them, and to consider possible alternatives" (p.221).

This is easier said than done. Earlier in this thesis (Section 2.9) some care has been taken to convey the theoretical and methodological orientations of the author in the conduct of research and the preparation of the text. What remains is to articulate the author's personal orientation to the research.

Therefore, I will briefly dispense with writing in the third-person and the passive tense in order to clarify the distinction. As a motorist myself, who has also made use of public transport at different times in the past, within similar travel contexts to participants I interviewed, I believe I was able to understand, and thus follow-up during interviews and interpret during analyses, many of the aspects of travel we talked about during the interviews: I could empathise with these aspects of their accounts. In contrast, participants talked about a number of life experiences I have not had (e.g. growing older, living abroad, getting divorced, having a family and having long-term health problems). Although I did my best to respectfully empathise with participants in

talking to participants about these aspects of their lives, and in interpreting these accounts subsequently, I cannot claim to have an 'insider's perspective', though my academic supervisors have been helpful in encouraging me to consider these experiences from different points of view during the analysis. Finally, a feature important to mention is my comparative lack of experience as a qualitative researcher: though this has been compensated for to a greater extent through the advice of my academic supervisors and those I consulted for advice, conducting interviews was a learning experience for me and so this may have had an impact upon the way in which participants interpreted the interview situation and gave their answers. For example, although I believe that 'rapport' was established with the majority of participants, and so interviews were not unproductive in yielding data, I suspect that prior assumptions or expectations participants had about me (as a 'psychologist' or a 'student' or a 'researcher') and that I had about individual participants were sometimes a hindrance in effectively interpreting what participants were saying; this is an obstacle experienced researchers may have been more successful overcoming during interviews (see Potter & Hepburn, 2005).

## **Chapter 4: An initial test of the Habit Discontinuity Hypothesis:**

### **Values, Habits and Transport-mode Change of Students Changing their Accommodation**

#### **4.1. Abstract**

*The aim of this study was to assess whether university students who moved from one term-time accommodation to another would more often change their travel behaviour than university students who did not do so during the university term. Different factors (e.g. anticipation of changing travel mode, values as motives, travel goals, perceived stress) were assessed with respect to whether they were involved in, or could explain, such an association. University students (N = 173) completed a research questionnaire, and a similar questionnaire approximately 96 days later, during which time 49 university students had moved from one term-time accommodation to another and 21 students had changed their primary travel mode choice to or from walking to the university. There was some evidence that students who moved more often changed their primary travel mode than students who did not move, and that these*

*changes were anticipated prior to moving house. There was some evidence that, with these changes in travel behaviour, new mode choices become more automatic and 'old' modes less automatic. There was no clear evidence that human values, travel goals or perceived stress explained this association between moving house and changing travel behaviour. These findings are discussed with respect to the habit discontinuity hypothesis.*

## **4.2. Introduction**

### **4.2.1. General introduction**

The choice to be physically active in reaching destinations, rather than using public transport or driving, is important to the confluence of policy aims concerning sustainability and public health (Woodcock, et al. 2009). There is some evidence to suggest that attitudes to transport and the relative merits of different modes are acquired early in the life course perhaps by social learning (Lorenc, Brunton, Oliver, Oliver & Oakley, 2008; Haustein, Klöckner & Blöbaum, 2009; Klöckner & Matthies, 2012). For this reason and others, it has been argued that the university campus represents an opportunity for promoting the use of these physically active travel modes amongst young people (Bop, Brehens & Velecina, 2014; Balsas, 2003; Shannon, Giles-Corti, Pikora, Bulsara, Shilton & Bull, 2006; see also Puhe & Schippl, 2014). Two further reasons for this are that, being generally younger, university students represent an early life-course intervention that could lead to better later patterns of behaviour (Bop, Brehens & Velecina, 2014; Verplanken & Wood, 2006) and that university students, in comparison to other demographics, change their residence predictably, and, therefore, in as far as residential relocation weakens existing travel habits (Bamberg, 2006; Verplanken, Walker, Davis & Jurasek, 2008; Jones & Ogilvie, 2012; Chatterjee, Sherwin & Jain, 2013), university students might be amenable to reconsidering travel habits learnt in the family household. In some situations, the nature of university campuses also may provide an opportunity for policy implementation (Balsas, 2003; Shannon, et al. 2006).

While this population offers some useful possibilities for encouraging active travel, there are some reasons to doubt that it can take place on the basis of value-led motives. In an optimal situation for encouraging sustainable travel (the re-formulation of workplace commutes by employees of an pro-environmental charity in the UK), little evidence was found for pro-environmental motives being connected to observed travel-



mode choice changes, despite the employer taking an active role in promoting such changes (Walker, Thomas & Verplanken, 2014). Similarly, a survey of environmental attitudes between differential modal users at a campus university did not detect a difference in environmental attitudes between different modal users (Thomas & Walker, 2015). In an Australian context, Shannon and colleagues (2006), surveying staff and students of a university, found evidence of willingness to consider adopting active travel modes, so long as they were comparable or superior in time, monetary cost and convenience. Further, it may be that as younger people already favour active transport (Lorenc, Brunton, Oliver, Oliver & Oakley, 2008) so it is already widely used. Given these findings, (a) how far might other value motives go in determining travel-mode changes in the light of changing circumstances and (b) to what extent might practicalities be a limiting factor to the take-up of walking amongst university students?

One proposal for the mechanism of behaviour change with residential relocation is the Habit Discontinuity Hypothesis (HDH: Verplanken et al. 2008). This hypothesis predicts that when life events lead to the removal of aspects of the environment that trigger habitual action (*context-cues*), habitual action will not be triggered and action will become more intentional (less automatic) and, to the extent that such events also activate individuals' values (such as pro-environmental values), more in accord with an individual's own core motivations (see also Verplanken & Holland, 2002; Schwartz, 2010). The present study uses a test-retest questionnaire design to study a sample of university students over twelve weeks. Some of the participants ('movers') changed their term-time accommodation during the academic year (mid-term) and some ('non-movers') did not. The movers may be compared to the non-movers to evaluate the effectiveness of accommodation-change as a factor in whether or not university students made a change in their primary travel mode and whether or not their travel habits became less automatic.

#### **4.2.2. Research questions**

This section identifies a series of particular research questions that have been addressed with this study. These questions are informed by the review of the literature undertaken in the second chapter of this thesis (see section 2.11.1). With respect to habit, see section 2.10.3.

**4.2.2.1. Accommodation Change (Question 1):** *To what extent does travel behaviour (and travel habit) change with a mid-term accommodation change?* From the HDH, one can predict that students who change their accommodation (residentially relocate) will also, more often, change their travel behaviour. While habit change is anticipated to take place with behaviour change (see sections 2.10.3. and 4.2.2.6.), it is also useful to see whether habits, in general, seem to weaken or strengthen with accommodation change.

**4.2.2.2. Existing Values (Question 2).** *To what extent do (existing) values moderate travel behaviour change with a mid-term accommodation change?* The role of values as motivations for behaviour change (habit change) with habit discontinuity during life events has been discussed (section 2.10.2.1.). If habit discontinuity with accommodation change leads to value-activation, then the presence or absence of particular values could moderate the association(s) between accommodation change and travel behaviour change.

**4.2.2.3. Stress as (failed) self-control (Question 3).** The role of self-regulation failure in habitual action, and its connection to stress experienced during important life events, has been discussed previously (section 2.10.4). It is possible, from this discussion, that when students move house mid-term, they also become stressed and, in doing so, fall back upon the ease of existing transport habits, even in the absence of contextual cues. If this was the case, then one would expect only students who perceived themselves to be less stressed to show an association between moving house and changing their travel behaviour (habit). This question involves two implicit questions (3a and 3b).

**Question 3a:** *To what extent are mid-term residential relocations stressful and so change self-control?*

**Question 3b:** *To what extent is stress (as self control failure) a moderator of travel behaviour (or habit) change with a mid-term accommodation change?*

**4.2.2.4. Travel goals (Question 4):** *To what extent do travel goals (as concrete motives as opposed to more abstract values) moderate travel behaviour (or habit) change with a mid-term residential relocation?* The role of relative priority with

behaviour change during life events has been considered previously (section 2.10.4). It is possible, from this consideration, that though student travel habits may discontinue with a residential relocation, behaviour change is made (or not made) in line with the priorities of travel behaviours, namely travel goals. If this was the case, then one would expect an association between accommodation change and travel behaviour (or habit) change to be conditional upon the presence of absence of particular travel goals.

**4.2.2.5. Planned behaviour (Question 5): To what extent is travel behaviour (or habit) change with a mid-term residential relocation anticipated or planned?** The role of conscious planning in behaviour change with habit discontinuity during life events has been considered previously (section 2.10.1). On the basis of this consideration, one might expect that planned changes in travel behaviour would be relatively easier to implement during habit discontinuity with accommodation change, and so a pattern of mediation would be expected for residential relocation, prior planning and subsequent travel behaviour (habit) change.

**4.2.2.6. Habit strength change (Question 6): To what extent is travel behaviour change with a mid-term accommodation change associated with increasing habit strength for the new behaviour and decreasing habit strength for the old behaviour?** Changes in habit have been considered previously in sections 2.3.2 and 2.3.3, and the question of changes in habit with behaviour change is central to the practical warrant of the habit discontinuity hypothesis (see section 2.2.1). If changes in behaviour with residential relocation are also changes in habit (behavioural automaticity), then one would expect increases in the strength of habit for new behaviours and decreases in the strength of habit for old behaviours.<sup>27</sup>

## 4.3. Method

### 4.3.1 Design and participants.

#### 4.3.1.1. Recruitment

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<sup>27</sup> The change in travel habit for old and new behaviours differs from travel habit change in the five previous questions. Both are changes in the strength of primary travel mode use habits. However, in the five previous questions, this is the habit change *irrespective of mode* (see Walker et al. 2014: p. 7), whereas, in this question (question six), this is the habit change either of the mode the participants used (primarily) at the beginning of the study (time one) or of the mode the participants used (primarily) at the close of the study (time two). These are described more precisely in section 4.4.1.4.1.

Volunteers (an opportunity sample) were sought through advertisements: advertisements appeared (a) on the Cardiff University intranet 'notice board'; (b) in Facebook group discussions (selected *prima facie* to target university-students); (c) on posters at Cardiff University; (d) in direct E-mails to students at several schools within Cardiff University. Two groups of volunteers were recruited to participate in the study: a group *intending* to move during the study and a non-equivalent (Alison, 1990) group *not* intending to move during the study.<sup>28</sup> The second group was recruited after the first group; these groups were *not* recruited simultaneously. This was a practical decision taken in order to ensure, as far as possible, that the second group was matched to the first both by age and by whether or not they were graduates (hence undergraduate or postgraduate students): it was anticipated that participants would naturally differ in their travel behaviour with these two factors. Some volunteers were excluded before they could participate in the study (they were screened at recruitment). Criteria for exclusion were: (a) if they were about to begin their studies and this move was the move to halls-of-residence and becoming a university student; (b) if they were about to finish their final year of study and so moving would coincide with a transition from being a student to further education or entering the labour market. These criteria were selected on the logic that, in addition to residential relocation, these participants would also be experiencing a life transition that may introducing extraneous disruptions to travel behaviour and circumstances more generally (Thompson et al. 2011). A third exclusion criterion was implemented after the study was complete: (c) if participants indicated, in either questionnaire, that their primary transport mode was cycling. This exclusion was implemented in order to capture real contrasts between walkers and those using motorised travel modes (public-transport and driving). Such a real contrast cannot easily be anticipated by considering walking and cycling together as *physically active* modes, because the experiences and motives of walkers and cyclists would appear to be different (Thomas & Walker, 2015) and so such a grouping would be according to a normative property (whether it is physically active) rather than an underlying homogeneous group.

#### 4.3.1.2. Design

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<sup>28</sup> These groups are not the same groups that constitute the dependent variable, *residential relocation*.

The principal dependent variables in this study were change in *travel behaviour* and change in *travel habit strength*. More specifically: the former was whether or not a participant had changed their primary travel-mode choice *from* or *too* walking during the study (whether they *changed* or did *not* change modes); the latter is the arithmetic difference between the measure of habit-strength for active travel modes from the second questionnaire and the same measure from the first questionnaire. The basic study design was a correlational study assessing the associations between having experienced a *residential relocation* (being a 'mover' or a 'non-mover') and the dependent variables; as the dependent variables were difference scores (transformations) the temporal element was captured in the dependent variable, rather than implemented as a separate independent variable (Alison, 1990; Howell, 2013).

#### 4.3.1.3. Participants

Of 240 participants, 199 (82.9%) completed both questionnaires and so completed the study and 173 (72.1%) remained once cyclists were excluded. Of this sample, 85 (49.1%) had intended to move during the study - 49 (28.3%) did so.<sup>29</sup> Thus, 49 participants were 'movers' and 124 participants were 'non-movers'. Some demographic information was recorded. The majority of participants (110, 63.6%) were aged between 18 and 21. Of the remaining participants, 56 (32.4%) were aged between 22 and 30. Two participants were aged between 36 and 44. The majority of participants (130, 75.1%) were female. Relatively few students were graduates studying for post-graduate qualifications: 38 (22%); similarly, the majority reported having achieved pre-university qualifications (124, 71.2%), such as A levels, and the minority university qualifications (48, 27.8%), such as undergraduate degrees. Despite efforts to recruit more evenly across the country, 91 (52.6%) participants were studying at Cardiff university.

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<sup>29</sup> A lack of clarity in the wording of questions, recognised after the first questionnaires were completed, lead to some doubt as to how far those who had answered that they intended to move during the study had not, in fact, intended only to move temporarily, rather than residentially relocate. In response to this issue, additional questions around the nature of the move were included in the second questionnaire and these were used to systematically judge whether or not each participant had moved house, or only lived somewhere else temporarily (e.g. moved to the family home during the vacation, been on a work placement, had undertaken voluntary work etc.). This process is reported in section 4.4.1.1.1.

The first questionnaire recorded 123 (71.1%) of participants as primarily walking to the university; of the rest, 32 (18.5%) used public transport and 18 (10.4%) drove. Around half (89, 51.4%) reported using their primary mode three or more times each day; around a further third (61, 35.3%) reported using their primary mode once or twice daily. As well as to access the university, majorities of the sample reported using their primary mode for shopping and personal business (141, 81.5%), leisure (121, 69.9%), or visiting friends and family (110, 63.6%).

#### 4.3.1.4. Statistical Power

Just as a threshold for statistical significant ( $\alpha < .05$ ) is used to control for the possibility of false positives (type I errors), so thresholds for statistical power should be determined in order to control for the possibility of false negatives (type II errors): studies with low statistical power are, in the long-run, fruitless in their inability to detect real effects (Howell, 2013). Statistical power is a function of the threshold for statistical significance ( $\alpha$ ), the difference between population means for the groups compared, the sample size and the variance(s) in the population(s). These factors, with a set target for power, can be used to estimate, *a priori*, the sample size necessary in order to achieve a power target in one's study without unnecessary recruitment (Dienes, 2008).

In the present study, given differences between previous empirical studies and the present study (see section 2.7.) this estimate began with a rough approximation of the effect size statistic, rather than the more adequate use of expected difference between means and expected variance (Howell, 2013). Correlation coefficients are the effect size statistic for (Pearson) correlations and, similarly, the standardised beta ( $\beta$ ) coefficients of predictors in multiple regression may also be used as effect sizes for these predictors for power calculations.<sup>30</sup> In Verplanken et al. (2008) the standardised beta coefficient for the interaction (between environmental concern and residential relocation) in predicting car use is given as .17. Consulting Howell (2013), for a power of .80, effect size as a function of sample size must be (where  $\rho_1$  is the effect size and  $\delta$  is the expected size of change):

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<sup>30</sup> Not to be confused with  $\beta$  as the criterion set to minimise type two errors.

Solving this equation for  $N$  and substituting the value .17 for the effect size gives an estimated necessary sample size of 272. During recruitment, a safe target of 300 was set (150 of whom intended to move house), however recruitment fell short of this target (fewer students than expected were residentially relocating at this time) and, moreover, sample sizes between groups (movers and non-movers) proved unequal, which also reduces statistical power achieved. The sample size (173), can be used to 're-estimate' a new level of *a priori* power (without using observed power, which is contingent upon the outcomes of the study: see Lenth, 2001). Moreover, a heuristic adjustment for the unequal samples of non-movers to movers is to reduce the sample size according to the power-loss ratio (Rosnow, Rosenthal & Rubin, 2000). The latter loss in participants is equivalent to 19 participants. Thus, re-estimating power with 154 participants gives an estimated power of .56, which is less than ideal (Dienes, 2008; Reinhart, 2015). From this level of power, an effect-size that the study is sensitive to can also be calculated: this is .221 ( $d = .453$ ).

**4.3.2. Materials.** To take measurements at baseline, two questionnaires were used: a questionnaire for the test group and a questionnaire for the comparison group, which differed only in the phrasing of some questions so as to avoid indicating to comparison participants the purpose of the study. All participants completed the same follow-up questionnaire. All three questionnaires can be found in full in Appendix B.<sup>31</sup>

**4.3.2.1. Mid-term accommodation change.** Anticipated term-time accommodation change was assessed using a single 'true-or-false' statement. For movers: "*I am 18 years old or older. I am a university student. I do not, or did not, start or finish my university course in this calendar year. I anticipate changing my term-time accommodation within the next 6 weeks.*"; for non-movers: "*I am 18 years or older. I am a university student. I do not, or did not, start or finish my university course in this calendar year. I have not changed my term-time accommodation since*

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<sup>31</sup> On closer examination, a number of the questions asked in these questionnaires (such as those relating to aspects of students' accommodations) have proved to be flawed in their construction and, hence, unreliable. To avoid misleading the reader, no results have been reported on the basis of these questions. This materials section reports all measures used so as to give the reader a full impression of *why* the participants answered different questions (which the questions themselves do not provide), but readers who wish to begin their own work with these materials would be well advised to consider starting with those used in the study reported in chapter five, which are generally better, as well as other, often better, sources than this thesis.

*the previous semester. I do not anticipate changing my term-time accommodation within the next 3 months". At follow-up, a single 'yes-or-no' question assessed whether participants had moved or not over the 12 week period: "Have you changed your accommodation within the last 12 weeks (or since you completed the first questionnaire)?"*

Additional questions were used in the follow-up questionnaire to disambiguate whether or not participants changed their accommodation, or only did not reside there during the vacation period. First, participants were asked (open response): *On what date did you move into your current accommodation (DD/MM/YYYY)?* Participants were also asked to indicate the truth of several different statements with respect to themselves: (a) *I changed my term-time accommodation shortly before completing the first questionnaire (approximately 12 weeks ago);* (b) *For most of the vacation between the Spring and Autumn Semesters this year I wasn't in residence at my term-time accommodation but lived elsewhere;* (c) *I relocated to the UK shortly before completing the first questionnaire (approximately 12 weeks ago);* (d) *My non-term-time accommodation (e.g. family home) changed in the last 12 weeks;* (e) *During the past 12 weeks I have been looking to change my term-time accommodation but have not yet done so;* (f) *I had arranged to change my term-time accommodation but my arrangements didn't go according to plan and so I didn't change my accommodation since completing the first questionnaire approximately 12 weeks ago;* (g) *None of the above.* These statements identified possibilities that would satisfy the ambiguous questions in the baseline questionnaire, but may or may not satisfy the criteria of the study (e.g. a student who had anticipated "changing" their "term-time accommodation within the next 6 weeks" may have done so because they anticipated spending their vacation elsewhere). Participants were also asked, if they indicated moving as a life event in the life event question (see 4.3.2.4. below): *In the last question you answered that you'd moved house in the last 3 months. Please indicate which of the following statements best describes this move.* The possible statements were: *this was a change in my term-time accommodation; this was a change in my non-term-time accommodation (e.g. my family moved house); this was a move from my non-term-time accommodation (e.g. family home) to my term-time accommodation; this was a move from my time accommodation to my non-term-time accommodation (e.g. family home); I don't have*



*both term-time and non-term-time accommodation and changed my permanent accommodation by moving house; Another type of house-move not listed above [open response].*

**4.3.2.2. Travel-mode choice and travel information.** Travel-mode choice was assessed using the question: "*Which mode of travel do you use the most in your daily life while at university?*", with different travel modes as answers (e.g. walking, car). Further questions were asked concerning: frequency of travel using their selected mode (1) the purposes for which the mode was used (2); ownership of travel 'assets' (e.g. car, bicycle, travel-pass) (3); travel distances and times (assessed at follow-up) (4).

**4.3.2.3. Habits.** Habits were measured as 'habit strength' (automaticity) using a four-item Self-Report Behavioural Automaticity Index (SR-BAI: Gardner, Abraham, Lally & Bruijn, 2012b; cf. Verplanken & Orbell, 2003), one for each type of travel mode.

**4.3.2.4. Intentions, perceived behavioural control (PBC) and life events.** Intentions to change travel-mode were assessed by a question, the wording of which differed between groups: "*Do you plan to change your normal mode of transport when you change your accommodation?*" or "*Do you plan to change your normal mode of transport in the next 3 months?*", the answers to which were 'yes', 'no' or 'I haven't thought about it'. PBC (see Ajzen, 1991) was assessed with the question: "*At the moment, how easy would you find it to change your normal mode of transport for your everyday travel?*" with 4 answers [Very Easy, Quite Easy, Not Very Easy and Not at all Easy]. These questions were asked at baseline only. Life events were assessed by asking "*Please indicate which, if any, of the following events you have experienced within the last 3 months. (select all that apply)*" and providing 23 response options: 20 life events, such as 'I got married' and 'I changed my place of work', and 'Nothing has changed', 'I have experienced a life event but I'd prefer not to say what it is' and 'I have experienced a life event not listed above (please state)'.

**4.3.2.5. Human values.** Human Values were assessed using the Portrait Value Questionnaire (PVQ: Schwartz, Melech, Lehmann, Burgess, Harris & Owens, 2001). For the baseline a 21 item version of the PVQ was used (Schwartz, 2003; e.g. Schwartz, 2012). In response to doubts concerning reliability, a mixture of a 40-item PVQ and a

21-item PVQ (48 items in total) was used at follow-up permitting both PVQ-21 and PVQ-40 to be scored. The PVQ was introduced: "*Here we briefly describe some people. Please read each description and think about how much each person is or is not like you. Tick the box to the right that shows how much the person in the description is like you.*" Items in the PVQ were phrased to refer to a man or a woman (to match the gender of the participant) and include such items as: 'Thinking up new ideas and being creative is important to him. He likes to do things in his own original way.' and 'It is important to her to be in charge and tell others what to do. She wants people to do what she says'. PVQ items had 7 responses: 'Very like me', 'Like me', 'Somewhat like me', 'A little like me', 'Not like me', 'Not like me at all', 'don't know'. The full list of PVQ items may be found in Appendix B.

**4.3.2.6. Accommodation information.** All participants were asked 4 questions about their accommodation: (1) "*Which of the following descriptions best describes your current accommodation arrangements?*", with answers such as 'I live with my parent(s) in their home' or 'I live in a shared house or flat'; (2) "*Which of the following best describes the area where you live during term time?*", with answers such as 'in (or close to) the middle of a town or city' or 'in the middle of the countryside' (3) "*How many adults (16 years old or more) occupy your household in total (including yourself)?*"; (4) "*How many children (less than 16 years old) occupy your household in total?*".

**4.3.2.7. Travel goals.** Travel Goals were assessed using a collection of 45 travel goals (Whitmarsh, Skippon & Xenias, 2013). These were introduced with the instruction: "Please indicate how much you agree that each of the following matters to you when travelling by your most frequently used travel mode during the university term". Examples of items include: 'Avoiding traffic jam delays', 'Showing my independence to others through the way I travel, the way I drive or the type of car I use' and 'Keeping my journey costs down'. Items were responded to on a 5-point scale with the labels 'Strongly agree', 'Agree', 'Neither Agree nor Disagree', 'Disagree' and 'Strongly Disagree'.

**4.3.2.8. Stress.** Perceived stress was measured using a 10-item version of the Perceived Stress Scale (Cohen, Karmarck & Mermelstein, 1983). The scale was

introduced: "The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable description." Examples of items include: 'In the last month, how often have you been upset because of something that happened unexpectedly?' and 'In the last month, how often have you felt confident about your ability to handle your personal problems?'. There were 5 response options [Very often, Fairly often, Sometimes, Almost Never and Never].

**4.3.2.9. Demographic information and additional information.** Some further demographic information was asked for at baseline only.<sup>32</sup> Participants were asked: their age bracket, gender, graduate status [undergraduate, postgraduate], length of course in years, year of study and highest educational qualification.

**4.3.3. Procedure.** Questionnaires were completed online through the World Wide Web using the Qualtrics website and software. The first questionnaire began with a briefing before proceeding to an electronic consent form and then the questionnaire itself. Participants who intended to move house completed the first questionnaire upon recruitment between the 27th of August 2014 and the 29th of October 2014; participants who did not intend to move house completed the first questionnaire after the 6th of October to permit matching for age and education. Contact-details were requested and stored confidentially to re-contact participants. A hyperlink to the follow-up questionnaire was E-mailed. Participants were re-contacted, approximately 12 weeks after they completed the first questionnaire, by E-mail (subsequently by telephone and letter if unresponsive). In practice, participants completed the follow-up questionnaire within a few weeks of being contacted, thus participants completed the first questionnaire between the 24th of November and the 10th of February (on average 96 days after the first questionnaire), with participants who did not intend to move house completing the follow-up questionnaire after the 4th of January. On completion of the

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<sup>32</sup> Gender was asked at both baseline and follow-up to ensure that participants completed a correctly-gendered version of the PVQ.

follow-up questionnaire, participants were thanked for their participation, debriefed and entered into a cash prize-draw as remuneration. Introductory, consent and debrief materials may be found in Appendix B.

#### **4.4. Results**

First (section 4.4.1), important descriptive statistics, analytic decisions, preparations of data and tests of statistical assumptions will be reported. Descriptive statistics are calculated from the full sample of 199 participants. Second (section 4.4.2), research questions will be addressed statistically, using the sample of participants without cyclists (173 participants).

##### **4.4.1. Descriptive statistics and data preparation**

###### ***4.4.1.1. Accommodation and Distance/time to Access University.***

*4.4.1.1.1. Analytic Decisions.* In the design of this analysis, it was anticipated that some participants would need to be re-assigned to different 'mover' and 'non-mover' groups to the extent that their intentions to move (not move) did not come to pass. In the event, the materials used to recruit those who intended to move and not-move were open to interpretation and, once this was realised, it became important to differentiate movers and non-movers more carefully using the second questionnaire, to which additional questions were added. Answers to questions in both questionnaires were then used to estimate whether each participant had or had not moved house during the study. While not ideal, this approach was considered preferable in the circumstances, and applicable to the extent that many of the participants' answers did not give any reasons to doubt that they had (or had not) moved during the study.

This re-grouping process began with the two groups of participants sampled, who did (and did not) intend to change their term-time accommodation in the near future. The additional questions in (see section 4.3.2.1) were used as the basis for re-grouping. In many cases, answers to these additional questions agreed with the answer to the planned follow-up question and with their previous intention to move. Where there was not agreement, all questions were examined for consistency. If answers were consistent with the participant changing term-time accommodation as it was originally conceived, or consistent with the participant not having done so, then the participant

was re-grouped accordingly. If, as occurred in a small number of cases, answering was inconsistent (some answers indicating a move and some not), then a weight-of-evidence heuristic was employed whereby answers supporting one or the other possibility were tallied and the largest tally (the most answers) indicated the event that was deemed to have transpired. In most cases, only one answer was inconsistent with the weight of evidence, but one case showed almost an equal weight of evidence on both sides, and so was excluded from the final sample.

Starting with the groups of participants who did (and did not), at baseline, intend to change their term-time accommodation in the near future, this process identified 50 (52.0%) 'false' movers (for instance, participants who intended to move and then did not or participants who *temporarily* moved to the family home for the vacation, rather than moved from one term-time accommodation to another) and 4 (3.9%) 'false' non-movers (who went on to move despite having not intended to do so at baseline). With re-categorisation, a mover group of 50 individuals and a non-mover group of 149 individuals were formed.

Self-reports of distances to travel and time taken when travelling to the university contained a number of missing values and inconsistent answering patterns: participants were omitted from analyses on this basis, 28 (14.1%) at baseline and 27 (13.6%) at follow-up. The data for the remaining participants were converted to common units - miles and minutes, respectively. In retrospect, questions used to assess participant accommodation type and approximate accommodation location were phrased ambiguously and, thus, descriptive statistics for these are reported separately in Appendix C.

*4.4.1.1.2. Descriptive Statistics.* Fifty-five participants (27.7%) experienced a change in *household composition* (changes in the number of people - adults or children - in the household<sup>33</sup>); household composition change is described in Table 3. Despite individual changes, there is little overall manifest change. Comparing adults and children in households, at both baseline and follow-up the majority of households (177, 88.9%) did not contain children under 16 years of age.

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<sup>33</sup> It is important to note that this variable records changes in the *numbers* of adults and/or children in the household. This is different from changes in the individuals in the household, which is assessed in the study reported in chapter 5.

**Table 3: Number of People in Participants' Households: Baseline and Follow-up**

|          | Follow-up |    |    |    |    |    |    |   |    |    | Total |
|----------|-----------|----|----|----|----|----|----|---|----|----|-------|
|          | 1         | 2  | 3  | 4  | 5  | 6  | 7  | 8 | 9  | 10 |       |
| 1        | 10        | 1  |    | 1  | 2  | 1  | 2  |   |    |    | 17    |
| 2        | 1         | 24 | 3  |    |    | 1  |    |   | 1  |    | 30    |
| 3        |           | 1  | 21 | 4  | 2  |    | 2  |   |    |    | 30    |
| 4        |           |    | 2  | 27 | 3  | 2  | 2  |   |    |    | 36    |
| Baseline | 5         |    | 2  | 2  | 22 | 1  | 1  |   | 1  |    | 29    |
| 6        |           |    |    | 1  | 4  | 12 | 1  |   |    | 1  | 19    |
| 7        |           |    |    | 1  | 1  |    | 13 | 1 |    |    | 16    |
| 8        |           | 1  |    |    | 2  |    | 1  | 6 |    |    | 10    |
| 9        | 1         |    | 1  |    | 1  |    |    |   | 8  |    | 11    |
| Total    | 12        | 27 | 29 | 36 | 37 | 17 | 22 | 7 | 10 | 1  | 198   |

While around 60% of participants lived within 3 miles of their university campus (BL: 122, 61.3%; FU: 124, 62.3%), the maximum distance was 60 miles,  $M (SD)_{BL} = 3.98 (8.12)$ ,  $Mdn (IQR)_{BL} = 1.50 (2.00)$ ,  $M (SD)_{FU} = 3.83 (8.13)$ ,  $Mdn (IQR)_{FU} = 1.00 (2.38)$ , indicating a negative skew. Times showed a similar pattern. Distances and times to the university campus are associated as baseline,  $r_{rho}(171) = .678, p < .001$  and follow-up,  $r_{rho}(172) = .697, p < .001$ ; changes in distance and time are associated,  $r_{rho}(171) = .607, p < .001$ . Participants who changed their term-time accommodation showed small reductions in the distances,  $M (SD)_{Difference} = -.15 (1.63 \text{ miles})$ ,  $Z(170) = -5.84, p < .0001$ , and times,  $M (SD)_{Difference} = -.89 \text{ minutes} (8.59)$ ,  $Z(170) = -3.70, p = .00022$ , to reach campus, a pattern that was not reversed when using partial-correlation to take into account changes in transport-mode choice.<sup>34</sup> Just over half (28, 60.9%) of the 46 participants who both *intended* to change their accommodation and subsequently did so reported that being closer to their place of work/education would be a reason for accommodation change. The relationship between intending to reduce travel distance/time and subsequently doing so was confirmed for *time*,  $Mdn_{difference} = -7.5$  minutes;  $Z = -2.05, p = .042$ , but not *distance*.

#### 4.4.1.2. Transportation, transport 'assets' and transport-change intentions.

4.4.1.2.1. *Analytic Decisions*. Fewer participants than anticipated changed their primary travel-mode choice: 34 participants (17.1%) changed their travel-mode, of

<sup>34</sup> It should be kept in mind that distance and time data were both collected only at follow-up and, therefore, are cross-sectional.

whom 23 (11.6%) change from one travel-mode *type* to another (e.g. from either walking or cycling (physically active travel) to either using a car or public transport - see section 4.3.1). Eleven of these participants changed *from* active transport to public transport (9) or to driving (2); eleven changed *to* active transport from public transport (10) or driving (1). This did not offer sufficient variation to investigate changes to and from *particular* travel-mode types - instead, as only 1 of the 23 participants did not either change *from* or *to* a form of active transport (walking or cycling), travel-mode choice change from *or* to active transport was calculated as a binary variable (change or no-change). Exclusion of cyclists renders this typology *from* or *too* walking.

4.4.1.2.2. *Descriptive Statistics.* Table 4 presents frequencies of primary transport choices over time; there are no changes on average between the number of participants using each type of transport mode. At both baseline and follow-up a majority of participants (74.9%, 149) use active transport primarily; of the rest, just under twice as many participants use public transport (32, 16.1%) as drive (18, 9.0%).

**Table 4: Primary Transport-Modes at Baseline and Follow-up**

|          |       | Follow-up |       |       |       |           |     | Total |     |   |
|----------|-------|-----------|-------|-------|-------|-----------|-----|-------|-----|---|
|          |       | Walk      | Cycle | Drive | Train |           |     |       |     |   |
|          |       |           |       |       | Local | Intercity | UGR | Bus   |     |   |
| Baseline | Walk  | 113       | 3     | 1     | 2     |           |     | 7     | 126 |   |
|          | Cycle | 5         | 17    | 1     |       |           |     |       | 23  |   |
|          | Drive | 1         |       | 16    | 1     |           |     |       | 18  |   |
|          | Train | Local     |       |       |       | 2         |     |       |     | 2 |
|          |       | Intercity |       |       |       | 1         | 1   |       |     | 2 |
|          |       | UGR       | 1     |       |       |           | 1   | 3     | 1   | 6 |
|          | Bus   | 9         |       |       |       |           |     | 13    | 22  |   |
| Total    |       | 129       | 20    | 18    | 6     | 2         | 3   | 21    | 199 |   |

Note: UGR = Underground Railway

Table 5 presents frequencies for the frequency of use of primary transport modes over time. 'Primary mode' implies frequency of use, and so between 99 (49.7% at baseline) and 81 (40.7% at follow-up) participants used their primary mode more than three times daily. The overall change in frequency of use was simple: 18 participants (9.0%) no longer used their primary mode more than three times daily; at the individual level, 28 participants (14.1%) increased the frequency of travel and 46 (23.1%) reduced the frequency of travel.

**Table 5: Primary Transport-Mode Frequency at Baseline and Follow-up**

|          |             | Follow-up |             |           |          | Total |
|----------|-------------|-----------|-------------|-----------|----------|-------|
|          |             | ≤3 weekly | 4- 6 weekly | 1-2 daily | ≥3 daily |       |
| Baseline | ≤3 weekly   | 2         | 1           |           |          | 3     |
|          | 4- 6 weekly | 2         | 11          | 9         |          | 22    |
|          | 1-2 daily   | 1         | 7           | 49        | 18       | 75    |
|          | ≥3 daily    |           | 6           | 30        | 63       | 99    |
| Total    | 4           | 25        | 88          | 81        | 199      |       |

Note: categories represent numbers of trips using mode on a daily or weekly basis.

Table 6 presents the change in use of primary transport mode for different purposes. A substantial number of participants cease to use their primary travel mode for shopping and leisure over the course of the study. Smaller changes are seen in other purposes: increases in commuting to and travelling for work, decreases in commuting to education, visiting family or friends and transporting children.

**Table 6: Primary Transport-Mode Purposes at Baseline and Follow-up**

|         |                                 | Frequency |     | Change     |
|---------|---------------------------------|-----------|-----|------------|
|         |                                 | BL        | FU  | (% sample) |
| Purpose | Commuting to place of education | 188       | 185 | -1.5       |
|         | Shopping or personal business   | 163       | 144 | -9.5       |
|         | Leisure                         | 140       | 119 | -10.6      |
|         | Visiting friends or family      | 124       | 119 | -2.5       |
|         | Commuting to work               | 58        | 67  | 4.5        |
|         | Travel for work                 | 24        | 30  | 3.0        |
|         | Dropping/collecting a child     | 7         | 0   | -3.5       |

Table 7 presents the change in transport 'assets' participants possessed; change was minimal. Around 60% of participants owned a discount card for public transport, around 35% owned a bicycle, around 25% owned a car, just under 10% had access to a car without ownership and about the same proportion owned a season-ticket for public transport.

**Table 7: Transport Assets at Baseline and Follow-up**

|             |                   | Frequency |     | Change     |
|-------------|-------------------|-----------|-----|------------|
|             |                   | BL        | FU  | (% sample) |
| Has or owns | Bicycle           | 75        | 68  | -3.5       |
|             | Car (owns)        | 50        | 48  | -1.0       |
|             | Car (only access) | 17        | 17  | 0          |
|             | PT Season Ticket  | 19        | 13  | -3.0       |
|             | PT Discount Card  | 122       | 128 | 3.0        |



Note: PT = Public transport

Of the 199 participants who completed the study, 23 (11.6%) intended to change their transport-mode during the study. Of these 23, 14 (60.9%) used active transport (primarily). Of these 23 participants, 11 (47.8%) subsequently changed the transport-mode they used. Of those who both intended to change and subsequently changed, 8 (34.8%) changed transport-mode *type*.

#### 4.4.1.3. Values

4.4.1.3.1. *Analytic Decisions*. The short (21-item) Portrait Value Questionnaire (see 4.3.2.5, above) is sufficient for the measurement of the four value-dimensions: *self-transcendence*, *self-enhancement*, *openness to change* and *conservation* (Davidov, Schmidt & Schwartz, 2008). Cronbach Alpha values were comparable to those obtained in previous research (Schwartz et al. 2001; Bardi et al. 2009; Bardi et al. 2014; i.e. greater than Alpha >.49) and are presented in Table 8.

**Table 8: Internal Reliability Statistics for Value Dimensions**

| Value              | Baseline (PVQ-21) | Follow-up (PVQ-21) |
|--------------------|-------------------|--------------------|
|                    | Alpha (items)     | Alpha (items)      |
| Conservation       | .670 (6)          | .703 (6)           |
| Self-Transcendence | .640 (5)          | .691 (5)           |
| Self-Enhancement   | .673 (4)          | .737 (4)           |
| Openness to Change | .591 (4)          | .660 (4)           |

4.4.1.3.2. *Descriptive Statistics*. Table 9 shows descriptive statistics for value dimension scales and changes in them between baseline and follow-up. Participants tended to show higher values, on average, for self-transcendence and lower values, on average, for conservation at baseline; other values were close to the centre of the scale.<sup>35</sup> Value changes were not great; no value change reached statistical significance and correlations between values across time are strong.

**Table 9: Descriptive Statistics for Revised Value Dimensions and Values changes**

| Value        | Mean Importance (SD) |             | Longitudinal Correlations |
|--------------|----------------------|-------------|---------------------------|
|              | BL                   | ΔValue      | R                         |
| Conservation | -.371 (.641)         | .025 (.476) | .704**                    |

<sup>35</sup> Value scores are centred on the mean of all value item scores and so permit comparison of means against zero.

|                    |              |              |        |
|--------------------|--------------|--------------|--------|
| Self Transcendence | .546 (.552)  | -.020 (.377) | .763** |
| Self Enhancement   | -.148 (.736) | -.048 (.505) | .752** |
| Openness to Change | .086 (.716)  | .026 (.515)  | .720** |

\*\* $p < .01$ ; \* $p < .05$ ; ° $p < .10$

#### 4.4.1.4. Transport habits.

4.4.1.4.1. *Analytic Decisions.* Habit scales were calculated by addition of the scores of the four habit-items that formed the SR-BAI scale (Gardner, Abraham, Lally & Bruijn, 2012b) to give a score between 4 and 20. Internal reliability statistics for these scales were consistently good: scales at baseline (active:  $\alpha = .954$ ; driving:  $\alpha = .979$ ; public:  $\alpha = .953$ ) and at follow-up (active:  $\alpha = .959$ ; driving:  $\alpha = .983$ ; public:  $\alpha = .965$ ). Descriptive statistics for these are reported in the next section. However, these were not the measures used to address the research questions.

Research question one concerned general changes in travel habit. As such, following Walker and colleagues (2014), the change in habit strength for primary travel mode type was calculated in the following way. First the habit score that corresponded to each participant's primary travel mode choice was recorded into two new variables, one for habits at the beginning of the study and one for habits at the end of the study. For instance, if a participant took public transport (primarily) at the beginning of the study, then their public transport habit was recorded into one variable; if a participant drove (primarily) at the end of the study, then their driving habit was recorded. From these two variables, the change score was calculated by subtracting one from the other.

Research question six concerned changes in the habit for travel modes that had been primary at particular times. These were calculated in the following way. First the set of two variables, described in the previous paragraph, was added to with two further variables, calculated in the same way, but this time taking the habit score corresponding to the primary travel mode given in the *opposite* questionnaire. For instance, if a participant's primary travel mode type at the *beginning* of the study was physically active travel (they primarily walked), then their walking habit at the *end* of the study was recorded; if they drove at the end, then their driving habit score at the beginning was recorded. Using these four variables, two change variables were calculated, the first as the difference between the habit scores corresponding to the mode used at the

beginning of the study and the second as the difference between the habit scores corresponding to the mode used at the end of the study.

*4.4.1.4.2. Descriptive Statistics.* Table 10 shows descriptive statistics for transport-mode type habit-strength for different primary transport-modes. On average, habit-strengths for primary transport-mode choices tend to be close to the scale maximum (20); other habit strengths are close to the scale mid-point (12), except for driving, which is close to the scale minimum (4). These differences between primary mode use in travel habit strengths are confirmed statistically (Kruskal-Wallis tests) for active-transport habit,  $\chi^2(2) = 57.909, p < .001$ , for driving choice habit,  $\chi^2(2) = 46.295, p < .001$ , and for public transport habit,  $\chi^2(2) = 55.120, p < .001$ . Distributions of habits for primary mode are negatively skewed.

**Table 10: Descriptive-Statistics for Travel Mode Choice Habit for different Primary Travel Mode Users**

|                    |         | <b>Habit Strength</b> |                 |                |                 |              |                 |                |
|--------------------|---------|-----------------------|-----------------|----------------|-----------------|--------------|-----------------|----------------|
|                    |         | Active                |                 |                | Driving         |              | Public          |                |
|                    |         | N                     | Mean<br>(SD)    | Mdn<br>(IQR)   | Mean<br>(SD)    | Mdn<br>(IQR) | Mean<br>(SD)    | Mdn<br>(IQR)   |
| <b>Primary TMC</b> | Driving | 17                    | 11.11<br>(6.10) | 12<br>(12)     | 17.18<br>(3.78) | 20<br>(6)    | 7.65<br>(4.64)  | 8<br>(4.5)     |
|                    | Active  | 147                   | 18.21<br>(3.10) | 20<br>(3)      | 6.93<br>(4.29)  | 4<br>(5)     | 8.36<br>(4.56)  | 8<br>(8)       |
|                    | Public  | 32                    | 12.94<br>(4.50) | 12.5<br>(7.75) | 6.84<br>(4.19)  | 4<br>(6.5)   | 16.78<br>(3.24) | 17.5<br>(4.75) |

#### *4.4.1.5. Perceived stress*

Perceived stress scores were calculated as the sum of the scores of the 10 stress items (some reversed), giving a score between a minimum of 10 and a maximum of 50. The scale was internally-reliable at baseline,  $\alpha = .793$ , and at follow-up,  $\alpha = .809$ . At baseline,  $M = 31.29, SD = 5.67$ , and at follow-up,  $M = 27.51, SD = 3.00$ , stress-scores demonstrated an approximate normal-distribution. The change in perceived stress between baseline and follow-up was statistically-significantly different from zero,  $t(197) = -8.52, p < .001, M_{\text{difference}} = -3.77, 95\% CI [-4.64, -2.90]$ , implying an overall fall in perceived stress between baseline and follow-up.

#### *4.4.1.6. Transport goals.*

4.4.1.6.1. *Analytic Decisions.* Examination of the answering patterns of goal items indicated that the mid-points and the strong negative answers were used interchangeably on many items, which introduces some ambiguity concerning the status of negative answers.<sup>36</sup> One item concerns the importance of 'masculinity' and another 'femininity' in travel: these items are considered separately and a third item (goal 46) was also calculated by gender (i.e. the 'masculinity' goal-score of males and 'femininity' goal-score of females).

4.4.1.6.2. *Descriptive Statistics.* Tables 11a and 11b present basic descriptive statistics for goal items in order of mean average importance. The average score for value items across all participants was 3.10 and the two tables represent this arbitrary division of more from less important goals. Few participants disagreed with the impotence of having good control of arrival time (16, 8.0%), keeping costs down (26, 13.1%) and getting to destinations quickly (33, 16.6%), therefore these were important travel goals for most participants. However, this general consensus leads to invariance in these variables that preclude useful statistical relationships with other variables: on this basis, these goals are not used for inferential statistics, though it is important to acknowledged this descriptive evidence of their importance as travel-goals.

**Table 11a: Descriptive Statistics for More Important Travel Goals**

| Goal | Item  | M (SD)      | Mdn (IQR) |
|------|---|-------------|-----------|
| 21   | Having good control of my arrival time.           | 4.34 (0.77) | 4 (1)     |
| 23   | Keeping my journey costs down.                    | 4.29 (0.85) | 4 (1)     |
| 20   | Getting to my destination as quickly as possible. | 4.09 (0.88) | 4 (1)     |
| 3    | Avoiding being harmed myself through an accident. | 3.87 (1.15) | 4 (2)     |
| 16   | Being comfortable.                                | 3.83 (1.00) | 4 (2)     |
| 2    | Avoiding being exposed to the weather.            | 3.81 (1.12) | 4 (2)     |
| 39   | Using time to think about other things.           | 3.80 (1.09) | 4 (2)     |
| 15   | Avoiding waiting.                                 | 3.75 (1.11) | 4 (2)     |
| 27   | Relaxing by listening to own music.               | 3.67 (1.24) | 4 (2)     |
| 42   | Keeping myself physically fit.                    | 3.67 (1.10) | 4 (1)     |
| 8    | Avoiding having to depend on others.              | 3.66 (1.27) | 4 (2)     |
| 4    | Avoiding causing harm to others.                  | 3.65 (1.27) | 4 (2)     |
| 10   | Avoiding journey hassle/stress.                   | 3.64 (1.13) | 4 (1)     |
| 17   | Carrying luggage/shopping etc.                    | 3.55 (1.19) | 4 (1)     |
| 26   | Possessing and controlling my own personal space. | 3.51 (1.10) | 4 (1)     |

<sup>36</sup> Pre-test cognitive interviews in preparation for the study reported in the following chapter supported this interpretation - in answering questions, different interviewees described these answers as indicative of a non-applicable goal.

|    |   |             |       |
|----|---|-------------|-------|
| 14 | Avoiding traffic jam delays.                                | 3.45 (1.19) | 4 (1) |
| 22 | Helping protect the environment.                            | 3.42 (1.06) | 3 (1) |
| 1  | Avoiding aggression from drivers.                           | 3.40 (1.12) | 4 (1) |
| 13 | Avoiding risk of being attacked by other people.            | 3.38 (1.35) | 4 (2) |
| 5  | Avoiding damage to my own vehicle.                          | 3.26 (1.30) | 3 (1) |
| 25 | Observing other people while travelling.                    | 3.26 (1.15) | 3 (2) |
| 6  | Avoiding difficulties parking.                              | 3.21 (1.30) | 3 (1) |
| 24 | Making use of the vehicle I already have.                   | 3.16 (1.27) | 3 (1) |
| 18 | Controlling temperature of my immediate environment myself. | 3.14 (1.10) | 3 (2) |
| 19 | Enjoying being exposed to the weather.                      | 3.12 (1.20) | 3 (2) |

-----  
*All items range between scores of 1 and 5.*

**Table 11b: Descriptive Statistics for Less Important Travel Goals**

| Goal | Item  | M (SD)      | Mdn (IQR) |
|------|---|-------------|-----------|
| 7    | Avoiding dirt.  | 3.09 (1.18) | 3 (2)     |
| 11   | Avoiding other people / having time alone.                                      | 3.05 (1.22) | 3 (2)     |
| 12   | Avoiding penalties from driving violations.                                     | 3.04 (1.27) | 3 (2)     |
| 43   | Meeting and talking to other people.  | 3.03 (1.22) | 3 (2)     |
| 9    | Avoiding having to navigate.  | 3.01 (1.18) | 3 (2)     |
| 38   | Using time to communicate with others, e.g. by phone.                           | 2.99 (1.32) | 3 (2)     |
| 40   | Avoiding tedium while travelling by having an active task to perform.           | 2.95 (1.21) | 3 (2)     |
| 45   | Relaxing through inactivity or sleep.   | 2.65 (1.26) | 3 (2)     |
| 37   | Travelling in the same way that other people like me do.                        | 2.63 (1.17) | 3 (2)     |
| 36   | Travelling in a way that my partner, friends or family would approve of.        | 2.60 (1.19) | 3 (2)     |
| 44   | Reading for leisure while travelling.   | 2.59 (1.20) | 2 (2)     |
| 41   | Doing work while travelling.  | 2.38 (1.14) | 2 (1)     |
| 32   | Showing others that I care about the environment through the way I travel [...] | 2.34 (1.19) | 2 (2)     |
| 29   | Showing my independence to others through the way I travel [...]                | 2.26 (1.26) | 2 (2)     |
| 35   | Transporting other people as well as myself                                     | 2.26 (1.15) | 2 (2)     |
| 30   | Showing my maturity to others through the way I travel [...]                    | 2.22 (1.21) | 2 (2)     |
| 31   | Showing my personality to others through the way I travel [...]                 | 2.16 (1.15) | 2 (2)     |
| 46   | Showing others that I'm feminine/masculine through the way I travel [...]       | 1.91 (1.04) | 2 (2)     |
| 34   | Showing others that I'm masculine through the way I travel [...]                | 1.87 (1.04) | 1 (2)     |
| 28   | Showing my financial standing to others through the way I travel [...]          | 1.81 (1.06) | 1 (1)     |
| 33   | Showing others that I'm feminine through the way I travel [...]                 | 1.80 (1.01) | 1 (2)     |

-----  
*All items range between scores of 1 and 5.*

Following Whitmarsh and colleagues (2013), a Principal Components Analysis (PCA) was performed on the data to identify the possibility of underlying travel goal

dimensions. The available dataset is insufficient to support the number of goal-items in a single analysis (Field, 2009) and so: (a) items 20, 21 and 23, as they are highly skewed, are not analysed and (b) nor are items that score less, on average, than the overall average for items (i.e. items in Table 11b), because they are less important goals. So a PCA was conducted on 22 items with direct oblimin rotation (delta zero), which was chosen because of the very real possibility that separate scale factors would not be orthogonal. Early calculations showed two items (goals 19 and 22) to be problematic because of low communality: they were removed and the analysis repeated. In the final analysis, the KMO measure (.823) indicated an adequate sample; individual KMO values for items range between .588 and .901, which is acceptable. Bartlett's test of sphericity showed sufficient relation between items for PCA,  $\chi^2(171) = 1448.66; p < .0001$ . Communalities ranged between .545 and .792, with an average of .645, indicating that while items tended to be assigned some unique variance, sufficient variance was in common with components. Scree plot and Kaiser's criterion converge on a five-component solution, explaining 64.47% of the variance. Table 12 shows the rotated component loadings (pattern matrix).

**Table 12: Pattern Matrix Factor Loadings of Travel Goal items on Components**

| <i>Item (Scale)</i>                                | <i>1</i>     | <i>2</i>     | <i>3</i>     | <i>4</i>     | <i>5</i>      |
|--|--------------|--------------|--------------|--------------|---------------|
| "Avoiding causing harm to others"                  | .87          |              |              |              |               |
| "Avoiding being harmed myself through an accident" | .863         |              |              |              |               |
| "Avoiding damage to my own vehicle"                | .752         |              |              |              |               |
| "Avoiding risk of being attacked by other people"  | .711         |              |              |              |               |
| "Making use of the vehicle I already have"         | .653         |              |              |              |               |
| "Avoiding aggression from drivers"                 | .586         |              |              |              |               |
| "Carrying luggage/shopping etc."                   |              | .77          |              |              |               |
| "Avoiding being exposed to the weather"            |              | .767         |              |              |               |
| "Controlling temperature [...]"                    |              | .726         |              |              |               |
| "Being comfortable"                                |              | .513         |              | .367         |               |
| "Relaxing by listening to own music"               |              |              | .751         |              |               |
| "Observing other people while travelling"          |              |              | .746         |              |               |
| "Using time to think about other things"           |              |              | .678         |              |               |
| "Possessing and controlling my own personal space" |              |              | .664         |              |               |
| "Avoiding waiting"                                 |              |              |              | .887         |               |
| "Avoiding traffic jam delays"                      |              |              |              | .796         |               |
| "Avoiding journey hassle/stress"                   |              |              |              | .616         |               |
| "Keeping myself physically fit"                    |              |              |              |              | .76           |
| "Avoiding difficulties parking"                    | .378         |              |              |              | -.572         |
| <b>Eigenvalue</b>                                  | <b>5.420</b> | <b>2.515</b> | <b>1.605</b> | <b>1.371</b> | <b>1.338</b>  |
| <b>% of Variance</b>                               | <b>28.52</b> | <b>13.23</b> | <b>8.45</b>  | <b>7.22</b>  | <b>7.04</b>   |
| <b>Alpha</b>                                       | <b>.859</b>  | <b>.705</b>  | <b>.717</b>  | <b>.740</b>  | <b>-.149‡</b> |

† Rotated Factor Loadings using direct-oblimin (delta zero) rotation. Loadings below .362 are not shown (Field, 2009). ‡ This cell contains the Pearson's R, as only two items load on this component.

The same PCA was conducted on the scores participants gave in the follow-up questionnaire and (broadly) the same factor structures were obtained. Item scores correlated longitudinally (between questionnaires, correlation-coefficients ranging between .284 and .611). Repeated-measures comparisons of these goal-item scores showed two of the nineteen goals to differ over time: "Avoiding being exposed to the weather",  $M(SD)_{\text{difference}} = .212 (1.24)$ ,  $Z(198) = -2.383$ ,  $p = .017$ , and "Observing other people while travelling",  $M(SD)_{\text{difference}} = .172 (1.15)$ ,  $Z(198) = -2.20$ ,  $p = .028$ , indicating that, at the sample level, these goals became more important over time. These possibly represent goals related to season (the weather) and vacations ('people watching').

The first component largely corresponds to *safe driving*, perhaps reflecting the fact that many of the motorists in the sample will have passed their driving test relatively recently. The second component seems to capture *physical comfort* - when one considers the weight of grocery shopping, the 'carrying' item seems to make sense. The third component describes *pleasant transport*, corresponding well to the leisure aspects of comfort identified in the previous study. The fourth component describes *efficient travel* - avoiding hold-ups, delays and the stress they bring. The fifth and final item describes *physical exercise*, as it is largely represented by a contrast between keeping fit and not having to park one's car, though the two items aren't closely associated. When constructing scales to compare these to other variables, the lack of reliability of the last component over time had to be taken into account by using *only* the item 'keeping myself physically fit'.

#### **4.4.2. Addressing Research Questions**

All moderated multiple regression was done according to the guidance of Dawson (2014). All mediation analysis was done using the Baron and Kenny (1986) method.

A 'family' of tests describes a set of tests applied to the same data set to answer the same empirical question (Field, 2009, p. 786). Family Wise Error Rate (FWER) corrections are usually applied when multiple tests are addressed at answering the same empirical question. This is often because the multiple tests address different types of an

entity at which a question is directed. For instance, the question 'does herbal tea effectively treat the common cold' would be best tested using a range of different herbal infusions, as no one infusion can be representative of all 'herbal tea'; the same logic might be applied to this example in testing the efficacy of a single tea (e.g. nettle tea) in relieving the different symptoms of cold (e.g. running nose, cough, fever), or in testing combinations of infusion and symptom. In the present study, two research questions are corrected in this way. The first is corrected with respect to different human values (section 4.4.2.2.) and the latter with respect to different travel goals (section 4.4.2.7). They are Bonferroni corrected.

Regression to the mean is a statistical phenomenon whereby, over time, variables tend towards their average. Thus, for example, if the performance of high and low performing schools is compared over time, high performing schools are more likely to show decreasing performance and low performing schools increasing performance, importantly, not because of any underlying change in performance, but because high or low performers still tend towards the mean performance in the long-run (Reinhart, 2015). Thus, due to the design of the present study, in tests involving degrees of change in the dependent variable over time (i.e. habit scores in section 4.4.2.1.), regression to the mean must be allowed for by inclusion of the initial level of the dependent variable as a predictor of subsequent change (see Alison, 1990; e.g. Lanzini & Thøgersen, 2014).

**4.4.2.1. Question 1: To what extent does travel behaviour (and travel habit) change with a mid-term accommodation change?** Mid-term accommodation change was not independent of travel behaviour change,  $\chi^2(1) = 4.383, p < .05$ . The effect size was fairly small,  $W = \Phi(\varphi) = .159, d = .322$ . A similar number of movers and non-movers changed their travel behaviour to or from walking, but the proportion of movers doing so was greater, 20.4% or 10 of 49, than the proportion of non-movers doing so, 8.9% or 11 of 124, though this difference in proportion was not statistically significant,  $.115, CI\ 95\% [-.062, .294]$ . On this basis, there is some evidence that mid-term accommodation change and changing to or from walking as a primary transport mode are associated, but this evidence is marginal. Mid-term accommodation change was independent of change in travel habit strength: the two variables were not statistically significantly associated,  $B(SE) = .904 (.519), p > .05, CI\ 95\% [-.121, 1.929]$ . On this



basis, there is no clear evidence that mid-term accommodation change and changing travel habit strength are associated.

**4.4.2.2. Question 2: To what extent do (existing) values moderate travel behaviour change with a mid-term accommodation change?** This was assessed using four binary logistic regression models for travel behaviour and four multiple linear regression models for travel habit. A Bonferroni correction was applied to control for the familywise error rate. Each model predicted the dependent variable using three predictors: a value dimension (self-transcendence, self-enhancement, openness to change or conservation), whether or not the participant changed their accommodation mid-term, and the product of these two as an interaction variable.

- The model using self-transcendence was not statistically significant,  $\chi^2(3) = 4.232$ ,  $p > .0125$ , and the interaction was not statistically significant,  $B (SE) = .311 (.834)$ ,  $p > .05$ , OR = 1.364, 95% CI [.266, 6.996].
- The model using self-enhancement was not statistically significant,  $\chi^2(3) = 5.034$ ,  $p > .0125$ , and the interaction was not statistically significant,  $B (SE) = .287 (.651)$ ,  $p > .05$ , OR = 1.33, 95% CI [.372, 4.773].
- The model using openness to change was not statistically significant,  $\chi^2(3) = 4.989$ ,  $p > .0125$ , and the interaction was not statistically significant,  $B (SE) = .195 (.638)$ ,  $p > .05$ , OR = 1.216, 95% CI [.348, 4.248].
- The model using conservation was not statistically significant,  $\chi^2(3) = 5.860$ ,  $p > .0125$ , and the interaction was not statistically significant,  $B (SE) = -.762 (.734)$ ,  $p > .05$ , OR = .467, 95% CI [.111, 1.967].

None of the four models reached statistical significance with respect to the interaction and, therefore, there is no evidence that existing values moderate travel behaviour change with a mid-term accommodation change.

**4.4.2.3. Question 3a: To what extent are mid-term residential relocations stressful and so change self-control?** To answer this question, the change in perceived stress between baseline and follow-up was compared between participants who changed their term-time accommodation and participants who did not do so using an independent samples  $t$  test. There was no statistically significant difference in the extent

to which perceived stress changed between the two groups,  $M_{\text{difference}} = 1.131$ , 95% CI [- .948, 3.210],  $t(170) = 1.065$ ,  $p > .05$ . Therefore, there is no clear evidence that mid-term residential relocations lead to changes in perceived stress and, by inference, change self-control.

**4.4.2.4. Question 3b: To what extent is stress (as self control failure) a moderator of travel behaviour change with a mid-term accommodation change?** To answer this question, a binary logistic regression model was used to model change in travel behaviour from accommodation change, perceived stress at the end of the study and the interaction between the two. The model was not statistically significant,  $\chi^2(3) = 4.278$ ,  $p > .05$ , and the interaction was not statistically significant,  $B(SE) = -.209(.209)$ ,  $p > .05$ , OR = .812, 95% CI [.1539, 1.222]. Therefore, there is no clear evidence that stress (as an indicator of self-control failure) moderates an association between mid-term accommodation change and travel behaviour change.

**4.4.2.5. Travel goals (Question 4): To what extent do travel goals (as concrete motives as opposed to more abstract values) moderate travel behaviour change with a mid-term residential relocation?** This was assessed using five binary logistic regression models for travel behaviour. A Bonferroni correction was applied to control for the familywise error rate. Each model predicted the dependent variable using three predictors: a goal score (safe driving, physical comfort, pleasant transport, efficient travel or physical exercise), whether or not the participant changed their accommodation mid-term, and the product of these two as an interaction variable. None of the five behaviour change models reached statistical significance.

- The model using goal 1 (safe driving) was not statistically significant,  $\chi^2(3) = 4.437$ ,  $p > .01$ , and the interaction was not statistically significant,  $B(SE) = -.176(.507)$ ,  $p > .05$ , OR = .834, 95% CI [.310, 2.266].
- The model using goal 2 (physical comfort) was not statistically significant,  $\chi^2(3) = 4.089$ ,  $p > .01$ , and the interaction was not statistically significant,  $B(SE) = .093(.623)$ ,  $p > .05$ , OR = 1.097, 95% CI [.324, 3.721].
- The model using goal 3 (pleasant transport) was not statistically significant,  $\chi^2(3) = 6.236$ ,  $p > .01$ , though the interaction was statistically significant,  $B(SE) = -1.326(.633)$ ,  $p < .05$ , OR = .265, 95% CI [.077, .919].

- The model using goal 4 (efficient travel) was not statistically significant,  $\chi^2(3) = 4.851$ ,  $p > .01$ , and the interaction was not statistically significant,  $B (SE) = -.442 (.533)$ ,  $p > .05$ , OR = .643, 95% CI [.226, 1.826].
- The model using goal 5 (physical exercise) was not statistically significant,  $\chi^2(3) = 6.445$ ,  $p > .01$ , and the interaction was not statistically significant,  $B (SE) = -.426 (.405)$ ,  $p > .05$ , OR = .653, 95% CI [.296, 1.444].

Therefore, there is little evidence to suggest that travel goals moderate associations between residential relocation and travel behaviour change.

**4.4.2.6. Question 5: To what extent is travel behaviour change with a mid-term residential relocation anticipated or planned?** This question can be tested by assessing whether or not intention to change travel mode (at baseline) statistically mediates the association between changing accommodation and changing travel mode. The criteria for mediation are, briefly: (a) the independent and dependent variables are associated; (b) the independent variable and the mediator are associated; (c) the mediator and the dependent variable are associated when the independent variable is controlled statistically; (d) in demonstrating '(c)', there is no association between the independent and dependent variables when the mediator is controlled statistically.

Travel behaviour change was considered. Condition '(a)' was satisfied - accommodation change was associated with travel behaviour change,  $\phi (173) = .159$ ,  $p < .05$  (see also 4.4.3.1). Condition '(b)' was satisfied - accommodation change was associated with intention to change travel behaviour,  $\phi (166) = .244$ ,  $p < .01$ . A logistic regression model of travel behaviour change from both accommodation change and intention to change travel was used to assess conditions '(c)' and '(d)'. The model was statistically significant,  $\chi^2 (2) = 12.122$ ,  $p < .01$ , and is shown in Table 13, below.

**Table 13: Model of Travel Change with Intention to Change Travel and Residential Relocation**

|                      | B (SE)                 | 95% CI for Odds Ratio |            |        |
|----------------------|------------------------|-----------------------|------------|--------|
|                      |                        | Lower                 | Odds Ratio | Upper  |
| Constant             | -2.503 (0.341)         |                       |            |        |
| Intention            | <b>1.643 (0.557)**</b> | 1.735                 | 5.17       | 15.407 |
| Accommodation-Change | .633 (0.513)           | .690                  | 1.884      | 5.146  |

$R^2 = .07$  (Cox & Snell), .132 (Nagelkerke).Model; \*\* $p < .01$ ; \* $p < .05$ ; ° $p < .10$

Condition '(c)' was satisfied - intention was a statistically significant predictor in this model; condition '(d)' was satisfied - accommodation-change was not a statistically significant predictor. The criteria for mediation were satisfied. Therefore, there was some evidence that travel behaviour change with mid-term residential relocation was anticipated or planned.

**4.4.2.7. Question 6: To what extent is travel behaviour change with a mid-term accommodation change associated with increasing habit strength for the new behaviour and decreasing habit strength for the old behaviour)?** As has been reported (4.4.3.1), 10 of 49 movers changed their travel behaviour; these 49 movers are considered here with respect to *not* the change in the strength of habit for *active travel* but change in the strength of habit for the participant's *old travel mode type*, and *new travel mode type*, between baseline and follow-up (see 4.4.1.4.1). The correlation between change in strength for old travel mode habit and travel behaviour change was statistically significant and consistent with decreasing habit strength for the old behaviour,  $r_{pb}(48) = -.478, p < .001, 95\% \text{ CI } [-.708, -.209]$ . The correlation between change in strength for new travel mode habit and travel behaviour change was also statistically significant and consistent with increased habit strength for the new behaviour,  $r_{pb}(48) = .449, p < .01, 95\% \text{ CI } [.176, .686]$ . On this basis, there is evidence for a fairly close association between travel behaviour change and both an increase in strength for current travel behaviour habit and a decrease in strength for previous travel behaviour habit.

## **4.5. Discussion**

### **4.5.1. Discussion of findings.**

In this study university students were studied with respect to their changing travel behaviour, assessed as whether they began to, or ceased to, walk to the university, primarily, rather than use motorised transport. These changes in travel behaviour were studied with respect to whether students moved to different accommodation during the university term, on the hypothesis that this residential relocation would remove the context cues that trigger habitual travel mode choice, leading to less automatic, and potentially different, travel choices. The overall purpose of the study was to consider the role of different additional factors in the habit discontinuity effect (see section 2.10).

First (section 4.4.2.1), there was some evidence that students who moved house also tended to change their travel behaviour (to, or from, walking to the university). This was consistent with the HDH, but also with other possibilities. That a lack of similar evidence with respect to travel automaticity (that travel was not evidenced to be more or less automatic with residential relocation) was not supportive of habit discontinuity being involved, though change in automaticity and change in habit are not necessarily always equivalent (see section 2.10.3). Second (section 4.4.2.2), there was no clear evidence that these changes in travel behaviour with residential relocation were moderated by existing values on the part of the students, indicating that the changes were not value-motivated (see section 2.10.2.1), though value activation has been proposed as being partly involved in the process of behaviour change with habit discontinuity during life events (Verplanken et al. 2008). It is possible that value-activation was not involved, and it is reasonable that value activation is not necessarily involved in motivating behaviour change with habit discontinuity (Wood et al. 2005). Also, it is worth considering the possibility that general values may not have been involved so much as specific values were (Maio, 2010). Third (sections 4.4.2.3 and 4.4.2.4), there was no evidence to suggest that perceptions of stress had changed during the study or that stress moderated changes in travel behaviour with residential relocation. These findings indicate, on balance, not so much that stress (as self regulation failure: see section 2.10.4) is unlikely to be involved in the habit discontinuity process, so much as mid-term residential relocation was not sufficiently stressful to bring about such effects. Measuring stress before and after the study period is also not ideal for assessing the role of stress when it is, perhaps, the stress at the very moment of change that is influential. Fourth (section 4.4.2.5), there was no clear evidence to suggest that travel goals moderated travel behaviour change with residential relocation, which fails to evidence either the idea that travel goals supplied concrete motivations for behavioural changes with habit discontinuity (section 2.10.2) or that travel goals represented conflicting priorities to those value motives that could have motivated change (section 2.10.4). One important consideration is that three travel goal items were consistently important to every participant (see section 4.4.1.6.2) and so the lack of variation in these could conceal an effect for these, as they would represent those goals most likely to either drive change or conflict with change if they were already being met. Fifth (section 4.4.2.6), there was some evidence to suggest that travel

behaviour change with residential relocation was often due to anticipation or planning to make a change (section 2.10.1). This evidences a path whereby students know they will change their accommodation and so anticipate changing their travel behaviour with the change in accommodation (this is in contrast to the idea that the experience of the residential relocation or the habit discontinuity itself would generate the intention to change travel behaviour). With this findings, there is reason to suspect that if habit discontinuity is involved it is involved in facilitating the implementation of plans formed prior to residential relocation. Finally (Section 4.4.2.7), there is evidence that when movers change their travel behaviour, they also show increasing automaticity for the new behaviour and less automaticity for the old behaviour, both indicative of changing habits. This is in line with expectations that habits will be learnt as behaviour is practiced (section 2.3.2) but is also hopeful with respect to old habits being forgotten (section 2.3.3). However, given that only automaticity is assessed, and then as a correlation between changes, rather than as a demonstration of the change in one occurring after the change in the other, there remain reasons to doubt. It would also be remiss not to mention that a similar limitation to that identified in prior work applies to this particular analysis, that only movers are considered and so comment cannot be made concerning how they may or may not differ from non-movers with respect to habit change (see Section 2.7.4).

Generally, the findings give the impression of the prospect of residential relocation mid-term leading a number of students to plan to change their travel behaviour with the move and then doing so, in the process behaving differently with respect to travel and thus acquiring new habits, or at least increasing fluency in these routines. A number of factors that one might have anticipated as being involved in a habit discontinuity effect did not seem to be important: value motives, travel goals and perceived stress. Thus, while the findings are consistent with a habit discontinuity leading to the facilitation of planned changes in travel behaviour with residential relocation, the findings are also consistent with changes in circumstances with residential relocation being anticipated and travel behaviour changes planned to meet these challenges or opportunities.

#### **4.5.2. Limitations and Implications**

This study had several important limitations. The first was the failure to meet recruitment targets coupled with different group sizes, which lead to a failure to realise expected levels of power and so to ensure sufficient certainty in making statistical inferences (evident from some fairly large confidence intervals). As it is, a number of inconclusive results may have been 'false negatives'. Repetition of the study with a view to addressing this deficiency is therefore important in ensuring greater confidence in these findings, particularly with respect to absence of anticipated findings. The second limitation is the group sampled. Students moving mid-term (students tend to 'house hunt' between terms) may not have lived in their current residence for a sufficient time to develop habits of travel and so there is some reason to believe that these students may have had a greater tendency toward more deliberate reconsideration of behaviour than might someone possessing strong habits. Such differences in habit were not manifest in initial habit scores, but the question remains to the extent that students can manifest automaticity in travel without it being context-specific. With respect to the application of this study to the efficacy of habit discontinuity in addressing university student travel behaviour, the evidence is mixed. On the one hand, there is no clear indication from this study as to what motivating factors could be involved, though there is some evidence to suggest, as with the study of Schäfer and colleagues (2012: considered in section 2.2.2), that interventions to change travel behaviour may be useful to the student in the lead-up to residential relocation. On the other hand, there is evidence that new travel behaviours are associated with increasing levels of automaticity and so perhaps new habits form.

## **Chapter 5: Active Travel-Mode Choice for University Students Changing their Term Time Accommodation Between Terms**

### **5.1 Abstract**

*This study sought to conceptually replicate and extend the findings of the study reported in Chapter 4. Therefore, the aim of this study was to assess whether university students who moved from one term-time accommodation to another would more often change their travel behaviour than university students who did not do so between university terms. Several different factors, both those assessed in the previous study (anticipation of changing travel mode, values as motives, travel goals, perceived stress) and*

*additional factors (change in walking distance, living with new people and Perceived Behavioural Control (PBC) of walking to the university) were assessed with respect to whether they were involved in, or could explain, an association between moving house and changing travel behaviour. University students (N = 226) completed a research questionnaire, and a similar questionnaire approximately 169 days later, during which time 141 university students had moved from one term-time accommodation to another. There was some evidence that students who moved more often chose to walk to university, and that these changes were anticipated prior to moving house. There was some evidence that, having moved house, participants who lived with new people also more often chose to walk to the university; estimated changes in walking distance did not seem to explain the same association. There was some evidence that, with these changes in travel behaviour, new mode choices become more automatic and 'old' modes less automatic. There was no clear evidence that human values, PBC, the importance of ongoing life events or pro-environmental identity explained this association between moving house and changing travel behaviour. These findings are discussed with respect to the habit discontinuity hypothesis.*

## **5.2 Introduction**

### **5.2.1. General Introduction**

The Habit Discontinuity Hypothesis (HDH) proposes that context changes (such as residential relocation) disrupt the contextual cues to habitual behaviour, resulting in a 'window of opportunity' during which behaviours can be reconsidered and perhaps changed (Verplanken et al. 2008). This may be a reconsideration based upon the individual's own motivations or it may be based upon these and the influence of interventions to actively change behaviour (Verplanken & Wood, 2006; Abraham & Michie, 2008). Travel-mode choice has been identified as a behaviour that is habitual (Gärling & Axhausen, 2003; Gardner, 2009; Thomas & Walker, 2015) and that has important consequences for the natural environment (Ribeiro et al. 2007; WHO, 2013) and human health (Delucchi, 2000; Woodcock et al. 2009). Therefore, it is useful to examine habit discontinuity effects as they apply to travel mode choice, particularly to consider the dichotomy between active travel (e.g. walking and cycling) and motorised travel modes.

A number of empirical studies have addressed the HDH (e.g. Wood, Tam & Witt, 2006; Verplanken et al. 2008; Walker, Thomas & Verplanken, 2014; Verplanken & Roy, 2016; Thomas et al. 2016) as well as theories that predict similar outcomes (e.g. Fuji, et al. 2001; Bamberg, 2006; Thøgersen, 2012). The purpose of this study is to



repeat the study reported in the previous chapter (chapter four) while addressing some of the limitations of that study, as well as to develop parallel approaches to the same research questions. In addition, some new questions, also arising from the previous review of the literature (chapter two) are addressed.

## **5.2.2. Research Questions.**

**5.2.2.1. *Accommodation Change (Question 1): To what extent do travel behaviour (habits) change during/following a residential relocation between university terms?*** As before (section 4.2.2.1.), from the HDH, one can predict that students who residentially relocate will also, more often, change their travel behaviour. It is also interesting to consider whether, in general, the automaticity of their behaviour strengthens or weakens with accommodation change.

**5.2.1.2. *Planned Change (Question 2): To what extent does prior intention to use active travel modes (as anticipation/planning) mediate change in travel behaviour during/following residential relocation between university terms?*** As before (section 4.2.2.5), one might expect that plans to use particular modes of travel (see section 2.10.1) would be relatively easier to implement during habit discontinuity with accommodation change, and so a pattern of mediation would be expected for residential relocation, prior planning and subsequent travel behaviour change.

**5.2.1.3. *Walking Distance (Question 3): To what extent is change in distance to the university with residential relocation between university terms associated with change in travel behaviour during/following residential relocation between university terms?*** There exists a tradition of investigation in transport and urban planning literatures of considering neighbourhoods in terms of their 'walkability' (Moudon, Lee, Cheadle, Garvin, Johnson, Schmid, Weather & Lin, 2006). Part of this tradition is to model travel behaviour through distances of participants' residences from 'attractor' land uses (e.g. shops and restaurants) and 'deterrent' land uses (e.g. office-blocks), amongst which the participant's own place of work is a prominent example of an 'attractor' (Saelens, Sallis & Frank, 2003). As well as general evidence for situational and psychological factors explaining travel mode choice together (Collins & Chambers, 2003; Næss, 2006), there exists some evidence to suggest that with residential

relocations, the concomitant changes in the neighbourhood *accessibility* (measured using density (e.g. houses per square mile), land use mix (e.g. residential, commercial, industrial) and street patterns) are associated with changes in distances individuals travel (Krizek, 2003), and it seems reasonable that part of these changes is the distance one must travel to the workplace. For full-time university students, the workplace is the university campus. This research raises the question of how far associations between residential relocation and travel mode change can be attributed to changes in the proximity of the destination (i.e. the university) with residential relocation. Distance changes will likely be related, in the conceptual framework previously considered (Thompson, et al. 2011: section 2.10) to the relative ease or difficulty of different behaviours: increasing walking distances will increase the difficulty of the behaviour through increasing costs of time and energy - an *actual* (not only a perceived) difficulty (2.10.2.2.). From an economic perspective, distance can be regarded as a proxy for time, and it is this that seems to be of importance to travellers when choosing a mode (Hupkes, 1982 see Section 3.4.1.1; see also Simons et al. 2014)).

**5.2.1.4. Household Changes (Question 4): To what extent is change in household Stability with residential relocation between university terms associated with change in travel behaviour during/following residential relocation between university terms?** In section 2.7.1, a study of habit discontinuity for residentially relocating students was discussed (Wood et al. 2006). This study identified changes in the social context of behaviours reading the newspapers (with or without others present; living with or without people who also read the newspapers) to be relevant to the continuance of these behaviours with residential relocation. Could the same apply to travel behaviour? If so, then one might expect that the association between residential relocation and travel behaviour change would be mediated by the extent to which a participant lived with new people or the same people one lived with before (household stability change). It is useful to consider some of the relevant articles in the empirical literature and what they convey about the context of student accommodation and changes in student accommodation.

Heath (2004), writing in *Current Sociology*, reported a study of the experience of peer-shared households ("households consisting of unrelated individuals living in self-contained houses and apartments" (p. 162), of which university student households

are a prime example), in contrast to the biographical contexts of these living arrangements, with their social and political implications (cf. Du Bois-Reymond, 1998; Rugg, Ford & Burrows, 2004). Heath (and colleagues) talked to a purposive sample of participants - mostly young professionals around the age of 25 who were currently living in peer-shared households - who discussed their present and past experiences of doing (and having done) so, and, importantly, the majority of whom had followed the 'student housing pathway'. Their study was guided by the simple research question: "why share?" (p. 166). While economic reasons were identified, high property prices and lack of affordable quality housing, the article focuses upon the social aspects. Those findings from Heath (2004) of significance to the present are these.<sup>37</sup> (a) Most peer-shared households form around loose friendship and/or work networks not initially suited to the 'proximity' of living together under the same roof. (b) This 'proximity' (can) lead to friendship, sociability and group identity: communal areas facilitate socialising; shared interests and opinions facilitate development of shared household-identity, sometimes through clear common values and practices (e.g. veganism, socialist politics/activism, ecological/green lifestyles, drinking or 'party' lifestyles). (c) Households of this sort formed rituals: shared social activities, shared meal occasions, celebrated special occasions together, and tended to share things in common. (d) An exception the proved the rule was the way in which new/replacement housemates were expected to conform to these rituals, particularly the balance established between communal and private activities.

Heath links this mismatching, '(d)', and the practice of landlords selecting tenants, with developing grievances around everyday matters (unequal division of labour, hygiene, noise) and higher turn-over of tenants. Hence, proximity and shared ritual were not *guaranteed* in the peer-shared household - they were a matter of circumstances, chance and expediency - but what appear to be relatively short-lived, contingent and transitional arrangements to the outsider were often described in terms of close friendships, shared experiences, and important periods in life. Heath's account of peer-shared accommodation, importantly, while covering many students and former

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<sup>37</sup> Findings from this study were presented in the article in the context of existing sociological theories/concepts of 'neo-tribalism' and 'quasi-communality' (amongst others), which I have not reported, as they do not seem to be directly relevant to a psychological consideration of the phenomenon, particularly when only university students, and not more established peer-shared households, are considered.

students, may have sampled only those individuals who, when undergraduate students, formed better communities, because that is how they now choose to live. There is some good (convergent) evidence to suggest that some of the basic process Heath identifies (bonding through sharing communal space, development of social identities with one's friendship network and one's shared household) *do* occur when students begin to study at university, when they move into university-owned accommodation (Easterbrook & Vignoles, 2012; 2015), which goes some way (though not all of the way) to suggest that this account of friendship and household identity could be a set of processes that *begin* at university and *continue* through university, rather than being the experience only of the individuals who do not seek alternatives to peer-shared households (those interviewed by Heath and colleagues).

These studies provide some *prima facie* evidence to anticipate that changes in who a student lives with will mark changes in the social context of the household and hence, perhaps, the removal of cues to habitual behaviour. The confounding factor of social identities, and the pressures these could create, is important to keep in mind, as well as the possibility that social context is not a salient source of cuing for travel behaviour.

#### **5.2.1.5. Motivations (Question 5): Are changes in travel behaviour with residential relocation value or identity led?**

**5.2.1.5.1. Values (Question 5a): To what extent do (existing) values moderate travel behaviour change during/following a mid-term residential relocation?** As before (section 4.2.2.2.). If habit discontinuity with accommodation change leads to value-activation (see section 2.10.2.1.), then the presence or absence of particular values could moderate the association(s) between accommodation change and travel behaviour change.

**5.2.1.5.2. Identity (Question 5b): To what extent does (existing) pro-environmental identity moderate travel behaviour change during/following a mid-term residential relocation?** The self activation hypothesis posits that a value must be central to the self concept for it to be acted upon once activated (Verplanken et al. 2008; see section 2.10.2.1). Therefore, if pro-environmental values motivated travel behaviour change with residential relocation (with habit discontinuity) then one would expect the

construct of *identity*, specifically pro-environmental identity, to demonstrate this association. The following paragraph briefly introduces the idea of *self identity*.

'Self identity' (as opposed to social identity, see Stets & Burke, 2000) is one's perception of one's own roles as an individual within society and, in this way, is salient to particular values with which the role is associated (Hitlin & Piliavin, 2004). For example, a person might self-identify as a 'green' consumer (Sparks & Shepherd, 1992), and so, when the situation is perceived to be relevant to this identity, or when the person's own self is brought into one's thinking about the decision (Utz, 2004; Verplanken, et al., 2009), one might respond in a manner consistent with this self-identity (e.g. recycling, saving energy). Similarly, self-identity has been identified as a useful additional predictor of behaviour in the TPB (Rise, Sheeran & Huckleberg, 2010; see section 2.6) and has been identified as an important means by which pro-environmental values are expressed through action (Whitmarsh & O'Neill, 2010; see also Van der Werff, Steg & Keizer, 2014; Steg, Bolderdijck, Keizer & Perlaviciute, 2014). Identity has been considered with respect to habits, and there is some evidence that they can be separate constructs (Gardner, Bruijn & Lally, 2012).

Returning to the question of whether or not identity is involved in travel behaviour, Whitmarsh and O'Neill (2010) considered self-identity as a 'green' consumer across a range of pro-environmental behaviours in a representative sample of the population ( $N=551$ ) and found that while this self-identity was associated with a number of different types of pro-environmental behaviour (e.g. eco shopping and eating, domestic energy conservation) it was not associated with sustainable transport behaviour or eco-driving (for 'eco-driving', see Sivak & Schoettle, 2012). Importantly, however, this may be because identity only becomes important with value activation as caused by a life event such as residential relocation (e.g. Verplanken et al. 2008; Thomas et al. 2016).

#### **5.2.1.6. Control (Question 6): Does a lack of control present barriers to making changes in travel behaviour with residential relocation?**

**5.2.1.6.1. Important Life Events (Question 6a): To what extent does life-event importance (as self-control or life event stress) moderate travel behaviour change during/following a mid-term residential relocation?** The question of whether self

regulation failure or the relative priority of different behaviours can limit habit discontinuity and preserve habitual behaviour has been considered previously in section 2.10.4. The results of the previous study with respect to this possibility were inconclusive: residential relocation was not evidenced to be any more or less stressful than remaining in the same residence and stress was not clearly a moderator of behaviour change with residential relocation (4.2.2.3); existing travel goals (as competing priorities) were not evidenced to moderate behaviour change with residential relocation (4.2.2.4). In this study, the importance of life events was assessed as a closer representation of the factor discussed by Thompson and colleagues (2011) in their framework of concepts, which also rests upon the observation that important life events are a close marker of life stress (Holmes & Rahe, 1967). If important life events have transpired, then one would anticipate a reliance upon prior habit to moderate tendencies for habit discontinuity to weaken the automaticity of behaviour; in these circumstances, behaviour change with residential relocation could also be limited.

**5.2.1.6.2. *Perceived Behavioural Control (Question 6b): To what extent does perceived behavioural control moderate travel behaviour change during/following a mid-term residential relocation?*** Alongside actual barriers and facilitators of behavioural change are one's perceptions of these, which are captured by the construct of perceived behavioural control (PBC: Ajzen, 1991; see section 2.5). While changes in distance may constitute changes in the ease or difficulty of walking with residential relocation (5.2.1.3. above; see also section 2.10.2.2.) distance change is only one important *actual* change, in contrast to an *overall* ease or difficulty, which may be best assessed from PBC. If PBC negatively moderates the association between residential relocation and travel behaviour change, then there is some evidence to suggest that a habit discontinuity effect may be limited by perceived difficulty.

**5.2.1.7. *Habit Change (Question 7): To what extent is travel behaviour change during/following a residential relocation between terms associated with increasing habit strength for the new behaviour and decreasing habit strength for the old behaviour?*** If changes in behaviour with residential relocation are also changes in habit (behavioural automaticity), then one would expect increases in the strength of habit for new behaviours and decreases in the strength of habit for old behaviours (see sections 2.3.2 and 2.3.3; for the practical implications, see section 2.2.1).

## 5.3. Method

### 5.3.1. Design and participants.

#### 5.3.1.1. Recruitment

Volunteers (an opportunity sample) were sought through advertisements: advertisements appeared (a) on the Cardiff University intranet 'notice board'; (b) in Facebook group discussions (selected *prima facia* to target university-students). Two groups of volunteers were recruited to participate in the study: a group *intending* to move during the study and a non-equivalent (Alison, 1990) group *not* intending to move during the study.<sup>38</sup> In contrast to the study reported in the previous chapter (see section 4.3.1.1.), the two groups were recruited simultaneously: the second group was not matched to the first, but quota sampling was used to ensure, as far as possible, that a similar proportion of postgraduate students was recruited to each group (on the assumption that the two groups would differ in their travel characteristics).<sup>39</sup> Some volunteers were excluded before they could participate in the study (they were screened at recruitment). Criteria for exclusion were: (a) if the quota to which a volunteered corresponded (e.g. an undergraduate intending to move) had been filled; (b) if they were not a university student; (c) if they were not living and studying in the UK; (d) if they anticipated completing their course over the duration of the study, e.g. if they were in their final year of study. Two further exclusion criteria were implemented after the study was complete: (e) if they were on a work-placement year during the study; (f) if they were undertaking distance-learning; (g) if they left their course of study; (h) if they primarily cycled to the university. This last criterion was implemented in order to capture real contrasts between walkers and those using motorised travel modes (public-transport and driving) - see section 4.3.1.1.

#### 5.3.1.2. Design

The principal dependent variables in this study were change in *travel behaviour* and change in *travel habit strength*. More specifically: the former was the change in the proportion of journeys to the university for which one primarily walked; the latter is the arithmetic difference between the measure of habit-strength for active travel modes

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<sup>38</sup> These groups are not the same groups that constitute the dependent variable, *residential relocation*.

<sup>39</sup> This assumption was generally consistent with the data from the previous study.

from the second questionnaire and the same measure from the first questionnaire. The basic study design was a correlational study assessing the associations between having experienced a *residential relocation* (being a 'mover' or a 'non-mover') and the dependent variables; as the dependent variables were difference scores (transformations) the temporal element was captured in the dependent variable, rather than implemented as a separate independent variable (Allison, 1990; Howell, 2013).

#### 4.3.1.3. Participants

Of 362 participants, 273 (75.4%) completed both questionnaires and so completed the study and 226 (62.4%) remained once all exclusion criteria were applied. Of this sample, 128 (56.6%) had intended to move during the study - 141 (62.4%) did so. Thus, 141 participants were 'movers' and 85 participants were 'non-movers'. Some demographic information was recorded. The majority of participants (149, 65.9%) were aged between 18 and 21. Of the remaining participants, 66 (29.2%) were aged between 22 and 30. Six participants were aged between 36 and 74. The majority of participants (168, 74.3%) were female. Relatively few students were graduates studying for post-graduate qualifications: 43 (19.9%); 161 (71.2%) were undergraduate students either moving from their first to their second year of study or from their second to their third year of study. Of the participants who were happy to indicate their annual income, almost all participants indicated an annual income of between £0 and £20,000 (189, 96.4%), with the modal income category at between £5001 and £10,000 (83, 36.7%). Despite efforts to recruit evenly across the country, 138 (61.1%) participants were studying at Cardiff university. The first questionnaire recorded 159 (70.4%) of participants as primarily walking to the university; of the rest, 43 (19.6%) used public transport and 16 (7.1%) drove; 8 (3.5%) used some combination of modes equally e.g. walking and taking the train.

#### 5.3.1.4. Statistical Power

In the present study, this estimate began with the effect size of the previous study as an approximation of the effect size anticipated in the present study (Howell, 2013):  $\phi = .159$  ( $d = .322$ ). Consulting Howell (2013), for a power of .80, effect size as a function of sample size must be (where  $\rho_1$  is the effect size and  $\delta$  is the expected size of change):



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Solving this equation for  $N$  and substituting the value .159 for the effect size gives an estimated necessary sample size of 311. During recruitment, a safe target of 350 was set (one half of whom intended to move house), and this target was met. However, the sample size after exclusions (226), can be used to 're-estimate' a new level of *a priori* power. Moreover, a heuristic adjustment for the unequal samples of non-movers to movers is to reduce the sample size according to the power-loss ratio (Rosnow, Rosenthal & Rubin, 2000). The latter loss in participants is equivalent to 6 participants. Thus, re-estimating power with 220 participants gives an estimated power of .65, which is below a standard level of .80 (Dienes, 2008; Reinhart, 2015), but is a slight improvement upon the power of the previous study (.56 - see section 4.3.1.4.). From this level of power, an effect-size that the study is sensitive to can also be calculated: this is .186 ( $d = .379$ ).

**5.3.2 Materials.** Participants completed two questionnaires. Questionnaires did not differ between test and comparison groups; different questions were asked in response to answers to previous questions. Full questionnaires can be found in Appendix D.

**5.3.2.1 Term-time accommodation change.** To assess intention to change accommodation, three separate questions were employed in the baseline questionnaire: (1) "*I anticipate moving into new term-time accommodation before the start of October this year*" (True/False); (2) a multiple-option questions with a series of descriptive statements such as "*I don't intend to move into new term-time accommodation before October this year*" and "*I have arranged new term-time accommodation (e.g. signed a contract), but I have yet to move into my new accommodation*"; (3) "[*Having moved into new term-time accommodation*] *Do you anticipate moving into new term-time accommodation before the start of October this year*"? (Yes, No, Unsure) - the stem in brackets was added for some answer combinations of (1) and (2). Participants who intended to move were asked, at baseline: "*for which of the following purposes are you changing your accommodation (tick all that apply)*" with a number of options such as "*so I can live nearer my place of work/education*" and "*so I can reduce the cost of my accommodation (e.g. Rent, utility bills)*".

At follow-up, participants were asked: "*When did you last move into new term-time accommodation?*" [*After September 1st, 2015*", "*August 2015*", "*June or July, 2015*", "*May, 2015*" and "*Before May 1st, 2015*"] this question determined both *when* participants changed term-time accommodation and *that* they had done so during the study; participants were also asked the following question if they indicated moving during or after May: "*It would be very useful to us if you could provide a precise date, or date range (e.g. 5th July-15th July) for when you last moved into new term-time accommodation*". To assess to what extent participants who moved only very recently had adjusted to their new accommodation, participants who indicated moving in September were asked: "*To what extent would you say you have "settled in", or gotten used to, living in your term-time accommodation?*" [*Not at all 'settled-in': I'm not used to it at all; Not settled-in, but I am beginning to get used to it; Unsure; Somewhat 'settled-in' it: I've gotten used to it; Very much 'settled-in': I've really gotten used to it*].

**5.3.2.2 Accommodation type and household composition.** At baseline and follow-up participants were asked *which of the following descriptions best describes your current term-time accommodation* and at baseline participants were asked *which of the following descriptions best describes your previous term-time accommodation*, both with the same answer-options such as "*I live with my parent(s) in their home*" and "*I live in a shared house or flat*", *I rent a house or flat by myself*, *I own my own home*, and *other (please state)*. At follow-up, participants were asked a number of questions about their household composition: to many of them they answered by indicating, using integer answer-options, how many adults or children they lived with, had lived with or had moved in or out of their accommodation. They were asked: (1) *how many adults and/or children do you share your term-time accommodation with*, and, if they answered 'yes' to the question *since you began living in your current term-time accommodation, have any of the people you share your accommodation with changed (i.e. has anyone moved in or moved out of the house/flat)*, then they were further asked *how many adults and/or children have moved in or moved out of your term-time accommodation since you moved in*. If participants indicated moving prior to May 1st, then they were also asked: *before you last moved into new term-time accommodation, how many adults and/or children did you share your term-time accommodation with?* If participants answered 'no' to the question *do you live with exactly the same people you*

*lived with before you changed your term-time accommodation then they were also asked how many people (adults and/or children) do you live with in your current term-time accommodation who you also lived with in your previous term-time accommodation?*

**5.3.2.3 Travel-mode choice, car Access and journey distance.** All questions in this section were asked both at baseline and at follow-up. Travel mode choice was assessed both for journeys to and from the university and for non-university journeys. Participants were asked: "*how many days in a typical week do you visit the university?*" [Never, 1 day, 2 days, 3 days, 4 days, 5 days, 6 or 7 days] and "*Indicate the number of days in a typical week where you use each of these modes of transport to get to and return from the university*". The latter question was answered using the same answer-options as the previous question, but for each of seven transport modes [e.g. *walk, car or motorcycle (as driver), bus*] and once for each of two columns titled "*To get to university from your term time accommodation*" and "*To return from university to your term-time accommodation*", respectively. An open-response question was also asked to assess whether participants used mixed modes. This explained the idea of mixed modes of travel, giving examples, before asking participants: "*If you combine modes of travel in a single trip, when travelling to or from the university during a typical week, than please describe how you do so*". Participants were also asked: "*please indicate the number of days in a typical week where you've used each of these modes of transport for purposes other than going to and from the university (e.g. shopping, leisure, commuting to paid work, visiting friends and family)*" with the seven transport modes and answer options between zero and seven days.

To assess car access and ownership, participants were asked: "*do you have a current driving license*" (yes, no, *I'm learning to drive at the moment*): if they did not answer 'no' they were asked: "*do you own a car or motorbike*" (yes, no, *I don't - but I have access to someone else's*); if they answered 'yes' they were also asked "*did you pass your test in the last 12 months*" (yes, no). If they owned a vehicle they were then asked "*do you keep your motor vehicle with you during term-time*" (yes, no); if they had access to someone else's vehicle they were asked "*do you have access to someone else's motor vehicle during term-time*" (yes, no).

Participants were asked - "*please provide the postcode of the term-time accommodation you are currently living in or have lived in most recently (not term-time accommodation you haven't moved into yet)*" - and, at follow-up - "*please provide the postcode of your term-time accommodation*". Participants were also asked, at baseline, "*at which UK university do you study*" and "*what is the name of your course e.g. 'Psychology and European History'*" (both open-answer questions); these were repeated at follow-up if the participant indicated that they'd changed during the study. Using the answers to these questions, distances were estimated.

**5.3.2.4 Habits.** For travel-mode types (physically-active, motorised and public) each habit was assessed using the 4-item Self-Report Behavioural Automaticity Index (SR-BAI: Gardner, Abraham, Lally & Bruijn, 2012b; cf. Verplanken & Orbell, 2003). Participants were asked: "*when I travel during the university term, travelling by [car or by motorcycle/ by walking or by bicycle/ by bus or by train] is something...*" [*...I do automatically, ...I do without having to consciously remember, ...I do without thinking, ...I start doing before I realize I'm doing it*] with answer options between *strongly agree* and *strongly disagree*.

**5.3.2.5 Intentions and perceived behavioural control (PBC).** Intentions were assessed using the question: "*during the next 6 months I will get to and from the university by...*" with three items [*...either walking or by cycling, ...by car, taxi or motorcycle, ...either bus or train*]. It was asked twice with different answer-options: first a scale between '1', *strongly agree*, and '7', *strongly disagree*, with '4', *neither agree nor disagree*, in the centre and second a scale between '1', *definitely will*, and '7', *definitely won't*, with '4', *unsure*, in the centre. PBC was assessed using the questions "*over the next 6 months how easy or difficult would it be for you to get to the university by...*" [answer-options from *extremely easy* (1) to *extremely difficult* (7) with *unsure* (4) in the centre], and "*over the next 6 months how possible or impossible would it be for you to get to the university by...*", [answer-options from *possible* (1) to *impossible* (7) with *unsure* (4) in the centre], each with the same three items [*...either walking or by cycling, ...by car, taxi or motorcycle, ...either bus or train*].

**5.3.2.6 Life events.** Participants were asked "*please indicate how far you have experienced important life changes in the following areas of your life at the moment*" at

baseline and " *please indicate how far you have experienced important life changes in the following areas of your life over the past 3 months...*" at follow-up. The questions had the same five items, which described areas of life, such as *in your living arrangements e.g. moving house or city, living with different people* and *in your personal relationships e.g. a new relationship, the death of someone close*. Answer options were between *no change* (1) and *a profound change* (7), with *an important change* (4) in the centre. For each item that a participant scored in the centre or higher, they were asked an open-response follow-up question, such as "*what was the nature of the change in your living arrangements? (Please write as little or as much as you like)*".

**5.3.2.7 Human values and environmental identity.** Human Values were assessed at baseline and follow-up using the 40-item Portrait Value Questionnaire (PVQ: Schwartz, Melech, Lehmann, Burgess, Harris & Owens, 2001). The PVQ was introduced: "*here we briefly describe some people. Please read each description and think about how much each person is or is not like you. Tick the box to the right that shows how much the person in the description is like you.*" Items in the PVQ were phrased to refer to a man or a woman (to match the gender of the participant) and include such items as: "*thinking up new ideas and being creative is important to him. He likes to do things in his own original way*" and "*It is important to her to be in charge and tell others what to do. She wants people to do what she says*". PVQ items had 7 responses ranging between *very like me* (1) and *not like me at all* (6), along with *don't know*. Environmental identity was assessed using a 4-item scale (Whitmarsh & O'Neill, 2010). The question was: *please indicate how far you agree or disagree with each of the following statements*. Items included *I think of myself as someone who is very concerned with environmental issues* and *I would be embarrassed to be seen as having an environmentally friendly lifestyle*. Answer options ranged between *strongly agree* (1) and *strongly disagree* (5).

**5.3.2.9 Demographic and academic information.** Participants indicated the truth-value of these statements: *I am a university student (true/false)*; (2) *I am studying part-time (true/false)*; (3) *I am a postgraduate student (true/false)*; (4) *I will be living (and studying) in the UK during the university term (true/false)*; (5) *I anticipate moving into new term-time accommodation before the start of October this year (true/false)*; (6) *I anticipate graduating later this year (true/false)*. Participants were also asked *please*

*indicate your gender (male, female); please indicate the age bracket you are in (18-21, 22-25, 26-30, 31-35, 36-44, 45-54, 55-64, 65-74, 75 or over, and prefer not to say); what year of study are you in at the moment? (first, second, third, fourth, fifth, sixth, and other (please state) - open answer response); which of these best describes your current year of study? (undergraduate taught, postgraduate taught, research, professional or work placement, other (please state) - open answer response). To assess income, participants were asked: "it would be useful if you could indicate your yearly (or weekly) income including any loans (such as student-loans), financial support, from family or friends, as well as salary/wages from paid employment" [(i) up to £5000 per year (or £96 per week), (ii) £5001 (£97 per week) to £10,000 (£192 per week), (iii) £10,001 (£193 per week) to £20,000 (£384 per week), (iv) £20,001 (£385 per week) to £30,000 (£577 per week), (v) more than £30,000 (£577 per week), (vi) I'd prefer not to say, (vii) I'm not sure, and (viii) other [please state] - an open-answer response]. Finally, the last question in each questionnaire was this open-response question: *if there is anything about your travel, accommodation or life in general that you'd like to add, or if you have any other comments then please feel free to write in the box below.**

**5.3.3 Procedure.** Questionnaires were completed online through the World Wide Web using the Qualtrics website and software. The first questionnaire began with a briefing, including electronic consent, before proceeding to an electronic consent form and then the questionnaire itself. Participants completed the first questionnaire between the 4th of May 2015 and 9th of June 2015 (the majority, 92.5%, in the month of May with 59.8% of participant completing first questionnaire before the 14th of May). Contact details were requested and stored confidentially in order to re-contact participants. A hyperlink to the follow-up questionnaire was E-mailed - participants were re-contacted on the 26th of October. Participants completed the follow-up questionnaire between the 26th of October 2015 and the 21st of November 2015 (70.9% in October): between 142 and 194 days after baseline (a mean of 169 days). On completion of the follow-up questionnaire, participants were thanked for their participation, debrief and remunerated with a £5.00 gift voucher. Introductory, consent and debrief materials may be found in Appendix D.

## **5.4 Results**

First (section 5.4.1), important descriptive statistics, analytic decisions, preparations of data and tests of statistical assumptions will be reported. Unless otherwise stated, descriptive statistics are calculated from the sample of 226 participants (where all exclusion criteria are applied). Second (section 5.4.2), research questions will be addressed statistically.

#### 5.4.1 Descriptive statistics and data preparation.

##### 5.4.1.1. Transportation

5.4.1.1.1. *Calculating Travel Behaviour Change.* In order to derive the dependent variable of change in travel behaviour from the data collected, several intermediate calculations were involved. (1) Travel modes were amalgamated by category (e.g. train and bus travel under 'public travel') - this gave the category (walking, public transport or driving) that described fore and aft journeys to the university daily. (2) Changes were made to take into account additional information about mixed travel modes given by participants in answer to the open-response part of the question. (3) Totals were divided by the number of days participants indicated attending the university each week, giving the proportion of use of categories of travel for daily fore-and-aft journeys to the university each week. (4) At this stage the sum of the three category values *could* exceed unity (i.e. 100%) if the participant had mixed travel modes within a single trip (e.g. driving to a train station and then catching a train). Therefore, proportions were transformed so that they would sum to unity (i.e. sum to a single unit or percentage) and, hence be comparable both within and across participants. (5) For *change* in travel-mode choice, the arithmetic (second less first questionnaire score) between the two proportions was calculated. Finally, (6) the change value for *walking* was used for inferential statistics, so *travel behaviour change* is the change in the proportion of university journeys walked each week by the participant.

5.4.1.1.2. *Descriptive statistics.* Table 25 presents descriptive statistics for transport-mode choice.

**Table 14: Statistics Descriptive of Travel-Mode Choice**

| TMC              | Baseline      |                 | Follow-up     |                 | Change        |
|------------------|---------------|-----------------|---------------|-----------------|---------------|
|                  | <i>M (SD)</i> | <i>Mdn(IQR)</i> | <i>M (SD)</i> | <i>Mdn(IQR)</i> | <i>M (SD)</i> |
| Active-Transport | .70 (.44)     | 1 (1)           | .65 (.45)     | 1 (1)           | -.04 (.30)    |

|                  |           |         |           |       |            |
|------------------|-----------|---------|-----------|-------|------------|
| Public-Transport | .20 (.37) | 0 (.16) | .19 (.56) | 0 (0) | .03 (.18)  |
| Driving          | .09 (.25) | 0 (0)   | .12 (.29) | 0 (0) | -.02 (.25) |

Note: Mdn - median; IQR - Interquartile range.

Changes in travel mode use were not statistically significant (three separate Wilcoxon signed rank tests did not yield  $p$  values less than the Bonferroni adjusted criterion of  $p < .017$ ). A majority of participants (162, 71.7%) were licensed motorists during the study. Of these, however, few had access to a car during term time, 46, 20.4%. During the study, 17 participants (7.5%) got access to a car and 8 (3.5%) lost car access: so 9 participants, net, acquired car access.

#### 5.4.1.2. Accommodation

5.4.1.2.1. *Calculating Distance Change.* Broadly, distances were straight-line distances between a participant's home (as indicated by their postal code) and a representative location at their university. The change in distance was the difference between this distance at time two from this distance at time one, and changed *only* with changes in the participant's accommodation and (very occasionally) with change in the participant's university destination (or both). Distances were calculated in the following way. (1) the two nodes (e.g. accommodation and university) were located and their longitudes and latitudes recorded, (2) the distances between the two points recorded were determined using the Haversine approximation (Chamberlain, 1996), which approximates the distance given the curvature of the Earth's surface.

Longitude and latitude were determined using two websites: Googlemaps<sup>40</sup> and GridReferenceFinder<sup>41</sup>. For term-time accommodation, postcodes centres were used as an approximation. For universities, a focal-building (such as a main-building or student's union) was selected, and a representative point marked from which longitude and latitude were taken; such a representative point was used for most students. Where the university had several campuses at some distance apart, student degree subject was used to determine to which campus they would generally travel (e.g. 'the campus where the school of engineering is based').

<sup>40</sup> <https://www.google.co.uk/maps>

<sup>41</sup> <http://www.gridreferencefinder.com/>



*5.4.1.2.2. Descriptive statistics.* The majority of participants who went on to change their term-time accommodation had also intended to do so at baseline (120, 88.2%). This is not surprising as 109 participants indicated, at baseline, having made arrangements (e.g. signed their tenancy agreements), rather than merely house-hunting. The majority of accommodation changes took place in September 2015 (89, 63.0%); almost all other participants moved in June, July and August (47, 32.6%). Participants who intended, and subsequently did, move, most often gave their reasons for moving as: living with new people (57, 47.5%), not being able to stay longer than one year in halls of residence (51, 42.5%) and so as to live in more pleasant accommodation (50, 41.7%). The reduce living costs (38, 31.7%), to be closer to place of work or the university (35, 29.2%), to avoid accommodation problems (25, 20.8%) and to live in a more pleasant neighbourhood (14, 11.7%) were comparatively infrequent reasons for moving.

The distances participants lived from their universities were typically within just over one kilometer, Median (Inter-Quartile Range) = 1.17 (2.19) - the pattern of scores was skewed, with higher frequencies of participants at closer distances to the university,  $M(SD) = 5.50 (15.16)$ . The *absolute change* in distance from the university indicates a change, on average, of around a kilometer for those who residentially relocated,  $M(SD) = .94 (2.07)$ . The *non-absolute* change in distance from the university was relatively small, on average,  $M(SD) = -.0327 (2.28)$ , indicating that moves towards and away from the university cancelled one-another out overall.

*5.4.1.3. Household stability.* *Household stability* is the proportion of the people in the household with which a student lived with previously. For instance, if there are five people in the household, and they had previously lived with three of them, then the household stability would be 60%. On average, the household stability of participants who moved house was relatively low,  $M(SD) = .36 (.38)$ , indicating that participants tended to move in with different people when they moved, though not invariably so.

*5.4.1.4. Values and environmental identity.* Table 29 shows Cronbach Alpha values and descriptive statistics for PVQ-40 value dimensions at baseline and follow-up.

**Table 15: Descriptive Statistics for Value Dimensions and Values changes**

| Value              | Mean Importance (SD) |            | Longitudinal Correlation<br>R | Alpha (items) |           |
|--------------------|----------------------|------------|-------------------------------|---------------|-----------|
|                    | Time 1               | ΔValue     |                               | BL            | FU        |
| Conservation       | -.30 (.49)           | -.01 (.35) | .748**                        | .770 (13)     | .801 (13) |
| Self Transcendence | .39 (.56)            | -.06 (.40) | .731**                        | .789 (10)     | .802 (10) |
| Self Enhancement   | -.33 (.85)           | .02 (.59)  | .754**                        | .852 (7)      | .836 (7)  |
| Openness to Change | .28 (.60)            | .05 (.43)  | .731**                        | .739 (7)      | .769 (7)  |

\*\* $p < .01$ ; \* $p < .05$ ; ° $p < .10$

Scales reliability was comparable to reliabilities obtained in previous research (Schwartz et al. 2001; Bardi et al. 2009; Bardi et al. 2014; i.e. Alpha >.49). Changes in values were not statistically significant (four separate one-sample t tests (null hypothesis of exactly no change) did not yield  $p$  values less than the Bonferroni adjusted criterion of  $p < .0125$ ). Environmental identity was internally reliable,  $\alpha_{BL} = .767$  (4 items),  $\alpha_{FU} = .633$  (4 items). On average environmental identity remained larger than the mid-point of the 5-point scale: at time one,  $M(SD)_{BL} = 3.80 (.73)$ , and time 2,  $M(SD)_{FU} = 3.75 (.65)$ . Although change in this score was not statistically significantly different from zero, some participants did change to a great extent,  $M(SD) = -.04 (.52)$  Range = 3.50.

**5.4.1.7. Habits.** Habit strength scales showed very high rates of internal reliability: for active transport,  $\alpha_{BL} = .977$  (4 items),  $\alpha_{FU} = .972$  (4 items), public transport,  $\alpha_{BL} = .978$  (4 items),  $\alpha_{FU} = .967$  (4 items), and driving,  $\alpha_{BL} = .984$  (4 items),  $\alpha_{FU} = .973$  (4 items). When the habit for primary travel-mode choice (to access the university) was calculated, it showed that primary travel-mode choices were strongly habitual at both time 1,  $M(SD) = 4.50 (.85)$ ,  $Mdn(IQR) = 5 (.75)$ , and time 2,  $M(SD) = 4.51 (.85)$ ,  $Mdn(IQR) = 5 (.75)$ . Identifying the habit change variable to use to answer particular research questions can be a subtle question (see discussion in section 2.10.3). Habit changes in the present study are identified in just the same way as in the previous study (see section 4.4.1.4.1. and also Walker et al. 2014). The only important difference in the calculations of these variables from those in the previous study was in using continuous, rather than categorical, measures to infer primary travel mode choice in order to determine which habit score corresponded to a participant's primary mode choice. In the present study primary travel mode choice was inferred from the proportional measure of travel mode behaviour by identifying the *most frequently* used mode type. For instance, if a participant walks 40% of trips to the university and uses

public transport for 60% of trips, then their primary travel mode choice is public transport and the habit score for public transport is taken. Thus, habit variables in this study do not compensate for using different modes on a weekly basis.

**5.4.1.8. Life event importance and descriptions.**<sup>42</sup>

5.4.1.8.1 *Baseline life events.* At baseline, there was a tendency, on average, for participants to have slightly more important events in their education/careers,  $M (SD) = 4.22 (2.23)$   $Mdn (IQR) = 4.00 (4.00)$ , and living arrangements,  $M (SD) = 4.42 (2.20)$ ,  $Mdn (IQR) = 4.00 (4.00)$ , than in their workplaces,  $M (SD) = 3.20 (2.10)$ ,  $Mdn (IQR) = 3.00 (4.00)$ , and other aspects of life,  $M (SD) = 3.34 (2.10)$   $Mdn (IQR) = 3.00 (4.00)$ ; relationship events were of intermediate importance,  $M (SD) = 4.05 (2.22)$   $Mdn (IQR) = 4.00 (4.00)$ . These differences was shown to be statistically significant using a Friedman test,  $\chi^2 (4) = 92.73, p < .0001$ . All life-event scores showed moderate positive correlation (using Spearman's Rho), with coefficients ranging between .253 and .559 (all  $p < .0001$ ), indicating that important life events tend to be associated across categories (prior to baseline).

A PCA was conducted on the five life event importances at baseline. The overall Kaiser-Meyer-Olkin (KMO) statistic was '.743', which shows an adequate sample for reliable components; individual KMOs were also adequate, being above '.7'. Bartlett's test of sphericity indicates adequate correlation between variables,  $\chi^2 (10) = 263.839, p < .001$ . Both Kaiser's criterion and scree plots indicated a single-component solution, and therefore rotation was unnecessary. This component explained 49.57% of the variance; communalities, which represent the degree to which each variable contributes shared-variance, were somewhat low (between '.418' and '.582', with an average of '.500'), suggesting that while the component is 'good', a fair amount of the variance for each variable is unique and so not represented by the component. Component loadings are presented in Table 32. The single component-score (*general life change*) was employed as a covariate in later analyses.

**Table 16: PCA Factor Loadings for Baseline Life Event Importance**

| <i>Item (Life change Importances)</i> | <i>General Life-Change†</i> |
|---------------------------------------|-----------------------------|
| Living Arrangements                   | 0.76                        |
| Career/Education                      | 0.74                        |
| Miscellaneous                         | 0.7                         |

<sup>42</sup> Statistics in this section are calculated on the basis of a sample that includes cyclists ( $n = 250$ ).

|                        |              |
|------------------------|--------------|
| Workplace              | 0.67         |
| Personal Relationships | 0.65         |
| <b>Eigenvalue</b>      | <b>2.479</b> |
| <b>% of Variance</b>   | <b>49.57</b> |
| <b>Alpha</b>           | <b>.744</b>  |

† Un-rotated Factor Loadings

5.4.1.8.2 *Life events during the study.* At follow-up, there was a tendency for participants to report important changes in their living arrangements - ( $M (SD) = 3.35 (2.16)$   $Mdn (IQR) = 3.00 (4.00)$ ) compared to other life-event categories, work -  $M (SD) = 2.58 (1.91)$   $Mdn (IQR) = 2.00 (3.00)$ , relationships -  $M (SD) = 2.88 (2.23)$   $Mdn (IQR) = 2.00 (4.00)$ , education -  $M (SD) = 2.48 (1.82)$   $Mdn (IQR) = 2.00 (3.00)$ , other -  $M (SD) = 2.36 (1.74)$   $Mdn (IQR) = 1.00 (3.00)$ . This can probably be ascribed to many in the sample changing term time accommodation: the two are associated,  $r_{pb}(250) = .562, p < .0001$ . Differences in importance between accommodation events and other events were statistically significant,  $\chi^2 (4) = 47.52, p < .0001$ . Scores for all life events were positively correlated, ranging from coefficients of .187 ( $p = .003$ ) to .441 ( $p < .0001$ ).

Along with importance-scores, participants were given the option of providing open-responses to categories that scored between the mid-point and the maximum of the scale (between 'important' and 'profound' anchors). In many cases they did so. This data was coded and analysed in the following way. In the sample, 190 (76.0%) participants provided some life-event information. After becoming familiar with this information (Braun & Clarke, 2006), the information provided by each participant across life-event categories was coded. The first form of coding was to identify descriptions of events that conformed to the list of life events used in the previous study (see 4.4.1.7.1): these were used as a coding frame (Flick, 2011). During this process, where the description *exceeded* the ability of the coding frame to provide adequate description, the case was flagged for secondary coding. These flagged cases (162) were then coded inductively (Braun & Clarke, 2006), with new codes identified. After both deductive and inductive coding, codes were amalgamated into broader overall categories that described a range of similarly coded life events. Thirty-three categories were identified. When the frequency of participants in each category was examined, 19 categories each represented experiences described by less than 10 individuals. So, where possible, these 19 smaller categories were merged with similarly-themed

categories. This left 22 broadly consistent categories of life event described by participants during the study, presented in Table 33.

**Table 17: Life Events During Study: frequencies, mean importance and examples.**

| Category   | F  | M <sup>‡</sup><br>(SD) | Example(s)  |
|--|----|------------------------|---|
| Moved House  | 86 | 1.37<br>(1.24)         | "New home [...]"; "Changed house[...]"  |
| Change in Household composition  | 58 | 1.09<br>(1.22)         | "One flatmate left, replaced by new flat mate"  |
| Work or Education becomes more difficult or challenging  | 42 | .92<br>(1.18)          | "I am completing my final year the work load has increased."  |
| Began a new job or Changed Job   | 32 | 1.11<br>(1.45)         | "I have started teaching in the medical school."  |
| Generally positive change in Lifestyle or Change in Values   | 26 | .94<br>(1.26)          | "I've made a very very important discovery about myself in terms of who I am[...] I now know what I want from life a lot more [...]"      |
| Changes in Accommodation Type (when accommodation changes)   | 25 | 1.28<br>(1.31)         | "Moved from university accommodation to shared accommodation"   |
| Someone important died, is chronically ill or is in serious trouble  | 20 | 1.5<br>(1.15)          | "Loss of a relative", "My dad passed away"  |
| Work-Placement, living abroad or returned to UK, recently  | 20 | 1.32<br>(1.11)         | "Was on a placement year working", "Going from an observation heavy year, to a practical experience year"                                 |
| Miscellaneous Workplace or Academic Event  | 19 | .84<br>(1.57)          | "Changed from subject I am personally interested in to subjects I feel I would perform the best in"; "Made redundant"                     |
| Ended a long-term Relationship   | 18 | 1.74<br>(1.24)         | "Break up of relationship", "A break up from my first serious relationship, of almost two years, which had a pretty rough effect on me"   |
| Miscellaneous relationship event (Including Long-Distance Romantic Relationships)                            | 18 | 1.56<br>(1.15)         | "Partner moved to another country", "Change in the relationship I have with my parents"   |
| Began a new Relationship   | 17 | 1.65<br>(1.17)         | "New relationship", "I started a new relationship several months ago but it has become a lot more serious (in a good way!)"               |
| Happy with new accommodation/housemates (when accommodation or housemates change)                            | 16 | 1.38<br>(1.15)         | "Moved in with bezzie mates", "We moved [...] into a much, much nicer shared flat"  |
| Significant Change in Work Hours   | 15 | .87<br>(1.19)          | "Job went from 12 hours a week to 60+ with no warning", "Have taken on more shifts at the bars"   |
| Moved in with, or moved geographically closer to, romantic partner (when accommodation or housemates change) | 14 | 1.28<br>(1.23)         | "The relationship with my partner has been strengthened [sic] by us having our own space and do as we please now we solely live together" |
| Better Relationships with friends/family/partner OR got married  | 11 | 1.36<br>(1.29)         | "Marriage", "Changed friend groups to a more relatable group of people"   |
| Unhappy with housemates/accommodation (when accommodation or housemates change)                              | 11 | 2.18<br>(.98)          | "My housemates have had arguments", "Moved [...] into a falling down house"   |
| First time living away from home, living in rental accommodation or having moved to                          | 11 | 1.73<br>(1.19)         | "Moving into privately rented accommodation for the very first time, the  |

|  |    |                |  |
|--|----|----------------|--|
| another town/city (when accommodation changes).  |    |                | <i>process in its entirety was new and thus somewhat overwhelming."</i>  |
| "Fell-out" with family/friends                   | 10 | 1.30<br>(1.49) | <i>"Falling out with long term partner", "A fall out between myself and a friend".</i>   |
| Suffering serious illness                        | 8  | 1.63<br>(1.30) | <i>"Diagnosed with a serious illness", "Personal Mental Health Issues".</i>  |
| All other Events, including those stated vaguely | 32 | .70<br>(1.10)  | <i>"[...] at home in Bridgend for summer [...]", "I now have pets - which is fantastic. I have wanted a pet for several years", "dealing with a new living arrangement", "university".</i> |

‡ Capable of ranging between 1 and 3.

The most important life events by category would seem to be (i) being unhappy with accommodation arrangements ( $n = 11$ ), (ii) ending a long-term relationship ( $n = 18$ ), (iii) first time living away from home ( $n = 11$ ), (iv) beginning a new relationship ( $n = 17$ ) and (v) suffering serious illness ( $n = 8$ ). In contrast, the least important would seem to be the miscellaneous or vague events ( $n = 32$ ), including miscellaneous workplace or academic events ( $n = 19$ ). Significant changes in working hours ( $n = 15$ ), work or education becoming more difficult or challenging ( $n = 42$ ) and generally positive change in lifestyle or values ( $n = 26$ ) are also assigned relatively low importance on average.

**5.4.1.9. Intentions and perceived behavioural control (PBC).** Intention was measured using two items, applied across three travel choice categories (active, public and driving) at each point in time. All these correlations were statistically significant, with coefficients ranging between .867 and .911. Therefore, the items were used to calculate six scale-variables. For each of these intentions, the most frequent scores were at the two extremes of the scale.

Similarly, PBC was measured using two items, applied across three travel choice categories (active, public and driving) at each point in time. All these correlations were statistically significant, with coefficients ranging between .535 and .787. Therefore the items were used to calculate six scale variables

#### 5.4.2. Addressing Research Questions

- All moderated multiple regression was done according to the guidance of Dawson (2014). All mediation analysis was done using the Baron and Kenny (1986) method.

- The approach to applying corrections for familywise error rates in this study was the same as that employed in the study reported in the previous chapter (outlined in section 4.4.2). In short, a Bonferroni correction was applied.
- Regression to the mean and the importance of correcting for this statistical artefact has been outlined previously, in section 4.4.2. As all the dependent variables tested in this study are change variables, it is important to allow for their initial levels by using these as predictors in the models (see Alison, 1990; e.g. Lanzini & Thøgersen, 2014).
- Across all regression models tested, plots of standardised residuals indicated problematic non-normality of residuals (a symmetric leptokurtic distribution). Thus, a bootstrapping<sup>43</sup> approach has been used to re-calculate these models without the necessity of normally distributed residuals (Howell, 2013). In each case, bootstrapping was 'simple' (unstratified), with 5000 bootstrap samples, and Bias-Corrected and accelerated (BCa) 95% confidence intervals.

**5.4.3.1. Question 1: To what extent do travel behaviour/habits change during/following a residential relocation between university terms?** This question was addressed using two multiple regression models: a travel behaviour model and a travel habit model. Each model explained the dependent variable using accommodation-change and baseline walking behaviour (habit). Both models were statistically significant and are presented in Table 18 and Table 19, respectively.

**Table 18: Change in Walking to the University from Change in Accommodation and Initial Walking at Baseline**

| <i>Independent Variable</i> | <i>B (SE)</i>         | <i>-CI</i> | <i>+CI</i> |
|-----------------------------|-----------------------|------------|------------|
| Accommodation Change        | <b>.111 (.049)*</b>   | .019       | .212       |
| Baseline Walking            | <b>-.259 (.055)**</b> | -.375      | -.157      |
| <i>Constant</i>             | -.042 (.051)          |            |            |
| R <sup>2</sup>              | .116                  |            |            |
| F Test of Model             | <b>14.687**</b>       |            |            |

Note: ° $p < .1$  \* $p < .05$ , \*\* $p < .01$

<sup>43</sup> Briefly, 'bootstrapping' involves re-sampling the data to generate large number of samples from which population parameters are estimated, thus avoiding the necessity of inferring population parameters from the original sample and a set of parametric assumptions.

**Table 19: Change in Travel Habit to the University from Change in Accommodation and Initial Travel Habit at Baseline**

| <i>Independent Variable</i>    | <i>B (SE)</i>        | <i>-CI</i> | <i>+CI</i> |
|--------------------------------|----------------------|------------|------------|
| Accommodation Change           | <b>.305 (.110)**</b> | .097       | .515       |
| Baseline Travel Habit Strength | <b>-.548 (.90)**</b> | -.717      | -.360      |
| <i>Constant</i>                | 1.976 (.467)         |            |            |
| R <sup>2</sup>                 | .276                 |            |            |
| F Test of Model                | <b>42.029**</b>      |            |            |

Note: ° $p < .1$  \* $p < .05$ , \*\* $p < .01$ .

From these models, there is some evidence that residential relocation (accommodation change) leads to increased walking behaviour (once allowing for baseline levels) and increased automaticity of primary travel mode use.

**5.4.3.2. Question 2: To what extent does prior intention to use active travel modes (as anticipation/planning) mediate change in travel behaviour during/following residential relocation between university terms?** To reiterate the criteria for mediation (see section 4.4.2.8): (a) the independent and dependent variables are associated; (b) the independent variable and the mediator are associated; (c) the mediator and the dependent variable are associated when the independent variable is controlled statistically; (d) in demonstrating '(c)', there is no association between the independent and dependent variables when the mediator is controlled statistically. In addressing the research question statistically, the independent variable was *residential relocation*, the mediator was *intention* to use active travel and the dependent variable was change in *travel behaviour*.

Condition '(a)' was satisfied in testing question 1 (section 5.4.3.1.). Condition '(b)' was tested using a regression model: intention was explained by accommodation change. The model was statistically significant,  $F(1,224) = 50.769$ ,  $p < .001$ , with accommodation change a significant explanatory variable,  $t(223) = 7.125$ ,  $p < .001$ ,  $B(SE) = 1.899 (.297)$ , BCa 95% CI [1.335, 2.503]. Therefore, condition '(b)' is met. Conditions '(c)' and '(d)' were tested using a multiple regression model: accommodation change, intention and initial levels of behaviour were used to explain travel behaviour change (Table 20).



**Table 20: Change in Walking to the University from Change in Accommodation, Intention to Travel Actively to the University and Initial Walking at Baseline**

| <i>Independent Variable</i>  | <i>B (SE)</i>            | <i>-CI</i> | <i>+CI</i> |
|------------------------------|--------------------------|------------|------------|
| Accommodation Change         | .087 (.045) <sup>°</sup> | .006       | .173       |
| Intention (to Walk or Cycle) | <b>.054 (.017)**</b>     | .021       | .092       |
| Baseline Walking             | <b>-.448 (.096)**</b>    | -.633      | -.272      |
| <i>Constant</i>              | <b>-.182 (.063)**</b>    |            |            |
| R <sup>2</sup>               | 0.181                    |            |            |
| F Test of Model              | <b>16.300**</b>          |            |            |

Note: <sup>°</sup> $p < .1$  \* $p < .05$ , \*\* $p < .01$ .

As intention was a statistically significant predictor, condition '(c)' was met. Evidence of (full) mediation is provided by a test of condition (d): that the independent variable (accommodation change) is not associated with the dependent variable (change in travel behaviour) when the mediator (intention) is taken into account. Condition '(d)' was tested using the same multiple regression model - while intention is statistically significant, accommodation change is not, meeting condition '(d)' for the most part. However, to provide supporting evidence, it is useful to test the statistical significance of the path from independent variable (accommodation change) to dependent variables (travel behaviour change) by means of the mediator (intention) using a Sobal test (Howell, 2013, p.549). This test for an intentional mediation of the association between accommodation change and travel behaviour were statistically significant,  $t(222) = 3.807, p < .05$ . On this basis, there is sufficient evidence for the association between accommodation change and change in walking to the university to have been mediated by prior planning or anticipation.

**5.4.3.3. Question 3: To what extent is change in distance to the university with residential relocation between university terms associated with change in travel behaviour during/following residential relocation between university terms?**

The same criteria for mediation as were used in the previous section (5.4.3.2) are employed here. The independent variable was *residential relocation*, the dependent variable was change in *travel behaviour* and the mediator was change in *distance to the university*. '(a)' was satisfied in testing question 1 (section 5.4.3.1.). Testing criterion '(b)', using simple linear regression, showed no statistically significant association between university distance change and accommodation change,  $B(SE) = -.102(.254)$ ,  $p > .05$ , 95%  $CI[-.603, .400]$ , and, therefore, criterion '(b)' was not satisfied. Condition

'(b)' is particularly important in establishing mediation (Kenny, Kashy & Bolger, 1998). As residential relocation is not shown to be associated with change in distance from the university, there is no clear evidence that change in distance from the university mediates the association between residential relocation and travel behaviour.

**5.4.3.4. Question 4: To what extent is change in household Stability with residential relocation between university terms associated with change in travel behaviour during/following residential relocation between university terms?**

The same criteria for mediation as were used in the previous sections (5.4.3.2 and 5.4.3.3) are employed here. The independent variable was *residential relocation*, the dependent variable was change in *travel behaviour* and the mediator was *household stability* (i.e. the proportion of the present household with whom the student lived with previously). . '(a)' was satisfied in testing question 1 (section 5.4.3.1.). Condition '(b)' was tested using a regression model: stability in the household was explained by accommodation change. The model was statistically significant,  $F(1,224) = 219.808, p < .001$ , with accommodation change a significant explanatory variable,  $t(223) = 14.826, p < .001, B(SE) = -.632 (.035), BCa\ 95\% CI [-.699, -.565]$ . Therefore condition '(b)' was satisfied. Conditions '(c)' and '(d)' were tested using a multiple regression model. Conditions '(c)' and '(d)' were tested using a multiple regression model: accommodation change, household stability and initial levels of behaviour were used to explain travel behaviour change (Table 21).

**Table 21: Change in Walking to the University from Change in Accommodation, Household Stability and Initial Walking at Baseline**

| <i>Independent Variable</i> | <i>B (SE)</i>         | <i>-CI</i> | <i>+CI</i> |
|-----------------------------|-----------------------|------------|------------|
| Accommodation Change        | .014 (.074)           | -.131      | .151       |
| Household Stability         | <b>-.155 (.078)*</b>  | -.308      | -.007      |
| Baseline Walking            | <b>-.263 (.055)**</b> | -.385      | -.149      |
| <i>Constant</i>             | <b>.21 (.144)**</b>   |            |            |
| $R^2$                       | 0.143                 |            |            |
| F Test of Model             | <b>12.339**</b>       |            |            |

Note: ° $p < .1$  \* $p < .05$ , \*\* $p < .01$ .

As household stability was a statistically significant predictor, condition '(c)' was met. Accommodation change is not a statistically significant predictor, so condition '(d)' was not met. A Sobal test of the mediation path (Howell, 2013, p.549) further supported this mediated effect of accommodation change upon travel behaviour change by means of household stability,  $t(222) = 2.587, p < .05$ . On this basis, there is

sufficient evidence for the association between accommodation change and change in walking to the university to have been mediated by household stability (the proportion of people with whom a student lives who they lived with previously).

#### **5.4.3.5. Question 5: Are changes in travel behaviour with residential relocation value or identity led?**

**5.2.1.5.1. Values (Question 5a): To what extent do (existing) values moderate travel behaviour change during/following a mid-term residential relocation?** This question was tested using four multiple regression models. Each model explained travel behaviour using accommodation change, a value dimension (self-transcendence, self-enhancement, openness to change, or conservation), the product of the accommodation change and the value dimension score, and initial travel. The criterion for statistical significance of these tests was Bonferroni corrected. All models were statistically significant, however neither the value dimension nor the interaction reached statistical significance in any model.

- The model using self-transcendence was statistically significant,  $F(4,219) = 7.434$ ,  $p < .0125$ , and the interaction was not statistically significant,  $B (SE) = .048 (.056)$ ,  $p > .05$ , 95% CI [-.061, .162].
- The model using self-enhancement was statistically significant,  $F(4,219) = 7.379$ ,  $p < .0125$ , and the interaction was not statistically significant,  $B (SE) = -.024 (.038)$ ,  $p > .05$ , 95% CI [-.099, .049].
- The model using openness to change was statistically significant,  $F(4,219) = 8.182$ ,  $p < .0125$ , and the interaction was not statistically significant,  $B (SE) = -.056 (.049)$ ,  $p > .05$ , 95% CI [-.157, .041].
- The model using conservation was statistically significant,  $F(4,219) = 8.255$ ,  $p < .0125$ , and the interaction was not statistically significant,  $B (SE) = .071 (.072)$ ,  $p > .05$ , 95% CI [-.073, .208].

On this basis, there is no clear evidence that values moderate the association between residential relocation and travel behaviour (habit) change.

#### **5.2.1.5.2. Identity (Question 5b): To what extent does (existing) pro-environmental identity moderate travel behaviour change during/following a mid-term residential**

**relocation?** This question was tested using a multiple regression model. Travel behaviour change was predicted using accommodation change, pro-environmental identity, their product and initial behaviour. While the model was statistically significant,  $F(4,221) = 7.847$ ,  $p < .05$ , pro-environmental identity and its interaction with accommodation change did not reach statistical significance,  $B (SE) = .077 (.053)$ ,  $p > .05$ , 95% CI [-.025, .182]. On this basis, there is no clear evidence that pro-environmental identity moderates the association between residential relocation and travel behaviour (habit) change.

**5.2.1.6. Control (Question 6): Does a lack of control present barriers to making changes in travel behaviour/habit with residential relocation?**

**5.2.1.6.1. Important Life Events (Question 6a): To what extent does life-event importance (as self-control or life event stress) moderate travel behaviour/habits change during/following a mid-term residential relocation?** This question was tested using a multiple regression model. Travel behaviour change was predicted using accommodation change, life event importance at baseline, their product and initial travel behaviour. While the model was statistically significant,  $F(4,221) = 9.705$ ,  $p < .05$ , life event importance and its interaction with accommodation change did not reach statistical significance,  $B (SE) = .055 (.038)$ ,  $p > .05$ , 95% CI [-.020, .128]. On this basis, there is no clear evidence that life event importance (as self-control or life event stress) moderates the association between residential relocation and travel behaviour change.

**5.2.1.6.2. Perceived Behavioural Control (Question 6b): To what extent does perceived behavioural control moderate travel behaviour change during/following a mid-term residential relocation?** This question was tested using a multiple regression model. Travel behaviour change was predicted from accommodation change, Perceived Behavioural Control (PBC) at baseline, their product and initial travel behaviour. The model was statistically significant,  $F(4,221) = 10.961$ ,  $p < .05$ , but neither PBC nor the interaction was statistical significant,  $B (SE) = .002 (.02)$ ,  $p > .05$ , 95% CI [-.035, .045]. On this basis, there is no clear evidence that PBC moderates the association between residential relocation and travel behaviour change.

**5.2.1.7. Habit Change (Question 7): To what extent is travel behaviour change during/following a residential relocation between terms associated with increasing habit strength for the new behaviour and decreasing habit strength for the old behaviour?** This question was tested using a series of correlations (Table 22), to each of which the Bonferroni correction was applied. Each correlation was conducted upon the group of participants who *did* change their residence/accommodation during the study. It was anticipated that changes in travel behaviour would be positively associated with changes in the matching travel habit and negatively associated with changes in non-matching travel habits.

**Table 22: Correlations Between Changes in Habit Strength and Travel Behaviour**

|                       |          | Travel Behaviour Change          |                              |                                  |
|-----------------------|----------|----------------------------------|------------------------------|----------------------------------|
|                       |          | Walking                          | Driving                      | Public                           |
| Habit Strength Change | Active   | <b>.415**</b><br>[.195, .594]    | -.257<br>[-.413, -.100]      | <b>-.328**</b><br>[-.555, -.074] |
|                       | Driving† | -.276<br>[-.518, .001]           | <b>.364*</b><br>[.006, .591] | .128<br>[-.070, .357]            |
|                       | Public   | <b>-.381**</b><br>[-.549, -.195] | .044<br>[-.084, .259]        | <b>.493**</b><br>[.333, .623]    |

As only licensed motorists are assessed for driving habit strength, correlations with driving habit strength and/or driving behaviour are from a group of 84 participants, other correlations are from a group of 140 participants. Correlation coefficients [95% confidence intervals]. \*\* $p < .001$ ; \* $p < .0056$ ; ° $p < .01$ .

For the most part, the predicted patterns of association are present. All 'consonant' changes in behaviour and habit are positive and statistically significant. Two of six 'dissonant' changes in behaviour and habit are negative and statistically significant. It is important to recognise that one might only expect correlation between 'dissonant' changes in behaviour and habit in so far as participants switched between these modes for accessing the university (e.g. if all the participants who stopped walking started taking the bus or train, then an increase in driving habit strength would not be a reasonable expectation). Switching between modes can be assessed by comparing the three associations between changes in different travel behaviours (Table 23).

**Table 23: Correlations Between Changes in Travel Behaviour**

|                         |          | Travel Behaviour Change |                |                |
|-------------------------|----------|-------------------------|----------------|----------------|
|                         |          | Walking                 | Driving        | Public         |
| Travel Behaviour Change | Walking  | -                       | <b>-.420**</b> | <b>-.667**</b> |
|                         | Driving† | -                       | -              | .093           |
|                         | Public   | -                       | -              | -              |

$n = 140$  participants. \*\* $p < .001$ ; \* $p < .0167$ ; ° $p < .05$ .

These indicate that *few* participants switched from (to) driving to (from) public transport; most participants switched from (to) walking. Therefore, one may conclude that there is evidence to suggest that while, generally, those who change residence strengthen the habit for modes they use more and weaken the habit for modes they use less, there was: (a) insufficient evidence to draw an inference with respect to changes between public transport and driving, as these did not generally occur, and (b) there was no clear evidence to suggest either that walking habits weakened when participants began driving to the university or that driving habits weakened when participants began walking to the university. One possible explanation for this would be if walking/driving, during the university term, was used for journeys other than to and from the university, which would sustain their habits of use.

## 5.5 Discussion

### 5.5.1. Discussion of findings.

As with the previous study, university students were studied with respect to whether they began to, or ceased to, walk to the university, rather than use motorised transport. These changes in travel behaviour were studied with respect to whether students moved to different accommodation *between* university terms (rather than mid-term), on the hypothesis that this residential relocation would remove the context cues that trigger habitual travel mode choice, leading to less automatic, and potentially different, travel choices. The overall purpose of the study was, again, to consider the role of different additional factors in the habit discontinuity effect (see section 2.10). The implementation of this study improved upon the previous study in several important respects: (a) the sample was more balanced between the two groups (movers and non-movers) and closer to the target for a study with sufficient statistical power (see

section 5.3.1.4); (b) students moving between-terms, rather than mid-term, were studied as more typical of student relocation and more plausible with respect to expecting habit discontinuity to occur; (c) a longer study was made in order to better detect changes following on from the event; (d) both groups were recruited simultaneously to allow for temporal differences in the academic or calendar years; (e) continuous measures of behaviour change were used to permit greater precision in determining change; (f) several additional research questions, particularly the role of ease and difficulty of behavioural change, were addressed.

First (section 5.4.3.1), there was some evidence that students who moved house also tended to increasingly choose to walk to the university. This effect was small and, though the results do not permit trivial effect sizes to be ruled out, large effects are not likely on the basis of this evidence. This conforms well to current empirical evidence that habit discontinuity has a small, rather than a large, effect (Verplanken & Roy, 2015; Thomas et al. 2016). Residential relocation was also evidenced to be associated with *increasing* automaticity of travel. The equivocal nature of interpreting such a finding has been considered (section 2.10.3). It is useful to consider this finding in its role as a repetition of the same test in the previous study. In the previous study, this test was not statistically significant, but favoured the possibility of a small positive association (see Section 4.4.3.1); in the present study, though the confidence interval covers trivially small associations, the overall indication is for a moderate positive association. When it is considered that, in all likelihood, less time was allowed after the residential relocation before collecting follow-up data in the first study than in the present study, one possible interpretation is that a stronger positive association with general habit change was recorded on account of student participants having had longer to practice travel after relocation. Perhaps those students who did not change mode with residential relocation had longer to recover automaticity for existing habits after their weakening with habit discontinuity (see Walker et al. 2014) and those who did change mode had longer to strengthen their new habits through practice?

Second (section 5.4.3.2), there was some evidence that the association between moving house and increasingly choosing to walk to the university was mediated by planning to walk to the university prior to moving house, thus providing some evidence that these changes were anticipated, rather than arising at the very moment of residential

relocation. This replicates the findings from the previous study (see Section 4.4.2.6) in a slightly different context (moving house between terms). As has been discussed (Section 2.10.1), this finding, in itself, gives only a small reason to doubt the role of the habit discontinuity in this change process, on the basis that while it evidences the case that many of the decisions to change are made in advance of residential relocation, it leaves open the possibility that habit discontinuity facilitates these changes into action (makes changing travel behaviour easier).

Third (section 5.4.3.3), there was no evidence to suggest that changes in distance between the university and students' accommodations mediated the association between residential relocation and changes in travel behaviour. This may seem counter-intuitive: how can changes in distance not be important? The question was not one of whether or not distance alone was important in travel behaviour (it almost certainly is) but whether or not distance can explain the observed association. As almost always a change in distance occurred with residential relocation, that the two are not associated must be due to the *direction* and *extent* of changes. Suppose that the result had been otherwise: residential relocation had been shown to be associated with a general reduction in distances as students moved closer to the university and had begun to walk to the university more often as a consequence - that mediation was evidenced - then there would be reason to believe that the association between moving house and changing travel behaviour was a matter of travel distances. As it was, there was no evidence to support such a claim: distances showed no overall general tendency to increase or to decrease. Therefore, importantly, that moving remained associated with switching to walking to the university could not be attributed to distances changing. So it follows that if it can be explained it should be explained in some other way than by change in distance, however important distances may be in themselves to travel behaviour.

Fourth (section 5.4.3.4), a *lack of* household stability was evidenced as a mediator of the association between residential relocation and travel behaviour change: living with a greater proportion of people with whom one did not live with before seemed to mediate the association between moving house and walking to the university more than before. This is *prima facie* evidence that, as Wood and colleagues (2005) found for some domestic habits (see section 2.7.1), travel habits are sensitive to the social situation in the household. As with the discussion of distance change in the



previous paragraph, it is important to recognise that this finding is due to an overall trend whereby movers also had less household stability than non-movers.

Fifth (section 5.4.3.5), there was no clear evidence either for values or for pro-environmental identity as moderating factors in the association between moving house and changing travel behaviour (more often walking to the university). This finding with respect to values conforms with the same finding in the previous study (section 4.4.2.2), though using a more statistically powerful study. That general values and pro-environmental identity do not appear to motivate this travel behaviour change with residential relocation makes value activation at the moment of habit discontinuity a less plausible explanation for the motivation that drives behaviour change with habit discontinuity, though it is possible that existing norms negatively moderated potential changes (Bardi & Schwartz, 2003). It remains possible that another specific value-identity is involved, but it is perhaps reasonable to conclude that there is little evidence for the involvement of value motives in this case. This does not mean values are not involved in travel mode choices - it is possible that travel choices are sometimes valued, though this does not appear to involve residential relocation.

Sixth (section 5.4.3.6), neither the importance of prior life events nor perceived behavioural control (PBC) were clearly evidenced as moderating factors in the association between moving house and changing travel behaviour. That the importance of life events was not clearly involved indicates, as did the findings of the previous study with respect to perceived stress (sections 4.4.2.3 and 4.4.2.4), that self-control failures and/or relative priorities (of one behaviour change over another) with the life event neither help nor hinder behaviour change with residential relocation. This could be because life events in the population are generally not of the kind that generate conflicting priorities, stress or other threats to self-control during behaviour change; on the other hand, this may be because behaviour changes are relatively simply implemented even when other important life changes are taking place. Importantly, this finding also helps in spanning the somewhat ill-defined distinction between life transitions and life events (see section 2.2.2): it is not unreasonable to suppose that the importance of ongoing transitions, as well as particular events (in the immediate past or in prospect), will have been factored in to the responses participants gave. Turning to PBC, that PBC had no particular moderating effect would seem to support the idea that

the anticipated ease or difficulty of travel change was not involved in those changes in travel that took place with residential relocation. This could be because residential relocation did not offer any help nor any hindrance with the prospect of travel behaviour change: that no circumstantial changes presented insurmountable problems.

Seventh (section 5.2.1.7), there was evidence to suggest that participants who residentially relocated also became more automatic in their use of 'new' modes of transport and less automatic in their use of 'old' modes of transport. This reproduces similar findings from the previous study (section 4.4.2.7). As before, these findings give *prima facie* support to the idea that habit change takes place with the practice of new travel behaviours, but, as only automaticity is indexed, this could be only a change in the automaticity of use and not of the underlying habit in memory (see section 2.10.3). Never the less, it is encouraging with respect to the prospect of applying these findings to behaviour change.

### **5.5.2. Implications and Limitations**

In conducting this study, several of the more important limitations of the previous study have been addressed (see sections 4.5.2. and 5.5.1.), but this is not to claim that this study is free from limitations. The first point to make clear is that though improvements in statistical power were achieved, these were comparatively modest and so there is still reason to suspect that some of the findings obtained will be 'false positives'. However, it is encouraging that where the same questions were asked across both studies, similar results were obtained. A substantial contribution to missing the power target for this study was the recruitment of students undertaking, or who went on to undertake, extended work placements as part of their degree and so: (a) these often involved further workplace or residential relocations; (b) these participants no longer commuted to the university on a regular basis (see section 4.3.1.1). In retrospect, not anticipating the high proportions of students for whom work placements are a substantial part of their degree courses was an oversight, and it is recommended that future work take this into account through screening during recruitment, or tailoring the questionnaire to record more information on this sub-group so they may be effectively taken into consideration.

The overall findings of this study largely conform to the description provided for the previous study (section 4.5.1), which was, briefly: the prospect of moving house seemed to lead a number of students to plan to change their travel behaviour with the move and, in implementing the changes, became more automatic in their execution of these new travel behaviours; a number of factors hypothesised to be involved from a consideration of the HDH did not seem to be involved. The present study went beyond the examination of change only (absolute change) to consider change to or from walking, with a view to capture the implications for residential relocation as a moment when naturally occurring habit discontinuity could lead to travel behaviour changes amongst university students (see section 4.2.1). In this regard, the results of the present study were encouraging in suggesting that residential relocation is associated with university students more often walking to the university. What is less encouraging is still not having identified why this might be.

It is useful that distance was not manifestly shown to be involved, for this would be one of the most readily available explanations. That the change appears to be mediated by changes in the household is one of the few findings indicative of habit discontinuity, because it conforms to past findings of the importance of social cues in the continuance of habitual behaviour for university students residentially relocating (Wood et al. 2005). However, both the study of Wood and colleagues and the present study were not experimentally controlled and permit the possibility of explanation by means of confounding factors (Wooldridge, 2008), though it is difficult to identify a plausible confound that could link residential relocation, household stability and travel behaviour change in the absence of habit discontinuity represented in the absence of social cues provided by previous housemates. One possibility is a factor that was not investigated in this study, that of subjective norms (see sections 2.5 and 2.10.2.2). It may be that, independent of the ease or difficulty a participant perceives in changing their travel behaviour (i.e. PBC), that an additional, less obvious factor, can exist in the form of social pressure from the household (see Ajzen, 1991). Both explanations, though they are drafted from different theories, bear some similarities, mostly to the extent that, given weaknesses in understanding the nature of context cuing of habit (see section 2.4), it becomes difficult to distinguish between *disruptions* and *habit discontinuities* (see section 2.2.2).

## 6. General Discussion

### 6.1 Overview

In this chapter, overall research questions are reviewed (6.2). Then specific findings are considered from across the thesis for each research question (6.3) before being considered together both in terms of their implications and limitations (6.4). Finally, conclusions are presented (6.5).

### 6.2. Summary of Research Questions

Briefly, the following research questions were addressed in this thesis. One question is addressed in the first study (Chapter 3).

- *What accounts do people give of change and continuity in their day-to-day travelling over time?*

Several questions are addressed in both the second and the third studies (Chapters 4 and 5).

- *To what extent does travel behaviour change with habit discontinuity (residential relocation)?*
- *To what extent does anticipation/planning lead to travel behaviour change with habit discontinuity (residential relocation)?*
- *To what extent do existing values motivate travel behaviour change with habit discontinuity (residential relocation)?*
- *To what extent does self-control failure (assessed as stress and as life-event importance) or do other priorities (assessed as travel goals) impact change in travel behaviour with residential relocation?*
- *Are changes in travel behaviour with residential relocation associated with strengthening of habit (automaticity) for new behaviours, and weakening of habit (automaticity) for old behaviours?*

The third study assesses two additional questions (Chapter 5).

- *To what extent does relative ease/difficulty of change (actual or perceived) impact, or explain, change in travel behaviour with residential relocation?*
- *To what extent does change in household stability, as a possible aspect of context, explain change in travel behaviour with residential relocation?*

### 6.3. Specific Findings

**6.3.1. *What accounts do people give of change and continuity in their day-to-day travelling over time?*** In the first study (Chapter 3), 29 motorists living in the Cardiff area were interviewed with respect to their day-to-day travel, both at the time of interview and in the past (see Appendix A for specific questions). Interview transcripts were analysed with respect to the research question using Thematic Analysis (TA: Braun & Clarke, 2006). For the most part, change and continuity were not thematically distinct, so much as were the ways in which participants *accounted* for their travel through rational considerations of the different *choice factors* involved distinct from the *experiences* of travel being enacted, which were often *accounts* of not concentrating, and being on 'autopilot', particularly to the extent that the route travelled was a familiar one. While a thematic distinction between changes and continuities in life in terms of conscious choices and habits, respectively, was asked after, no such distinction (reflecting habit discontinuity as an experience) was reported by participants, or could be inferred from what was said.

Perhaps the most interesting findings from this study with respect to this thesis as a whole is the lack of clear, distinctive accounts either of change in travel with key life events or continuity in travel with stable life circumstances. While particular routes were familiar and travelled automatically, participants described their travel choices as being decided by a number of criteria, whether these were linked to ongoing events (e.g. relocations leading practical changes (time, cost, accessibility) in commuting) or not. On this basis, habit discontinuity would not seem to feature either in people's own explanations of their travel, or as part of the experience of day-to-day travel.

**6.3.2. *To what extent does travel behaviour change with habit discontinuity (residential relocation)?*** In the second study (Chapter 4), university students ( $N = 173$ ) completed a research questionnaire at the beginning and end of a period of around 96 days, during which some residentially relocated (around one quarter of the final sample) from one term-time accommodation to another. As the study took place during the university term, this was a mid-term relocation, as opposed to a (more typical) between-term relocation. Around 71% of participants primarily walked to the university, and the study assessed the change *from* or *to* walking, as opposed to motorised travel (driving or

using public transport). Comparison of the proportions showed some reason to believe that whether a university student changed their primary travel mode or not was not independent of whether or not they moved house. More specifically, few participants who changed their primary travel behaviour (12.1%) were better represented amongst movers (20%) than non-movers (9%). In the third study (Chapter 5) university students ( $N = 226$ ) completed a research questionnaire at the beginning and end of a period of around 169 days, during which some residentially relocated (around 62% of the final sample) from one term-time accommodation to another. This study took place between two university terms, so this was a between-term relocation. Again, around 70% of participants primarily walked to the university; improving on the previous study, this study assessed change in the proportion of trips to the university that a student walking, as opposed to using motorised travel modes. Once the initial extent of walking to the university was accounted for, moving was associated with small increases in the proportion of journeys to the university students would walk (perhaps an 11 percentage point increase).

Effects in both studies were relatively small and, despite improved statistical power in the third study, neither study effectively ruled out the possibility of the effect being trivially small. Never the less: (a) it is encouraging that both studies detected this association; (b) the second study demonstrated that this change was *towards* walking more, which is encouraging with respect to the environmental significance of travel behaviour. These studies, considered together, demonstrate that one can anticipate a relatively small, but perhaps non-trivial, change in travel behaviour with residential relocation (habit discontinuity).

**6.3.3. *To what extent does anticipation/planning lead to travel behaviour change with habit discontinuity (residential relocation)?*** Both quantitative studies evidenced the importance of anticipation/planning as a potential mediator between residential relocation and travel behaviour change. In the second study, there was evidence for a pattern of mediation whereby those who changed their accommodation mid-term also, more often than not, intended to change their primary travel mode during the study period and, having this intention, more often switched from or to walking to the university primarily. In the third study, there was similar evidence for a similar pattern of mediation, only this time intention to walk or cycle to the university was

assessed using two Likert scale items, which both permitted degrees of intention and assessed intention *to use* this mode type rather than to *change* (any) mode type.<sup>44</sup>

Mediation in correlational studies cannot be conclusive of causal mediation, but shows a *pattern* of mediation only. This pattern, though, appears in both studies, and is less consistent with changes in travel behaviour due to a sudden activation of existing values (see section 2.10.2.1) or a renewed restored focus upon salient information (see section 2.6) than it is consistent with anticipated change, and the intention to change (see section 2.10.1), though further research would be necessary to demonstrate which factors are or are not involved (because anticipation/planning does not rule out a spontaneous element).

**6.3.4. To what extent do existing values motivate travel behaviour change with habit discontinuity (residential relocation)?** With the value activation hypothesis (Verplanken et al. 2008: see Section 2.10.2.1), values are proposed to motivate behavioural changes with naturally occurring habit discontinuity when the value is central to the self and when, with the life event/habit discontinuity it is cognitively activated. In the second study (4.4.2.2) and the third study (5.2.1.5.1) there was no clear evidence to indicate that values moderated the association between moving house and changing travel behaviour, which is what would be anticipated if general values were the primary motivation for travel behaviour change with residential relocation/habit discontinuity. This study also assessed the possibility that one particular self-identity (that of pro-environmental self-identity), as a construct, perhaps, closer to the idea that value activation is dependent upon the centrality of the value to the self, would show a similar pattern of association: it did not (Section 5.2.1.5.2). Improved statistical power in the second of these studies went some way to providing greater confidence in this conclusions, though the possibility of non-trivial, but small, value-moderation effects cannot be excluded (i.e. values could provide some motivation or motivation for some in these circumstances).

That these studies did not evidence value motivation for behaviour change with habit discontinuity/residential relocation is *not* to conclude that values are not an influence, only that *these* changes with residential relocation do not appear to depend upon existing values. It is important to keep in mind that the processes whereby values

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<sup>44</sup> As cyclists were excluded, it is safe to assume that this measure assessed intention to walk only.

come to influence behaviour are theorised to depend upon factors not assessed in the present study (Schwartz, 1977; Dahlstrand & Biel, 1997; Stern, 2000): that a value-led change *begins* with value activation (perhaps caused by habit discontinuity), does not mean that travel behaviour change will follow if other factors, such as problem awareness, that influence the formation of a personal norm, 'block' the change (Nordlund & Garville, 2003; Klöckner & Matthies, 2004). Another possibility is that habit discontinuity lead to a more *conscious* (less automatic) implementation of existing behaviour that was already congruent with existing values: habits, being formed through conscious, perhaps value-led, choices in the past (see Section 2.3.2) may have been congruent with existing values *from the outset* (see also Section 2.5: para. 6). Perhaps, therefore, the 'missing element' was not an absent mediating factor between value activation and behaviour, but that, with university students (by and large) habits of travel have formed, but the time since this formation has been *insufficient* for the values that informed habit formation to have *changed*, leading to value-habit incongruence (see also Bardi, Lee, Hofmann-Towfigh & Soutar, 2009; Bardi & Goodwin, 2011). Such an account might, perhaps, be contrary to the idea that it is travel habits formed through socialisation within the family or community context that would be called into question through habit discontinuity (see Haustein, Klöckner & Blöbaum, 2009).

**6.3.5. To what extent does self-control failure (assessed as stress and as life-event importance) or do other priorities (assessed as travel goals) impact change in travel behaviour with residential relocation?** Broadly (see Thompson, et al. 2011), this covered the idea that life events lead to reduced self-regulation that, in turn, preserves automatic or habitual behaviour, either because one fails to implement a lasting change, or because one does not attempt this when prioritising more important changes, or because different priorities lead to a lack of awareness, even, of the possibility of change (see section 2.10.4). This was tested in three different ways. In the second study, both perceived stress and travel goals were considered as possible moderators of the association between residential relocation and travel behaviour change - either that life stress stymies travel change or that other goals preclude change. In the third study, life event importance was considered as a moderator of the association between residential relocation and travel behaviour change - as an indicator of stress (Holmes & Rahe, 1967) and of priorities specific to ongoing life changes. All findings from these



tests were inconclusive.<sup>45</sup> Importantly, change in perceived stress during the study was not evidently different for movers compared to non movers in the second study, which indicated that it may not be that the *principle* that informs this research question is not sound, so much as that, because the move was not a source of stress, stress (and associated factors) were not involved. This may have been a property of the context within which residential relocation was considered: students, by and large, may have fewer hassles in relocating between rented rooms within shared houses located in the same city compared to older individuals, who may be relocating as a family household, between whole properties (not only rooms), sometimes with changes in property ownership, and often between cities.<sup>46</sup>

**6.3.6. Are changes in travel behaviour with residential relocation associated with strengthening of habit (automaticity) for new behaviours, and weakening of habit (automaticity) for old behaviours?** This idea was founded upon the idea that new behaviours would come to be executed with greater automaticity, and 'old' behaviours with less automaticity, with travel behaviour change amongst participants who residentially relocated, because new habits would be forming through practice, and the cues to old habits, being absent, would lead to these actions being undertaken correspondingly deliberately. This general pattern was strong and evident in both study two and study three, but the loss of statistical power in considering only a sub-group meant estimates of coefficients were less precise, and the possibilities of relatively weak (or even stronger) associations should be entertained. Additionally, inferences could only be drawn about the sub-group, and not between movers and non-movers. Generally, the evidence for increasing automaticity of new travel behaviour was superior to the evidence for weakening automaticity of (implying more deliberate use of) 'old' travel behaviour. Part of this is due to the patterns of change between travel modes, which were not uniform, but a most important consideration is that only journeys *to the university* are assessed, and the automaticity of old behaviours may well be maintained by their use to access other locations. These results can also be considered in the context of the work of Walker and colleagues (2014) with respect to

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<sup>45</sup> The moderation effect of life event importance in the third study was not statistically significant, however the confidence interval does not exclude the possibility of a small moderation effect.

<sup>46</sup> Several studies specified intercity moves within their criteria for residential relocation, especially those of Bamberg and colleagues considered in Sections 2.7.4. and 2.7.5.

changes in travel automaticity with workplace relocation, where weakening/strengthening of automaticities was present, but more gradual and less complete than anticipated.

**6.3.7. To what extent does relative ease/difficulty of change (actual or perceived) impact change in travel behaviour with residential relocation?** An important point to consider in discussing some of these findings is the similarity and difference between the ideas of *ease/difficulty* (section 2.10.2.2) and *self-regulation/priorities* (section 2.10.4) as moderators of travel behaviour change with residential relocation/habit discontinuity. Had the latter (e.g. perceived stress, travel goals) been shown to moderate the association, then it would seem reasonable to view it both in itself, *and* as one of many possible instances of changes in the relative ease/difficulty of changing travel behaviour (e.g. it may be *difficult* to switch *to* driving from walking (or *easy* to switch *from* walking to driving) if one has a (conflicting) goal of comfort or flexibility when making travel choices). However, arguably, ease/difficulty is *not* one of different possible instances of changes in self-regulation (success/failure) or goals (convergent/divergent), but that it is always the other way round.

Drawing this distinction, ease/difficulty as a moderator of the association between residential relocation and travel behaviour change was assessed in the third study with respect to: (a) one, specific and (plausibly) *actual* source of ease/difficulty in changing to or from walking to the university (the change in distance to the university from the student's accommodation: Section 5.4.3.3); (b) a general index of *perceived* ease/difficulty of walking to the university (Perceived Behavioural Control, PBC: Section 5.2.1.6.2; see also Sections 2.5 and 2.10.2.2).

There was no evidence that changes in distances between the university and students' accommodations *mediated* the association between travel behaviour change and accommodation change, this was because change in distance to the university and moving house were not associated with one another. Briefly, while moving was almost invariably the reason that the distance changed, it was unrelated to whether, or by how much, the university became closer or further from a student's accommodation. Therefore, while it is very plausible that distances changes lead to changes in the extent to which students walked to the university, there is no clear evidence that this then lead

to a general pattern whereby (for instance) students moved closer to the university and walked more, but that, having moved, students more often chose to walk to the university, this irrespective of whether they now lived nearer or further from the university. This result is important, because it implies that distance change (a factor that very often arises with moving house) can, tentatively, be ruled out as an explanation for the association between moving house and travel behaviour change, leaving a number of other possibilities (e.g. habit discontinuity). It is important to acknowledge, however, that: (a) the straight-line distances estimated may not have been entirely representative of the distances that participants would actually travel to reach the university, because their actual routes are not known and no allowance was made either for changes in gradient (hills) or city-blocks, road crossings and other obstacles; (b) when the distance changes are split between movers and non-movers, the variance of this variable is far greater for movers than non-movers - though bootstrapping does not necessitate the assumption of homogeneity of variance (Howell, 2013), it still provides a very wide confidence interval.

More generally, PBC for walking/cycling was not found to *moderate* the association between moving house and changing travel behaviour. This would seem to support the idea that change in travel behaviour with residential relocation is independent of the *perception* of how easy or difficult it will be. It is important to point out that this is a prospective perception and may be less accurate compared to such perceptions measured closer to the residential relocation event. It is also important to remind the reader that perceptions of ease and difficulty are most likely an important general factor in choosing a travel mode, but one that does not appear to be involved where residential relocation is concerned.

**6.3.8. To what extent does change in household stability, as a possible aspect of context, explain change in travel behaviour with residential relocation?** Although the review of literature in Chapter 2 was somewhat critical of the present state of habit theory with respect to the role of context, it did identify one previous study (Wood et al. 2005) that had presented evidence that the discontinuity of habit, for residentially relocating university students, may have been a matter of the absence of social context cues relating to the people with whom the participants shared their house. Similarly, as outlined in the introduction to Chapter 5 (5.2.1.4), there is sufficient evidence to believe

that the household identities and practices of university students are not necessarily trivial in comparison to more traditional households. Thus, changes in the social context, indexed by changes in household composition, are a faltering first step in identifying an aspect of context cuing of habit of the sort outlined by Verplanken (2011) and others (Gardner, 2015; Wood & Runger, 2016). Mediation analysis indicated that a pattern of mediation exists whereby the association between residential relocation and travel behaviour change is entirely mediated by the proportion of people with whom a student lived with at the end of the study who they also lived with at the beginning of the study (household stability) - importantly, household *stability* was associated with walking to the university *on fewer occasions*, hence the path was one whereby those who lived with new people also tended to choose to walk to the university (rather than use a motorised form of transport).

Interpreting this findings is not straightforward, as, while the variable is a real proportion (which is generally advantageous), its psychological significance is not without ambiguity. This finding *is consistent* with the HDH interpretation sketched above, that cues to habitual travel, tied to people in the 'old' household, are absent in the new household. This finding may have a more prosaic explanation. The first is social influence through social identity. As a student lives with new people (and ceases to live with 'old' housemates), social pressures change, which explain behavioural change without reference to habit discontinuity (see Sections 2.5 and 2.10.2.2). It is not intuitive that travel behaviour should be a way in which a university student 'fits in' to a household, but it is broadly consistent with the idea that travel, car use particularly, can have symbolic/affective motives that are implicit, in contrast to the 'acceptable' discourse of the practicalities of travel (Steg, 2005; see also Section 2.9.1). Another prosaic explanation arises from the 'student housing pathway', that is the typical biography of university student accommodation (Rugg, Ford & Burrows, 2004), which includes the possibility that later accommodation changes may occur if "opportunities arose either to join with friends or a better quality or cheaper property became available" (p. 26). Such motives were identified by larger proportions of those students who intended to move in the present study (Section 5.4.1.2.2.), however they were identified in approximately equal proportions, so, while it is possible, for instance, that economic motives lead to both residential relocation to a larger house (with less rent *per*

*capita*) and to walking to the university (which has little financial cost), moving to *better* quality properties implies the *opposite*.

## **6.4. Findings in General: Implications and Limitations**

**6.4.1. The Habit Discontinuity Hypothesis.** This study did not set out to test the HDH. Never the less, some of the findings are of interest with respect to its scope. In the first study (Chapter 3), participant accounts of travel gave the impression that the HDH (Verplanken, et al. 2008) is not a common experience with respect to travel. Further, the other studies (Chapters 4 and 5), while they did evidence a basic effect (that residential relocation was associated with travel behaviour change), this effect seemed best explained by anticipation, or planning, to make a change in travel. Although this latter pattern does not exclude the HDH, it does seem to limit its scope to the facilitation of prior, conscious motives to change travel with residential relocation, excluding students becoming aware of the applicability of internal information (beliefs, values, etc.) and external information (e.g. the travel environment and different travel options) with the discontinuity of habit. One factor to keep in mind in evaluating this latter finding, however, is the necessity, for these study designs, of using participant's own intentions to residentially relocate to recruit the sample. This should be kept in mind because it is possible that the processes tentatively excluded - attention to information (see Section 2.6), value activation (Verplanken & Holland, 2002; see Section 2.10.2.1) - may have occurred, or began, prior to recruitment to the study.

**6.4.2. Habit Discontinuity: Values and other Motives.** In a similar vein, participants in the first study (Chapter 3) largely did not talk about their travel in terms of values or 'green' values, though they were explicitly questioned about the latter. In both quantitative studies (Chapters 4 and 5), general values were not found to moderate the association between relocation and travel change and, thus, did not appear to be involved in the putative habit discontinuity effect as motives (cf. Verplanken et al. 2008). In the final study (Chapter 5), pro-environmental identity, also, did not appear to be involved. This is similar to the finding of Walker and colleagues (2014), where a workplace location lead to travel mode changes, but these were not demonstrably linked to pro-environmental attitudes.

In previous studies of the habit discontinuity hypothesis, pro-environmental values/ attitudes have been applied to choosing to drive (Verplanken, et al. 2008; Thomas, et al. 2016). It is important to keep in mind that the present study focused on walking behaviour and, in this way, the value aspect of the behaviour may have been less salient and so were either less likely to become activated, or, once activated, could be justified as a case to which values were not applicable (Schwartz, 1977; see Section 2.10.2.1). Another possibility is that, of those who relocated, most already travelled in a pro-environmental way accord to their values, and so could walk no more than they already did. However, the evidence from this thesis can only indicate that values do not seem to be capable of explaining the putative habit discontinuity association between residential relocation and travel change in university students. Another possible motive is less plausible when it is considered that travel goals, too, do not appear to explain the same association, thus appearing to exclude both value and practical (travel) motives, at a general level. Thus, beyond seeming to be anticipated or planned, the quantitative component of this thesis had supplied little clear evidence of what might motivate these changes (beyond the possibility that motivations are eclectic). It is important to recall, however, that because there was almost no variation in some travel goal items, these (quite clearly) important goals could not be assessed, and it is possible that these (e.g. getting to destinations on time and reducing travel costs) motivated the observed changes with habit discontinuity - this is plausible to the extent that these are factors that might be anticipated and which qualitative evidence from the first study demonstrates are clearly factors that consciously influence (or at least provide post-hoc explanation for) travel choices (for applicability to a student sample, see also Simon, Clarys, DeBourdeaudhuij, DeGeus, Vandelanotte & Deforche, 2014).

**6.4.3. Habit Discontinuity and Restrictions.** Several of the research questions addressed in the two qualitative studies can broadly be classed as tests of factors that might restrict the process of habit discontinuity and subsequent behaviour change. These were the following (a-c). (a) (In the third study: Chapter 5) the ease or difficulty of making a travel change, including both perceptions and an actual change in difficulty/ease of walking to the university reflected by the change in the distance to travel. (b) (In the second and third studies: Chapters 4 and 5) the possibilities of self-regulation failure, associated with stress or importance of the life events experienced,

leading either to preservation of habitual behaviour (Neal, et al. 2013) or the failure to implement a behavioural change (Baumeister & Heatherton, 1996: p. 2). (c) (In the second study: Chapter 4) the possibility of competing priorities, in the form of travel goals, having priority over higher-order motives to change. While each of these is a plausible restriction upon behaviour change with habit discontinuity, these studies found no clear evidence that the absence of these factors was important in changing travel behaviour with residential relocation. Many of the factors participants in the first study (Chapter 3) identified as relevant to their travel could also serve as restrictions, particularly to the extent that the convenience of travel would be threatened, and they would feel (and be) disempowered.

#### **6.4.4. Absence of Cues, or Situational Norms?**

In the qualitative study reported in Chapter 3, one of the less prevalent, but none the less interesting, themes identified around experiences of travel was its situational character: the way in which the nature of the experience depended, to a certain extent, on an interplay between current goals and characteristics of the environment. This is not dissimilar to the findings, in the last study (Chapter 5) that the putative habit discontinuity association (between relocation and travel behaviour change) showed a pattern of mediation by means of living with new housemates (as opposed to living with the same housemates students had been living with before). These findings, together, reflect an interesting aspect of habit, identified in previous literature, between context-cued habitual behaviour and *situational norms*.

A number of different approaches to norms exist (White, Smith, Terry, Greenslade & McKimmie, 2009), though they are, together, different aspects of a person's beliefs about what is normal. Cialdini, Reno and Kallgren (1990), for instance, drew an important distinction between descriptive norms (beliefs about what others did) and injunctive norms (beliefs about what others approve and disapprove of)<sup>47</sup>, and the importance of this distinction has been useful in understanding pro-environmental behaviour, such as household energy conservation (Schultz, Nolan, Cialdini, Goldstein & Giskevicius, 2007). These norms can also be situational norms, tied to the particular social context (Aarts & Dijksterhuis, 2003) that pertain to a situation or context and not

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<sup>47</sup> Injunctive norms and subjective norms (Ajzen, 1991: see Section 2.5) are quite similar.

beyond it. For example, Miao and Wei (2013) identified a difference between norms in hotels (as hedonic) and in the household (as pro-environmental) (see also Goldstein, Cialdini & Griskevicius, 2008). It was earlier noted (Section 2.4.3) that research pertaining to subconscious activation of situation norms also pertains to the contextual cuing of habitual behaviour. Indeed, Neal and colleagues (2011) have, in demonstrating habit as necessary in the process of situational norms, challenged the distinction, which also applies, to a lesser extent, to Neal and colleagues (2009) work (see Section 2.4.1), where an experimental paradigm (Wansink & Park, 2001; Wansink & Kim, 2005) originally used to investigate situational norms (amongst other) explanations of food consumption (Wansink, 2004) was augmented to include habit, with less mention made of normative explanations. It is useful, therefore, to entertain either the idea that habits may be explained as actions based upon situational norms, or that it is situational norms (or rather behaviour based upon them) that become automated by habits in the first instance.

The theme of *interpreting the situation* (Section 3.4.2.3) was, perhaps, somewhat vague in participant accounts, because, like automaticity (Bargh, 1989; see Section 2.9.1), normative social influence is largely not detected by those so influenced (Nolan, Schultz, Cialdini, Goldstein & Griskevicius, 2008). However, some qualitative evidence exists that social influence is a conscious factor in the travel mode choices of young people, including university students (Simons, Clarys, DeBourdeaudhuij, DeGeus, Vandelanotte & Deforche, 2014: p. 155). Thus, while findings reported here (Chapter 3) may show that travellers tend to emphasise the role of rational, practical factors in their travel choices, social influence may be a salient factor for younger people (of whom there were relatively few in the qualitative sample). In the final study, there was some evidence to suggest that when university students changed their term-time accommodation, they also lived with new housemates and, in doing so, more often walked to the university than they had done previously (5.4.3.4). While this may only be a set of incidental correlations, it would seem to support prior claims about the consistency of social cues keeping habits stable with student residential relocation (Wood, et al. 2005). It is possible that group norms (of travel) are formed in the household and that this situational norm changes when a student lives with different people, resulting in a change in travel behaviour. If so, the discontinuity of habit could



be involved to the extent that household norms became automated, and this discontinuity permitted active reconsideration of unthinking behaviour (see also Section 5.2.1.4).

However, the earlier discussion concerning the anticipation of change seems to contradict this strong account of situational norms and habit discontinuity (6.4.1). One possible explanation is that, rather than becoming more autonomous with the disruption of household norms/habits, they moved from one set of norms to another set of norms, and therefore had some insight into the changes that would be required in travel, though not necessarily insight into why they would be required. (Schäfer, Jaeger-Erben and Bamberg (2012) identify something of this order in descriptions of the way new co-residents 'negotiate' different aspects of the household). This is plausible when one considers that students might already be friends with those they move in with (Heath, 2004), and they may have spent time in each others' company in a domestic setting, as friends often do. These explanations, however, may be in keeping with certain domestic behaviours, like reading the newspaper or breakfasting (Wood et al. 2005; Neal et al. 2013), but it is not intuitively clear how these might generalise to day-to-day travel. Such household norms of travel could be entirely ideographic, or they might be connected to a pattern of living in households where travel norms are relevant to interests within the household (e.g. 'green' consumerism). This latter possibility might fit well with the seeming absence of involvement of pro-environmental identity in the process (Section 6.4.2), as it may be that norms of 'green' consumption in the household influence behaviour irrespective of values held by the individual. Perhaps more plausible is that anticipation of living in a new household involves an (implicit) anticipation of the social influence there will be on behaviour (see Simons et al. 2014).

While these possibilities, in the absence of further evidence, can be only speculation, there would appear to be interesting questions to ask both of the real distinction between the context-cuing of habitual behaviour and the situational norm of behaviour in contexts, and how, with context change, one precursor may be distinguished from another. With respect to applications, while these results are far from being a basis for developing these, they would appear to lend some further credence to the use of information-based interventions *at the household level* with residential relocation (Verplanken & Roy, 2016).

#### **6.4.5. Changes in Automaticity (habit?).**

In Section 2.10.3, the scope of questions tested with respect to changes in habit were outlined: that (briefly) changes in automaticity as a result of behavioural changes in the wake of residential relocation (habit discontinuity) could be assessed, but that neither the general weakening of automaticity (habit) that *is* habit discontinuity nor changes in habits (associations in mind) could be directly evaluated (though changes in automaticity are, perhaps, a necessary but not sufficient condition of the latter).

Given this scope, both the second and third studies (Chapters 4 and 5, respectively) evidenced an anticipated reciprocal pattern of changes in automaticity for participants who had relocated, whereby new travel behaviours were enacted with increasing automaticity and 'old' travel behaviours were enacted with decreasing automaticity (which implies with greater awareness and deliberation). Accounts from the first study (Chapter 3) largely support these findings to the extent that participants in this study seemed to be aware of travelling in an automatic way in *familiar* circumstances, having practiced their journeys extensively. The importance of these findings in the context of the thesis overall is one of reassurance. This is because, having shown such reciprocal changes in automaticity, there are grounds for suggesting that habits, themselves, might also be changing but, had these results been inconclusive, this would have been an indication that the changes in travel behaviour recorded were of a very temporary nature, and there would be no grounds to suggest that they could be lasting, or that these findings could be of relevance in using the fixation of behaviour that habits bring (see Chapter 1). However, it is important to reiterate that showing such changes in the automaticity of behaviour is not (ultimately) sufficient to demonstrate that habits themselves have changed.

#### **6.4.6. General Limitations**

It would be remiss not to, at this point, quickly review some of the most important limitations to the empirical evidence reported in this study as, ultimately, these limitations determine the extent to which it evidences the argument in this thesis. While these limitations can be of a theoretical nature, or arising from methodological choices, many are ultimately arose as part of the author's own learning and development as a researcher: this section attempts to capture both these aspects as, without this latter

knowledge, the former may appear incongruous (raising questions such as 'if this was such a problem, then why didn't the researcher do something about it?').

In the absence of the resources to convincingly isolate the mechanism behind habit discontinuity, and study this without the possibility of confounding, it is difficult to infer from an association between a life event and a subsequent behaviour change to the phenomenon itself: to this extent the work in this thesis is contingent upon future research demonstrating this plausible, but hypothetical, mechanism. Thus, in short, that the findings of this thesis can be applied to habit discontinuity is conjecture.

The qualitative study (Chapter 3) was conducted with a degree of flexibility that, in the circumstances, was necessary (beginning with a question derived mostly from prior theory, rather than experience), but may have resulted in findings that are not rooted in strong theoretical assumptions and, therefore, may be read to reflect more an organisation of the content of the data, rather than strong, creative insight or new interpretations. This is a risk in all inductive qualitative research (Reichartz, 2014), but one that coherent methodology mitigates. The study presented in Chapter 3 does, in the author's view, present new ideas, but missed opportunities to explore the subject further. It would also be remiss not to mention that some suggested measures that might have improved the validity or reliability of the study (see Elliott, Fischer & Rennie, 1999) were not implemented due to their practical difficulties. The author learnt a great deal from conducting this study, particularly with respect to the practical and theoretical differences in approach between qualitative and quantitative traditions but, unfortunately, the price of this learning was often paid in opportunities missed, particularly with respect to not appreciating, alongside the benefits of mixing methods, also, some of the challenges this would bring.

The first quantitative study (Chapter 4) had, due to recruitment problems and several mistakes in implementation, limited statistical power, which places limitations on the extent to which its findings may be taken to represent the population. While the second quantitative study (Chapter 5) addressed a number of the limitations from the first study, and so had improved power, at least one key issue - the impact work-experience might have on university student travel to the university - led the study to fall short of recruitment targets. Therefore, while, to some extent, the results of the

second of these studies lend some confidence to the results of the first (no important finding was contrary), the high rate of inconclusive/ non-statistically-significant results may either be taken as some indication that the effects hypothesised, if they do exist, are small, or perhaps trivial, *or* be taken as an indication that both studies may have a tendency to generate 'false-negative' results from statistical tests. These setbacks have also been an important source of development for the author as a researcher, in learning the paramount importance of: (a) informal, or formal exploratory, research of the target population in order to gain some basic understanding of the practicalities involved for recruitment and drawing inferences from the sample to the population; (b) implementing targeted recruitment, including the craft of questionnaire design with participants in mind (e.g. Tourangeau & Rasinski, 1988).

Both quantitative studies, also, do not directly address the role of norms as an additional factor in the HDH process: in retrospect, this was an important oversight, because to do so might have settled a number of unanswered questions that have arisen in consequence of the findings obtained, particularly with respect to the role of household changes. The source of this oversight is in the author's proliferation of interests with respect to the HDH, which divided time and effort across a number of research questions (many of which were not sufficiently considered with respect to their validity or feasibility for their inclusion in this thesis). This provided less time for considering the importance of norms that, with hindsight, have proved to be a more important element than the author had initially anticipated. These setbacks have been an important source for the author's development as a researcher in showing the importance of putting aside a diversity of interests (a set of studies cannot address all outstanding questions) in favour of a concerted attempt to address only a particular question of importance, and this, and no other, question in appreciation of its aspects, varieties and possibilities.

Both quantitative studies were studies of the travel behaviour of university students when they residentially relocate between term-time accommodation. University students represent an interesting population to consider with respect to habit discontinuity and travel mode choice (see Sections 4.2.1 and 5.2.1.4). However, another reason for considering university students as a population was their convenience: (a) university students knew when they would residentially relocate, and

did so at particular times of year that could be anticipated; (b) the co-operation of 'gatekeepers' for participants recruitment was largely unnecessary. This convenience permitted a degree of control that is usually not possible in field studies of naturally-occurring phenomena, thus improving the internal validity of these studies. The cost is a certain risk that the population selected was not a valid one for the occurrence of habit discontinuity (perhaps students do not have the time to develop strong habits in or around term-time accommodation; perhaps students, as younger people, have not developed strong general habits of travel). The finding of a habit discontinuity effect in both studies helps vindicate the idea that students might experience habit discontinuity in the same way other populations may or may not do. However, the absence of evidence for many of the hypothesised additional effects does not remove doubt that the effect found may have been due to something else that the studies did not assess (e.g. changes in finance as students use their student loans). In retrospect, the price of somewhat greater internal reliability at the risk of external validity may not have been the best of trade-offs, however this approach does provide some convergent validity to the findings of others to the extent that: (a) the effect seems to persist under slightly more controlled conditions and (b) the effect seems to occur for university students and their walking behaviour, in contrast to the automobile driving behaviour of workplace commuters (Verplanken et al. 2008; Walker et al. 2014; Thomas et al. 2016).

## **6.5. Conclusions**

In the introduction to this thesis (Chapter 1) two broad questions were stated as being addressed in this thesis: (a) whether habit discontinuity (and habit more generally) is something that is experienced and which individuals include in their own accounts of travel change and continuity; (b) the role of other factors, related to the context of habit discontinuity within a life event, in the habit discontinuity effect itself. These two general questions were addressed using different methodologies: the first was addressed using a qualitative research study (see Section 2.9 and Chapter 3); the second was addressed using two quantitative research studies (see Chapters 4 and 5).

With respect to the first question, interviews with a group of commuters from the same locale was not characterised by a qualitative distinction between travel at times of change and times of stability. Instead, a pattern was identified whereby travel

choices were made using reasoning and taking into account various different important considerations, whereas travel itself may be enacted with various degrees of concentration/consciousness, particular with respect to whether the route had been travelled regularly over a long period of time. Thus, while the findings reflected an awareness of the operation of habit in the *action* or travel, they did not do the same for either habit in travel *choices* or any important change in the way travel choices were made over time. While this represents an initial, qualitative study, designed to explore and raise questions rather than to verify/falsify and answer questions, the findings of this study point to an absence of awareness of habit discontinuity, as well as an absence of awareness of more implicit motives, on the part of the day-to-day traveller.

With respect to the second question, two studies demonstrated a small association between residential relocation (university students changing their term-time accommodation) and changing travel behaviour (the extent to which university students walked when travelling to their university). This association is consistent with the habit discontinuity hypothesis (Wood et al. 2005; Verplanken et al. 2008). A pattern of reciprocal changes in the automaticity of travel also favoured the idea that behaviour changes may reflect changes in habit (consistent with the findings of Walker, et al. 2014). However, other factors hypothesised to be important to the habit discontinuity effect were not evidenced as of any importance in either study (with one or two exceptions). Importantly, existing values (as well as pro-environmental identity) were not shown to be motivations that explained the association observed: unlike previous studies (Verplanken, et al. 2008; Thomas, et al. 2016) values did not appear to be the motivation for change in travel. Thus, while the habit discontinuity hypothesis was consistent with the findings, the value activation hypothesis was not. Hypotheses related to barriers to implementing changes due to ease/difficulty (Thompson, et al. 2011) and the relationship between habitual behaviour and self-regulation (Neal, Wood & Drolet, 2013; see also Thompson, et al. 2011) were not evidenced, findings that may indicate that, in the context of students changing accommodation and travel behaviour, these were not relevant factors (perhaps changes were easy, not stressful and were not a source of conflicting priorities).

Importantly, there was no evidence to suggest that changes in walking-distance with residential relocation explained changes in walking behaviour, as this was perhaps

the most intuitive alternative explanation for the association between relocation and more often choosing to walk to a destination. Interestingly, however, the extent to which participants lived with new housemates, rather than the housemates they lived with before, seemed to mediate the association between relocation and walking to the university. While this is consistent with the idea that this may be due to the absence of cues to habitual travel in the new household compared to the old household (e.g. Wood et al. 2005), it is also consistent with the idea that situational norms (Aarts & Dijsterhuis, 2003) around the household may have changed, and produced the same pattern of association to the extent that norms determine this behaviour. Further research is necessary to resolve these two competing explanations within the context of habit discontinuity, particularly to the extent that habits, themselves, may be preserving behavioural norms (Klößner & Matthies, 2012). Finally, a similar pattern of mediation, across both studies, was evidenced for anticipating/planning to travel in a certain way. This favours the idea that changes in behaviour with relocation were *not* reconsiderations of behaviour with external events (e.g. Dahlstrand & Biel, 1997) or by-products of behavioural disruption (e.g. Fuji & Kitamura, 2003), but favours deliberation of making changes prior to residential relocation that may, or may not, have been facilitated by habit discontinuity (e.g. Schäfer, et al. 2012).

With respect to theory, the findings in this thesis serve to cast doubt on certain possibilities, such as: (a) that habit discontinuity, or habitual travel mode choice, are phenomena that individuals are aware of; (b) that habit discontinuity involves spontaneous, as opposed to prior, reconsideration of behaviour; (c) that natural habit discontinuity would require the activation of values as a motivation. However, it must be conceded that these doubts are far from conclusive, and may only assist future work by pointing to more likely possibilities.

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## Appendix A: Interview Guide

### Research Question:

**What accounts do people give of change and continuities in their day-to-day travelling over time?** (To what extent are continuities described as routine or habitual? To what extent are changes described as being part of moments of changing circumstances?)

I1. Outline the nature of the interview and obtain informed consent.

QA. **"How would you describe your experiences of everyday travel [at the moment]?"**

What do you do while you're travelling?

"What goes through your mind during day-to-day travel?"

Do you try to enjoy the journey; do work, or study?

How much do you plan your journeys before you set off?

Do you think much about your travelling while you're making the journey?

"How much attention would you say you give to these journeys?"

"To what extent would you describe your day-to-day travel as 'routine' or 'repetitive'; something you do on 'auto-pilot'?"

QB. **"Can you tell me about a time when you've changed your day-to-day travel?"**

What lead to the change? [Could you tell me a bit more about the circumstances of the change?]

[After reflecting the before, during and after] "Could you tell me a bit more about your experience of travel *before, during and after* the change" [Split them up, if necessary].

"So [to clarify] would you say *this change was due to circumstances or something you would have done anyway*, all things being equal, *or was it prompted by something in particular?*"

So, overall, what would you say were your motives for the change?

"Were there other things you had to change on the same account?"/ "To what extent did the purposes of your travel change at this time?"

"How did you find 'getting used to' day-to-day travel after the change?"

"How did changing the way you travel impact on other things that you do day-to-day?"

"Is there anything else that you'd like to say about this particular change before we move on?"

QC. **"Before we finish, I'd just like to ask whether there's anything else that we might have missed?"**

I2. Debrief.

## **Appendix B: Questionnaire Materials - First Questionnaire Study**

### **B1.1. Baseline Questionnaire (Change and No-Change participants)**

[Screening, Briefing and Consent]

Welcome and thank you for your interest in our study. The aim of this study is to find out about the travel-psychology of university students. Before you begin please answer whether the following statement is true of you or not true of you.

"I am 18 years old or older. I am a university student. I do not, or did not, start or finish my university course in this calendar year. I anticipate changing my term-time accommodation within the next 6 weeks."

[For no-change participants, this statement read...

"I am 18 years or older. I am a university student. I do not, or did not, start or finish my university course in this calendar year. I have not changed my term-time accommodation since the previous semester. I do not anticipate changing my term-time accommodation within the next 3 months."]

- True (1)
- False (2)

If you agree to take part in this study then it will involve completing two questionnaires, each taking approximately 20-25 minutes to complete. One of these questionnaires you would complete now and the other you would complete in approximately 12 weeks from now. In return for completing both these questionnaires your name will be entered into a prize draw with a chance to win one of 10 prizes of £100.

In order to contact you again after 12 weeks and to make the payment I will need to keep your contact details. I will store these confidentially in a password protected computer file, separate from your questionnaire answers, to which only researchers on this project will have access. Once you have completed both questionnaires and, if you should win a cash prize, confirmed that you receive payment, I will remove your contact details and make your data anonymous, so that it cannot be traced back to you individually.

Your participation is voluntary and your decision about participation will not affect your rights or access to services/benefits or have negative consequences. You can withdraw from the study at any time prior to the prize draw and prior to your data being made anonymous.

The project has been reviewed and ethically approved by the School Research Ethics Committee. If you have any questions, comments or concerns about the study then please contact myself (Paul Hagggar), my project supervisor (Dr. Lorraine Whitmarsh) or the School Research Ethics Committee at the addresses below.

[Contact Details for PhD candidate, academic supervisor at Cardiff University and the secretary of the school ethics committee.]

understand that my participation in this project will involve completing two questionnaires on attitudes and travel, with a 12 week interval in between, each questionnaire taking approximately 20-25 minutes to complete. I understand that participation in this study is entirely voluntary and that I can withdraw from the study at any time. I understand that I am free to ask any questions at any time. I am free to withdraw or discuss my concerns with Dr. Lorraine Whitmarsh. I understand that the information provided by me will be held confidentially, such that only Paul Hagggar and Lorraine Whitmarsh can trace this information back to me individually. I understand that my data will be anonymised on my completion of the study and that after this point no-one will be able to trace my information back to me. The anonymised information will be retained indefinitely. I understand that I can ask for the information I provide to be deleted/destroyed at any time up until the data has been anonymised and I can have access to the information up until the data has been anonymised. I also understand that at the end of the study I will be provided with additional information and feedback about the purpose of the study. I consent to participate in the study conducted by Paul Hagggar, School of Psychology, Cardiff University with the supervision of Dr. Lorraine Whitmarsh.

*[Participant Information]*

Q1 Please indicate your gender:

- Male (1)
- Female (2)

Q2 Please indicate the age bracket you are in:

- 18-21 (1)
- 22-25 (2)
- 26-30 (3)
- 31-35 (4)
- 36-44 (5)
- 45-54 (6)
- 55-64 (7)
- 65-74 (8)
- 75 or over (9)
- Prefer not to say (10)

Q3 Are you an undergraduate student or a postgraduate student?

- Undergraduate (1)
- Postgraduate (2)

Q4 What is the total length of your course in years?

- 1 or less (1)
- 2 (2)
- 3 (3)
- 4 (4)
- More than 4 (5)

Q5 What year of your course will you be beginning, or have you begun, this year?

- First (1)
- Second (2)
- Third (3)
- Fourth (4)
- Other (5)

Q6 What is your highest educational qualification?

- No qualification (1)
- GCSEs or equivalent (2)
- A-levels or equivalent (3)
- HNC / HND (4)
- Undergraduate degree (e.g. BA or BSc) (5)
- Postgraduate qualification (e.g. MSc or PhD) (6)
- Other (7)

[No-change participants were not asked question 7.]

Q7 For which of the following purposes are you changing your accommodation (tick all that apply):

- So I can live nearer my place of work/education (1)
- So I can reduce the cost of my accommodation (e.g. Rent, utility bills) (2)
- So I can live in more pleasant accommodation than I do now (3)
- So I can live together with different people to those I currently live with (4)
- So I can live in a more pleasant neighbourhood or settlement (5)
- So I can avoid current problems with the people I live with or my landlord (6)
- Other (Please specify) (7) \_\_\_\_\_

[Values]

Q8 Here we briefly describe some people. Please read each description and think about how much each person is or is not like you. Tick the box to the right that shows how much the person in the description is like you.<sup>48</sup>

[Answer options were: "Very much like me" (1); "Like me" (2); "Somewhat like me" (3); "A Little like me" (4); "Not like me" (5); "Not like me at all" (6); "Don't know" (7).]

1. Thinking up new ideas and being creative is important to her. She likes to do things in her own original way.
2. It is important to her to be rich. She wants to have a lot of money and expensive things.
3. She thinks it is important that every person in the world should be treated equally. She believes everyone should have equal opportunities in life.
4. It's important to her to show her abilities. She wants people to admire what she does.
5. It is important to her to live in secure surroundings. She avoids anything that might endanger her safety.
6. She likes surprises and is always looking for new things to do. She thinks it is important to do lots of different things in life.
7. She believes that people should do what they're told. She thinks people should follow rules at all times, even when no-one is watching.
8. It is important to her to listen to people who are different from her. Even when she disagrees with them, she still wants to understand them.
9. It is important to her to be humble and modest. She tries not to draw attention to herself.
10. Having a good time is important to her. She likes to "spoil" herself.
11. It is important to her to make her own decisions about what she does. She likes to be free and not depend on others.
12. It's very important to her to help the people around her. She wants to care for their well-being.
13. Being very successful is important to her. She hopes people will recognise her achievements.
14. It is important to her that the government ensures her safety against all threats. She wants the state to be strong so it can defend its citizens.
15. She looks for adventures and likes to take risks. She wants to have an exciting life.
16. It is important to her always to behave properly. She wants to avoid doing anything people would say is wrong.
17. It is important to her to get respect from others. She wants people to do what she says.
18. It is important to her to be loyal to her friends. She wants to devote herself to people close to her.
19. She strongly believes that people should care for nature. Looking after the environment is important to her.
20. Tradition is important to her. She tries to follow the customs handed down by her religion or her family.
21. She seeks every chance she can to have fun. It is important to her to do things that give her pleasure.

[*Perceived Stress*]

Q9 The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you

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<sup>48</sup> Depending upon whether the participants answered to being male or female earlier, a matching gender version of this question was given.

should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable description.

[Answer options were: "Very often" (1); "Fairly often" (2); "Sometimes" (3); "Almost Never" (4); "Never" (5).]

1. In the last month, how often have you been upset because of something that happened unexpectedly?
2. In the last month, how often have you been unable to control the important things in your life?
3. In the last month, how often have you felt nervous and "stressed"?
4. In the last month, how often have you dealt successfully with irritating life "hassles"?
5. In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?
6. In the last month, how often have you felt confident about your ability to handle your personal problems?
7. In the last month, how often have you felt that things were going your way?
8. In the last month, how often have you found that you could not cope with all the things that you had to do?
9. In the last month, how often have you been able to control irritations in your life?
10. In the last month, how often have you felt that you were on top of things?

[*Travel Questions*]

Q10 Which mode of travel do you use the most in your daily life while at university?

- Walk (1)
- Cycle (2)
- Car or van (as driver) (3)
- Car or van (as passenger) (4)
- Local Train (5)
- Intercity Train (6)
- Underground Train (7)
- Bus (8)
- Tram (9)
- Motorcycle (10)
- Other (11)

Q11 How frequently do you use this mode of travel?

- More than 3 times per day (1)
- Once or twice per day (2)
- Between 4 and 6 times per week (3)
- Between 1 and 3 times per week (4)
- Less frequently (5)



Q12 Which of the following purposes do you use this mode for? (Select all that apply.)

- Commuting to work (1)
- Commuting to place of education (e.g., university) (2)
- Travel for work (3)
- Shopping or personal business (4)
- Visiting friends or family (5)
- Leisure (6)
- Dropping/collecting a child (e.g., to/from school) (7)
- Other (8)

Q13a Do you plan to change your normal mode of transport when you change your accommodation?

- Yes (1)
- No (2)
- I haven't thought about it (3)

[No-change participants were asked Q13b instead of Q13a.]

Q13b Do you plan to change your normal mode of transport in the next 3 months?

- Yes (1)
- No (2)
- I haven't thought about it (3)

Q14 At the moment, how easy would you find it to change your normal mode of transport for your everyday travel?

- Very Easy (1)
- Quite Easy (2)
- Not Very Easy (3)
- Not at all Easy (4)

[*Travel Goals*]

Q15 Please indicate how much you agree that each of the following matters to you when travelling by your most frequently used travel mode during the university term:

[Answer options were: "*Strongly Agree*" (1); "*Agree*" (2); "*Neither Agree nor Disagree*" (3); "*Disagree*" (4); "*Strongly disagree*" (5).]

1. Avoiding aggression from drivers.
2. Avoiding being exposed to the weather.
3. Avoiding being harmed myself through an accident.
4. Avoiding causing harm to others.
5. Avoiding damage to my own vehicle.

6. Avoiding difficulties parking.
7. Avoiding dirt.
8. Avoiding having to depend on others.
9. Avoiding having to navigate.
10. Avoiding journey hassle/stress.
11. Avoiding other people / having time alone.
12. Avoiding penalties from driving violations.
13. Avoiding risk of being attacked by other people.
14. Avoiding traffic jam delays.
15. Avoiding waiting.
16. Being comfortable.
17. Carrying luggage/shopping etc.
18. Controlling temperature of my immediate environment myself.
19. Enjoying being exposed to the weather.
20. Getting to my destination as quickly as possible.
21. Having good control of my arrival time.
22. Helping protect the environment.
23. Keeping my journey costs down.
24. Making use of the vehicle I already have.
25. Observing other people while travelling.
26. Possessing and controlling my own personal space.
27. Relaxing by listening to own music.
28. Showing my financial standing to others through the way I travel, the way I drive or the type of car I use.
29. Showing my independence to others through the way I travel, the way I drive or the type of car I use.
30. Showing my maturity to others through the way I travel, the way I drive or the type of car I use.
31. Showing my personality to others through the way I travel, the way I drive or the type of car I use.
32. Showing others that I care about the environment through the way I travel, the way I drive or the type of car I use.
33. Showing others that I'm feminine through the way I travel, the way I drive or the type of car I use.
34. Showing others that I'm masculine through the way I travel, the way I drive or the type of car I use.
35. Transporting other people as well as myself.
36. Travelling in a way that my partner, friends or family would approve of.
37. Travelling in the same way that other people like me do.
38. Using time to communicate with others, e.g. by phone.
39. Using time to think about other things.
40. Avoiding tedium while travelling by having an active task to perform.
41. Doing work while travelling.
42. Keeping myself physically fit.
43. Meeting and talking to other people.
44. Reading for leisure while travelling.
45. Relaxing through inactivity or sleep.

*[Habit Strengths]*

Q16 During the university term choosing to drive a car or ride a motorcycle is something...

Q17 During the university term choosing to walk or cycle is something...

Q18 During the university term choosing to take the bus or train is something...

[Each Question had the same four items]

1. ... I do automatically.
2. ... I do without having to consciously remember.
3. ... I do without thinking.
4. ... I start doing before I realize I'm doing it.

[Answer options were: "Strongly agree" (1); "Tend to agree" (2); "Neither agree nor disagree" (3); "Tend to disagree" (4); "Strongly disagree" (5).]

[Additional Questions]

Q19 Please indicate which of the following statements is true of you (select all that apply).

- I own a functioning bicycle (1)
- I own a functioning and legal motor vehicle (automobile, motorbike etc.) (2)
- I do not own a motor vehicle but I have regular use of someone else's (3)
- I own a public-transport season ticket of 3 month duration or more in total (4)
- I possess a rail-card or bus pass that affords a discount on travel by public transport (e.g. A student railcard) (5)

Q20 Please indicate which, if any, of the following events you have experienced within the last 3 months. (select all that apply):

- I moved house (1)
- I moved to another town or city (2)
- I changed my place of work (3)
- I changed my job (4)
- I started a new job (5)
- I left a job or was made redundant (6)
- I changed to a different line of work (7)
- I changed my working hours significantly (e.g. From full-time to part-time employment) (8)
- I ended a long-term relationship (9)
- I began a new relationship (10)
- My partner and I moved in together (11)
- I got married (12)
- I, or my partner, has become pregnant (13)
- I became a parent for the first time (14)
- I had another child (15)
- I started studying full-time (16)
- I completed full-time study (17)
- I chose to retire (18)
- Someone I was close to died (19)
- I have returned to the country from living abroad (20)
- Nothing has changed (21)
- I have experienced a life event but I'd prefer not to say what it is (22)
- I have experienced a life event not listed above (please state) (23) \_\_\_\_\_

Q21 Which of the following descriptions best describes your current accommodation arrangements?

- I live with my parent(s) in their home (1)
- I live in university or privately-managed halls-of-residence (2)
- I live in a shared house or flat (3)
- I rent a house or flat by myself (4)
- I own my own home (5)
- Other (6)

Q22 Which of the following best describes the area where you live during term time?

- In (or close to) the middle of a town or city (1)
- In a suburb (2)
- On the edge of the countryside (3)
- In the middle of the countryside (4)

Q23 How many adults (16 years old or more) occupy your household in total (including yourself)?

- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- More than 8 (9)

Q24 How many children (less than 16 years old) occupy your household in total?

- 0 (1)
- 1 (2)
- 2 (3)
- 3 (4)
- 4 (5)
- 5 (6)
- 6 (7)
- 7 (8)
- 8 (9)
- More than 8 (10)

*[Contact Details]*

The following information is necessary for contacting you in 12 weeks in order to complete the second questionnaire and also for making payments.

Q25 Please provide your full name: [open response].

Q26 Please provide your email address: [open response].

Q27 Please provide your full address: [open response].

Q28 Please provide a contact telephone number: [open response].

*[Completion Message]*

Thank you for completing this questionnaire, which is the first of two questionnaires. A researcher will E-mail you in approximately 12 weeks with a hyperlink to the second questionnaire and, once you complete this second questionnaire, you will be entered into the prize draw.

If you have any questions about the study so far then please contact myself (Paul Haggar) or my project supervisor (Dr. Lorraine Whitmarsh) at the addresses below. If you wish to complain about your experience of the study so far then please contact the secretary of the ethics committee at the address below.

[Contact Details for PhD candidate, academic supervisor at Cardiff University and the secretary of the school ethics committee.]

## B1.2. Follow-up Questionnaire.

*[Follow-up Questions]*

Q1 Please enter your E-mail address and your full name.

E-mail Address (1) [open response]

Full Name (2) [open response]

Q2 Please indicate your gender

- Male (1)
- Female (2)

Q3 At which UK University are you studying? [open response]

Q4 Have you changed your accommodation within the last 12 weeks (or since you completed the first questionnaire)?

- Yes (1)
- No (2)

*[If Q4 is answer "Yes (1)", then Q5 is asked.]*

Q5 On what date did you move into your current accommodation (DD/MM/YYYY)? [open response]

*[If Q4 is answer "No (2)", then Q6 is asked.]*

Q6 Please indicate which of the following statements is true for you [tick all that apply]:

- I changed my term-time accommodation shortly before completing the first questionnaire (approximately 12 weeks ago). (1)
- For most of the vacation between the Spring and Autumn Semesters this year I wasn't in residence at my term-time accommodation but lived elsewhere. (2)
- I relocated to the UK shortly before completing the first questionnaire (approximately 12 weeks ago). (3)
- My non-term-time accommodation (e.g. family home) changed in the last 12 weeks. (4)
- During the past 12 weeks I have been looking to change my term-time accommodation but have not yet done so. (5)
- I had arranged to change my term-time accommodation but my arrangements didn't go according to plan and so I didn't change my accommodation since completing the first questionnaire approximately 12 weeks ago. (6)
- None of the above. (7)

[If Q6 is answer "I change my term-time accommodation... (1)", then Q7 is asked.]

Q7 In the last question you answered that you changed your term time accommodation shortly before completing the first questionnaire. On what date (approximately) did you make this change? [open response].

[If Q6 is answer "None of the above (7)" or not answered, then Q8 is asked.]

Q8 Could you describe briefly the place or places you've been living for the last 12 weeks?

Before I completed the first questionnaire I was living... [open response]

Between completing the two questionnaires I was living... [open response]

I am now living... [open response]

[Values]

Q9 Here we briefly describe some people. Please read each description and think about how much each person is or is not like you. Tick the box to the right that shows how much the person in the description is like you.<sup>49</sup>

[Answer options were: "Very much like me" (1); "Like me" (2); "Somewhat like me" (3); "A Little like me" (4); "Not like me" (5); "Not like me at all" (6); "Don't know" (7).]

1. Thinking up new ideas and being creative is important to her. She likes to do things in her own original way.
2. It is important to her to be rich. She wants to have a lot of money and expensive things.
3. She thinks it is important that every person in the world should be treated equally. She believes everyone should have equal opportunities in life.
4. It's important to her to show her abilities. She wants people to admire what she does.
5. It is important to her to live in secure surroundings. She avoids anything that might endanger her safety.
6. She likes surprises and is always looking for new things to do. She thinks it is important to do lots of different things in life.
7. She believes that people should do what they're told. She thinks people should follow rules at all times, even when no-one is watching.
8. It is important to her to listen to people who are different from her. Even when she disagrees with them, she still wants to understand them.
9. It is important to her to be humble and modest. She tries not to draw attention to herself.
10. Having a good time is important to her. She likes to "spoil" herself.
11. It is important to her to make her own decisions about what she does. She likes to be free and not depend on others.
12. It's very important to her to help the people around her. She wants to care for their well-being.

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<sup>49</sup> Depending upon whether the participants answered to being male or female earlier, a matching gender version of this question was given.

13. Being very successful is important to her. She hopes people will recognise her achievements.
14. It is important to her that the government ensures her safety against all threats. She wants the state to be strong so it can defend its citizens.
15. She looks for adventures and likes to take risks. She wants to have an exciting life.
16. It is important to her always to behave properly. She wants to avoid doing anything people would say is wrong.
17. It is important to her to get respect from others. She wants people to do what she says.
18. It is important to her to be loyal to her friends. She wants to devote herself to people close to her.
19. She strongly believes that people should care for nature. Looking after the environment is important to her.
20. Tradition is important to her. She tries to follow the customs handed down by her religion or her family.
21. She seeks every chance she can to have fun. It is important to her to do things that give her pleasure.
22. She thinks it is important to do lots of different things in life. She always looks for new things to try.
23. She thinks it's important not to ask for more than what you have. She believes that people should be satisfied with what they have.
24. It is important to her to make her own decisions about what she does. She likes to be free to plan and to choose her activities for herself.
25. Being very successful is important to her. She likes to impress other people.
26. It is very important to her that her country be safe. She thinks the state must be on watch against threats from within and without.
27. She likes to take risks. She is always looking for adventures.
28. It is important to her to be in charge and tell others what to do. She wants people to do what she says.
29. Religious belief is important to her. She tries hard to do what her religion requires.
30. It is important to her that things be organized and clean. She really does not like things to be a mess.
31. She thinks it's important to be interested in things. She likes to be curious and to try to understand all sorts of things.
32. She believes all the worlds' people should live in harmony. Promoting peace among all groups in the world is important to her.
33. She thinks it is important to be ambitious. She wants to show how capable she is.
34. She thinks it is best to do things in traditional ways. It is important to her to keep up the customs she has learned.
35. Enjoying life's pleasures is important to her. She likes to 'spoil' herself.
36. It is important to her to respond to the needs of others. She tries to support those she knows.
37. She believes she should always show respect to her parents and to older people. It is important to her to be obedient.
38. She wants everyone to be treated justly, even people she doesn't know. It is important to her to protect the weak in society.
39. She likes surprises. It is important to her to have an exciting life.
40. She tries hard to avoid getting sick. Staying healthy is very important to her.
41. Getting ahead in life is important to her. She strives to do better than others.
42. Forgiving people who have hurt her is important to her. She tries to see what is good in them and not to hold a grudge.
43. It is important to her to be independent. She likes to rely on herself.
44. Having a stable government is important to her. She is concerned that the social order be protected.
45. It is important to her to be polite to other people all the time. She tries never to disturb or irritate others.
46. She really wants to enjoy life. Having a good time is very important to her.
47. She always wants to be the one who makes the decisions. She likes to be the leader.
48. It is important to her to adapt to nature and to fit into it. She believes that people should not change nature.



[*Perceived Stress*]

Q9 The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable description.

[Answer options were: "*Very often*" (1); "*Fairly often*" (2); "*Sometimes*" (3); "*Almost Never*" (4); "*Never*" (5).]

1. In the last month, how often have you been upset because of something that happened unexpectedly?
2. In the last month, how often have you been unable to control the important things in your life?
3. In the last month, how often have you felt nervous and "stressed"?
4. In the last month, how often have you dealt successfully with irritating life "hassles"?
5. In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?
6. In the last month, how often have you felt confident about your ability to handle your personal problems?
7. In the last month, how often have you felt that things were going your way?
8. In the last month, how often have you found that you could not cope with all the things that you had to do?
9. In the last month, how often have you been able to control irritations in your life?
10. In the last month, how often have you felt that you were on top of things?

[*Travel Questions*]

Q10 Which mode of travel do you use the most in your daily life while at university?

- Walk (1)
- Cycle (2)
- Car or van (as driver) (3)
- Car or van (as passenger) (4)
- Local Train (5)
- Intercity Train (6)
- Underground Train (7)
- Bus (8)
- Tram (9)
- Motorcycle (10)
- Other (11)

Q11 How frequently do you use this mode of travel?

- More than 3 times per day (1)
- Once or twice per day (2)
- Between 4 and 6 times per week (3)
- Between 1 and 3 times per week (4)
- Less frequently (5)

Q12 Which of the following purposes do you use this mode for? (Select all that apply.)

- Commuting to work (1)
- Commuting to place of education (e.g., university) (2)
- Travel for work (3)
- Shopping or personal business (4)
- Visiting friends or family (5)
- Leisure (6)
- Dropping/collecting a child (e.g., to/from school) (7)
- Other (8)

*[If Q12 is answered with response "Commuting to place of education [...] (2)" then Q13 is asked.]*

Q13 How long does the journey to your university campus take? [open response]

*[If Q4 is answered "Yes (1)" then Q14 is asked.]*

Q14 Before you changed your accommodation, how long did the journey to your university campus take? [open response]

*[If Q4 is answered "No (2)" then Q15 is asked.]*

Q15 Twelve weeks ago (when you completed the previous questionnaire), how long did the journey to your university campus take? [open response]

*[If Q6 is answer "I change my term-time accommodation... (1)", then Q16 and Q17 are asked.]*

Q16 Earlier in the questionnaire you stated that you changed your term-time accommodation shortly before completing the first questionnaire. How long did the journey to your university campus take you at that time? [open response]

Q17 Earlier in the questionnaire you stated that you changed your term-time accommodation shortly before completing the first questionnaire. Which mode of travel did you use the most in your daily life while at university before changing term-time accommodation?

- Walk (1)
- Cycle (2)
- Car or van (as driver) (3)
- Car or van (as passenger) (4)
- Local Train (5)
- Intercity Train (6)
- Underground Train (7)
- Bus (8)
- Tram (9)
- Motorcycle (10)
- Other (11)

[*Travel Goals*]

Q18 Please indicate how much you agree that each of the following matters to you when travelling by your most frequently used travel mode during the university term:

[Answer options were: "*Strongly Agree*" (1); "*Agree*" (2); "*Neither Agree nor Disagree*" (3); "*Disagree*" (4); "*Strongly disagree*" (5).]

1. Avoiding aggression from drivers.
2. Avoiding being exposed to the weather.
3. Avoiding being harmed myself through an accident.
4. Avoiding causing harm to others.
5. Avoiding damage to my own vehicle.
6. Avoiding difficulties parking.
7. Avoiding dirt.
8. Avoiding having to depend on others.
9. Avoiding having to navigate.
10. Avoiding journey hassle/stress.
11. Avoiding other people / having time alone.
12. Avoiding penalties from driving violations.
13. Avoiding risk of being attacked by other people.
14. Avoiding traffic jam delays.
15. Avoiding waiting.
16. Being comfortable.
17. Carrying luggage/shopping etc.
18. Controlling temperature of my immediate environment myself.
19. Enjoying being exposed to the weather.
20. Getting to my destination as quickly as possible.
21. Having good control of my arrival time.
22. Helping protect the environment.
23. Keeping my journey costs down.
24. Making use of the vehicle I already have.
25. Observing other people while travelling.
26. Possessing and controlling my own personal space.
27. Relaxing by listening to own music.
28. Showing my financial standing to others through the way I travel, the way I drive or the type of car I use.

29. Showing my independence to others through the way I travel, the way I drive or the type of car I use.
30. Showing my maturity to others through the way I travel, the way I drive or the type of car I use.
31. Showing my personality to others through the way I travel, the way I drive or the type of car I use.
32. Showing others that I care about the environment through the way I travel, the way I drive or the type of car I use.
33. Showing others that I'm feminine through the way I travel, the way I drive or the type of car I use.
34. Showing others that I'm masculine through the way I travel, the way I drive or the type of car I use.
35. Transporting other people as well as myself.
36. Travelling in a way that my partner, friends or family would approve of.
37. Travelling in the same way that other people like me do.
38. Using time to communicate with others, e.g. by phone.
39. Using time to think about other things.
40. Avoiding tedium while travelling by having an active task to perform.
41. Doing work while travelling.
42. Keeping myself physically fit.
43. Meeting and talking to other people.
44. Reading for leisure while travelling.
45. Relaxing through inactivity or sleep.

*[Habit Strengths]*

Q19 During the university term choosing to drive a car or ride a motorcycle is something...

Q20 During the university term choosing to walk or cycle is something...

Q21 During the university term choosing to take the bus or train is something...

[Each Question had the same four items]

- 1... I do automatically.
- 2... I do without having to consciously remember.
- 3... I do without thinking.
- 4... I start doing before I realize I'm doing it.

[Answer options were: "Strongly agree" (1); "Tend to agree" (2); "Neither agree nor disagree" (3); "Tend to disagree" (4); "Strongly disagree" (5).]

*[Additional Questions]*

Q20 Please indicate which of the following statements is true of you (select all that apply).

- I own a functioning bicycle (1)
- I own a functioning and legal motor vehicle (automobile, motorbike etc.) (2)
- I do not own a motor vehicle but I have regular use of someone else's (3)
- I own a public-transport season ticket of 3 month duration or more in total (4)
- I possess a rail-card or bus pass that affords a discount on travel by public transport (e.g. A student railcard) (5)

Q21 Please indicate which, if any, of the following events you have experienced within the last 3 months. (select all that apply):

- I moved house (1)
- I moved to another town or city (2)
- I changed my place of work (3)
- I changed my job (4)
- I started a new job (5)
- I left a job or was made redundant (6)
- I changed to a different line of work (7)
- I changed my working hours significantly (e.g. From full-time to part-time employment) (8)
- I ended a long-term relationship (9)
- I began a new relationship (10)
- My partner and I moved in together (11)
- I got married (12)
- I, or my partner, has become pregnant (13)
- I became a parent for the first time (14)
- I had another child (15)
- I started studying full-time (16)
- I completed full-time study (17)
- I chose to retire (18)
- Someone I was close to died (19)
- I have returned to the country from living abroad (20)
- Nothing has changed (21)
- I have experienced a life event but I'd prefer not to say what it is (22)
- I have experienced a life event not listed above (please state) (23) \_\_\_\_\_

[If Q21 is answer "I moved house (1)", then Q22 was asked.]

Q22 In the last question you answered that you'd moved house in the last 3 months. Please indicate which of the following statements best describes this move.

- This was a change in my term-time accommodation. (1)
- This was a change in my non-term-time accommodation (e.g. my family moved house). (3)
- This was a move from my non-term-time accommodation (e.g. family home) to my term-time accommodation. (4)
- This was a move from my time accommodation to my non-term-time accommodation (e.g. family home) . (10)
- I don't have both term-time and non-term-time accommodation and changed my permanent accommodation by moving house. (9)
- Another type of house-move not listed above (please describe) (5) \_\_\_\_\_

[If Q21 is answer "I moved to another town or city... (2)", then Q23 was asked.]

Q23 In the last question you answered that you'd moved to another town or city in the last 3 months. Please indicate which of the following statements best describes this move.

- This was a change in my term-time accommodation. (1)
- This was a change in my non-term-time accommodation (e.g. my family moved house). (2)
- This was a move from my non-term-time accommodation (e.g. family home) to my term-time accommodation. (3)
- This was a move from my time accommodation to my non-term-time accommodation (e.g. family home) . (6)
- I don't have both term-time and non-term-time accommodation and changed my permanent accommodation by moving to a new town or city. (5)
- Another type of house-move not listed above (please describe) (4) \_\_\_\_\_

Q24 Which of the following descriptions best describes your current accommodation arrangements?

- I live with my parent(s) in their home (1)
- I live in university or privately-managed halls-of-residence (2)
- I live in a shared house or flat (3)
- I rent a house or flat by myself (4)
- I own my own home (5)
- Other (6)

Q25 Which of the following best describes the area where you live during term time?

- In (or close to) the middle of a town or city (1)
- In a suburb (2)
- On the edge of the countryside (3)
- In the middle of the countryside (4)

Q26 How many adults (16 years old or more) occupy your household in total (including yourself)?

- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- More than 8 (9)

Q27 How many children (less than 16 years old) occupy your household in total?

- 0 (1)
- 1 (2)
- 2 (3)
- 3 (4)
- 4 (5)
- 5 (6)
- 6 (7)
- 7 (8)
- 8 (9)
- More than 8 (10)

[If Q12 is answered with response "Commuting to place of education [...] (2)" then Q28 is asked.]

Q28 How many miles (approximately) do you live from the university campus where you study?  
[open response]

[If Q4 is answered "Yes (1)" then Q29 is asked.]

Q29 Before you changed your accommodation, how many miles (approximately) did you live from the university campus where you study? [open response]

[If Q4 is answered "No (2)" then Q30 is asked.]

Q30 Twelve weeks ago (when you completed the previous questionnaire), how many miles (approximately) did you live from the university campus where you study? [open response]

[If Q6 is answer "I change my term-time accommodation... (1)", then Q31, Q32, Q33, Q34 Q35 and Q36 are asked.]

Q31 Earlier in the questionnaire you stated that you changed your term-time accommodation shortly before completing the first questionnaire. Please answer the following four questions with regard to your accommodation arrangements before you made this change.

Q32 Which of the following descriptions best describes your accommodation arrangements before you changed your accommodation?

- I live with my parent(s) in their home (1)
- I live in university or privately-managed halls-of-residence (2)
- I live in a shared house or flat (3)
- I rent a house or flat by myself (4)
- I own my own home (5)
- Other (6)

Q33 Which of the following best describes the area where you lived during term time before you changed your accommodation?

- In (or close to) the middle of a town or city (1)
- In a suburb (2)
- On the edge of the countryside (3)
- In the middle of the countryside (4)

Q34 How many adults (16 years old or more) occupied your household in total (including yourself) at that time?

- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- More than 8 (9)

Q35 How many children (less than 16 years old) occupied your household in total at that time?

- 0 (1)
- 1 (2)
- 2 (3)
- 3 (4)
- 4 (5)
- 5 (6)
- 6 (7)
- 7 (8)
- 8 (9)
- More than 8 (10)

Q36 Earlier in the questionnaire you stated that you changed your term-time accommodation shortly before completing the first questionnaire. How many miles did you live from the university campus where you were studying at that time?

*[Completion Message and Debrief]*

### **Travel habit, travel behaviour and value change with student residential relocation**

**Thank you very much for taking part in my study.**

The purpose of this study is to try to psychologically explain changes in travel behaviour that arise after a life event that disturbs a person's travel routines. We are testing the idea that a life event that disrupts travel routines (such as moving house as a student) will lead to closer reflection on travel and whether it is meeting your current needs or is simply being done out of habit. So it is possible that when a person's travel routines are disrupted they will be more receptive to reconsidering how they travel: we are seeing if this is the case or not with a view to improving the provision of safety and environmental information provided to travellers.

In order to test this idea we are asking people who expect to experience these life events to complete a questionnaire before and after the life events and then seeing if the answers change in a consistent way across all the people who take part. If you didn't change your accommodation over the course of the study then you participated in the control group: it is important to have a group of participants who are not changing accommodation so that we can



compare your answers to the answers of participants who did change their accommodation to see whether changing accommodation was the important factor in changes in travel attitudes and behaviour.

Now that you have completed both questionnaires, your data will be stored confidentially until after the prize-draw, whereupon we will inform you whether you have won a prize or not and delete/destroy the record of your name and contact details, either at this point or after the prize is paid to you, in order to make the data anonymous (untraceable to you as an individual). You may still withdraw from the study without stating reasons for doing so, by contacting me (Paul Haggar), but you may no longer withdraw from the study once your data is made anonymous, because we won't be able to determine which is your data and which is not.

If you have any questions, comments or concerns about the study then please contact myself (Paul Haggar), my project supervisor (Dr. Lorraine Whitmarsh) or the School Research Ethics Committee at the addresses below.

[Contact Details for PhD candidate, academic supervisor at Cardiff University and the secretary of the school ethics committee.]

## Appendix C: Additional results from Chapter 4 study.

### C1.1 Additional Accommodation Statistics

Tables C1a and C1b show self-report accommodation description across time for participants who changed and who didn't change their term-time accommodation. It would seem to be the case that most students who change accommodation move to shared accommodation, either from other shared accommodation or from the parental household. Participants who didn't change term-time accommodation mostly live in shared accommodation. Little variation was apparent in location within town participant reported their accommodation to be in: a majority of participants lived, at baseline or follow-up, in urban areas (189, 95.0%).

**Table C1a: Frequency of Accommodation Descriptions for Accommodation-change participants**

|                 |          | Follow-up |       |        |          |       | Total |
|-----------------|----------|-----------|-------|--------|----------|-------|-------|
|                 |          | Parents   | Halls | Shared | Own-rent | Other |       |
| <b>Baseline</b> | Parents  | 2         | 1     | 17     | 1        | 0     | 21    |
|                 | Halls    | 0         | 0     | 5      | 1        | 0     | 6     |
|                 | Shared   | 0         | 1     | 17     | 0        | 0     | 18    |
|                 | Own-rent | 1         | 0     | 1      | 0        | 0     | 2     |
|                 | Other    | 0         | 0     | 1      | 0        | 1     | 2     |
| <b>Total</b>    |          | 3         | 2     | 41     | 2        | 1     | 49    |

**Table C1b: Frequency of Accommodation Descriptions for No Accommodation-change participants**

|  | Follow-up | Total |
|--|-----------|-------|
|--|-----------|-------|

|                 | Parents  | Halls | Shared | Own-rent | Own-home | Other |     |
|-----------------|----------|-------|--------|----------|----------|-------|-----|
| <b>Baseline</b> | Parents  | 17    | 0      | 6        | 0        | 0     | 23  |
|                 | Halls    | 0     | 19     | 3        | 0        | 0     | 22  |
|                 | Shared   | 0     | 0      | 76       | 2        | 0     | 78  |
|                 | Own-rent | 0     | 0      | 3        | 12       | 0     | 17  |
|                 | Own-home | 0     | 0      | 0        | 0        | 2     | 2   |
|                 | Other    | 1     | 0      | 3        | 1        | 1     | 7   |
| <b>Total</b>    | 18       | 19    | 91     | 15       | 3        | 3     | 149 |

Excluding reduction in travel distances/times as a reason for accommodation change (see 4.4.1.1.1 in the thesis), other reasons included: to live in more pleasant accommodation (19, 41.3%); to live with different people (18, 39.1%); to reduce the cost of accommodation (15, 32.6%); to avoid current problems with housemates or the landlord (7, 15.2%); to live in a more pleasant area (3, 6.5%). These reasons pertained in the majority of cases, but some participants gave their own reasons to the free-response item instead: 2 (4.3%) intended to move due to the necessity of vacating halls-of-residence after the first year; 1 (2.2%) moved in with their fiancé; 1 (2.2%) moved to "fulfil their course requirements" (perhaps to undertaken research elsewhere or to complete a work-placement).

## Appendix D: Questionnaire Materials - Second Questionnaire Study

### D1.1: Baseline Questionnaire

#### *[Initial Briefing]*

Welcome and thank you for your interest in our study. The aim of this study is to find out about the travel-psychology of university students over an extended period of time.

We're particularly interested in the psychological and practical aspects of everyday travel when university students change their term-time accommodation.

If you agree to take part in this study then it will involve completing:

- one 20 minute questionnaire now
- ... and another 20 minute questionnaire after the 27th of October.

In return for completing both these questionnaires you will receive a £5 Amazon gift voucher.

#### *[Screening Questions]*

Q1. Before you begin the questionnaire, please indicate which of these following statements, for you, is true of false.

1. I am a university student.
2. I am studying part-time.
3. I am a postgraduate student.
4. I will be living (and studying) in the UK during the university term.
5. I anticipate moving into new term-time accommodation before the start of October this year.
6. I anticipate graduating later this year.

*[Those answering 'false' to questions 1 or 4, or 'true' to question 6 were screened at this point. If answers to questions 3 and 5 corresponded to a quota that had been fulfilled, then the*

*participant was screened at this point. Screened participants received a short message thanking them for volunteering and explaining (very briefly) why they could not continue.]*

*[Complete Briefing]*

Before beginning the questionnaire please read the following important information.

The questionnaires will ask you to provide some confidential information, your:

- Full name,
- Contact address,
- Contact telephone number,
- Contact E-mail address
- Post-code of your term-time address.

We ask for your name, E-mail address and telephone number in order to get in touch with you again, after the 27th of October, to complete the second questionnaire. We ask for your postal address so that we can send you the Amazon gift voucher after completing both questionnaires. We ask for your term-time accommodation postcode so that we can estimate the distances between your term-time accommodation and other locations (such as your university, population centres and public-transport).

We store this information confidentially, separately from your other answers, in a password protected computer file. Only Paul Haggard and Dr. Lorraine Whitmarsh have access to either of these files. Once the study is complete we will destroy this confidential information. This will make the data we keep anonymous: your answers cannot be linked to you as an individual.

Your participation is voluntary. You can withdraw from the study at any time prior to the gift-voucher being sent to you and your data being made anonymous. Once you have completed the final questionnaire after the 27th of October you will receive a full explanation regarding the specific objectives of the study and how our findings will be used. If, at this point, you are unhappy with the objectives of the research, you are free to withdraw from the study. The reason we don't provide a full explanation at the beginning of the study is because doing so can alter the way people answer some questions (Orne, 1962; Furnham, 1986).

This project has been reviewed and ethically approved by the School Research Ethics Committee. If you have any questions, comments or concerns about the study then please contact myself (Paul Haggard), my project supervisor (Dr. Lorraine Whitmarsh) or the School Research Ethics Committee using the following contact information

[Contact details for those listed].

*[Consent]*

I understand that my participation in this project will involve completing two questionnaires, each taking 20 minutes to complete, with an interval of up to 6 months in between.

I understand that participation in this study is entirely voluntary and that I can withdraw from the study at any time prior to the data being made anonymous at the end of the study; I am

free to ask any questions at any time and to discuss my concerns with Dr. Lorraine Whitmarsh.

I understand that the information provided by me will be held confidentially. I understand that my data will be anonymised on my completion of the study and that after this point no-one will be able to trace my information back to me. I understand that I can ask for the information I provide to be deleted/destroyed at any time up until the data has been anonymised and I can have access to the information up until the data has been anonymised.

I also understand that at the end of the study I will be provided with additional information and feedback about the purpose of the study.

I consent to participate in the study conducted by Paul Haggar, School of Psychology, Cardiff University under the supervision of Dr. Lorraine Whitmarsh.

- I consent (1)
- I do not consent (2)

[Participants answering 'I do not consent (2)' were screened at this point and thanked for taking the time to consider participating].

*[Demographic Information]*

Q1 Please indicate your gender:

Male (1)

Female (2)

Q2 Please indicate the age bracket you are in:

18-21 (1)

22-25 (2)

26-30 (3)

31-35 (4)

36-44 (5)

45-54 (6)

55-64 (7)

65-74 (8)

75 or over (9)

Prefer not to say (10)

Q3 What year of study are you in at the moment?

- First (1)
- Second (2)
- Third (3)
- Fourth (4)
- Fifth (5)
- Sixth (6)
- Other (please state) (7) \_\_\_\_\_

Q4 Which of these best describes your current year of study?

- Undergraduate Taught (1)
- Postgraduate Taught (2)
- Research (3)
- Professional or Work Placement (4)
- Other (please state) (5) \_\_\_\_\_

[Participants who answered 'true' to the third screening question were not presented with option '1'; other participants were not presented with options '2' or '3'.]

Q5 At which UK university do you study? [open-response]

Q6 What is the name of your course e.g. "Psychology and European History" [open-response]

*[Car License Information]*

Q6 Do you have a current driving license?

- Yes (1)
- No (2)
- I'm learning to drive at the moment (3)

[If Q6 was answered 'Yes (1)', Q7 and Q8 were asked.]

Q7 Did you pass your driving test in the past 12 months?

- Yes (1)
- No (2)

Q8 Do you own a car or motorbike?

- Yes (1)
- No (2)
- I don't, but I have access to someone else's (3)

[If Q8 was answered 'Yes (1)', then Q9 was asked; if Q8 was answered 'I don't [...] someone else's (3)', Q10 was asked.]

Q9 Do you keep your motor vehicle with you during term-time?

- Yes (1)
- No (2)

Q10 Do you have access to someone else's motor vehicle during term-time?

- Yes (1)
- No (2)

*[Accommodation Information]*

The following questions ask you about your term-time accommodation arrangements.

When you answer these questions, please keep in mind that your term-time accommodation is where you live while you're studying at university. So if you live in the same accommodation both during the academic term and during holidays/recesses, then this is your term-time accommodation. However, if there is a place that you only live in when you're not studying then this is not your term-time accommodation.

Q11. Which of the following best describes your term-time accommodation arrangements?

1. I don't intend to move into new term-time accommodation before October this year.
2. I am either thinking about, or looking for, new term-time accommodation or housemates.
3. I have arranged new term-time accommodation (e.g. signed a contract), but I have yet to move into my new accommodation.
4. I have arranged new term-time accommodation (e.g. signed a contract), and have moved into my new accommodation.
5. Other (please state) \_\_\_\_\_

[If answers to the fourth screening item and the answers to Q11 did not agree (e.g. 'true' to the screen and '1. I don't intend [...] to Q11, then Q12 was asked.]

Q12. Do you anticipate moving into new term-time accommodation before the start of October this year?

- Yes (1)
- No (2)
- Unsure (3)

[If the fourth screening question was answered 'true' and Q11 was answered '4. I have arranged [...] and have moved into my new accommodation ', then Q13 was asked.]

Q13. Having moved into new term-time accommodation, do you intend to change your term-time accommodation again before October this year?

- Yes (1)
- No (2)
- Maybe (3)

[If answers to the fourth screening item and Q11 concurred, or if Q12 was answered 'Yes (1)' or Q13 was answered 'Yes (1)', then Q14 was asked.]

Q14 For which of the following purposes are you changing your accommodation (tick all that apply):

- So I can live nearer my place of work/education (1)
- So I can reduce the cost of my accommodation (e.g. Rent, utility bills) (2)
- So I can live in more pleasant accommodation than I do now (3)
- So I can live together with different people to those I currently live with (4)
- So I can live in a more pleasant neighbourhood or settlement (5)
- So I can avoid current problems with the people I live with or my landlord (6)
- As I cannot stay on in halls-of-residence/ university accommodation (8)
- Other (Please specify) (7) \_\_\_\_\_

[If answers to the fourth screening item and Q11 concurred, or if Q12 was answered 'Yes (1)' or Q13 was answered 'Yes (1)', then Q15 was asked.]

Q15 When do you anticipate moving into your new term-time accommodation?

- After September 1st, 2015 (1)
- June, July or August, 2015 (2)
- April or May, 2015 (3)
- Before April 19th, 2015 (4)
- Unsure (5)

Q16 Your current term-time accommodation is where you lived most recently or are living in at the moment. Which of the following descriptions best describes your current term-time accommodation?

- I live with my parent(s) in their home (1)
- I live in university or privately-managed halls-of-residence (2)
- I live in a shared house or flat (3)
- I rent a house or flat by myself (4)
- I own my own home (5)
- Other (please state) (6) \_\_\_\_\_

Q17 It would be very useful to us if you could provide a precise date, or date range (e.g. 5th July-15th July, 2014), for when you moved into your current term-time accommodation. [open response].

[If Q11 was answered '4. I have arranged [...] and have moved into my new accommodation ', then Q18 was asked.]

Q18 Which of the following descriptions best describes your previous term-time accommodation?

- I live with my parent(s) in their home (1)
- I live in university or privately-managed halls-of-residence (2)
- I live in a shared house or flat (3)
- I rent a house or flat by myself (4)
- I own my own home (5)
- Other (6)

*[Travel-Mode Choice]*

Q19 How many days in a typical week do you visit the university?

- Never (1)
- 1 day (2)
- 2 days (3)
- 3 days (4)
- 4 days (5)
- 5 days (6)
- 6 or 7 days (7)



Q20.1 Please Indicate the number of days in a typical week where you use each of these modes of transport to get to and return from the university.<sup>50</sup>

|  | To get to university from your term time accommodation |                       |                       |                       |                       |                       |                       | To return from university to your term-time accommodation |                       |                       |                       |                       |                       |                       |
|--|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|  | Never (1)  | 1 day (2)             | 2 days (3)            | 3 days (4)            | 4 days (5)            | 5 days (6)            | 6 or 7 days (7)       | Never (1)   | 1 day (2)             | 2 days (3)            | 3 days (4)            | 4 days (5)            | 5 days (6)            | 6 or 7 days (7)       |
| Walk (1)   | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Cycle (2)  | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Car or motorcycle (as driver) (3)                    | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Car or motorcycle (as passenger including taxis) (4) | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Train (5)  | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Bus or Tram (6)                                      | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other (7)  | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q20.2 We're also interested in the extent to which you mix two or more different modes of travel to get to the university during a typical week.

Examples: (1) driving to a car-park and then walking for 15 minutes to the university; (2) cycling for 3 minutes to a train-station before taking the train to the university. If you combine modes of travel in a single trip, when travelling to or from the university during a typical week, than please describe how you do so.

[open response]

Q21 Please Indicate the number of days in a typical week where you've used each of these modes of transport for purposes other than going to and from the university (e.g. shopping, leisure, commuting to paid work, visiting friends and family).<sup>51</sup>

<sup>50</sup> The table represents the approximate layout of the question and answer-response options. Only two responses could be selected in each row, one for each set of 1-7 options; the default response, selected for all items on the page opening, was '1 Never'.

<sup>51</sup> The table represents the approximate layout of the question and answer-response options. Only one responses could be selected in each row. The default response, selected for all items on the page opening, was '1 Never'.

|  | Never<br>(1)          | 1 day a<br>week<br>(2) | 2 days a<br>week (3)  | 3 days a<br>week (4)  | 4 days a<br>week (5)  | 5 days a<br>week (6)  | 6 or 7<br>days a<br>week (7) |
|--|-----------------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------------|
| Walk (1)   | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |
| Cycle (2)  | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |
| Car or motorcycle (as<br>driver) (3)                       | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |
| Car or motorcycle (as<br>passenger including<br>taxis) (4) | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |
| Train (5)  | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |
| Bus or Tram (6)  | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |
| Other (7)  | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |

*[Intentions and PBC]*

Q22 During the next 6 months I will get to and from the university by...

[Answer options were: "Strongly agree (1)", "(2)", "(3)", "Neither Agree Nor Disagree (4)", "(5)", "(6)", "Strongly Disagree (7)".]

1. ...either walking or by cycling
2. ...by car, taxi or motorcycle
3. ...either bus or train

Q23 During the next 6 months I will get to and from the university by...

[Answer options were: "Definitely Will (1)", "(2)", "(3)", "Unsure (4)", "(5)", "(6)", "Definitely Won't (7)".]

1. ...either walking or by cycling
2. ...by car, taxi or motorcycle
3. ...either bus or train

Q24 Over the next 6 months how easy or difficult would it be for you to get to the university by...

[Answer options were: "*Extremely Easy (1)*", "(2)", "(3)", "*Unsure (4)*", "(5)", "(6)", "*Extremely Difficult (7)*".]

1. ...either walking or by cycling
2. ...by car, taxi or motorcycle
3. ...either bus or train

Q25 Over the next 6 months how possible or impossible would it be for you to get to the university by...

[Answer options were: "*Possible (1)*", "(2)", "(3)", "*Unsure (4)*", "(5)", "(6)", "*Impossible (7)*".]

1. ...either walking or by cycling
2. ...by car, taxi or motorcycle
3. ...either bus or train

[*Habit Strengths*]

[If Q6 was answered 'Yes (1)', then Q26 was asked.]

Q26 When I travel during the university term, travelling by car or by motorcycle is something...

[Answer options were: "*Strongly agree (1)*", "*Tend to agree (2)*", "*Neither agree nor disagree (3)*", "*Tend to disagree (4)*", "*Strongly disagree (5)*".]

1. ... I do automatically.
2. ... I do without having to consciously remember.
3. ... I do without thinking.
4. ... I start doing before I realize I'm doing it.

Q27 When I travel during the university term, travelling by walking or by bicycle is something...

[Answer options were: "Strongly agree (1)", "Tend to agree (2)", "Neither agree nor disagree (3)", "Tend to disagree (4)", "Strongly disagree (5)".]

1. ... I do automatically.
2. ... I do without having to consciously remember.
3. ... I do without thinking.
4. ... I start doing before I realize I'm doing it.

Q28 When I travel during the university term, travelling by bus or by train is something...

[Answer options were: "Strongly agree (1)", "Tend to agree (2)", "Neither agree nor disagree (3)", "Tend to disagree (4)", "Strongly disagree (5)".]

1. ... I do automatically.
2. ... I do without having to consciously remember.
3. ... I do without thinking.
4. ... I start doing before I realize I'm doing it.

[Values]

Q28 Here we briefly describe some people. Please read each description and think about how much each person is or is not like you. Tick the box to the right that shows how much the person in the description is like you.<sup>52</sup>

[Answer options were: "Very much like me (1)", "Like me (2)", "Somewhat like me (3)", "A little like me (4)", "Not like me (5)", "Not like me at all (6)", "Don't Know (7)".]

1. Thinking up new ideas and being creative is important to her. She likes to do things in her own original way.
2. It is important to her to be rich. She wants to have a lot of money and expensive things.
3. She thinks it is important that every person in the world should be treated equally. She believes everyone should have equal opportunities in life.
4. It's important to her to show her abilities. She wants people to admire what she does.
5. It is important to her to live in secure surroundings. She avoids anything that might endanger her safety.
6. She believes that people should do what they're told. She thinks people should follow rules at all times, even when no-one is watching.
7. It is important to her to listen to people who are different from her. Even when she disagrees with them, she still wants to understand them.
8. It is important to her to be humble and modest. She tries not to draw attention to herself.
9. It's very important to her to help the people around her. She wants to care for their well-being.
10. It is important to her always to behave properly. She wants to avoid doing anything people would say is wrong.
11. It is important to her to be loyal to her friends. She wants to devote herself to people close to her.
12. She strongly believes that people should care for nature. Looking after the environment is important to her.
13. She seeks every chance she can to have fun. It is important to her to do things that give her pleasure.
14. It is important to her to adapt to nature and to fit into it. She believes that people should not change nature.
15. She always wants to be the one who makes the decisions. She likes to be the leader.
16. She really wants to enjoy life. Having a good time is very important to her.
17. It is important to her to be polite to other people all the time. She tries never to disturb or irritate others.
18. Having a stable government is important to her. She is concerned that the social order be protected.

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<sup>52</sup> Depending upon whether the participants answered to being male or female earlier, a matching gender version of this question was given.

19. It is important to her to be independent. She likes to rely on herself.
20. Forgiving people who have hurt her is important to her. She tries to see what is good in them and not to hold a grudge.
21. She thinks it is important to do lots of different things in life. She always looks for new things to try.
22. She thinks it's important not to ask for more than what you have. She believes that people should be satisfied with what they have.
23. It is important to her to make her own decisions about what she does. She likes to be free to plan and to choose her activities for herself.
24. Being very successful is important to her. She likes to impress other people.
25. It is very important to her that her country be safe. She thinks the state must be on watch against threats from within and without.
26. She likes to take risks. She is always looking for adventures.
27. It is important to her to be in charge and tell others what to do. She wants people to do what she says.
28. Religious belief is important to her. She tries hard to do what her religion requires.
29. It is important to her that things be organized and clean. She really does not like things to be a mess.
30. She thinks it's important to be interested in things. She likes to be curious and to try to understand all sorts of things.
31. She believes all the worlds' people should live in harmony. Promoting peace among all groups in the world is important to her.
32. She thinks it is important to be ambitious. She wants to show how capable she is.
33. She thinks it is best to do things in traditional ways. It is important to her to keep up the customs she has learned.
34. Enjoying life's pleasures is important to her. She likes to 'spoil' herself.
35. It is important to her to respond to the needs of others. She tries to support those she knows.
36. She believes she should always show respect to her parents and to older people. It is important to her to be obedient.
37. She wants everyone to be treated justly, even people she doesn't know. It is important to her to protect the weak in society.
38. She likes surprises. It is important to her to have an exciting life.
39. She tries hard to avoid getting sick. Staying healthy is very important to her.
40. Getting ahead in life is important to her. She strives to do better than others.

*[Other Motives]*

Q29 Please indicate how far you agree or disagree with each of the following statements.

[Answer options were: "Strongly Agree (1)", "Mildly Agree (2)", "Unsure (3)", "Mildly Disagree (4)", "Strongly Disagree (5)".]

1. Humans have the right to modify the natural environment to suit their needs.
2. Humans are severely abusing the planet.
3. Plants and animals have the same rights as humans to exist.
4. Nature is strong enough to cope with the impact of modern industrial nations.
5. Humans were meant to rule over the rest of nature.
6. The balance of nature is very delicate and easily upset.

Q30 Please indicate how far you agree or disagree with each of the following statements.

[Answer options were: "Strongly Agree (1)", "Mildly Agree (2)", "Neither Agree Nor Disagree (3)", "Mildly Disagree (4)", "Strongly Disagree (5)".]

1. I think of myself as an environmentally-friendly consumer.
2. I think of myself as someone who is very concerned with environmental issues.
3. I would not want my family or friends to think of me as someone who is concerned about environmental issues.
4. I would be embarrassed to be seen as having an environmentally friendly lifestyle.

Q31 Please indicate how important having each of these goals is to you, that...

[Answer options were: "Extremely important (1)", "(2)", "(3)", "(4)", "Moderately important (5)", "(6)", "(7)", "(8)", "Not at all Important (9)".]

1. I will be in good physical shape
2. I will feel good about my level of physical fitness
3. I will be relatively free from sickness
4. I will be physically healthy

[Life Events]

Q32 Please indicate how far you have experienced important life changes in the following areas of your life at the moment.

[Answer options were: "No change (1)", "(2)", "(3)", "An important change (4)", "(5)", "(6)", "A profound change (7)".]

1. In your living arrangements e.g. moving house or city, living with different people
2. In your work e.g. a new job, different working hours
3. In your personal relationships e.g. a new relationship, the death of someone close
4. In your career/education e.g. transferred to another course, took a gap year or work placement
5. In another aspect of your life

[If any Q32 item was answered between 4 and 7, then the corresponding question (from Q33 to Q37) was asked.]

Q32 What was the nature of the change in your living arrangements? (Please write as little or as much as you like). [open response]

Q33 What was the nature of the change in your work? (Please write as little or as much as you like). [open response]

Q34 What was the nature of the change in your personal relationships? (Please write as little or as much as you like). [open response]

Q35 What was the nature of the change in your career/education? (Please write as little or as much as you like). [open response]

Q36 What was the nature of the change the another aspect of your life? (Please write as little or as much as you like). [open response]

*[Contact Information and Comments]*

Please provide the following information, which is necessary for getting in touch with you again on or after the 27th of October, 2015, to ask you to complete the second questionnaire.

Q37 Please provide your full name: [open response]

Q38 Please provide your email address: [open response]

Q39 Please provide the postcode of the term-time accommodation are currently living in or have lived in most recently (not term-time accommodation you haven't moved into yet): [open response]

Q40 Please provide a contact telephone number: [open response]



Q41 If there is anything about your travel, accommodation or life in general that you'd like to add, or if you have any other comments then please feel free to write in the box below.

[open response]

*[Closing Message]*

Thank you for completing this questionnaire, which is the first of two questionnaires. A researcher will E-mail you on or around the 27th of October with a hyperlink to the second questionnaire and, once you complete this second questionnaire, you will be sent a £5 Amazon gift voucher in the post.

If you have any questions about the study so far then please contact myself (Paul Haggar) or my project supervisor (Dr. Lorraine Whitmarsh) at the addresses below. If you wish to complain about your experience of the study so far then please contact the secretary of the ethics committee at the address below.

**[Contact details for aforementioned.]**

## **D1.2: Follow-up Questionnaire**

*[Briefing and Refreshment of Consent]*

Welcome to the second questionnaire.

As mentioned in the first questionnaire, which you completed earlier in the year, the aim of this study is to find out about the travel-psychology of university students over an extended period of time. We're particularly interested in the psychological and practical aspects of everyday travel when university students who have, or have not, changed their term-time accommodation. Your answers to this questionnaire will give us an idea of how things have changed or stayed-the-same since you completed the previous questionnaire.

On completing this questionnaire you will be sent an Amazon gift voucher worth £5.

Before beginning this questionnaire, we'd like you to provide the following information: (1) your full name, (2) your E-mail address (3) the postcode of your term-time accommodation (4) your full postal address.

This information is requested to confirm your identity (so we can match your questionnaire to the one you completed previously), to send you an Amazon voucher by post and to estimate the distances you might travel on a day-to-day basis. This information will be stored confidentially for the duration of the study and, thereafter, erased.

If you would like more information about how the data is stored, and other ethical aspects of your participation in this study, then please select the appropriate option below.

- I'm happy to proceed. (1)
- I'd like more information. (2)

[Option 2 sent participants to the same information page as was presented in questionnaire one (with minor changes in grammar, such as past and present tenses) before offering the option to continue ("I'm happy to proceed") or not continue ("I'm not happy to proceed and would like to withdraw from the study"). If participants chose the latter, they questionnaire ended, thanking them for their help and these participants were excluded from the study. Option 1, or, on seeing information, within to continue, led to the next question.]

*[Contact Details and Identity Confirmation.]*

Q1 Please provide your full name: [open response]

Q2 Please provide your email address: [open response]

Q3 Please provide the postcode of your term-time accommodation: [open response]

Q4 Please provide your contact address (and postcode): [open response]

*[Demographic Information]*

Q5 Please indicate your gender:

- Male (1)
- Female (2)

Q6 Are you still a university student in the UK?

- Yes (1)
- No (2)

Q7 It would be useful if you could indicate your yearly (or weekly) income including any loans (such as student-loans), financial support, from family or friends, as well as salary/wages from paid employment.

- Up to £5000 per year (or £96 per week) (1)
- £5001 (£97 per week) to £10,000 (£192 per week) (2)
- £10,001 (£193 per week) to £20,000 (£384 per week) (3)
- £20,001 (£385 per week) to £30,000 (£577 per week) (5)
- More than £30,000 (£577 per week) (9)
- I'd prefer not to say (7)
- I'm not sure (8)
- Other [please state] (6) \_\_\_\_\_

[If Q6 was answered 'Yes (1) then Q8 was asked.]

Q8 Have you transferred to a different university this year?

- No (1)
- Yes (2)

[If Q8 was answered 'Yes (2) then Q9 was asked.]

Q9 At which UK university do you now study? [open response]

[If Q6 was answered 'Yes (1) then Q10 was asked.]

Q10 Have you changed your course-of-study this year? For example, from MSc Physics to MSc Medical Physics or from BA English Language to BSc Informatics.

- No (1)
- Yes (2)

[If Q10 was answered 'Yes (2) then Q11 was asked.]

Q11 What is the name of your current course e.g. "BA Psychology and European History":

*[Accommodation Information]*

The following questions ask you about your term-time accommodation arrangements and how they may have changed. When you answer these questions, please keep in mind that your term-time accommodation is where you live while you're studying at university. So if you live in the same accommodation both during the academic term and during holidays/recesses, then this is your term-time accommodation. However, if there is a place that you only live in when you're not studying then this is not your term-time accommodation.

Q12 Which of the following descriptions best describes your term-time accommodation at the moment?

- I live with my parent(s) in their home (1)
- I live in university or privately-managed halls-of-residence (2)
- I live in a shared house or flat (3)
- I rent a house or flat by myself (4)
- I own my own home (5)
- Other (6)

Q13 How many adults and/or children do you share your term-time accommodation with?

[Answer options were: "0", "1", "2", "3", "4", "5", "6", "7", "8 or more".]

1. Adults (16 years old or more)
2. Children (less than 16 years old)

Q14 Since you began living in your current term-time accommodation, have any of the people you share your accommodation with changed (i.e. has anyone moved in or moved out of the house/flat)?

- No (1)
- Yes (2)
- Unsure (3)

[If Q14 is answered 'Yes (2)' then Q15 is asked.]

Q15 How many adults and/or children have moved in or moved out of your term-time accommodation since you moved in?

[Answer options were: "0", "1", "2", "3", "4", "5", "6", "7", "8 or more".]

1. Adults Moved in
2. Children Moved in
3. Adults Left
4. Children Left

Q16 When did you last move into new term-time accommodation?

- After September 1st, 2015 (1)
- August 2015 (2)
- June or July, 2015 (3)
- May, 2015 (4)
- Before May 1st, 2015 (5)

[If Q16 is answered with any option *except* 'Before May 1st, 2015 (5)', then Q17, Q18 and Q19 were asked.]

Q17 It would be very useful to us if you could provide a precise date, or date range (e.g. 5th July-15th July) for when you last moved into new term-time accommodation.

[open response]

Q18 Before you last moved into new term-time accommodation, how many adults and/or children did you share your term-time accommodation with?

[Answer options were: "0", "1", "2", "3", "4", "5", "6", "7", "8 or more".]

1. Adults (16 years old or more)
2. Children (less than 16 years old)

Q19 Do you live with exactly the same people you lived with before you changed your term-time accommodation?

- Yes (1)
- No (2)

[If Q19 is answered 'No (2)', then Q20 is asked.]

Q20 How many people (adults and/or children) do you live with in your current term-time accommodation who you also lived with in your previous term-time accommodation?

[Answer options were: "0", "1", "2", "3", "4", "5", "6", "7", "8 or more".]

1. Adults (16 years old or more)
2. Children (less than 16 years old)

[If Q16 is answered 'After September 1st, 2015 (1)' then Q21 is asked.]

Q21 To what extent would you say you have 'settled in', or gotten used to, living in your term-time accommodation?

- Not at all 'settled-in': I'm not used to it at all. (1)
- Not settled-in, but I am beginning to get used to it. (2)
- Unsure. (3)
- Somewhat 'settled-in' it: I've gotten used to it. (4)
- Very much 'settled-in': I've really gotten used to it. (5)

Q22 Do you intend to change your term-time accommodation in the next 3 or 4 months?

- Yes (1)
- No (2)
- Unsure (3)

[If Q22 is answered *not* answered 'No (2)' then Q23 is asked.]

Q23 Which of the following best describes your current term-time accommodation arrangements?

- I will begin looking for new accommodation soon. (1)
- I have begun looking for accommodation but have yet to find a suitable place. (2)
- I have found a new house/flat, but have yet to move from my previous house/flat. (3)
- I have moved from my old house/flat but have yet to move into my new house/flat. (4)
- Other (please state) (5) \_\_\_\_\_

*[Car License Information]*

Q24 Do you have a current driving license?

- Yes (1)
- No (2)
- I'm learning to drive at the moment (3)

[If Q24 is answered 'Yes (1)' then Q25 is asked.]

Q25 Did you pass your driving test in the past 12 months?

- Yes (1)
- No (2)

[If Q24 is *not* answered 'No (2)' then Q26 is asked.]

Q26 Do you own a car or motorbike?

- Yes (1)
- No (2)
- I don't, but I have access to someone else's (3)

[If Q26 is answered 'I don't [...] someone else's (3)' then Q27 is asked.]

Q27 Do you have access to someone else's motor vehicle during term-time?

- Yes (1)
- No (2)

[If Q26 is answered 'Yes (1)' then Q28 is asked.]

Q28 Do you keep your motor vehicle with you during term-time?

- Yes (1)
- No (2)

*[Travel-mode Choice]*

Q29 How many days in a typical week do you visit the university?

- Never (1)
- 1 day (2)
- 2 days (3)
- 3 days (4)
- 4 days (5)
- 5 days (6)
- 6 or 7 days (7)

Q30.1 Please Indicate the number of days in a typical week where you use each of these modes of transport to get to and return from the university.<sup>53</sup>

|  | To get to university from your term time accommodation |                       |                       |                       |                       |                       |                       | To return from university to your term-time accommodation |                       |                       |                       |                       |                       |                       |
|--|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|  | Never (1)  | 1 day (2)             | 2 days (3)            | 3 days (4)            | 4 days (5)            | 5 days (6)            | 6 or 7 days (7)       | Never (1)   | 1 day (2)             | 2 days (3)            | 3 days (4)            | 4 days (5)            | 5 days (6)            | 6 or 7 days (7)       |
| Walk (1)   | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Cycle (2)  | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Car or motorcycle (as driver) (3)                    | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Car or motorcycle (as passenger including taxis) (4) | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Train (5)  | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Bus or Tram (6)                                      | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other (7)  | <input type="radio"/>                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q30.2 We're also interested in the extent to which you mix two or more different modes of travel to get to the university during a typical week.

Examples: (1) driving to a car-park and then walking for 15 minutes to the university; (2) cycling for 3 minutes to a train-station before taking the train to the university. If you combine modes of travel in a single trip, when travelling to or from the university during a typical week, than please describe how you do so.

[open response]

<sup>53</sup> The table represents the approximate layout of the question and answer-response options. Only two responses could be selected in each row, one for each set of 1-7 options; the default response, selected for all items on the page opening, was '1 Never'.



Q31 Please Indicate the number of days in a typical week where you've used each of these modes of transport for purposes other than going to and from the university (e.g. shopping, leisure, commuting to paid work, visiting friends and family).<sup>54</sup>

|  | Never<br>(1)          | 1 day a<br>week<br>(2) | 2 days a<br>week (3)  | 3 days a<br>week (4)  | 4 days a<br>week (5)  | 5 days a<br>week (6)  | 6 or 7<br>days a<br>week (7) |
|--|-----------------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------------|
| Walk (1)   | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |
| Cycle (2)  | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |
| Car or motorcycle (as<br>driver) (3)                       | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |
| Car or motorcycle (as<br>passenger including<br>taxis) (4) | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |
| Train (5)  | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |
| Bus or Tram (6)  | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |
| Other (7)  | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>        |

*[Intentions and PBC]*

Q32 During the next 6 months I will get to and from the university by...

[Answer options were: "Strongly agree (1)", "(2)", "(3)", "Neither Agree Nor Disagree (4)", "(5)", "(6)", "Strongly Disagree (7)"].

4. ...either walking or by cycling
5. ...by car, taxi or motorcycle
6. ...either bus or train

Q33 During the next 6 months I will get to and from the university by...

[Answer options were: "Definitely Will (1)", "(2)", "(3)", "Unsure (4)", "(5)", "(6)", "Definitely Won't (7)"].

4. ...either walking or by cycling
5. ...by car, taxi or motorcycle
6. ...either bus or train

<sup>54</sup> The table represents the approximate layout of the question and answer-response options. Only one responses could be selected in each row. The default response, selected for all items on the page opening, was '1 Never'.

Q34 Over the next 6 months how easy or difficult would it be for you to get to the university by...

[Answer options were: "*Extremely Easy (1)*", "*(2)*", "*(3)*", "*Unsure (4)*", "*(5)*", "*(6)*", "*Extremely Difficult (7)*".]

4. ...either walking or by cycling
5. ...by car, taxi or motorcycle
6. ...either bus or train

Q35 Over the next 6 months how possible or impossible would it be for you to get to the university by...

[Answer options were: "*Possible (1)*", "*(2)*", "*(3)*", "*Unsure (4)*", "*(5)*", "*(6)*", "*Impossible (7)*".]

4. ...either walking or by cycling
5. ...by car, taxi or motorcycle
6. ...either bus or train

[*Habit Strengths*]

[If Q6 was answered 'Yes (1)', then Q26 was asked.]

Q26 When I travel during the university term, travelling by car or by motorcycle is something...

[Answer options were: "*Strongly agree (1)*", "*Tend to agree (2)*", "*Neither agree nor disagree (3)*", "*Tend to disagree (4)*", "*Strongly disagree (5)*".]

5. ... I do automatically.
6. ... I do without having to consciously remember.
7. ... I do without thinking.
8. ... I start doing before I realize I'm doing it.

Q27 When I travel during the university term, travelling by walking or by bicycle is something...

[Answer options were: "Strongly agree (1)", "Tend to agree (2)", "Neither agree nor disagree (3)", "Tend to disagree (4)", "Strongly disagree (5)".]

5. ... I do automatically.
6. ... I do without having to consciously remember.
7. ... I do without thinking.
8. ... I start doing before I realize I'm doing it.

Q28 When I travel during the university term, travelling by bus or by train is something...

[Answer options were: "Strongly agree (1)", "Tend to agree (2)", "Neither agree nor disagree (3)", "Tend to disagree (4)", "Strongly disagree (5)".]

1. ... I do automatically.
2. ... I do without having to consciously remember.
3. ... I do without thinking.
4. ... I start doing before I realize I'm doing it.

*[Travel Goals]*

Q29 Please indicate how much each of the following matters to you when travelling during the university term:

[Answer options were: "Really Matters (1)", "(2)", "(3)", "Neither Matters Nor Doesn't Matter (4)", "(5)", "(6)", "Really Doesn't Matter (7)", "N/A (8)".]

1. Keeping myself physically fit
2. Keeping my journey costs down
3. Helping protect the environment
4. Travelling in a way that my partner, friends or family would approve of
5. Showing others that I care about the environment through the way I travel, the way I drive or the type of car I use
6. Travelling in the same way that other people like me do
7. Getting to my destination as quickly as possible
8. Having good control of my arrival time
9. Transporting other people as well as myself

[Values]

Q30 Here we briefly describe some people. Please read each description and think about how much each person is or is not like you. Tick the box to the right that shows how much the person in the description is like you.<sup>55</sup>

[Answer options were: "Very much like me (1)", "Like me (2)", "Somewhat like me (3)", "A little like me (4)", "Not like me (5)", "Not like me at all (6)", "Don't Know (7)".]

1. Thinking up new ideas and being creative is important to her. She likes to do things in her own original way.
2. It is important to her to be rich. She wants to have a lot of money and expensive things.
3. She thinks it is important that every person in the world should be treated equally. She believes everyone should have equal opportunities in life.
4. It's important to her to show her abilities. She wants people to admire what she does.
5. It is important to her to live in secure surroundings. She avoids anything that might endanger her safety.
6. She believes that people should do what they're told. She thinks people should follow rules at all times, even when no-one is watching.
7. It is important to her to listen to people who are different from her. Even when she disagrees with them, she still wants to understand them.
8. It is important to her to be humble and modest. She tries not to draw attention to herself.
9. It's very important to her to help the people around her. She wants to care for their well-being.
10. It is important to her always to behave properly. She wants to avoid doing anything people would say is wrong.
11. It is important to her to be loyal to her friends. She wants to devote herself to people close to her.
12. She strongly believes that people should care for nature. Looking after the environment is important to her.
13. She seeks every chance she can to have fun. It is important to her to do things that give her pleasure.
14. It is important to her to adapt to nature and to fit into it. She believes that people should not change nature.
15. She always wants to be the one who makes the decisions. She likes to be the leader.
16. She really wants to enjoy life. Having a good time is very important to her.
17. It is important to her to be polite to other people all the time. She tries never to disturb or irritate others.
18. Having a stable government is important to her. She is concerned that the social order be protected.
19. It is important to her to be independent. She likes to rely on herself.
20. Forgiving people who have hurt her is important to her. She tries to see what is good in them and not to hold a grudge.
21. She thinks it is important to do lots of different things in life. She always looks for new things to try.
22. She thinks it's important not to ask for more than what you have. She believes that people should be satisfied with what they have.
23. It is important to her to make her own decisions about what she does. She likes to be free to plan and to choose her activities for herself.
24. Being very successful is important to her. She likes to impress other people.

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<sup>55</sup> Depending upon whether the participants answered to being male or female earlier, a matching gender version of this question was given.

25. It is very important to her that her country be safe. She thinks the state must be on watch against threats from within and without.
26. She likes to take risks. She is always looking for adventures.
27. It is important to her to be in charge and tell others what to do. She wants people to do what she says.
28. Religious belief is important to her. She tries hard to do what her religion requires.
29. It is important to her that things be organized and clean. She really does not like things to be a mess.
30. She thinks it's important to be interested in things. She likes to be curious and to try to understand all sorts of things.
31. She believes all the worlds' people should live in harmony. Promoting peace among all groups in the world is important to her.
32. She thinks it is important to be ambitious. She wants to show how capable she is.
33. She thinks it is best to do things in traditional ways. It is important to her to keep up the customs she has learned.
34. Enjoying life's pleasures is important to her. She likes to 'spoil' herself.
35. It is important to her to respond to the needs of others. She tries to support those she knows.
36. She believes she should always show respect to her parents and to older people. It is important to her to be obedient.
37. She wants everyone to be treated justly, even people she doesn't know. It is important to her to protect the weak in society.
38. She likes surprises. It is important to her to have an exciting life.
39. She tries hard to avoid getting sick. Staying healthy is very important to her.
40. Getting ahead in life is important to her. She strives to do better than others.

*[Other Motives]*

Q31 Please indicate how far you agree or disagree with each of the following statements.

[Answer options were: "Strongly Agree (1)", "Mildly Agree (2)", "Unsure (3)", "Mildly Disagree (4)", "Strongly Disagree (5)".]

1. Humans have the right to modify the natural environment to suit their needs.
2. Humans are severely abusing the planet.
3. Plants and animals have the same rights as humans to exist.
4. Nature is strong enough to cope with the impact of modern industrial nations.
5. Humans were meant to rule over the rest of nature.
6. The balance of nature is very delicate and easily upset.

Q32 Please indicate how far you agree or disagree with each of the following statements.

[Answer options were: "Strongly Agree (1)", "Mildly Agree (2)", "Neither Agree Nor Disagree (3)", "Mildly Disagree (4)", "Strongly Disagree (5)".]

5. I think of myself as an environmentally-friendly consumer.
6. I think of myself as someone who is very concerned with environmental issues.
7. I would not want my family or friends to think of me as someone who is concerned about environmental issues.
8. I would be embarrassed to be seen as having an environmentally friendly lifestyle.

Q33 Please indicate how important having each of these goals is to you, that...

[Answer options were: "Extremely important (1)", "(2)", "(3)", "(4)", "Moderately important (5)", "(6)", "(7)", "(8)", "Not at all Important (9)".]

5. I will be in good physical shape
6. I will feel good about my level of physical fitness
7. I will be relatively free from sickness
8. I will be physically healthy

[Life Events]

Q34 Please indicate how far you have experienced important life changes in the following areas of your life over the past 3 months.

[Answer options were: "No change (1)", "(2)", "(3)", "An important change (4)", "(5)", "(6)", "A profound change (7)".]

6. In your living arrangements e.g. moving house or city, living with different people

7. In your work e.g. a new job, different working hours
8. In your personal relationships e.g. a new relationship, the death of someone close
9. In your career/education e.g. transferred to another course, took a gap year or work placement
10. In another aspect of your life

[If any Q32 item was answered between 4 and 7, then the corresponding question (from Q33 to Q37) was asked.]

Q35 What was the nature of the change in your living arrangements? (Please write as little or as much as you like). [open response]

Q36 What was the nature of the change in your work? (Please write as little or as much as you like). [open response]

Q37 What was the nature of the change in your personal relationships? (Please write as little or as much as you like). [open response]

Q38 What was the nature of the change in your career/education? (Please write as little or as much as you like). [open response]

Q39 What was the nature of the change the another aspect of your life? (Please write as little or as much as you like). [open response]

*[Comments]*

Q40 If there is anything about your travel, accommodation or life in general that you'd like to add, or if you have any other comments then please feel free to write in the box below.

[open response]

*[Debrief]*

**Thank you very much for taking part in our research. You have now completed this study.**

**We will send you a £5 Amazon voucher in the post. Once this has been sent, your contact details will be erased and your data stored anonymously. You can still withdraw from the study up until this point by contacting us (see below), but after this point we will not be able to distinguish your data from the data of other participants and so withdrawing from the study will not be possible.**

**What follows is an outline of the purpose of the study and how your answers will be used by us.**

**"Human Values, Travel Goals and Habit Discontinuity: Psychological Antecedents of Travel Mode change and Stability for Residentially Relocating University Students"**

**It has been theorised that when people experience an important event in their lives, this makes them think deliberately about actions that they'd normally not think deliberately about: actions they'd do out of habit. This deliberate thought during life events can, perhaps, result in people breaking their old habits and establishing new patterns of everyday behaviour. The purpose of this study was to see whether this was true for**



university students as they change their term-time accommodation and, perhaps, reconsider how they travel on a day-to-day basis.

The reason we chose travel choices is because they have a number of consequences for road safety, human health (fitness, air pollution) and sustainability (greenhouse gas emissions) and are, therefore, important to understand.

We asked students, some of whom were changing their accommodation later in the year and some of whom were not, to complete a questionnaire about their travel and their attitudes and values once, before they changed accommodation and, once again, after they changed their accommodation. By examining the answers given by students who changed their accommodation compared to those who did not we can find out whether students who change their term-time accommodation change the way they travel to a greater extent than those who don't and whether these changes are due to student's goals and values or due to more practical considerations (such as changes in distance from the university).

Our immediate research aim is to publish out results in a peer-reviewed scientific journal and to disseminate our findings through conference presentations. It will also form part of Paul Haggar's PhD research and appear in his doctoral thesis. In the longer term, we hope it will help inform the actions of information campaigns in order to better encourage more healthy, sustainable and safer travel-mode choices by people in the future.

If you have any questions, comments or concerns about the study, or would like to know more about the ideas behind it, then please contact myself (Paul Haggar), my project supervisor (Dr. Lorraine Whitmarsh) or the School Research Ethics Committee at the addresses below.

[Contact details for aforementioned.]