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Users of different travel modes differ in journey satisfaction and habit strength but not environmental worldviews: A large-scale survey of drivers, walkers, bicyclists and bus users commuting to a UK university

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Abstract

People who travel to the same university workplace by bicycle, bus, car, and walking were compared in a survey (N=1609). Data are presented on environmental worldviews, journey affective appraisals, and habit strength. Unexpectedly, findings showed comparable levels of environmental worldview across modes. This might reflect the role of attitudes on behaviour, or question the validity of the established environmental worldview scale used here. Results also replicated previous work on affective appraisal, and suggested that whilst walking, bicycling and bus use have distinctive affective appraisals associated with each mode, car driving was affectively neutral, generating no strong response on any dimension – a finding tentatively explained with reference to the normative status of driving. The survey also showed users of active travel modes reported stronger habit strength than car or public transport users, with possible links to the role of affect in formulating habit strength in line with habit theory.

Introduction

Research on travel mode choice largely aims to understand why people travel as they do so that they might be influenced towards healthier and more sustainable patterns of behaviour. As car users are the group practitioners would most like to influence, research on travel motives has primarily focused on understanding this group. Studies have covered such areas as qualitative motivations for car use (Gardner & Abraham, 2007), car users' satisfaction (Ellaway, Macintyre, Hiscock, & Kearns, 2003), symbolic and affective motives for car use (Steg, 2005), and whether a taxonomy of car users can

be developed using psychological values (Anable, 2005). A concern with previous literature on travel motivations, such as these, is that research efforts have almost invariably focused on one mode at a time, which makes assessing the true importance of travel motivations problematic. Cross-group comparisons may offer stronger insights into the motives behind choosing a travel mode.

The current study is a follow-up investigation to an earlier qualitative analysis of discussions amongst users of car, bus, bicycle, motorcycle and walkers (Thomas, Walker, & Musselwhite, 2014). That Grounded Theory analysis of these focus group discussions identified three areas in which users of different modes appeared to show patterns of agreement and disagreement: environmental worldviews, affective appraisals of the commute, and the strength of habit for using a travel mode. This paper explores these three topics in a more representative manner than focus groups, using a quantitative approach to evaluate whether groups travelling to the same university location by different modes vary in each of the three concepts.

Firstly, we consider how travel mode user groups may differ in their environmental worldviews. Environmental worldviews may be seen as the strength of a person's attitude towards environmental issues, over the strength of their attitudes in favour of materialistic and ego-centric concerns (Dunlap et al. 2000). Environmental worldviews are interesting since they are often applied to users of travel mode user groups – for example, the public perception of bicyclists is that they are 'green' with stronger environmental worldviews that other travel mode users (Daley & Rissel, 2011; Gatersleben & Haddad, 2010), and environmental worldviews have been used to segment different types of car users, including the grouping of "car-less crusaders" whose environmental worldviews define their use of travel mode (Anable, 2005).

Yet, despite the implicit claim arising from such work, that some modes should be associated with greener users, and whilst environmental views are important for people to accept environmental policies (Whitmarsh, 2011), the link between environmental worldviews and transport behaviour remains uncertain (Steg & Vlek, 2009), particularly in terms of differences between users of various travel modes (Flamm, 2009). National surveys either suggest no link between car use and concern for climate change (DfT, 2011a) or a slight sign of reduced frequency of car use in the environmentally concerned (NatCen, 2012). Additionally, some researchers, focusing

on car use, have found no predictive link between environmental worldviews and travel mode choice (Poortinga, Steg, & Vlek, 2004; Whitmarsh & O'Neill, 2010). The present study, then, sought to provide clearer data on whether users of different modes differ in their levels of environmental worldviews by comparing people on an established scale.

The second issue arising in our previous study was the difference in affective appraisals of travel mode. Users of all modes in the qualitative study expressed positive experiences with their travel mode, with the exception of bus users. These were highly dissatisfied but – perhaps curiously – showed no sign of trying to change to other modes. It is possible that without ownership of a vehicle, and relinquishing control of their travel to another, it becomes easier to attach negative ratings to a travel mode; it may also be more socially acceptable to criticise public transport than other modes, perhaps because it is perceived as being of lower status. By examining the experience of travel mode use, we can consider how people feel, as an affective response to the behaviour, when travelling. There have been previous comparisons of affective appraisal by commuting mode, often indicating that active mode users show highest general enjoyment, followed by car users, then public transport users (Olsson, Gärling, Ettema, Friman, & Fujii, 2012; Páez & Whalen, 2010). Recently a Satisfaction with Travel Scale (STS) has been developed for this very purpose (Ettema et al., 2011).

Gatersleben (2007) compared users of different travel modes and used discriminant function analysis to produce a two-axis grid of affective responses. Gatersleben and Uzzell indicated two distinct functions of 'relaxing-stressful' and 'depressing-exciting', and identified how travel mode users were successfully identified from these two affective functions: walking and bicycling were relaxing (and bicycling was also exciting), bus use was depressing, and car use was stressful. This exploratory work by Gatersleben (2007) has received no replication since its publication, and although other reports (Olsson et al., 2012; Páez & Whalen, 2010) evaluate general satisfaction with travel mode, they did not address the multidimensional nature of affective appraisal identified by Gatersleben and Uzzell. Additionally, whilst the STS has shown promising results in evaluation (Friman, Fujii, Ettema, Gärling, & Olsson, 2013), more data on the relationship between travel mode choice and journey experience would clearly be useful.

The third issue to arise in the earlier qualitative study, and addressed here, was the role of habit in travel. Focus group participants showed some uncertainty about whether car use was the only form of travel to show a habitual pattern, or whether all modes showed a degree of habitual behaviour. Habitual behaviours can be defined as those which, over time, reach a state in which they can be automatically triggered by contextual cues (Verplanken & Aarts, 1999). Theoretical work has expanded the definition of habit from a learned method of achieving a goal, to a more complex interaction of goals and intentions that define automatic behaviour cued by a context (Wood & Neal, 2007). The importance of habit on travel mode choice is well-documented, with a range of papers exploring habit and car use (Gardner, 2009; Gardner & Abraham, 2008; Verplanken, Walker, Davis, & Jurasek, 2008; Walker, Thomas & Verplanken, 2014). Habitual behaviour is an important topic for travel mode choice because habit can moderate the link between intention and behaviour, such that when car-use habits are stronger, intention to use (or not to use) the car becomes less able to predict actual behaviour (Gardner, 2009). In other words, in stable contexts in which behaviour becomes habitual, a disjunct can appear such that behaviour is no longer a product of its usual antecedents such as attitudes (Verplanken et al., 2008), or even of what people intend to do. As such, people exhibiting habitual patterns of behaviour are less amenable to behavioural interventions. They can additionally show biased information searches which favour the habitual travel mode (Verplanken, Aarts, & Van Knippenberg, 1997), and have lower expectations of satisfaction with alternative travel modes (Pedersen, Kristensson, & Friman, 2012).

As habit strength has a number of implications for travel mode maintenance, evaluating the strength of a travel habit can be a useful method of further understanding differences between travel mode groups, particularly with a view to facilitating mode change in the future. Studies of naturalistic and comparative habit strengths are few, however, and though methods exist for the measurement of habit strength (Verplanken & Orbell, 2003), comparisons of habit strength between travel groups and across travel behaviours have not been reported.

In summary, then, this survey builds upon previous work by exploring three areas (environmental worldviews, journey affective experience and habit strength) for the first time in users of different travel mode groups who made regular journeys to the

same workplace. By testing a large number of people making comparable journeys to the same location, we hoped to minimise any potentially confounding influences of geographic variation when comparing users of different travel modes. As exploratory work, this study made no formal hypotheses of differences or similarities between user groups. The intention was rather to establish whether there were any sufficient differences in environmental worldview among users of different modes, whether habit strength varied significantly by travel mode, to replicate previous work identifying affective appraisals of travel mode use, and whether differences in affective appraisal of the daily commute existed.

Method

An online survey was developed for all staff and students at the University of Bath, UK, to complete during April and May 2011. Respondents were invited to enter a prize draw for £150 of vouchers for completing the survey, whether or not they completed the optional psychology section.

Measures

The survey asked respondents to select a travel mode choice that represented the largest part of their journey. Respondents were asked to state their age, gender, frequency of travel, living location, attitude toward university travel facilities, motives for travel mode choice, and any mobility-related disabilities.

Environmental worldview was assessed using the Revised New Ecological Paradigm (NEP: Dunlap, Van Liere, Mertig, & Jones, 2000), a 15-item scale of statements covering five sub-scales, which showed good internal reliability in the survey ($\alpha = .83$). Affective appraisal of the commute replicated the method of Gatersleben and Uzzell (2007), in which people rated the extent to which their daily commute could be described by six affective terms: Exciting, Pleasant, Relaxing, Depressing, Boring, Stressful. Habit strength for each respondent's main mode of travel was measured using the 12-item Self-report Habit Index (SRHI: Verplanken & Orbell, 2003), and focused on journeys to the university workplace. It has been suggested that the SRHI may be biased by including a measure of identity (Gardner, de Bruijn, & Lally, 2011), which may influence habit strength; especially for bicyclists with strong group identity (Daley & Rissel, 2011). Mean habit strength scores are thus calculated without the measure of identity, and showed good internal reliability in our sample ($\alpha = .83$).

All scales used a 7-point Likert scale, rating statements from "Strongly agree" to "Strongly disagree", including a midpoint "neutral/no opinion" value. Incidentally, the Ten Item Personality Inventory (Gosling, Rentfrow, & Swann Jr, 2003) was also used, but results were not analysed due to low reliability of subscales (Chronbach's alpha < .70).

Participants

A total of 2,616 respondents logged usable responses on the core section of the survey (traditional questions on mode and attitudes to facilities). Of these, 1,704 (65.2%) agreed to the optional psychology section. Of the valid responses, 635 (37.3%) reported the car as their main travel mode, 587 (34.4%) reported using the bus, 265 (15.6%) walked and 122 (7.2%) rode a bicycle, with the remaining 95 (5.5%) using other modes. Due to the relatively small number of respondents using 'other' modes (motorcycle, train, or reported "other" as main mode), these were excluded from analysis, leaving four main groups of walkers, bicycle users, bus users, and car users (N = 1609). Sample demographics of the four travel groups indicated a mean age of 31.86 (SD = 13.31) with 55.6% female respondents. Mean age and gender ratios were calculated for car users (M = 41.12, SD = 12.70, 59% female), bus users (M = 23.90, SD = 7.74, 59.6% female), walkers (M = 26.74, SD = 11.04, 53.4% female) and bicyclists (M = 31.59, SD = 13.03, 26.0% female). For non-car users, the proportion of respondents that indicated they had access to a car for their commute was 34.2% of bicyclists, 21.2% of bus users, and 29.1% of walkers. As a university-wide survey, staff/student response ratios varied across modes. The proportion of staff using each mode were 44.3% of bicyclists, 12.3% of bus users, 81.7% of car users, and 24.2% of walkers. Different proportions of staff/student use may confound comparisons between groups (e.g. income, age, etc.), so where possible, staff/student status is controlled for in the analyses below. Users of each mode were equally likely to take part in the additional psychological part of the survey, $\chi^2 (5) = 8.78$, $p = .12$.

Results

As the study had a relatively large sample, this article will supplement null hypothesis tests with standardized effect sizes (Hedge's g and partial eta squared η^2), and conclusions will mostly be based on these, since a large sample can make even minor effects reach conventional levels of statistical significance (Walker, 2010). We suggest

the cautious use of conventions for Hedge's *g* values as 'small' (0.2), 'medium' (0.5) and 'large' (0.8) advised by Durlak (2009), and partial η^2 values as small (.009), 'medium' (.059) and 'large' (.138) described by Richardson (2011).

Comparison of Environmental Worldviews

First we explored environmental worldviews, as measured by the NEP (Dunlap et al., 2000), by travel mode. Mean values of NEP scores, between 1 (low NEP worldview) and 7 (high NEP worldview) are calculated for car users (M = 4.85, SD = 0.81), bicyclists (M = 5.00, SD = 0.75), bus users (M = 4.82, SD = 0.74), and walkers (M = 4.85, SD = 0.81).

Two-way ANOVA of mean NEP scores indicated a small significant effect of staff/student status, $F_{(1, 1358)}$ = 18.33, *p* <.001, η_p^2 =.013, with staff environmental worldviews (M = 4.94, SD = 0.82) greater than students' (M = 4.70, SD = 0.74, *g* = 0.21). A significant, very small separate effect of travel mode was found, $F_{(3, 1358)}$ = 3.21, *p* = .022, η_p^2 = .007, and there was no significant interaction, $F_{(3, 1358)}$ = 1.79, *p* = .147. With unequal sample size groups, both Gabriel's and Hochberg's GT2 post-hoc tests were used since Gabriel's is more powerful but influenced by heavily uneven samples (Field, 2009). Both post-hoc tests indicated no significant comparisons between travel mode groups.

Comparison of Affective Appraisal of Commute

Affective appraisal of commute used six measures assessing the extent to which commuting was seen as Exciting, Pleasant, Relaxing, Depressing, Boring, and Stressful. Replicating the method used by Gatersleben and Uzzell (2007), discriminant function analysis was used in the current analysis to establish how the travel mode groups might be classified by their scores on these six variables. Discriminant analysis can be viewed as a both a MANOVA and multiple regression approach, evaluating differences between groups (similar to MANOVA) on linear combinations of variables. Combinations of variables (weighted by predictive ability) are calculated into canonical variables, or functions, that best discriminate between the established groups. There will, in total, be one function fewer than the number of outcome groups, but it is possible that not all the functions are useful for predicting which group a person will fall into. Accordingly, the discriminant function analysis here revealed 3 functions that significantly contributed to group separation. The structure matrix loadings of each of

the 6 affective appraisals onto these functions, and the standardised canonical discriminant function coefficients used to calculate discriminant scores, are shown in Table 1.

[PLEASE INSERT TABLE 1 HERE]

The first function explained 78.1% of the variance (canonical R^2 = .30), the second explained 12.5% of the variance (canonical R^2 = .07), and the third explained 9.4% of the variance (canonical R^2 = .05). Combination of the three functions significantly differentiated travel mode users, Λ = 0.62, χ^2(18) = 696.11, p < .001. Removing the first function maintained a significant discrimination between groups using Functions 2 and 3, Λ = 0.89, χ^2(10) = 171.46, p < .001, and the third function in isolation significantly discriminated between group users, Λ = 0.95, χ^2(4) = 73.70, p < .001. Function 1, which discriminates groups based on high scores on the three positive measures (pleasant, exciting, and relaxing) and low scores on the three negative measures (depressing, boring and stressful), was named "Positivity". Function 2, discriminating groups based on high scores for the 'exciting' and 'stressful' measures, was named "Arousal". Function 3 was named "Relaxation" and discriminated groups based on high 'relaxing' and 'boring' variables. The group centroids are shown in Table 2 below.

[PLEASE INSERT TABLE 2 HERE]

Table 2 shows bicycling to be strongly associated with higher positivity, higher arousal and low relaxation. Walkers display similarly strong levels of positivity, with lower levels of arousal and higher relaxation. Bus use is clearly defined by negative positivity ratings and low arousal (whilst also being relaxing), whilst car use sits close to zero on positivity, with low arousal, and has a moderate amount of relaxation. Interestingly, the data in Table 2 suggest car commuting was not associated with any particularly strong affective appraisal in any direction.

As mentioned above, the first function ('Positivity') found all 6 affective measures to be strong discriminant predictors of travel mode group. It was also, as indicated by the canonical R^2 scores, by far the most important discriminator amongst travel mode groups. To explore this factor more clearly, the 6 variables were collated into a single scale of affective experience anchored around zero (±3, given the original 7-point scales that included a neutral point), which proved to have good reliability (α = .88). Creating a single measure of affective appraisal by collapsing several items is comparable to the

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STS approach (Friman et al., 2013), and offers a single value summarising affective evaluations. Comparison of travel modes using this aggregate affective appraisal scale is shown in Figure 1.

[PLEASE INSERT FIGURE 1 HERE]

Two-way ANOVA indicated a significant but very small effect of staff/student status, $F (1, 1348) = 5.19, p = .023, \eta_p^2 = .004$. A significant and large effect of travel mode group, controlling for staff/student status, was also found, $F (3, 1348) = 104.26, p <.001, \eta_p^2 = .188$. Gabriel's and Hochberg's GT2 post-hoc analysis indicated bus affective appraisal was significantly lower than bicycle, walking or car (all $p < .001$; $g = 1.57$, $g = 1.50$, $g = 0.42$ respectively). Car affective appraisal was lower than bicycle or walking ($p < .001$, $g = 1.13$ and $g = 1.05$ respectively). There was no significant difference between bicyclist and walker affective appraisal (Gabriel's $p = .836$, Hochberg's GT2 $p = .845$, $g = 0.16$). A one-sample t-test for car users showed no significant difference from zero, $t(524) = -0.11, p = .914$, again indicating a lack of any strong affective appraisal in this group. There was also a small significant interaction effect between staff/student status and travel mode group, $F (3, 1348) = 3.81, p = .01, \eta_p^2 = .008$. The interaction arose because affective appraisal of buses from staff (M = -.23, SD = 1.13) and students (M = -.52, SD = 1.14) was significantly different ($g = 0.25$), as was the affective appraisal of walking: staff (M = 1.54, SD = 0.88), students (M = 0.96, SD = 0.78) with $g = 0.70$. Conversely, staff (M = 1.19, SD = 0.88) and student (M = 1.28, SD = 0.86) affective appraisals of bicycling were similar, as were the affective evaluations of car use between staff (M = -0.01, SD = 1.16) and students (M = 0.03, SD = 1.02).

Comparison of Habit Strength

Habit strength scores were rated from 1 (low) to 7 (high) using the SRHI (Verplanken & Orbell, 2003). Means scores were: car users (M = 4.67, SD = 0.94), bicyclists (M = 5.18, SD = 0.92), bus users (M = 4.84, SD = 0.87) and walkers (M = 5.22, SD = 0.94). Two-way ANOVA indicated a significant but small effect of staff/student status, $F (1, 1389) = 10.45, p <.001, \eta_p^2 = .016$, caused by students having slightly stronger travel habits. Independent of this, there was a significant small-to-moderate effect of travel mode group on habit strength, $F (3, 1389) = 8.81, p <.001, \eta_p^2 = .023$. Gabriel's and Hochberg's GT2 post-hoc analysis between modes indicated bicyclists showed greater habit strength than bus users ($g = 0.39$) and car users ($g = 0.45$), both with $p < .001$. In

addition, walkers had stronger habits than bus users ($g = 0.42$) and car users ($g = 0.48$), both with $p < .001$. There was no significant difference in habit between bicyclists and walkers (Gabriel's and Hochberg's GT2 $p = .99$, $g = 0.04$), nor between bus and car users (Gabriel's and Hochberg's GT2 $p = .67$, $g = 0.09$). As such, we can say that walkers and bicyclists together show stronger habits and car drivers and bus users show weaker habits. No significant interaction between staff/student status and mode group was found, $F (3, 1389) = 0.33$, $p = .80$.

Discussion

This paper used a large-scale survey of people travelling to the same university workplace using several different travel modes to compare three main areas of interest identified from earlier qualitative work: environmental worldviews, affective appraisals of the commute, and travel mode habit strength. Users of the four most popular modes reported (car, bus, walk and bicycle) were compared on these three areas.

The first finding was that groups showed a minute, yet significant, difference on a measure of environmental worldview, though post-hoc tests were unable to detect which groups significantly differed – an issue often apparent when differences are very small (Cardinal & Aitken, 2013). Given the tiny standardized effect size and the lack of any differences in post hoc tests, it is reasonable to conclude that, to a first approximation, there were no notable differences in environmental worldview between users of different travel modes. Whilst some previous work looking at modes in isolation has found no significant link between environmental worldview and car ownership (Poortinga et al., 2004), or car use (Whitmarsh & O'Neill, 2010), and whilst some research compares travel mode groups using general views on climate change (DfT, 2011a; NatCen, 2012), we believe this paper shows the first detailed comparison of environmental worldviews across users of several travel modes. The lack of any clear differences between groups is surprising, especially when the popular stereotypes of certain groups, such as bicyclists, includes higher levels of environmental concern than other mode users (Daley & Rissel, 2011; Gatersleben & Haddad, 2010), or the use of environmental orientation to segment different types of car drivers (Anable, 2005). Using a large sample size, the current research suggests that any differences in worldview are likely to be extremely subtle, and are not an important feature differentiating users of different modes.

Alternatively, a recent trend appears to favour the use of values, theoretically a more stable and guiding influence on daily lives than attitudes or worldviews, as a predictive measure of environmentally sustainable behaviours (Steg et al., 2011, Steg and Vlek, 2009 and Thomas and Walker, 2014). Yet given the lack of differences observed among travel mode users using environmental worldviews, it may also be that such broad measures are not applicable. Steg and Sievers (2000) found that specific questions on the impact of car use on the environment was significantly linked to reduced car use and increased use of alternative modes. Further investigations may be required to discover how specific lines of questioning may illustrate differences in environmental views between travel mode groups, given conventional worldview measures appear to be too broad for this purpose.

The second construct included in this study, as a replication of Gatersleben and Uzzell (2007), was affective appraisals of travel mode, measured by having participants rate their commutes using six affective ratings: Pleasant, Relaxing, Exciting, Stressful, Depressing, and Boring. Our results are largely comparable to Gatersleben and Uzzell (2007), who identified two factors of 'relaxing-stressful' and 'depressing-exciting', though we interpreted our first factor as a more general, evaluative 'positivity' scale which rates the overall quality of the commute, as all positive and negative measures were strongly weighted in opposite directions. We also separated 'arousal' and 'relaxation' into separate functions. Our mapping of modes onto these factors does differ slightly from Gatersleben and Uzzell (2007) however: their original work showed bicycling characterized by high 'relaxing' and 'exciting' scores, with walking characterized by high scores on 'relaxing' and 'boring'. We propose that our definition, which describes walking and bicycling as both being modes with an overall positive experience, but differing in both 'relaxation' and 'arousal', is a more suitable assessment.

More generally, our results allow each of the four modes to be characterized by these dimensions of general positivity, relaxation and arousal: bicycling was positively rated, arousing, and not relaxing; walking was high on general positivity and relaxation, but low on arousal; and bus use was low on positivity and above average on arousal and relaxation. The striking exception was driving, which showed no strong connection to any affective discriminant function.

To further explore this, the six affective appraisals were combined into a single measure of affective appraisal, similar to the Satisfaction with Travel Scale (Ettema et al., 2011; Friman et al., 2013). Using these combined scores, car users showed no significant difference from a neutral affective experience, in contrast to significant positive evaluations by active mode users, and significantly negative views from bus users. The clear picture of ambivalence amongst car users seen within this study contrasts with positive affective evaluations reported by drivers in earlier qualitative (Gardner & Abraham, 2007; Thomas et al., 2014) and quantitative reports (Olsson et al., 2012). Whilst this difference might simply reflect the current sample's characteristics, we wish to offer here a speculative hypothesis, which is that the neutral response of drivers on all the discriminant functions might reflect the normative, 'default' status of car use. Our reasoning is thus: given car use is by far the most common travel mode (DfT, 2011b), and given the perception that other modes are 'different' to car use, which tends to be used as the comparator against which other modes are judged (Thomas et al., 2014), the lack of any affective response in car users may show that car use is a 'default' behaviour which is not, in a sense, consciously chosen by people but which people adopt relatively unthinkingly because it is seen as the 'proper' or 'normal' thing to do in societies such as the one studied here – especially if a person already owns a car. We hypothesise that the decision to walk, bicycle or take the bus, in contrast, requires some level of deliberate mode choice, and thereby the behaviour acquires an emotional connotation - higher affective appraisals in the case of walking and bicycling and lower appraisal in the case of bus use. Car use, in contrast, might be maintained more through social norms and habits than through affective experiences. Of course, this is currently speculative, and undoubtedly further investigations of affective experience within travel mode choice are now warranted, perhaps using Ettema et al.'s (2011) Satisfaction with Travel Scale (STS). Not yet available when the current study took place, the STS combines affective evaluations and cognitive assessment, and recently received supportive evaluations (Friman et al., 2013). Similar to our results, it has been used to show that commute satisfaction decreases as one moves from active mode users, to car users, and finally to public transit users (Olsson et al., 2012).

The final goal of this study was to compare habit strength across users of different modes. Active mode users (bicyclists and walkers) showed stronger habit strength than

car and bus users. This surprised us, as a priori we assumed that walking and bicycling would be the modes most likely to see some people adjust their behaviour day to day based on the weather and other such variables. We are unaware of any research that has explored habit strength across travel mode choice, and welcome future work evaluating habit strength by mode. Some research suggests that active mode users require less cognitive effort than car or bus use (Gatersleben & Uzzell, 2007), which may reflect the automaticity of habits (Verplanken & Orbell, 2003). Bicyclists are recognised as a group who have a strong sense of identity linked to their behaviour (Daley & Rissel, 2011), and the measure of habit included a measure of identity that may influence results (Gardner, de Bruijn, & Lally, 2011). However, after excluding the identity item from the habit measure, active mode users still showed significantly stronger habit strength than car or bus users. How best to explain the greater habit strength in active mode users? One explanation that seems plausible is that a link between affect and habit may exist, which supplements the automaticity of behaviours. Wood and Neal (2007) suggested that habit is defined by three principles: they are context-cued, goal-independent, and yet interact with goals and intentions. Of interest here is the first principle, with Wood and Neal (2007) offering two ways in which context might cue behaviour: a direct, almost behaviourist, triggering of associations between context and behaviour, and a motivated form where affective rewards from performing the behaviour strengthen the habit itself.

As affective appraisals of the commute were so much higher amongst the groups with the strongest habits in this study, we tentatively propose that the affective response from a behaviour may strengthen a habit, and that both direct and motivated habit cuing may exist. For active travel mode users, the positive affective appraisal – essentially a reward – from using their mode may strengthen their habit, in accordance with Wood and Neal's (2007) statement "it is possible that motivational cuing works to augment and enhance, rather than replace, context–response learning based on direct cuing" (p.846). If this interpretation is correct, car and public transport users, whose habits are weaker, likely have these habits based around contextual cues alone, without the additional habit-strengthening force of positive affective appraisals. Previous evaluations have suggested that habits are not linked to emotions, as the automaticity and repetition removes them from conscious processing of emotion (Wood, Quinnn, & Kashy, 2002).

However, as with other researchers, we use the term 'affect' to represent an automatic valance rating – whether positive or negative – rather than an emotion, which is more of a cognitive and considered notion (Aarts, Custers, & Veltkamp, 2008; Slovic, Finucane, Peters, & MacGregor, 2002). If one accepts that positive affect is linked to increased motivation to pursue a goal (Aarts et al., 2008; Custers & Aarts, 2005), and that habit might develop through repeated motivation towards a goal (Wood & Neal, 2007), positive affective appraisals gained through carrying out a behaviour might lead to stronger habit strength than would be expected simply from context-cued behaviours. Moreover, analysis of how enjoyment predicts behaviour maintenance suggests a role for affective feedback in supporting a behaviour independently of goals (Phillips & Chapman, 2012). Though this concept requires further exploration, results from this study certainly seem to support the idea that there is a role for affect in explaining different habit strengths among people travelling to the same location by different modes.

A limitation of this study is the sample employed. Although the sample is large, thereby allowing small effects to be observed, it is likely unrepresentative of the general UK population as it comes from staff and students at a university. Ideally, future work may replicate the current results with a varied range of socio-economic groups, given that subjective ratings of travel mode options differ by socio-economic status (DfT, 2011a) which may influence affective appraisals or habit strength. Also when considering the measure of environmental worldviews, the University-based sample may hold generally stronger views than the population average (Hawcroft & Milfront, 2010), which could make identification of group differences more difficult. Secondly, geographical context may also influence travel mode choice, and additional samples may vary in their assessment of travel mode choices.

Conclusions

This paper compared, on various measures, users of cars, bicycles, buses and walking who all travelled regularly to the same university. Only extremely small differences in environmental worldview were seen between users of different modes, possibly challenging certain stereotypes about greater environmental consciousness in active travellers. Affective appraisals of the daily commute generally supported previous findings (Gatersleben & Uzzell, 2007), whilst suggesting that three of the four main

travel modes showed unique affective evaluations. The exception was driving, which falls close to the neutral point of every affective axis – a finding we tentatively explain with reference to the normative, 'default' status of this mode. This therefore challenges the idea that people using cars are difficult to shift from this mode because they derive affective reward from the experience. Lastly we report a difference in habit strength among travel modes such that active mode users were in a state of greater habit than car or public transport users. We tentatively propose that the increased affective value gained by active mode users may lead to the formation of stronger habits, in line with Wood and Neal's (2007) ideas about the role of direct and motivational cuing of habits. Whilst not conclusive, by presenting previously unreported differences across travel mode user groups, we hope to generate further cross-mode evaluations which in turn will be useful for informing travel mode interventions.

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Table 1: Structure Matrix loadings of affective appraisal items

Table 1

Structure Matrix Loadings & Standardised Canonical Function Coefficients

Item	Function			Standardised Canonical Function Coefficients		
	1	2	3	1	2	3
Pleasant	.732			.179	.044	1.040
Exciting	.627	.714		-.436	.930	.205
Relaxing	.548		.609	.179	.044	1.040
Boring	-.717		.412	.280	.103	.768
Depressing	-.578			.032	-.387	.118
Stressful	-.752	.496		.550	.503	-.265

Note: Function loadings >.40 shown, as advised by Field (2009)

Table 2: Functions at Group Centroids

Table 2

Functions at Group Centroids

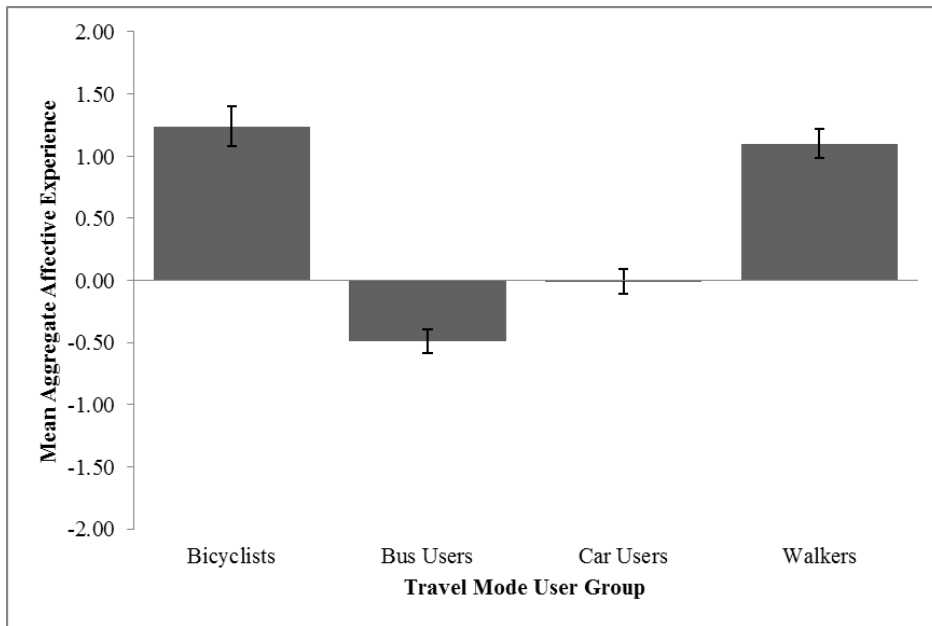| Group	Function		
	1 "Positivity"	2 "Arousal"	3 "Relaxation"
Bicycle	1.212	.740	-.198
Car	-.065	-.164	-.244
Bus	-.637	.133	.166
Walk	1.018	-.251	.306

Figure 1: Mean scores (with 95% CI) for travel modes on aggregate affective evaluation scale using 6 commute descriptions