Department for Transport

# Provision of market research for value of travel time savings and reliability

## Walk and Cycle Report

Issue | 14 August 2015

In Partnership with:

ITS Accent



Job number

**Ove Arup & Partners Ltd**
13 Fitzroy Street
London
W1T 4BQ
United Kingdom
www.arup.com

ARUP

# Contents

## Appendices

**Appendix A**

Walking and cycling initial depths

# 1 Introduction

This document represents a supplementary item to the Final Report of the study **'Provision of market research for value of time savings and reliability'** undertaken by the Arup/ITS Leeds/Accent consortium for the Department for Transport (the Department).

The objectives of the aforementioned study were to:

- Provide recommended, up-to-date national average values for in-vehicle travel time savings.
- Improve understanding of what drives the values of travel time savings and the uncertainty around the values.
- Consistently estimate values for trip characteristics of related factors, e.g. reliability and crowding.

In pursuit of these objectives, the study employed an analysis framework based upon the primary dimensions of trip purpose and mode. With regards to mode, the Department commissioned analysis of the three 'required' modes of car, bus and rail, plus two 'optional modes, namely walk and cycle and 'other PT'; the air access mode was not commissioned.

At the outset, it was acknowledged by both the Department and the study team that, given the dearth of previous VTT research on walk and cycle, Stated Preference (SP) analysis of this mode would be somewhat exploratory. Indeed, the process of developing the survey approach for walk and cycle proved challenging, and some elements of the process needed to be repeated more than once before 'proof of concept' could be established.

As a result, it was agreed with the Department that walk and cycle would be researched on a deferred schedule, and reported separately from the mechanised modes. This document represents the report of the walk and cycle research.

## 1.1 Scope

The scope of the walk and cycle research was restricted to the commuting and other non-work trip purposes, on the grounds that walk and cycle were of minor significance for business travel.

## 1.2 Study Evolution

The walk and cycle study has been exploratory in nature and evolved in response to emerging challenges. We therefore provide at the outset an overview of how the study progressed.

Throughout, two SP exercises were used for both walkers and cyclists. The first (SP1) aimed to obtain monetary values of times savings whilst the second (SP2) explored how walk and cycle valuations varied with the conditions in which the journey was made.

In the first round of development and testing, SP1 was based around a hypothetical trip where a tolled bridge would reduce the travel time, whilst SP2 traded-off travel time in different conditions along with elements of waiting time at junctions or to cross the road again for a hypothetical trip. Depth interviews were conducted prior to the conduct of a pilot study. It was deemed that the SP2 exercise had worked but that despite the findings of the depth interviews SP1 was unsuccessful.

In a second round of development and testing, the SP1 exercise was subsequently re-designed, and based around mode choice and cycle hire. However, focus groups revealed that these were not ideal.

A further re-design arrived at the use of a segregated cycleway for which a charge was payable and departed from looking at walking as a mode in its own right and examined it as the egress component of a car or bus trip. Focus groups deemed these to be satisfactory and these were the SP1 exercises that were applied in the main data collection as part of this study, with the SP2 exercises the same as in Phase 1.

# 2 Phase 1 design of method

## 2.1 SP1 presentation and design

Contrasting with the mechanised modes, it was judged that walk and cycle called for a fundamentally different design approach, for the following reasons:

- Walking and cycling are typically free at the point of use, meaning that there is no direct payment vehicle which can be used to infer valuations of travel time savings.
- There is the added complication that walkers and cyclists typically associate reduced travel times with increased walking/cycling effort.

In addressing these complications, some of the exercises used adopted an entirely hypothetical approach, deliberately steering the respondent away from their current journey. Such an approach lent itself to a 'fixed levels' SP design, as opposed to the 'pivot' approach employed for the mechanised modes.

### 2.1.1 SP1 for walk and cycle

Two games were initially designed and tested. The first game (SP1) was a within-mode time vs. cost game (**Figure 1**), framed around a choice between a typical on-street walk/cycle journey (Route A), and a more direct, quicker route (Route B) which makes use of a tolled bridge built solely for pedestrian/cyclist use. Each respondent received 5 repetitions of this game. The times in the hypothetical journey could centre around a 10 minute, a 20 minute or a 30 minute trip, with respondents randomly allocated to one of the three.

**Figure 1: Time vs. cost experiment for walk and cycle (SP1)**

| | Route A | Route B |
|---|---|---|
| Fee | None | £0.20 |
| Cycling time | 25 minutes | 15 minutes |
| | Option A | Option B |

### 2.1.2 SP2 for walk and cycle

The second game (SP2) dispensed with the payment vehicle, by presenting a within-mode entirely time-based game, involving two alternative journeys characterised by time in different walking/cycling conditions and different types of waiting (**Figure 2** and **Figure 3**). This game might thus be seen as a synthesis of the reliability and quality games of the mechanised modes. Each respondent received 8 repetitions of this game.

The variables covered in the cycling SP2 exercise are important attributes of cycle improvement schemes and key determinants of the attractiveness of cycling as a mode. The attributes cover different traffic levels and different levels of cycle facility, ranging from an unsegregated cycle lane, segregation by a barrier, a shared footpath and an off-road cycleway. The wait times were composed to distinguish the effects of the number of waits and the amount of wait time. The cycle condition attributes were:

- Cycling on a 20 mph limit road with little traffic and no cycle facilities
- Cycling on a 30 mph limit road with little traffic and no cycle facilities
- Cycling on a 30 mph limit road with a lot of traffic and no cycle facilities
- Cycling on a 30 mph limit road with a lot of traffic but with good quality cycle lane
- Cycling in a wide bus lane of a 30 mph limit road with a lot of traffic
- Cycling on a road with a lot of traffic but t separated from motor traffic by a kerb or other physical barrier
- Cycling alongside a road with a lot of traffic but   on the footway and separated from pedestrians by a white line
- Cycling on a good quality surfaced route away from the road that only cyclists can use

These attributes are in line with the now considerable number of studies in the cycling literature (although the specific issue of VTT for cycling has received rather less attention).

**Figure 2: Time vs. quality/reliability experiment for cycling (SP2)**

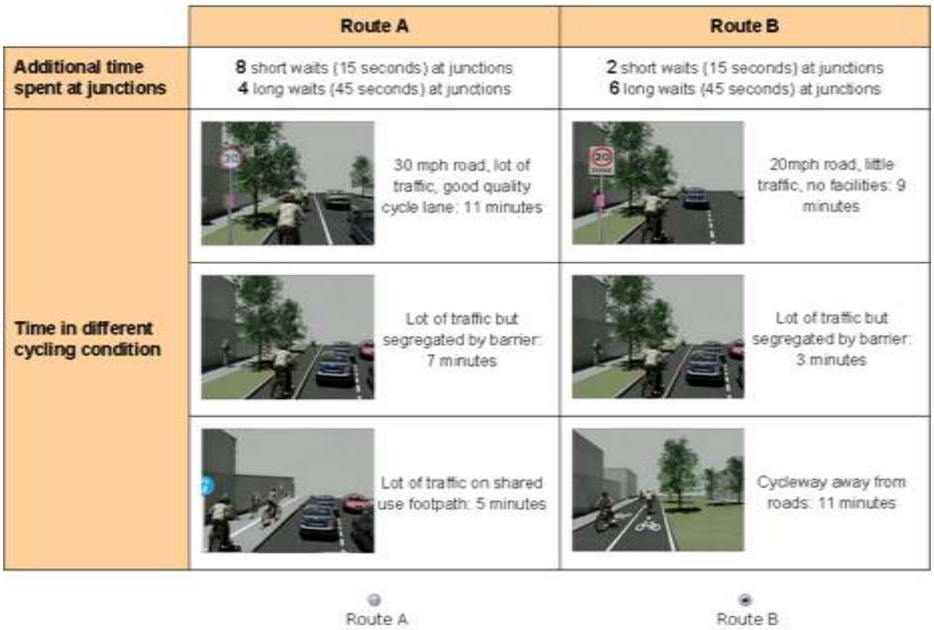
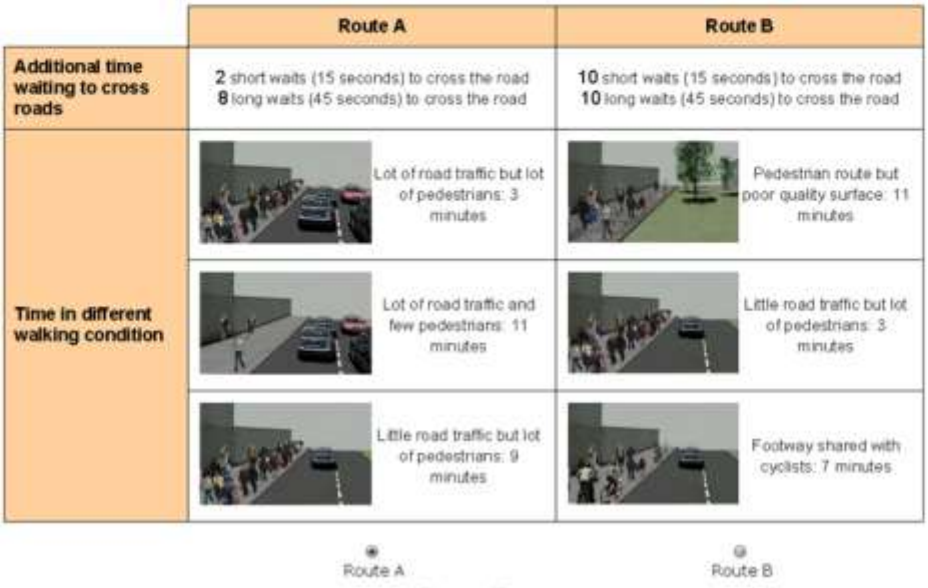


**Figure 3: Time vs. quality/reliability experiment for walking (SP2)**



| | Route A | Route B |
|---|---|---|
| Additional time waiting to cross roads | 2 short waits (15 seconds) to cross the road<br>8 long waits (45 seconds) to cross the road | 10 short waits (15 seconds) to cross the road<br>10 long waits (45 seconds) to cross the road |
| Time in different walking condition | Lot of road traffic but lot of pedestrians: 3 minutes | Pedestrian route but poor quality surface: 11 minutes |
| | Lot of road traffic and few pedestrians: 11 minutes | Little road traffic but lot of pedestrians: 3 minutes |
| | Little road traffic but lot of pedestrians: 9 minutes | Footway shared with cyclists: 7 minutes |
| | Route A | Route B |

As far as we are aware, there is limited literature on walking generally. In the absence of prior focus groups to inform us, we felt that the most important factors for pedestrians were the amount of traffic (reflecting noise and perhaps safety issues), the quality of the footpath surface, the number of other pedestrians (to explore the extent to which congested conditions increase the value of walking time), and the contentious issue of shared space with cyclists. The walking condition attributes were:

- Walking alongside a road with little traffic on a footpath with few people
- Walking alongside a road with a lot of traffic on a footpath with few people
- Walking alongside a road with little traffic and on a footpath with a lot of people that hinders progress
- Walking alongside a road with a lot of traffic on a footpath with a lot of people that hinders progress
- Walking along a route only for walkers which is separated from motor traffic, and which is good in overall quality (e.g. a high quality surface)
- Walking along a route away from the road and mixed with cycle users and pedestrians
- Walking on a footway shared with lots of cycle users and pedestrians
- Walking along a route only for walkers which is separated from motor traffic, but which is poor in overall quality (e.g. an uneven surface)

## 2.2 Initial Qualitative Research

Five depth interviews were conducted with walkers/cyclists, specifically to focus on how walk and cycle should best be presented, especially given the absence of an obvious payment vehicle.

A general message from the qualitative research was that the SP preamble should describe the context of the journey, including road conditions, weather and the cycle parking facilities at the destination.

With regards to the SP1 experiment which offered a time/cost trade-off, respondents were happy to conceptualise a hypothetical journey, but struggled with the notion of paying for walking journeys.

With regards to the SP2 experiment which compared different types of time (i.e. walking/cycling under different traffic conditions) but omitted cost, respondents felt that it offered a realistic choice.

**Appendix A** to this document contains detailed findings from these depth interviews.

## 2.3 Cognitive Depths

Part of the methodological development for the Phase 1 study included cognitive depths, to test the comprehensibility of the SP experiments and associated background questions. Four depths were undertaken with walk and cycle respondents.

Both walking and cycling respondents experienced difficulty in focussing on a specific journey and in reporting how long the journey took to complete. It was commented that some of the text used, for example quality and attractiveness of roads or routes, was subjective and not easy to understand. It was felt that headings could improve navigation in places.

In SP1 for walk, one respondent did not find the tolled footbridge to be a realistic concept.

In SP2 for cycling, one respondent viewing on a laptop complained that the images were too small. In SP2 for walking, another respondent viewing on a standard PC felt that the images were suitable in size.

As a result of this feedback, we changed the definition of 'attractiveness', added headings to the SP, and enlarged the images as recommended.

# 3 Pilot data collection

This section sets out the method for the walk and cycle pilot surveys. This was undertaken in two waves, in conjunction with the Phase 1 pilots for the mechanised modes outlined in the Final Report.

The walk and cycle sample was intercept recruited. The intercept CAPI[1] survey was administered face-to-face using Android tablets. Interviewers approached 1 in n adults and asked scoping questions to check whether the respondent was in scope and matched required quotas. If in scope, the respondent was invited to undertake a follow up survey online or by phone. The interviewer collected their contact details (name and telephone number for follow up telephone interview and name and email address for follow up online survey). The intercept interview data was uploaded to Accent's servers during or after each fieldwork shift. Those providing email addresses were sent an email with a unique web-link to the survey within 24 hours of recruitment. The names and phone numbers of those preferring to undertake the interview by phone were loaded into the telephone unit sample. All fieldwork took place on weekdays with fieldwork shifts either 07:00-13:00 or 13:00-19:00.

## 3.1 Wave 1 pilot

The Wave 1 pilot took place between 11 and 22 August 2014 in the following locations:

- Ealing
- Peterborough
- Newcastle
- Oxford Street/Regent Street

There were 223 walk and cycle intercept recruits.

**Table 1: Wave 1 interception recruits by mode and purpose**

| | Commute | Other Non-Work | Total |
|---|---|---|---|
| Walk | 43 | 129 | 172 |
| Cycle | 21 | 30 | 51 |
| **Totals** | **64** | **159** | **223** |

The number of interviews by mode and purpose is shown below.

[1] Computer Aided Personal Interview

**Table 2: Wave 1 pilot SP interviews by mode and purpose**

| | Commute | Other Non-Work | Total |
|---|---|---|---|
| Walk* | 35 | 17 | 52 |
| Cycle* | 14 | 4 | 18 |
| **Totals** | **49** | **21** | **70** |

*walk and cycle respondents' hypothetical SP were based on commuting if they ever made commuting trips on foot/by cycle

The response rates were 30% for walk and 35% for cycle.

Of the 70 SP interviews with the car and walk sample, 64 were undertaken online and 6 were undertaken by telephone.

In Wave 1, the walk target numbers were achieved, but the cycle target numbers were not achieved because of difficulties in locating in-scope cyclists. For the Wave 2 pilot, the scoping was changed so that the respondent did not need to be making a cycling trip when recruited to be in scope. The average questionnaire length was 18 minutes.

## 3.2 Wave 2 pilot

The Wave 2 pilot took place between 10 and 22 September 2014. There were 319 walk and cycle intercept recruits.

**Table 3: Wave 2 interception recruits by mode and purpose**

| | Commute | Other Non-Work | Total |
|---|---|---|---|
| Walk | 54 | 89 | 143 |
| Cycle | 109 | 67 | 176 |
| **Totals** | **163** | **156** | **319** |

The number of interviews by mode and purpose is shown below.

**Table 4: Wave 2 pilot SP interviews by mode and purpose**

| | Commute | Other Non-Work | Total |
|---|---|---|---|
| Walk* | 43 | 5 | 48 |
| Cycle* | 68 | 5 | 73 |
| **Totals** | **111** | **10** | **121** |

*walk and cycle respondents' hypothetical SP were based on commuting if they ever made commuting trips on foot/by cycle

The response rates were 34% for walk and 43% for cycle.

Of the 121 SP interviews with the car and walk sample, 114 were undertaken online and 7 were undertaken by telephone.

In Wave 2, the walk and cycle targets were achieved. The average questionnaire length was 18 minutes.

# 4 Pilot results

Following the pilot surveys, we had a brief opportunity to analyse the data and determine the success or otherwise of the SP experiments. This process is outlined for all modes in the Phase 1 report, and summarised here for walk and cycle specifically.

Given the intensity of the timelines for Phase 1 (the Phase 1 report was delivered to the Department less than a week after data collection for Wave 2 was completed), this discussion focuses principally on the analysis of Wave 1, and adds insights from Wave 2 as appropriate – and especially where significant divergences arise from Wave 1. Given the relative paucity of data for walk and cycle, we also report in this case results from a merged Wave 1 and Wave 2 dataset.

## 4.1 Cycle

We conducted two SP exercises on cyclists as described in **Sections 2.1.1** and **2.1.2** above:

- SP1: A simple time-cost trade-off involving a tolled bridge which could be used as a more direct route.
- SP2: Trade-offs between different cycling conditions, including time spent waiting at junctions.

With reference to **Table 5**, the problem with the cycling models was that they were based on only 18 respondents. As such, we were unable to read too much into the low and insignificant time coefficients seen here. Nonetheless, we noted that 61% of the sample always opted for the uncharged option. This might have reflected strategic bias, but it might also have reflected a feeling that a new tolled bridge was an unrealistic option.

SP2 offered trade-offs between time spent in different conditions, as described in **Section 2.1.2**. What was quite remarkable here was the precision with which many coefficients were estimated, when the sample was so small and individuals valued only a subset of the various conditions.

Wait time had a significant effect, with longer wait times of 45 seconds having a higher unit disutility. Time3[2] had the highest disutility, which was not surprising since these were the worst conditions. Time7 and Time8 represented off-road cycling, which might be regarded as the safest, and so it is not surprising they had

[2] Time1=Cycling on a 20mph limit road with little traffic and no cycle facilities; Time2=Cycling on a 30 mph limit road with little traffic and no cycle facilities; Time3=Cycling on a 30 mph limit road with a lot of traffic and no cycle facilities; Time 4= Cycling on a 30 mph limit road with a lot of traffic but good quality cycle lane; Time5=Cycling in a wide bus lane of a 30 mph limit road with a lot of traffic; Time6 = Cycling on a road with a lot of traffic but separated from motor traffic by a kerb or other physical barrier; Time7=Cycling alongside a road with a lot of traffic but on the footway and separated from pedestrians by a white line; Time8=Cycling on a good quality surfaced route away from the road that only cyclists can use.

the lowest valuation. Generally, time spent where there were no facilities (Time1, Time2, Time3) had the highest disutility.

The results were less conclusive for cycling SP1. On the one hand, we suspected and indeed observed a reluctance to pay a charge for a time saving on the new bridge. On the other hand, there were some credible and remarkably precise results for different cycling conditions, bearing in mind the very small sample size.

The proportion of cyclists stating that SP1 was ‘understandable’ was 80%, with 68% saying it was ‘realistic’ and 95% saying it was ‘easy’. As with the walking SP1 discussed below, it was unsurprising that this exercise performed less well in terms of realism than the SP1 exercises for mechanised modes. SP2 was deemed to be slightly more realistic, at 78%, but 68% found it ‘easy’ to make choices. These figures indicated that cyclists were able to deal with the SP exercises but, as with walking below, this did not preclude the existence of strategic bias.

As for Wave 2, the number who always chose the free route in SP1 fell to 45%. In the Wave 1 & 2 SP2, the relatively high disutility for Time3 was maintained, whilst those scenarios where there was separation from road traffic had lower disutility. It was concluded that SP2 for cycling had worked reasonably well but with reservations surrounding the SP1 context, particularly when the results for walking were taken into account.

**Table 5: Cycle models from pilot survey**

| | SP1 | SP2 Wave 1 | SP2 Wave 1 & 2 |
|---|---|---|---|
| Respondents | 18 | 18 | 93 |
| Observations | 90 | 144 | 744 |
| Time (mins) | -0.0358 (0.5) | | |
| Cost (£) | -2.2833 (3.3) | | |
| Wait 15 seconds | | -0.0808 (2.3) | -0.0462 (2.9) |
| Wait 45 seconds | | -0.1705 (2.5) | -0.1078 (4.4) |
| Time1 (mins) | | -0.1368 (1.8) | -0.0389 (1.5) |
| Time2 (mins) | | -0.0986 (1.6) | -0.0257 (1.1) |
| Time3 (mins) | | -0.1724 (2.0) | -0.0695 (2.9) |
| Time4 (mins) | | -0.0994 (1.3) | -0.0133 (0.5) |
| Time5 (mins) | | -0.0753 (1.0) | -0.0445 (1.7) |
| Time6 (mins) | | -0.1701 (2.3) | -0.0261 (1.2) |
| Time7 (mins) | | -0.0476 (0.8) | -0.0218 (1.0) |
| Time8 (mins) | | -0.0485 (0.8) | 0.0162 (0.7) |
| **UTILITY SPACE** | | | |
| Adjusted $\rho^2$ | 0.28 | 0.03 | 0.02 |
| Wave 2 Respondents | 93 | | |
| Wave 2 Observations | 465 | | |
| Wave 2 Adjusted $f\rho^2$ | 0.36 | | |
| **LOG WTP SPACE** | | | |
| Adjusted $\rho^2$ | 0.32 | | |

Notes: t ratios in parentheses.

## 4.2 Walk

Two SP exercises were conducted for walkers as described in **Sections 2.1.1** and **2.1.2** above:

- SP1: A simple time-cost trade-off involving a tolled bridge which could be used as a more direct route.
- SP2: Trade-offs between different walking type conditions, including time spent waiting to cross roads.

With reference to **Table 6**, the cost coefficient was much more precisely estimated than the time coefficient. Whilst it could be that a significant number of individuals walk for health, financial or environmental reasons, and might not value time savings highly, we suspected that there had been a protest response to paying to use the bridge, even though the scenario was entirely hypothetical. This was reflected in the degree of non-trading on cost; 54% of the sample opted for the untolled option in all five scenarios.

Such a possibility had been anticipated, although it did not emerge in the cognitive testing. For SP1, the proportions who 'strongly agreed' or 'agreed' that the exercise was understandable, realistic and easy were 85%, 68% and 87% respectively. It was not surprising that the exercise performed worst in the area of realism. For SP2, the responses were similar except for ease of answering, where only 59% found making choices 'easy'. Overall, this pattern of answers did not reveal serious concerns, but neither did it preclude the existence of strategic bias.

Whilst SP2 returned coefficients which were not significant, the sample size was small, and bearing in mind that each respondent had considered only a subset of the different conditions, there were some encouraging findings.

The walk6[3] and walk8 coefficients were amongst the smallest in magnitude, but might have been expected to be relatively attractive options. By contrast, walk3 and walk4 were the highest, and noticeably these related to crowded footpaths that hinder progress.

There remained a strong element of protest in the Wave 2 SP1 exercise, with 43% choosing the free route in all cases. As for SP2, the combined Wave 1 & 2 data delivered a model with some significant coefficients and most others nearly significant; in particular, walk7 had a relatively low coefficient – in line with expectations.

[3] Walk1=Walking alongside a road with little traffic on a footpath with few people; Walk2 = Walking alongside a road with a lot of traffic on a footpath with few people; Walk3=Walking alongside a road with little traffic and on a footpath with a lot of people that hinders progress; Walk4=Walking alongside a road with a lot of traffic on a footpath with a lot of people that hinders progress; Walk5= Walking along a route only for walkers which is separated from motor traffic and which is good in overall quality (e.g. a high quality surface); ; Walk6=Walking along a route away from the road and mixed with cycle users and pedestrians; Walk7=Walking on a footway shared with lots of cycle users and pedestrians; ; Walk8=Walking along a route only for walkers which is separated from motor traffic, but which is poor in overall quality (e.g. an uneven surface).

Despite the mixed results, it was difficult to conclude that asking walkers to value time was inherently impossible. There were some encouraging features of SP2, as for cycling, particularly given the small sample size. Nonetheless, the issue of protest response in SP1 against a charge to use the bridge was noted to be a serious one.

**Table 6: Walk models from pilot survey**

| | SP1 | SP2 Wave1 | SP2 Wave 1&2 |
|---|---|---|---|
| Respondents | 52 | 52 | 100 |
| Observations | 260 | 416 | 800 |
| Time (mins) | -0.0682 (2.0) | | |
| Wait 15 seconds | | -0.0027 (0.1) | -0.0242 (1.6) |
| Wait 45 seconds | | -0.0358 (1.0) | -0.0451 (2.0) |
| Walk1 (mins) | | -0.0379 (1.1) | -0.0410 (1.9) |
| Walk2 (mins) | | -0.0286 (0.8) | -0.0281 (1.2) |
| Walk3 (mins) | | -0.0775 (1.8) | -0.0466 (1.9) |
| Walk4 (mins) | | -0.0680 (1.6) | -0.0346 (1.4) |
| Walk5 (mins) | | -0.0607 (1.4) | -0.0622 (2.5) |
| Walk6 (mins) | | -0.0228 (0.6) | -0.0339 (1.7) |
| Walk7 (mins) | | -0.0508 (1.5) | -0.0304 (1.5) |
| Walk8 (mins) | | -0.0295 (0.9) | -0.0355 (1.7) |
| Cost (£) | -2.4008 (5.6) | | |
| UTILITY SPACE | | | |
| Adjusted $\rho^2$ | 0.31 | 0.01 | 0.01 |
| Wave 2 Respondents | 100 | | |
| Wave 2 Observations | 500 | | |
| Wave 2 Adjusted $\rho^2$ | 0.25 | | |
| LOG WTP SPACE | | | |
| Adjusted $\rho^2$ | 0.35 | | |

Notes: t ratios in parentheses.

# 5 Review of options after Phase 1

Following Phase 1, which demonstrated a mixed picture of success for walk and cycle, the Department asked us to set out revised options for valuing time savings on journeys made by bicycle or on foot (SP1) in Phase 2, although it was decided that the exercises dealing with detailed walking and cycling conditions (SP2) could be retained in their existing form.

We here set out the options that were considered to provide a more suitable choice context for monetary valuation, bearing in mind the objective to value time savings for walking and cycling as main modes.

## 5.1 The issues

There are challenges unique to cycle and walking that need to be addressed if money values are to be successfully recovered. These are:

- Cost needs to be introduced in a realistic and uncontentious manner;
- Variations in cycle times and costs need to be introduced in a realistic manner;
- Walk and cycle can be main modes in their own right or access modes.

On the first point, walking and cycling are free and there are no natural payment mechanisms. The cognitive testing conducted in Phase 1 seemed to indicate that respondents could relate to a context of paying to use a new facility to save time, but this did not seem to have been the case in the Phase 1 SP1 exercises.

With regard to the need for realism, this applies to all SP exercises, and is the reason why the SP exercises for the other modes offer attribute levels that pivot off existing levels using sensible proportionate variations. However, the issue here is that varying times for a given distance can imply sub-optimal amounts of effort since, for example, walkers and cyclists could already save time by walking or cycling more quickly. Equally, if variations in distance are the source of time variations, then the benefit of a time saving is confounded with the benefits of less effort. The latter is fine if we are evaluating a scheme that reduces distance and time, but not if we are evaluating a scheme that just reduces time, say by easing traffic flow, removing obstacles or reducing waiting times

Walk time is an essential part of using any mode of travel. Regardless of differences between those who walk and those who use other modes in their outlook on walking, it can be expected that short and mandatory walks to a bus stop are somewhat different in nature to longer walks of an optional nature whilst the former are also part of a somewhat longer journey. As such, the value of saving walk or cycle time as a main mode might be different to the value of saving such time as an access mode. Indeed, the requirement of this study was to estimate values of savings in cycle and walk time as a main mode.

The fact that some people walk and cycle for health and fitness reasons need not concern us unduly; they have lower values of time than others, just as those who spend train travel time productively will have lower values than others.

## 5.2 The options

We identified several contexts as possible options for obtaining money values of time savings for cyclists and walkers:

- Main mode choice
- Access mode choice
- Station/stop choice
- Cycle hire
- Cycle parking
- Paid to cycle
- Tolled cycle route
- Destination choice
- Council tax

In the following sub-sections we discuss the pros and cons of each option.

### 5.2.1 Main mode choice

Some people do make choices between walking, cycling, bus, car, taxi and, in some locations, trams or underground. The motorised modes involve a cost which opens up the possibility of trading-off time and money.

This context would therefore seem to be a candidate for an SP choice exercise, and indeed might be supplemented with RP mode choice data from a real world context.

Designing the SP exercise would be challenging however, since cycle is cheaper and can often be quicker than bus, and train is not generally relevant for the short distance journeys here involved. Similarly, for some journeys, walking is both quicker and cheaper than bus once waiting times are taken into account.

There are examples in the literature of successful SP mode choice exercises covering cycle (Stangeby, 1997; Wardman et al., 2007; Börjesson, and Eliasson, 2012). The qualitative depths suggested that the mode choice experiment was understandable and acceptable to those interviewed, although this was not included in the pilots.

However, we are also aware of SP mode choice exercises that faced problems or whose results for cycle values are not entirely credible (Wardman et al., 1997; Björklund and Isacsson, 2013).

It might not be possible to present credible trade-off situations to respondents, on the grounds that cycle or walk would be quicker and cheaper, whilst some respondents might not be making real choices. Care therefore needs to be taken to identify those for whom the choice context is realistic. It might be necessary to offer limited stop bus services or to identify trips where people have a realistic choice (say instead involving taxis).

In addition, care needs to be taken to ensure that the cycle or walk time variations (for the fixed distance journey) does not imply sub-optimal levels of effort. This might limit the extent of time variations.

There is also the undesirable presence of confounding factors which influence mode choices, but an attraction is that there might be RP possibilities to complement the SP work.

### 5.2.2 Access (to rail) mode choice

Rail travellers can access train stations by a variety of modes. There might be trade-offs between walking or cycling to the station for free and getting there more quickly by bus or taxi which have costs associated with them.

By their very nature, these are access journeys however, and not the main mode journeys that this study is concerned with. Moreover, the respondents would be rail users who can hardly be deemed representative of walkers and cyclists. On the other hand, this context would offer possibilities for introducing RP data.

### 5.2.3 Station choice/stop choice/parking location choice

This could take the form of 'travelling short' in order to save money, whereupon additional walking time is incurred, or choosing a different origin stop or station which involves a trade-off between walk time and different fares. Motorists might be offered different parking places, with ones nearer their destination being more expensive.

Whilst such choice contexts might not be a common part of everyday travel, they could provide realistic trade-offs between walking time and money. However, ensuring these were conducted in situations that respondents could relate to would make recruitment expensive.

We are again confronted with the walk time being access rather than main mode and the users being unrepresentative or walkers. Moreover, it does not cover cycling.

To the extent that different distances are involved, the time variations confound with effort variations.

### 5.2.4 Cycle hire

There are now cycle hire schemes in London and other cities. This introduces the possibility of paying to cycle and thereby save time, especially in relation to walking. This context would allow the estimation of money values for both walking time and cycle time.

The cycle element would still involve some walking and there might be a need to customise to a realistic context. And it would be necessary to isolate any confounding effects due to how the cycle is paid for.

We are aware that SP research has been conducted for TfL regarding the cycle hire scheme. Our understanding is that it was successful in terms of trading-off time and money.

### 5.2.5 Cycle parking

Being able to park a cycle in a safe and secure place is something that cyclists might well be prepared to pay for and it is not inconceivable that such charged facilities could be offered. Values of time can be estimated if the parking facility is in a location closer to the desired destination. However, is it realistic to offer a cycle parking facility which has to be paid for which is nearer to the destination of the trip?

### 5.2.6 Electric cycles

Electric cycles, which reduce the amount of effort involved in cycling, are becoming more popular. The bikes have to be charged which introduces a cost element.

The trade-off would be that more time could be saved on a journey but this would take more energy and hence incur greater cost. We do not think that trading-off the purchase price of an electric bike against the potential time savings would be sensible, and would in any event confound time savings with reduced effort.

We are aware on an ongoing study of electric bikes in Norway on this issue, but the emphasis there is on the take-up of this product rather than time savings.

Moreover, too few people own electric bikes and it is difficult to see that the cost variations could be sufficiently large to introduce sensible time-cost trade-offs. Furthermore, it obviously covers only cycling, and a separate walking exercise would be needed.

### 5.2.7 Paid to cycle

As an inducement to cycling, a policy option that has been considered is to pay people to cycle to work, say through tax breaks. This introduces money into cycle decision making.

This would only really be an option as part of a broader mode choice exercise, since there is no practical means of trading-off the tax rebate and cycle time savings.

This option would only realistically cover cycle commuting trips, such that other purposes, and walking, would need to be covered with a separate SP exercise.

Moreover, a key concern is that the valuation would not be based on willingness to pay, and values based on money received may well be different.

### 5.2.8 Tolled cycle route

Cyclists could be charged to use a segregated cycleway, as might be provided alongside a railway line, and route choices considered. Offering a number of routes, with different levels of facilities say, provides a means of introducing realistic time variations.

Whilst this is in principle similar to the SP exercise that did not work in Phase 1, we should point out that it was used with some success by Hopkinson and Wardman (1996). That might have been because it was based around a real journey and the realistic possibility to install a cycleway next to the Shipley to Bradford Forster Square railway line.

A problem with this approach is that ideally it has to be based on a journey where it is realistic to introduce a segregated cycleway and charge for its use. Thus recruitment costs would be high. The appetite for such an approach might be diminished given the experiences of the Phase 1 cycling SP exercise.

Walking would have to be covered with a separate SP exercise.

### 5.2.9 Destination choice

It is sometimes possible to save money by travelling to a more distant location. So an SP exercise might offer choices between supermarkets where the local one is more expensive or a cheaper meal is possible by travelling to a more distant restaurant.

Again, whilst this would not be the mainstay of an RP data collection exercise since it is a rarely made choice, we could envisage that respondents could relate to time-cost trade-offs offered in judiciously chosen choice context.

Given that the SP exercise would have to be based on a real-world trade-off situation, there might be a range of other variables that influence choices and have a potentially confounding effect. Recruitment costs, based around a real context, would be high.

These problems would be avoided if an artificial choice context were used. However, this choice context is not in itself the most common or familiar, and using an artificial variant would be risky on the grounds of realism. Another problem here is that the different distances confound effort and time, whilst the approach would not be suitable for commuting trips.

### 5.2.10 Council tax

There is no market in which improvements in environmental quality can be directly purchased and no natural payment mechanism, but this has not deterred environmental economists from obtaining valuations. We could therefore offer a package of area wide cycling improvements which would reduce journey times but at the cost of higher council taxes. It might also be possible to offer a range of improvements than reduced walking times.

However, the respondent would have difficulty working out the extent of any time savings. Even if we could realistically offer a total level of time saving, trading-off cost at some weekly or monthly level against some aggregated amount of time saving is not the same as valuing savings on specific trips.

In addition, there are other problems with this numeraire, such as the respondent not being responsible for paying the council tax.

### 5.2.11 Recommendations

Having reviewed the above options, we concluded that the mode choice exercise would be viable, provided realistic variations were offered and we could identify people who were faced with real choices. Such an exercise would cover both cycling and walking. The qualitative depths undertaken previously seemed to indicate that respondents could relate to this context, and there were examples where this approach had been used successfully to estimate values of time.

We also concluded that the cycle hire approach, which encompassed both walking and cycling, was now a familiar choice context and offered the possibility to trade-off walking time, cycling time and cost. We noted that there had been successful studies in the area, and that this also represented a viable candidate for implementation.

We concluded that these two options were worthy of further consideration. However, we advised the Department that there needed to be careful testing and piloting in order to avoid committing significant resources to an exercise that ultimately might not work. We felt that focus groups would be a good setting for testing the SP exercise, and this is described in **Section 6** which follows.

# 6 Focus groups for the revised concepts

The overall objective of these groups was to provide specific direction for walk and cycle SP for the quantitative stage, based on the recommendations arrived at in our review of alternative ways forward for obtaining monetary values for walking and cycling as set out in **Section 5**. The specific objectives were:

- To explore attitudes and behaviour of walkers and cyclists with respect to travel time including any associated benefits of travel related time savings
- To test the different SP experiments proposed in **Section 5.2.11**, in order to see how participants made their choices, to understand the degree of comprehension, and to identify which experiments worked and any changes needed to increase clarity.

Four 90-minute pre-tasked discussion groups were held on Monday 8th and Tuesday 9th December 2014 as detailed in **Table 7**.

**Table 7: Pilot SP interviews by mode and purpose**

| Group | Location | Mode | Journey Purpose |
|---|---|---|---|
| 1 | Birmingham | Cyclists | Commuters |
| 2 | Birmingham | Walkers | Other Non-Work |
| 3 | Bristol | Cyclists | Other Non-Work |
| 4 | Bristol | Walkers | Commuters |

The pre-tasks comprised asking recruited participants to complete a simple workbook designed to get collect information about journey behaviour, modal shift and relationship with walking/cycling. There were two tasks:

- Collage exercise – create a collage that depicts your thoughts and feelings towards cycling/walking AND alternative mode
- Journey diary – complete a journey diary outlining journeys made and reasons for modal choice

As for the SP element, ‘mock-up’ SP exercises were presented to participants in the focus groups to explore whether these provided a satisfactory basis for valuing time savings for walkers and cyclists. In addition, broader attitudes towards and motivations for walking and cycling were explored in detail.

Walkers were offered exercises where they could choose between taxi and walking, or between cycle hire and walking. Cyclists were offered exercises where they could choose between cycling and taxi. Taxi was used as the alternative on the grounds it would be available to everyone.

Participants were offered three choice scenarios for each exercise, based around the times of a journey they made but allowing the journey times for walking and cycling to be varied; by plus or minus five minutes around the central value, with smaller variations for very short journeys.

The key findings from the groups were reported to the Department in a PowerPoint presentation on 16th December 2014.

The key conclusions with respect to participant attitudes and behaviours were:

- There was a limited desire for time savings for non-time critical non-work journeys, especially amongst walkers.
- Commuters demonstrated more appetite for time savings.
- Walking and cycling delivers rational and emotional rewards which can be deep rooted.
- There were three different types of cyclists identified; those whose motivations for cycling were more rational were more likely to trade time and cost.
- Cycling was seen as a faster alternative to public transport and taxis in city centres.

The key conclusions with respect to the SP experiments were:

- The longer distance experiments seemed to work better as there was more opportunity for meaningful time savings.
- Cycle hire for walking commuters could work if there were good time savings and low costs (as there were also exercise benefits).
- Car sharing was an interesting alternative to consider for cyclists – possibly with shared costs.
- Taxi as an alternative mode was problematic due to a range of other associated benefits (beyond time) that impact on choice.
- Taxi costs were seen as unrealistically low, but had been set at such levels to offer sensible time-cost trade-offs.
- Whilst walking times were considered to be fairly predictable, the variations offered were not unrealistic although it was deemed important to explain why walk time would vary across scenarios.
- “cycling seen as faster alternative to PT and taxis in the city centre”.
- “commitment to walking is strong so the starting point is a reluctance to trade”.
- As might seem obvious, but are often overlooked, the conditions of travel were particularly important for walk and cycle. These included the weather, time of day (dark or light) and health issues.
- There were a lot of detailed issues that needed to be clearly specified, since they could impact on realism and choice. These included why times vary, sensibility of monetary costs needed for trade-offs versus free modes, realism of cycle hire schemes for the journey in question, and the ‘hidden’ costs of using cycle hire and taxi.
- Motivations for cycling and walking could be so strong that there was little point offering SP exercises to save time.

In the light of the above findings, we expressed reservations about the mode choice approach used, on the grounds of the strong extraneous influences upon choice which could distort the values obtained. Whilst taxi is available to everyone, it was not everyone's best alternative. The taxi fares needed to be limited to offer sensible trade-offs, but on the other hand these fares might not be realistic. There were also elements of time related to booking, waiting and paying. Extending the approach to include the best alternative mode would however complicate matters, without necessarily dealing with the extraneous mode specific influences.

We also expressed reservations about the cycle hire mode choice exercise offered to walkers. Firstly, it was a particular type of walker who would consider cycle hire. Secondly, some questioned the realism of a cycle hire facility during the course of their walk journey, although reference to 'Boris Bikes' did help with the concept. Thirdly, the non-work subset was not interested in cycle hire. In addition, the cost element had to be fairly low in order to incorporate sensible time-cost trade-offs, but this was challenging from a design perspective and might not turn out to be credible.

The cycle hire was, on the grounds of realism, not offered for the entire journey. Hence walking to and from the facility was specified. This posed two potential problems. Firstly, for some journeys this inevitably meant that some of the components of the journey (walk access, cycle, walk egress) were small. Secondly, there was a view that the overall journey time was needed, but then this introduced the risk (which we resisted in other aspects of the study) that respondents would focus on the total journey and not its component parts.

Our preference therefore, as far as is possible, was to offer within-mode trade-offs. The overriding message from the focus groups seemed to be:

- *walkers and cyclists might want a time saving but they don't necessarily want a mode switch*

On the basis of these findings, we again revisited the choice contexts that we might use to obtain monetary values for walk and cycling, accepting that it might be necessary to cover these modes as access/egress modes rather than as main modes.

# 7 Further review of options

Informed by the findings from the focus groups reported in **Section 6** above, we provided a revised set of recommendations as to how the walk and cycling SP exercises should progress. These focussed on 'within-mode' choice contexts.

## 7.1 Cycling

We had previously floated the idea of cyclists being charged for a segregated cycleway, but one that could be sensibly offered as a new facility such as along an existing railway line with clear entry and exit points where a charge would be incurred. In this context, it would be crucial to control for effects which could potentially confound VTT, such as journey ambiance and health considerations.

Our view was that this had to be a realistic offering. The experience of the Phase 1 SP exercise, which offered a tolled bridge across an obstacle, was unrealistic for cyclists who could not envisage such a bridge facility or, more importantly, did not encounter such an obstacle.

We judged that a segregated cycle route was more realistic than a cycle bridge on the grounds that these could be installed alongside current rail routes. An essential requirement was to focus on corridors where such a facility could be installed, although this potentially added significantly to data collection costs.

## 7.2 Walking

On reflection, we decided that there was no credible within-mode choice context where walkers could purchase a walk time saving through some monetary payment.

Destination choice, whereby the same goods or services could be purchased with less walking time but higher costs, did not appear to be a familiar choice context, and there was the chance that extraneous factors could be at work here.

Data collection costs would be high because it would be highly advisable to identify respondents who had some realistic possibility of trading-off walk time and cost through destination choice.

## 7.3 Walking as access/egress mode

We judged that people who walked as a main mode might have a fundamentally different take on walking than pedestrians who had parked their cars or people accessing/egressing public transport.

Given the difficulties of offering trade-offs between walk time as a main mode and cost, we suggested that access/egress walk time could be examined. In this context, it would again be crucial to control for effects which could potentially confound VTT however, such as scheduling considerations.

But, in recognition that people who walked as a main mode might have somewhat different valuations of walk to those who simply use it to access/egress other modes, we recommended that there was segmentation of the walk time according to the type of 'walker'. At one extreme is someone who never walks unless they have to, whilst at the other extreme is someone who happens to be using a motorised mode and has to access/egress but otherwise often chooses walk as a main mode. We speculated that valuations of walking access/egress would be interesting both in absolute terms, and also in terms of their relativity to IVT.

We therefore recommended the following choice contexts as discussed above:

- Motorists' choices between parking locations, with those with lower walking times to the destination having higher parking charges.
- Bus users' choices between different routes and access/egress time with different fares on each route or possibly higher fares for the final leg into a town centre.

We noted that both of these contexts had previously been used in SP studies to value access time.

We were reluctant to suggest different rail (alongside bus) routes with different access times and fares on the grounds that an SP exercise would be unrealistic.

## 7.4 Contingent Valuation (CV)

Alongside the SP, we considered that there would be some benefit from simply asking cyclists and walkers how much they would pay for a saving in their journey time. This could take the form:

- On the (walk/cycle) journey we have contacted you on, would you want a shorter journey time (e.g., by a more direct route or less 'congestion').
- If yes – Suppose you could pay money to save time, how much would you be prepared to pay?

The attraction of this method was that it was a relatively straightforward question to ask, and could provide useful corroboration to the SP.

Given the difficulties encountered previously in devising a viable research method, we again counselled exploratory testing (**Section 8.1** below).

# 8 Re-design of SP presentations and designs

## 8.1 Focus groups

A second set of groups were undertaken in February 2015 to test revised SP concepts and CV questioning.

Four 90-minute pre-tasked discussion groups were held on 4th and 5th February 2015 as detailed in **Table 8**.

**Table 8: Pilot SP interviews by mode and purpose**

| Group | Location | Mode | Journey Purpose |
|---|---|---|---|
| 1 | Exeter | Cyclists | Commuters |
| 2 | Exeter | Walkers | Other Non-Work |
| 3 | Manchester | Cyclists | Other Non-Work |
| 4 | Manchester | Walkers | Commuters |

The pre tasks involved asking recruited participants to complete a simple workbook to collect information about journey behaviour, modal shift and relationship with walking/cycling. There were two tasks:

- Collage exercise – create a collage that depicts your thoughts and feelings towards cyclingwalking AND alternative mode
- Journey diary – complete a journey diary outlining journeys made and reasons for modal choice

The key findings from the groups were reported to the Department in a PowerPoint presentation on 20th February 2015.

## 8.2 Findings

### 8.2.1 Summary findings for cyclists

- There were significant emotional benefits associated with cycling.
- Cyclists were not looking for time savings, but some potential to explore WTP for enhanced cycling experience focused around road safety attributes.
- The use of a hypothetical journey in the SP was fine for understanding the value of enhanced experience but not for values of time.
- The cycleway should be described as segregated, dedicated or exclusive in order to clearly demonstrate that it is for cyclists only and is situated away from any other road traffic or pedestrians.
- A visual of a cycleway would be helpful.
- Presenting WTP as a £10 monthly or annual unlimited charge for ongoing maintenance and policing of the cycle way would be a starting point.

### 8.2.2 Summary findings for walkers

- Everyone claimed to be time poor therefore saving time has a degree of importance to everyone. However, forcing people to pay to save time changes their gut response.
- Commuters would argue that their journeys are more time critical (e.g. they have to get to work on time and/or there is a great appeal in getting home early) **but** the cumulative cost of time saving – even with relatively low unit costs forces many to change their mind.
- Overall, walkers did not show a strong need to save time. Any 'lost time' can be factored into their everyday journeys.
- Pure walking (and as part of egress) is not seen as 'wasted time'.
- There are certain circumstances where walkers are prepared to pay to save time, but this is not about journey purpose. Instead it is about mood, occasion and circumstance (e.g. weather).
- In these situations, the time saving still need to be significant enough to make a difference, e.g. 15 minutes or more one way.
- Costs should be presented as absolutes.
- There were difficulties with conveying details of the car parks and zones, which suggested that an abstract portrayal would be most appropriate approach for the SP.

### 8.2.3 Recommendations for the SP

**Cycle**

Two SP experiments were recommended for cyclists:

- cycleway SP
- SP on different cycling conditions on the existing route (essentially transferring time between conditions and valuing that rather than time savings alone).

As there were strong attitudes towards paying for cycleways, we recommended that there should be attitudinal 'debrief' questions to understand responses to SP options.

Furthermore, we advised that a payment mechanisms should be offered which did not require cyclists to stop, e.g. electronic payment (pay per journey was thought better than a permit on the grounds that there might be uncertainties as to how many times the facility would be used in the period).

We advised that maps of possible routes should be provided with clear description of facilities.

**Walk**

Two following SP experiments were recommended for walkers:

- **For car users:** abstract car parking location exercise (as there were a number of factors counting against using real locations, and it was easier/more realistic to get people to imagine different walking times from abstract car parks than to vary walking times from actual car parks).
- **For public transport users:** unspecified operator choice, with different operators setting-down at distinctly different places in the city centre. There was also the possibility of varying where buses departed from at the home end.
- **For all:** different walking conditions on the existing route (essentially valuing the transfer of time between conditions rather than valuing time savings alone).

We noted that the SP exercises would need to account for people choosing activities near to car parks/PT stops and also be clear on whether the walking time was one way or both ways.

## 8.3 Revised SP presentation and design

The conclusions drawn from the second set of focus groups were that egress from car parks or bus stops was deemed the most suitable method to obtain walk time values, albeit not for walk as the main mode, whilst a segregated and charged cycleway should be offered to cyclists. These would form the first SP exercise (SP1) charged with obtaining money values.

The conclusion from Phase 1 was that the second SP exercise, dealing with different types of walk and cycle time and also waiting time at junctions or to cross roads, had largely been successful and hence no changes were made to these.

### 8.3.1 Cycle SP1

This offered cyclists choices between the route taken for their actual cycle trip and the new cycleway. They were presented with maps depicting the route of the cycleway and access points. The cycleway was next to an existing railway line, of high surface quality and solely for the use of cyclists but a charge would be payable using contactless payment to avoid delays. Given the contentious nature of charging for cycle space, it was stated that, “Please note, that if such a cycleway were ever to be built, it may or may not be free to use and we are asking about costs here to assess the potential value it may have”.

Having identified where the cycleway would be joined and left, estimates of access and egress time were provided, which respondents could adjust if inaccurate. The respondent was asked to break the access and egress times down into waiting at junctions, cycling in conditions where there is little motor traffic, and cycling in conditions where there is a lot of motor traffic. They were also presented with a time on the cycleway which could also be corrected if deemed unrealistic. For their actual cycle trip, their perceived amounts of time at junctions, cycling in light traffic and cycling in heavy traffic were also collected.

The information on the actual cycle trip and the cycleway possibility formed the basis of the SP exercise, with variations around these levels. The choice situations were presented as in **Figure 4** below.

Each respondent received 5 repetitions of this game.

**Figure 4: Revised SP1 cycle**

| | Existing Route | Cycleway |
|---|---|---|
| **Travel time** | #x# minutes in conditions where there is little motor traffic<br>#x# minutes in conditions where there is a lot of motor traffic<br>#x# minutes at junctions | #x# minutes **to** Cycleway<br>#y# minutes **on** Cycleway<br>#z# minutes **from** Cycleway |
| **One way cost** | | £#Y# |

### 8.3.2 Walk SP1

Motorists with a current egress time from their parking space of at least 5 minutes were offered a choice of parking locations with different egress times and parking costs. For bus users, different egress times came in terms of different bus stops to alight at.

#### Motorists' parking choice

Motorists were asked to imagine that they were faced with a choice of car parks in different locations with different costs but otherwise identical. The two car parks were defined in terms of overall parking charge, one-way time from the car park to their destination, and the time spent in the car getting to the car park. The times and costs were varied around the levels reported for their actual trip. They were told that walking times could vary due to location and time to cross roads whilst the car time varied due to different routes to the car parks. All else was the same for each car park. The choice situations were presented as in **Figure 5** below.

Each respondent received 5 repetitions of this game.

**Figure 5: Revised SP1 walk – parking choice**

| | Car Park A | Car Park B |
|---|---|---|
| **One way walking time from car park to destination** | #X# minutes | #Y# minutes |
| **Time in Car** | #A# minutes | #B# minutes |
| **Parking cost** | £#X# | £#Y# |

### Bus users' bus stop choice

Bus users who paid a fare were asked to imagine that they had a choice of different bus stops to alight at with different egress times to their destination. The two bus stops were characterised by different amounts of walking time to the respondent's destination, different amounts of time on the bus, and different fares. All else was specified to be the same for each bus stop, with the same crowding levels and bus quality specifically mentioned.

The egress times, bus times and bus fares presented were varied around current levels. It was explained that walking times could vary due to the bus stop location and bus times were dependent upon congestion and the route taken. The choice situations were presented as in **Figure 6** below.

Each respondent received 5 repetitions of this game.

**Figure 6: Revised SP1 walk – bus stop choice**

| | **Bus journey A** | **Bus journey B** |
|---|---|---|
| **Walking time from bus stop to destination** | #X# minutes | #Y# minutes |
| **Time on Bus** | #A# minutes | #B# minutes |
| **Bus fare** | £#X# | £#Y# |

# 9 Extended pilot data collection

## 9.1 Introduction

There was a target of 200 walk and 200 cycle SP interviews. These were all intercept recruited.

The intercept CAPI[4] survey was administered face-to-face using Android tablets. Interviewers approached a random sample of adults (typically 1 in 3) and asked scoping questions to check whether the respondent was in scope and matched required quotas.

If in scope, the respondent was invited to undertake a follow up survey online or by phone (for walk only). The interviewer collected their contact details (name and telephone number for follow up telephone interview and name and e-mail address for follow up online survey). The intercept interview data was uploaded to Accent's servers during or after each fieldwork shift. Those providing e-mail addresses were sent an e-mail with a unique web-link to the survey at the end of the shift. The names and phone numbers of those preferring to undertake the interview by phone were loaded into the telephone unit sample on a daily basis.

Fieldwork intercept shifts took place from 20th April to 1st May 2015 and were scheduled between 07:00 and 19:00. There were 1,387 recruits.

The specific methods for cycle and walk recruitment are shown below.

### 9.1.1 Cycle method

Cycleway route maps were prepared for each location showing one or two cycleways running alongside a railway line towards the centre.

Interviewers went to locations along the cycleway route maps for each location. For each cycleway they were instructed to recruit at one, two or three locations at different distances from the centre.

To be in scope the respondent had to make **cycle** journeys at least once a week. Those using cycle hire were out of scope.

### 9.1.2 Walk method

As regards the walk sample, interviewers recruited in the centre of the town or city. To be in scope the respondent had to either:

- pay to use a **bus** to the centre and then walk for five or more minutes to their destination.
- **drive** to the centre, pay to park and then walk for five or more minutes to their destination.

[4] Computer Aided Personal Interview

For car, we recruited in the city/town centre or near car parks.

For bus, we recruited at city/town centre bus stops.

### 9.1.3 Locations

For the cycle sample, as for the focus groups, we needed to credibly introduce a tolled cycleway alongside a railway line and recruit cyclists on that route. We considered locations based on this criteria, as well as on the basis of cycling activity and population (**Table 9**).

From those with relatively central stations, and ensuring that there was a spread of cycle use and location size, the following six locations were selected:

- Birmingham
- Manchester
- Bristol
- Reading
- Exeter
- Southport

For practical reasons, the same locations by and large were used for walk as for cycle, except for Norwich and Gloucester being added and Reading and Southport dropped. The list of walk locations was:

- Birmingham
- Manchester
- Bristol
- Norwich
- Exeter
- Gloucester

**Table 9: Potential cycle locations**

| | Whether station is reasonably central | Ex-cycling demonstration town, or ex-cycling city/town | Population | Commuting by cycle proportion (2011)[5] |
|---|---|---|---|---|
| Bristol | Yes | Yes | 535,907 | 8% |
| Exeter | Yes | Yes | 113,507 | 6% |
| Manchester | Yes | | 510,746 | 4% |
| Reading | Yes | | 218,705 | 4% |
| Derby | Yes | | 255,394 | 4% |

[5] http://www.ctc.org.uk/blog/chris-peck/whats-happened-to-cycle-commuting-in-england-and-wales

| | Whether station is reasonably central | Ex-cycling demonstration town, or ex-cycling city/town | Population | Commuting by cycle proportion (2011)[5] |
|---|---|---|---|---|
| Southport | Yes | Yes | 91,703 | 3% |
| Birmingham | Yes | | 1,085,810 | 2% |
| Liverpool | Yes | | 552,267 | 2% |
| Stoke-on-Trent | Yes | Yes | 270,726 | 2% |
| Cambridge | No | Yes | 145,818 | 30% |
| Oxford | No | | 159,994 | 18% |
| Lancaster | No | Yes | 48,085 | 4% |
| Chester | No | Yes | 86,011 | 3% |

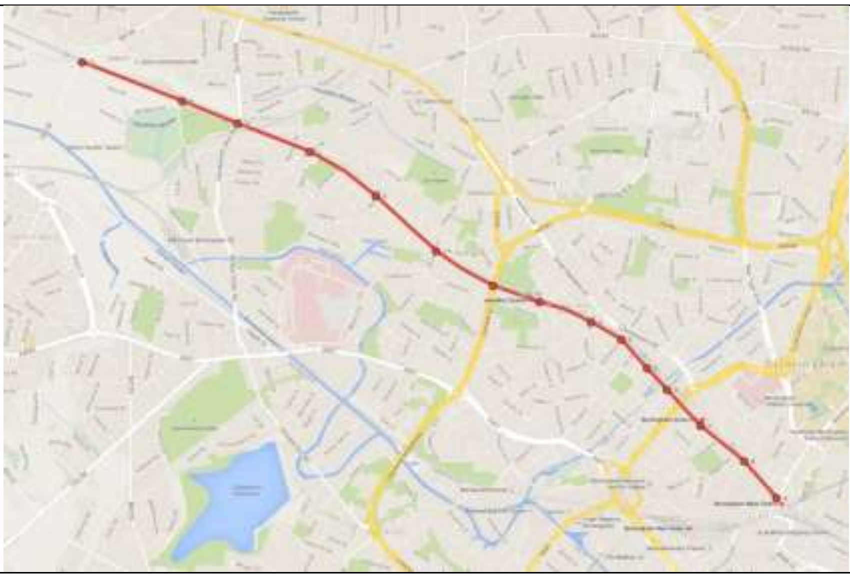
### 9.1.4 Cycleway maps

As was remarked earlier, for each location, we prepared map(s) of the hypothetical cycleway(s) for use in the SP exercise (**Figure 7**).

For each route, the coordinates of each access/egress point (an intersection with another road) was included in the questionnaire, and this was used in conjunction with the Google map tool to calculate distances from the trip origin to the cycleway entry point and from the cycleway exit point to the trip destination. In addition, the distance between points was used to estimate cycle time on the cycleway.

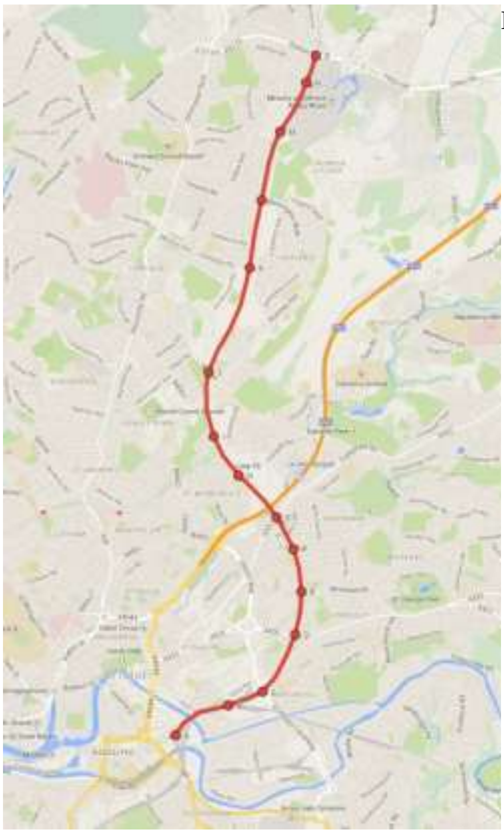
**Figure 7: Maps of the cycleway locations**

Birmingham A



Birmingham B

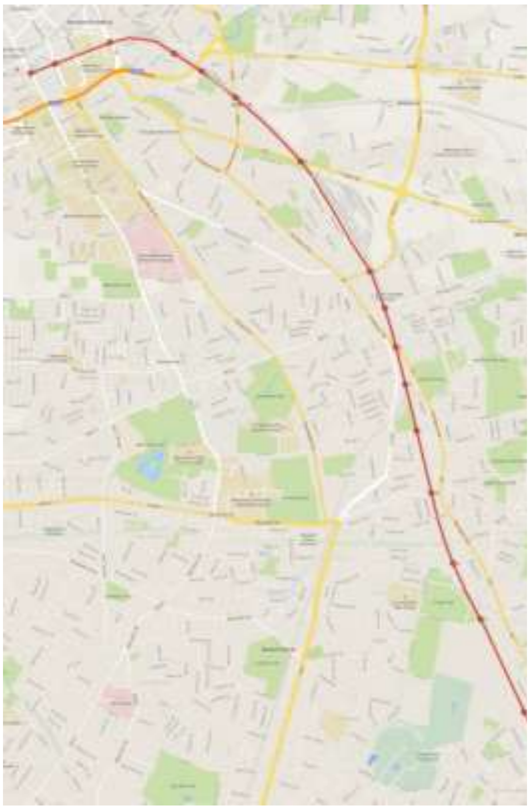
Bristol A



Bristol B

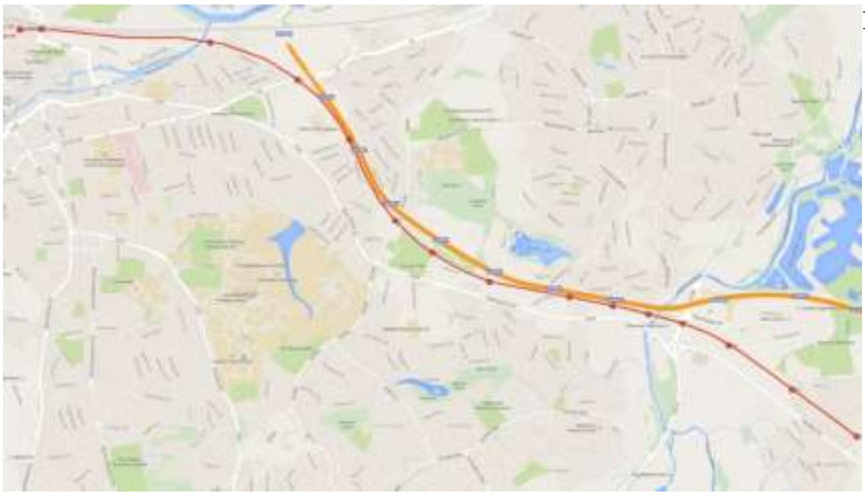
Exeter A

Exeter B



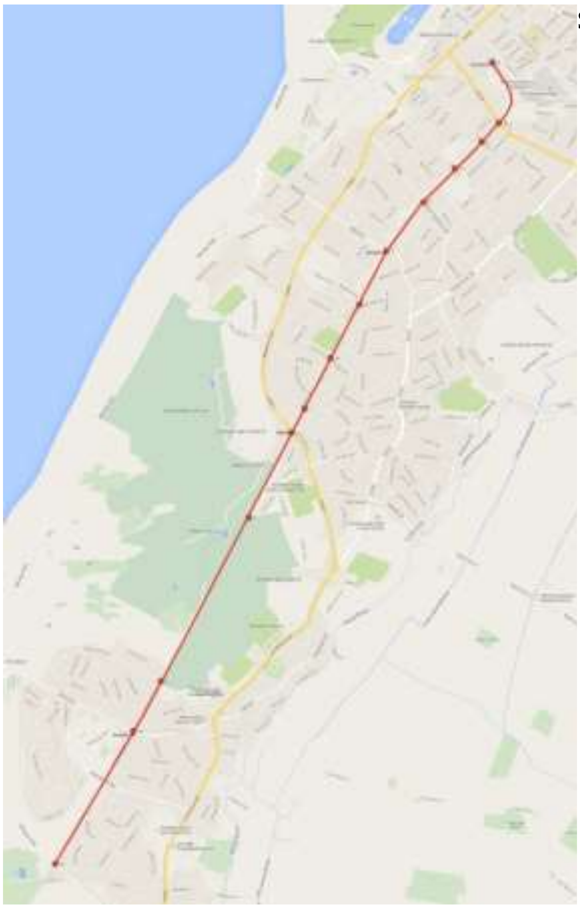
Manchester A

Manchester B



Reading A

Reading B



Southport

## 9.2 Achieved sample size

1,314 were sent an email invite. 592 entered the survey, of which 81 were out of scope (as quotas closed at the end of the fieldwork period) and 409 completed the online questionnaire and three completed the questionnaire by phone. The average questionnaire length was 29 minutes.

412 interviews were undertaken in total: 208 walk and 204 cycle.

The overall response rate was 30%.

# 10 Market research findings

## 10.1 Cycling

This section describes the market research findings from the cycle sample. Overall, there were 204 in the sample recruited at the following locations (disaggregated by whether they were on commute or other non-work trips).

**Table 10: Location for cycle sample**

| | Commute % | Other Non-Work % |
|---|---|---|
| Birmingham | 29 | 10 |
| Manchester | 10 | 14 |
| Bristol | 27 | 31 |
| Reading | 17 | 9 |
| Exeter | 13 | 26 |
| Southport | 5 | 9 |
| **Base** | **105** | **99** |

### 10.1.1 Nature of cycling trips

The length of cycling trips was probed by asking what distance journeys they would consider cycling.

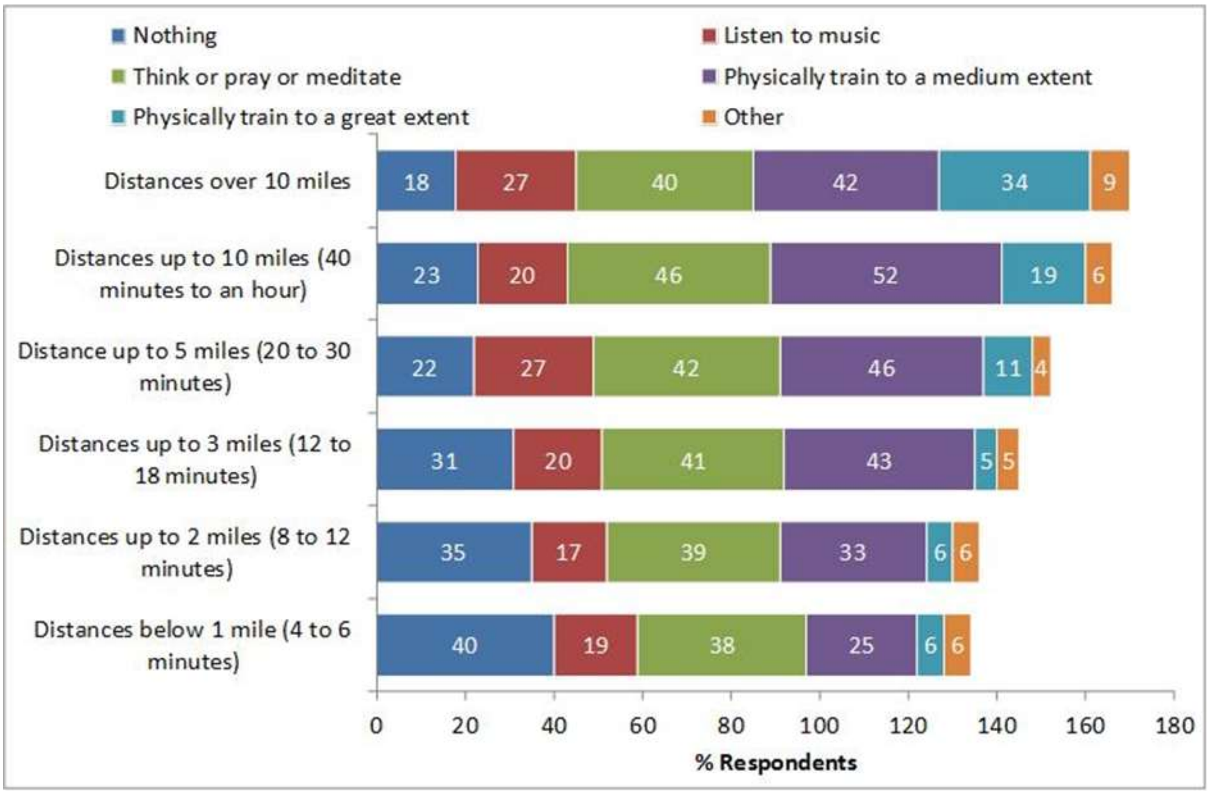
Almost two-thirds (65%) would consider cycling up to 5 miles, 61% up to 10 miles and 59% over 10 miles.

The activities undertaken for different length cycle trips were probed. The longer the trip the less likely that nothing was done. The main activities for all trip lengths were:

- Think, pray or meditate
- Physically train to a medium extent
- Listen to music

Physically training to a great extent was important for distances over 10 miles – with a third mentioning it.

**Figure 8: Activities undertaken whilst cycling by distance (more than one activity could be mentioned)**




Base: Distances below 1 mile 81, Distances up to 2 miles 95, Distances up to 3 miles 102, Distances up to 5 miles 133, Distances up to 10 miles 124, Distances over 10 miles 120.

### 10.1.2 Factors in choice of cycle routes

Cyclists were asked whether they agreed or disagreed with a list of the factors that might affect how one makes choices about cycling routes. These were grouped into categories as shown in **Table 11**.

**Table 11: Factors affecting choice of cycle route**

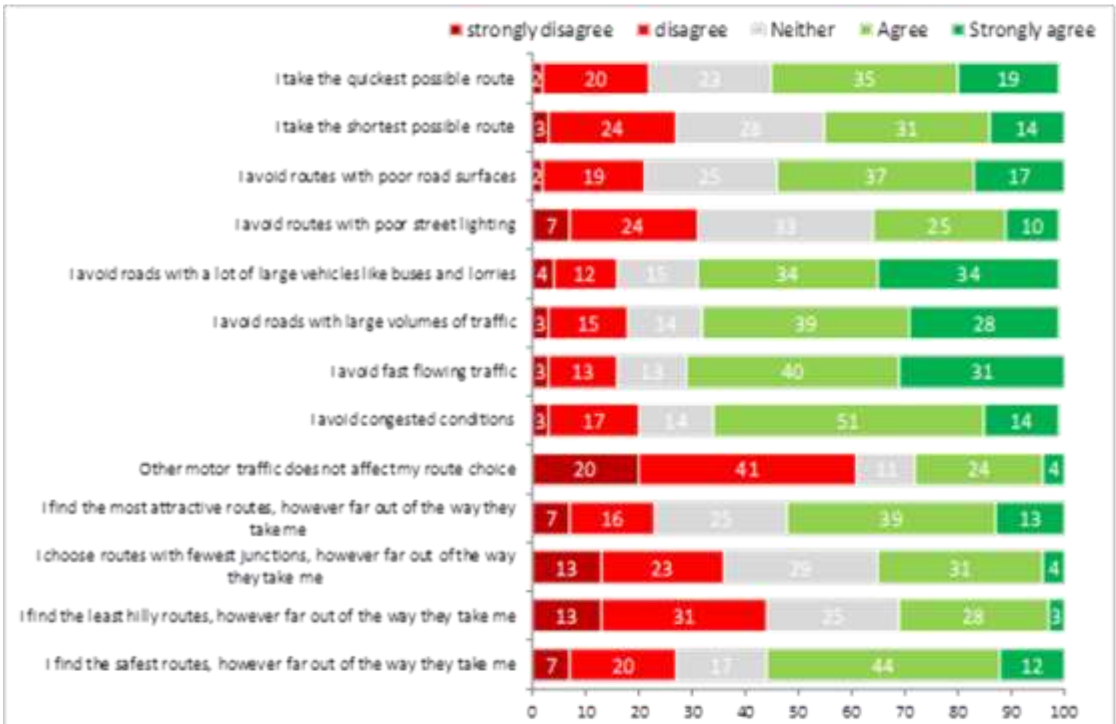
| Category | Factor |
|---|---|
| **Safety** | I find the safest routes, however far out of the way they take me |
| **Hilliness** | I find the least hilly routes, however far out of the way they take me |
| **Number of junctions** | I choose routes with fewest junctions, however far out of the way they take me |
| **Attractiveness of route** | I find the most attractive routes, however far out of the way they take me |
| **Other motor traffic** | Other motor traffic does not affect my route choice<br>I avoid congested conditions<br>I avoid fast flowing traffic<br>I avoid roads with large volumes of traffic |

| Category | Factor |
|---|---|
| | I avoid roads with a lot of large vehicles like buses and lorries<br>I avoid routes with poor street lighting<br>I avoid routes with poor road surfaces |
| Direct routes | I take the shortest possible route<br>I take the quickest possible route |

The factors most agreed with were ‘I avoid fast flowing traffic’ with 71% agreeing, ‘I avoid roads with a lot of large vehicles like buses and lorries’ (68%), ‘I avoid roads with large volumes of traffic’ (67%) and ‘I avoid congested conditions’ (65%).

The factors which drew least agreement were ‘Other motor traffic does not affect my route choice’ (28% agree), ‘I find the least hilly routes, however far out of the way they take me’ (31%), ‘I choose routes with fewest junctions, however far out of the way they take me’ (35%) and ‘I avoid routes with poor street lighting’ (35%). See **Figure 9**.

**Figure 9: Whether you agree or disagree with statements about the factors that affect how you make choices about cycling routes**

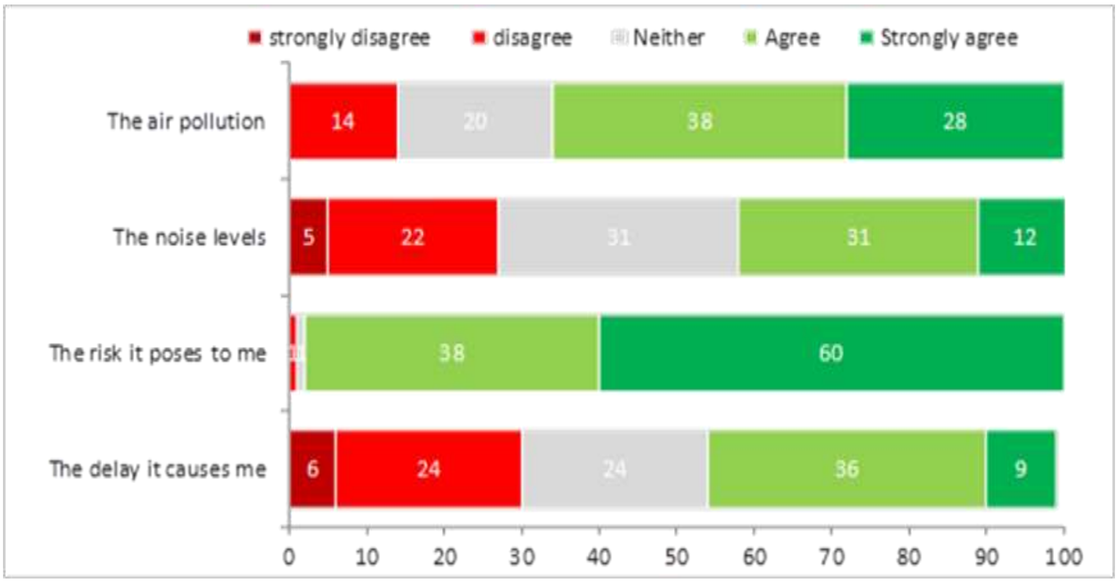



Base: 204 cyclists

Those who disagreed with the statement ‘Other motor traffic does not affect my route choice’ (61% of cyclists) were asked to say whether they agreed or disagreed with possible reasons for why they avoided motor traffic.

By far the main reason for avoiding motor traffic was ‘the risk it poses me’ with 98% agreeing (60% strongly agreeing). Air pollution was the second most important reason two-thirds agreeing. Noise and delays were much less important. See **Figure 10**.

**Figure 10: Whether you agree or disagree with the following reasons for avoiding motor traffic**




Base: 124 cyclists who disagreed that 'Other motor traffic does not affect my route choice'

### 10.1.3 Questions on specific cycling trip

Cyclists were asked some questions about the cycle trip they were making when recruited.

For almost all (88%), the trip was on a weekday. For commuters, 94% said it was on a weekday, as compared to 80% for other non-work.

The weather was good for the majority of cyclists:

- 68% sunny, 27% cloudy and dry, 3% light rain and 2% heavy rain
- 63% still, 34% quite windy and 3% very windy
- 72% mild, 11% cold and 1% very cold

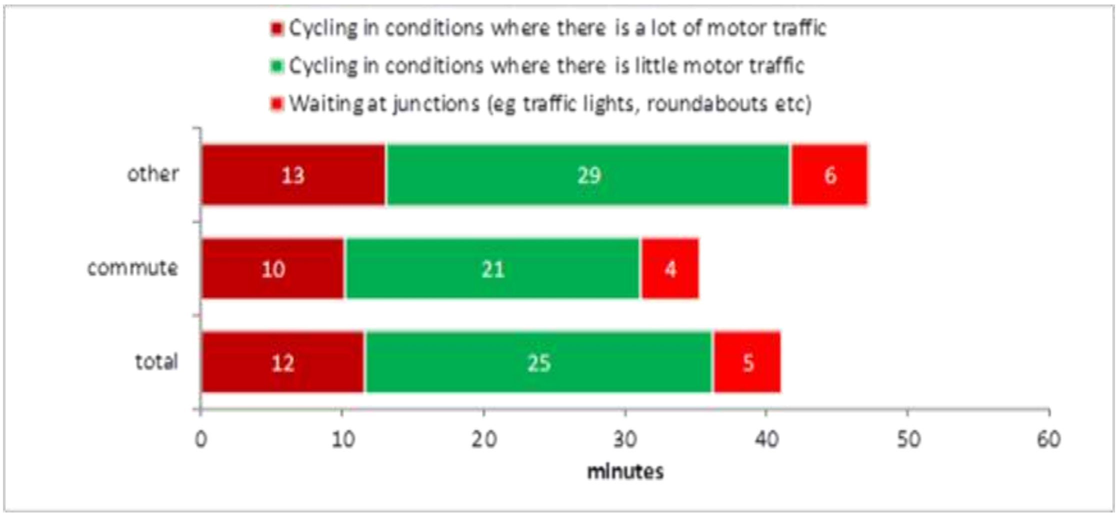
The cycle trip was frequent, particularly for commuters:

- **Commuters:** 94% once a week or more including 27% 3-4 times a week and 57% five or more times a week
- **Other non-work:** 78% once a week or more including 27% 3-4 times a week and 17% five or more times a week

Cyclists were asked where (using Google maps) and when they started and finished their cycling journey and asked how long it took.

Cyclists were reminded of how long their cycling journey took and asked the length of time that they spent in different conditions. See **Figure 11**.

**Figure 11: Length of time spent in different conditions by purpose**




Base: 204 cyclists, 105 commute, 99 other

### 10.1.4 Cycleway

How the cycleway conceptually underpinned the SP exercise was discussed in **Section 8.3.1**. We here provide more detail on the new facility that was offered.

The concept of the cycleway was introduced as follows:

> *"We'd like you to imagine that a completely segregated cycleway (that is, dedicated to cyclists only and separated from road traffic) had been installed next to a railway line that runs from near where you start your journey and the [town/city] centre….*
>
> *You would be able to use this for part, but not all, of your cycle trip. This would have a high quality surface and there would be no other traffic or any junctions.*
>
> *The cycleway would go alongside the railway but be fenced off from the railway line. It would be for cycles only, no other traffic or pedestrians would be allowed."*

Cyclists were shown two cycleways and asked to choose the one that was closest to their route (except for Southport where there was only one cycleway).

They were asked to look at the cycleway route and select where they would join and leave the cycleway, were they to use it for the cycle journey under consideration.

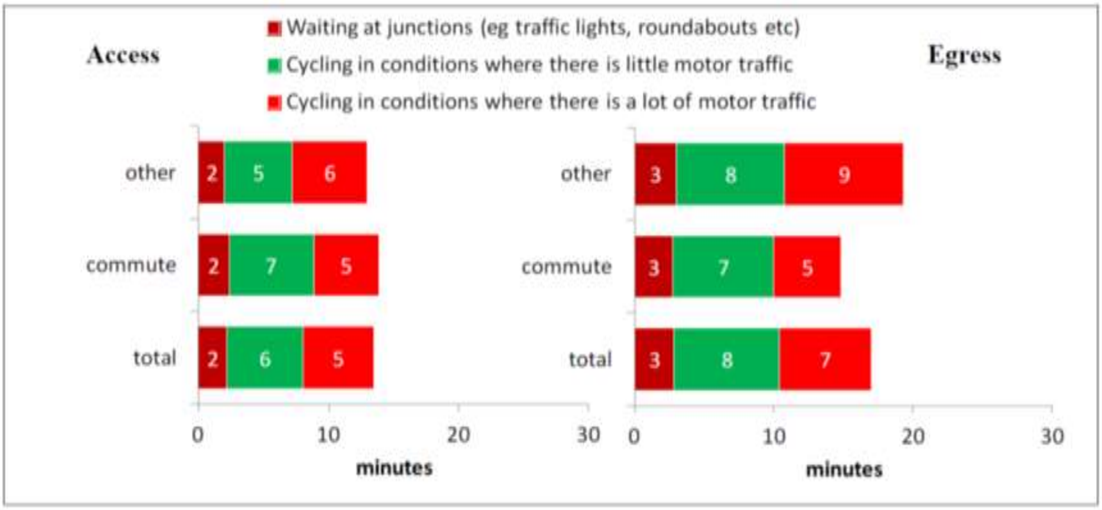
The questionnaire software used the Google maps data for the origin and destination to calculate the distance and estimate times to and from the cycleway.

For the cycleway itself, the software calculated the distance between joining and leaving points and calculated the time it would take.

For all the estimates, cyclists were asked if they agreed with them and if not, to say how long they estimated the times should be. 82% agreed with the access estimate, 86% with the cycleway estimate, and 60% with the egress estimate.

For the access to and egress from the cycleway parts of the cycle trip, they were asked to estimate the length of time that they spent in different conditions. See **Figure 12**.

**Figure 12: Length of access and egress time spent in different conditions by purpose**




Base: 204 cyclists, 105 commute, 99 other

Cyclists were informed that the cycleway might be charged as follows:

> *"In order to recoup the costs of the new cycleway you might be asked to pay a small charge to use it, based on distance. This would use contactless payment so you would simply need to show a contactless payment card or a Cycleway Smartcard.*

> *Please note, that if such a cycleway were ever to be built, it may or may not be free to use and we are asking about costs here to assess the potential value it may have."*

### 10.1.5 SP1 cycleway diagnostics

The modelling of the SP exercises is reported in **Section 0** to follow.

Below, we show the answers to the diagnostic questions which were asked after each of the two SP exercises. Overall, these are encouraging and show relatively high levels of understanding, ease of undertaking the task, and agreement that the options were realistic and that they were able to make choices as in real life.

**Table 12: SP1 cycleway diagnostics**

| | Strongly agree % | Somewhat agree % | Neither agree nor disagree % | Somewhat disagree % | Strongly disagree % |
|---|---|---|---|---|---|
| I was able to understand the choices I was faced with | 37 | 29 | 20 | 7 | 6 |
| I found the options I was presented with realistic | 19 | 34 | 24 | 15 | 9 |
| I was able to make choices as in real life | 26 | 33 | 24 | 9 | 7 |
| I found it easy to choose between the options I was presented with | 36 | 27 | 16 | 14 | 6 |

Base: 204

**Table 13: SP2 route choice diagnostics**

| | Strongly agree % | Somewhat agree % | Neither agree nor disagree % | Somewhat disagree % | Strongly disagree % |
|---|---|---|---|---|---|
| I was able to understand the choices I was faced with | 34 | 41 | 14 | 6 | 4 |
| I found the options I was presented with realistic | 27 | 39 | 22 | 8 | 3 |
| I was able to make choices as in real life | 29 | 39 | 21 | 6 | 5 |
| I found it easy to choose between the options I was presented with | 25 | 35 | 21 | 12 | 6 |

Base: 204

After both SP exercises, respondents were asked which aspects they considered when making their choice. The main aspects were separation from traffic and level of motor traffic.

- Separation from traffic 75%
- Level of motor traffic 74%
- Cycling facilities 57%
- Footway shared with cyclists 50%
- Time waiting at junctions 38%
- Number of junctions 27%
- Other 13%

### 10.1.6 Accidents and health

The cyclists in the sample had experienced a high level of road accidents and near misses, which is likely to be a factor in the preference for segregated cycleways.

26% of the cycle commuter sample had been involved in a road accident as a cyclist in the last three years, as had 19% of other non-work cyclists.

Those who had not been involved in a road accident as a cyclist in the last three years were asked if they had been involved in any near misses as a cyclist in the last three years. Over half had: 55% commuters and 61% other non-work.

Almost all cyclists said that over the last twelve months their health had on the whole been good or fairly good: 72% good, 25% fairly good.

### 10.1.7 Respondent characteristics

#### Age

The modal age range was 40-49 years old for commuters. For other non-work 21-29 years old was the modal age range.

**Table 14: Age by purpose**

| | Purpose | |
|---|---|---|
| | **Commute %** | **Other Non-Work %** |
| 17-20 | 2 | 20 |
| 21-29 | 12 | 26 |
| 30-39 | 31 | 13 |
| 40-49 | 38 | 12 |
| 50-59 | 14 | 12 |
| 60-69 | 2 | 15 |
| 70+ | 0 | 1 |
| **Base** | **105** | **99** |

#### Gender

Three-quarters of the cycle sample was male: 70% of commuters and 82% of other non-work.

#### Employment status

42% of the other non-work sample was in employment, 32% were students and 12% were retired.

**Table 15: Employment status by purpose**

| | Purpose | |
|---|---|---|
| | Commute % | Other Non-Work % |
| Full time paid employment | 76 | 25 |
| Part time paid employment | 10 | 9 |
| Full time self-employment | 4 | 5 |
| Part time self-employment | 4 | 3 |
| Student | 2 | 32 |
| Waiting to take up a job | 0 | 2 |
| Unemployed | 1 | 4 |
| Unable to work | 0 | 1 |
| Retired | 1 | 12 |
| Looking after home/family | 2 | 3 |
| Other | 0 | 3 |
| **Base** | **105** | **99** |

## Household income

Commuters had higher household incomes than other non-work: 64% of commuters had household incomes over £30,000 compared to 35% other non-work.

**Table 16: Household income by purpose**

| | Purpose | |
|---|---|---|
| | Commute % | Other Non-Work % |
| Under £10K | 9 | 26 |
| £10-20K | 13 | 18 |
| £20-30K | 13 | 17 |
| £30-40K | 22 | 5 |
| £40-50K | 15 | 10 |
| £50-75K | 14 | 11 |
| £75-100K | 8 | 7 |
| More than £100K | 5 | 2 |
| Not stated | 1 | 3 |
| **Base** | **105** | **99** |

## 10.2 Walking

This section describes the market research findings from the walk sample. Overall, there were 208 in the sample recruited at the following locations (disaggregated by whether they undertook the car park egress or the bus stop egress for SP1).

**Table 17: Location for walk sample**

| | Car park for walk<br>% | Bus egress for walk<br>% |
|---|---|---|
| Birmingham | 8 | 14 |
| Manchester | 26 | 32 |
| Bristol | 3 | 20 |
| Norwich | 27 | 4 |
| Exeter | 20 | 10 |
| Gloucester | 15 | 19 |
| **Base** | **88** | **118** |

### 10.2.1 Nature of walking trips

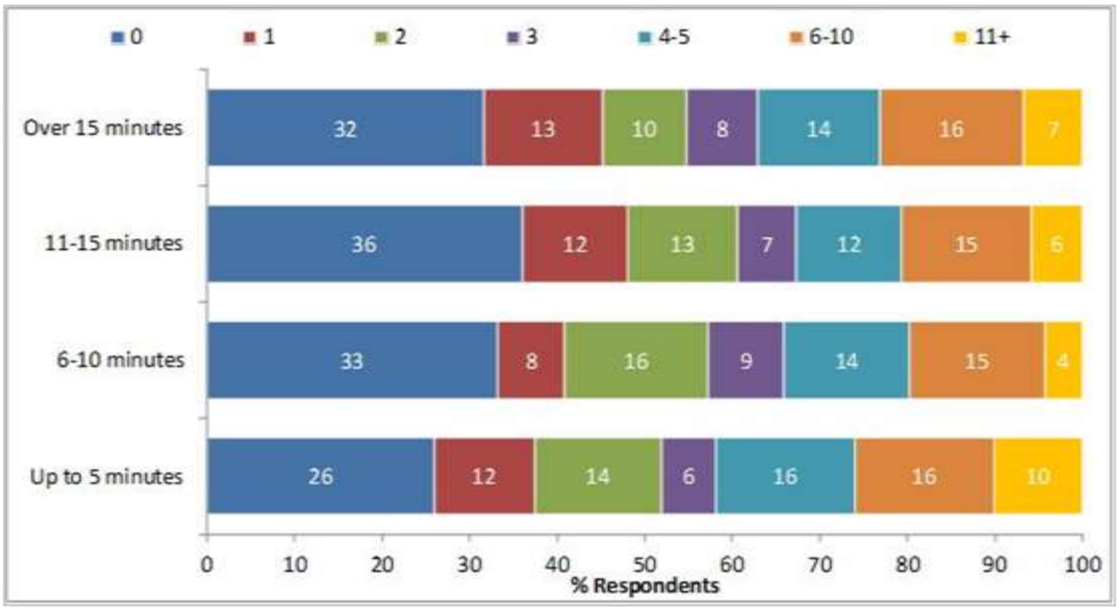
The walk sample was asked for what purposes they made door-to-door journeys on foot (that is journeys that are entirely made on foot).

Over half (57%) made shopping trips, 51% made trips to visit friends and/or relatives and 39% made commuting trips:

| | |
|---|---|
| Commuting to/from work | 25% |
| Commuting to/from place of education | 14% |
| Shopping | 57% |
| Personal business | 18% |
| Visiting friends /relatives | 51% |
| Sport /entertainment | 27% |
| Other leisure | 28% |
| Escorting someone | 8% |
| Other | 6% |

The length of walking trips was probed by asking how many single leg door-to-door journeys on foot they made each week for distances. The results are shown in **Figure 13**.

**Figure 13: Number of single leg door-to-door journeys on foot by distance**




Base: 208 walkers

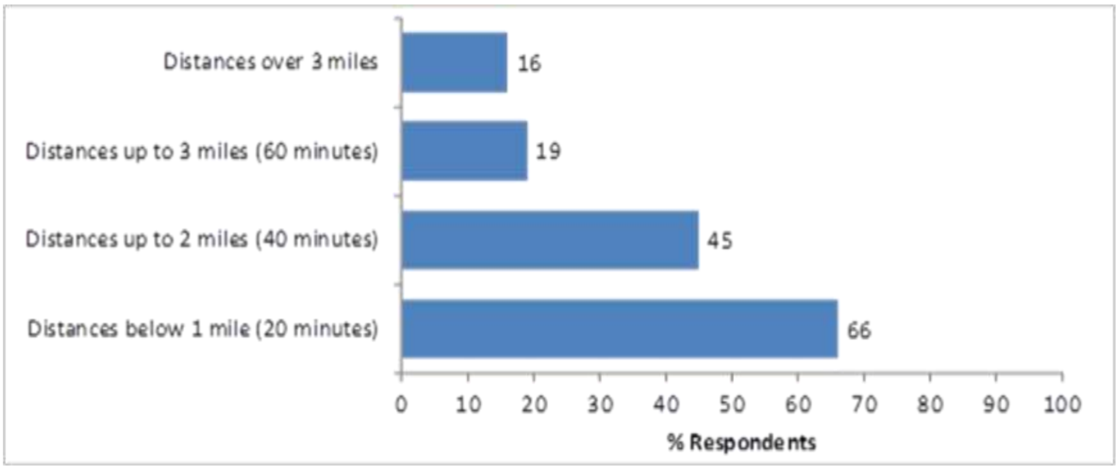
The average number of trips by distance band were:

- Up to 5 minutes 4.7
- 6-10 minutes 3.4
- 11-15 minutes 3.2
- Over 15 minutes 3.9

The length of cycling trips was probed by asking what distance journeys they would consider cycling.

Two-thirds (66%) would consider walking up to one mile, 45% up to 2 miles and less than a fifth said they would consider walking longer distances. See **Figure 14**.

**Figure 14: For what distance journeys would you consider walking**



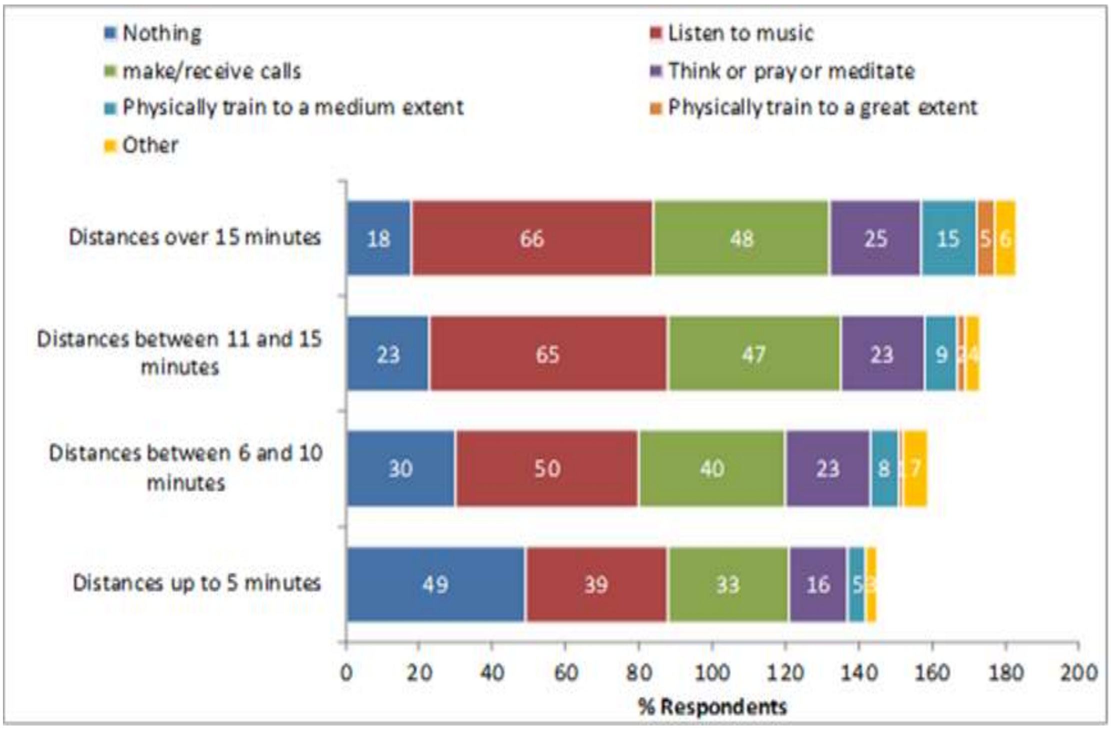

Base: 208 walkers

The activities undertaken for different lengths of walking trips were probed. The longer the trip the less likely that nothing was done. The main activities for all trip lengths were:

- Listen to music
- Make/receive calls
- Think, pray or meditate

Physically training to a great extent was important for distances over 10 miles – with a third mentioning it.

**Figure 15: Activities undertaken whilst walking by distance (more than one activity could be mentioned)**



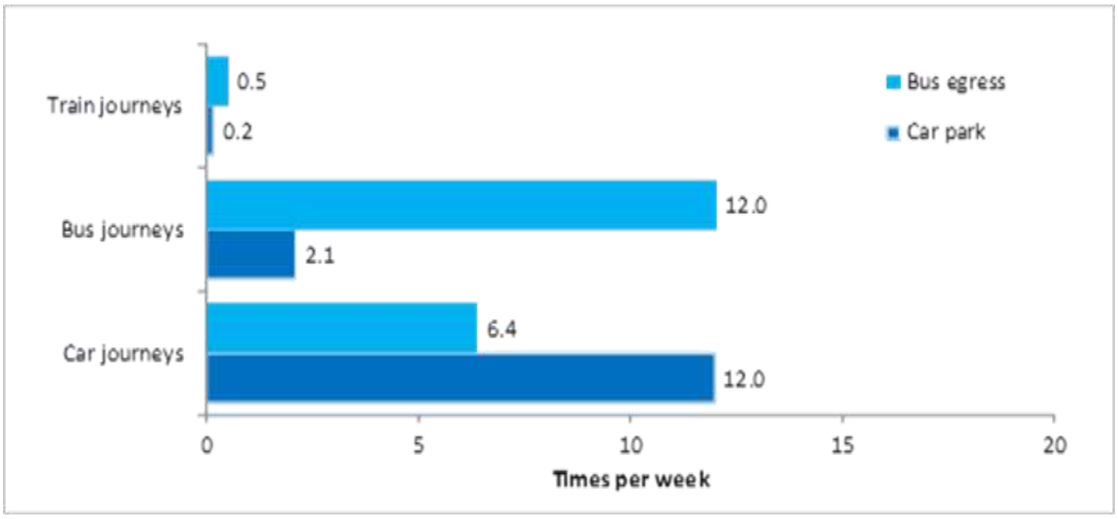

Base: 208 walkers

### 10.2.2 Car, bus and train journeys

To understand the frequency and length of walking egress trips made by the sample, first they were asked how often then made trips by bus, car and train.

**Figure 16** shows the number of bus, car and train trips per week for the car park and bus samples. Unsurprisingly there is a strong correlation between the nature of the sample and mode use, with the bus egress sample making 12 bus trips a week on average and the car park sample making 12 car trips a week on average. Train was barely used by both samples.

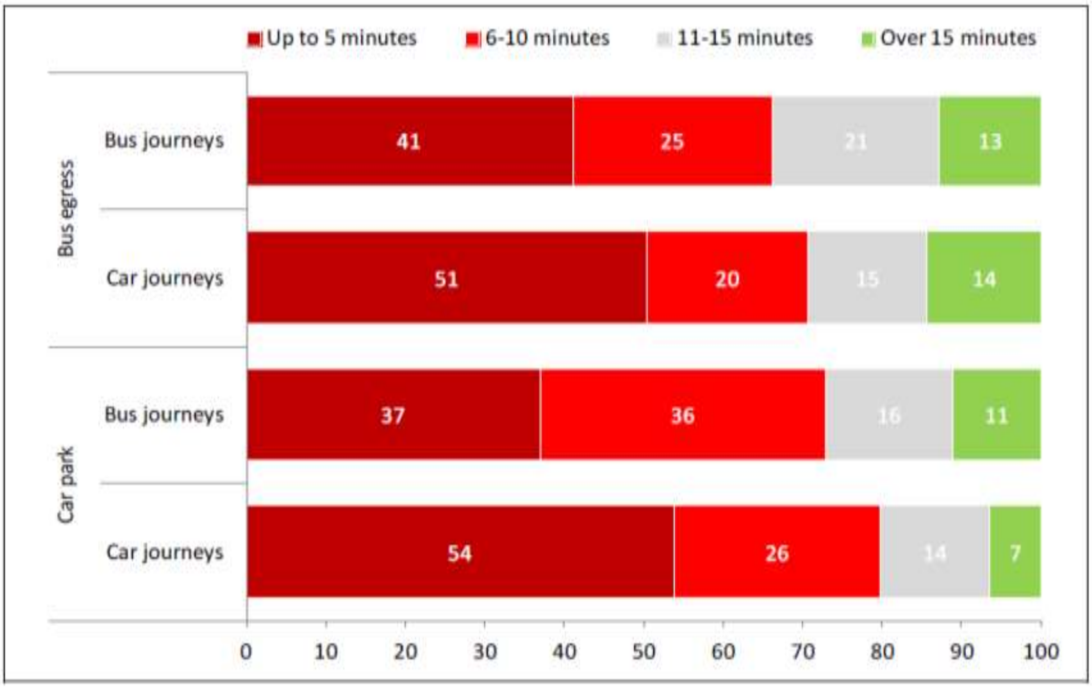
**Figure 16: Number of car, bus and train journeys made a week**




Base: 88 car park, 108 bus egress

The distances of the egress trips from the bus stop and from where the car was parked were probed. Roughly half of the walking trips were over five minutes in length (which was the required length of time to be in scope for the research).

**Figure 17: Length of egress walk trip after leaving bus/car**




Base: 88 car park, 108 bus egress

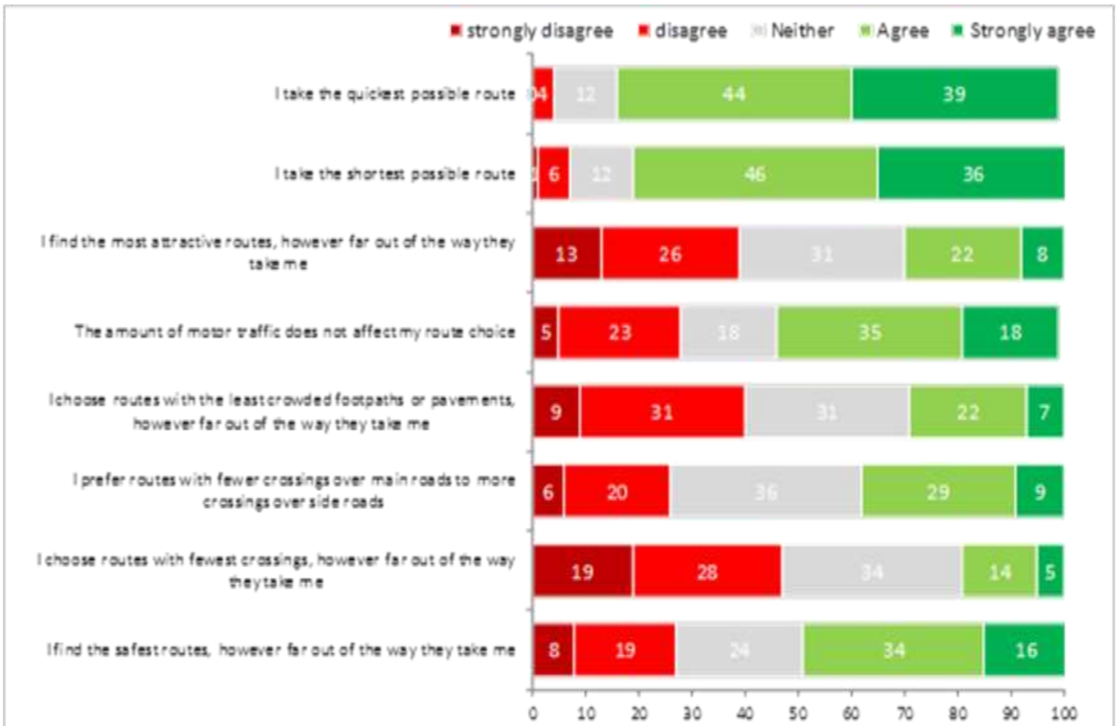
### 10.2.3 Walking route choice

Walkers were asked whether they agreed or disagreed with a list of the factors that might affect how one makes choices about walking routes. These were grouped into categories as shown in **Table 18**.

**Table 18: Factors affecting choice of walking route**

| Category | Factor |
|---|---|
| **Personal safety and security in relation to crime and fear of crime** | I find the safest routes, however far out of the way they take me |
| **Number of roads you have to cross** | I choose routes with fewest crossings, however far out of the way they take me<br>I prefer routes with fewer crossings over main roads to more crossings over side roads |
| **How crowded the footpaths/ pavements are with other pedestrians** | I choose routes with the least crowded footpaths or pavements, however far out of the way they take me |
| **Amount of motor traffic nearby** | The amount of motor traffic does not affect my route choice |
| **The amount of motor traffic does not affect my route choice** | I find the most attractive routes, however far out of the way they take me |
| **Direct routes** | I take the shortest possible route<br>I take the quickest possible route |

**Figure 18: Whether you agree or disagree with statements about the factors that affect how you make choices about the routes you take**




Base: 208 walkers

The factors most agreed with were ‘I take the quickest possible route’ with 83% agreeing and ‘I take the shortest possible route’ with 82% agreeing.

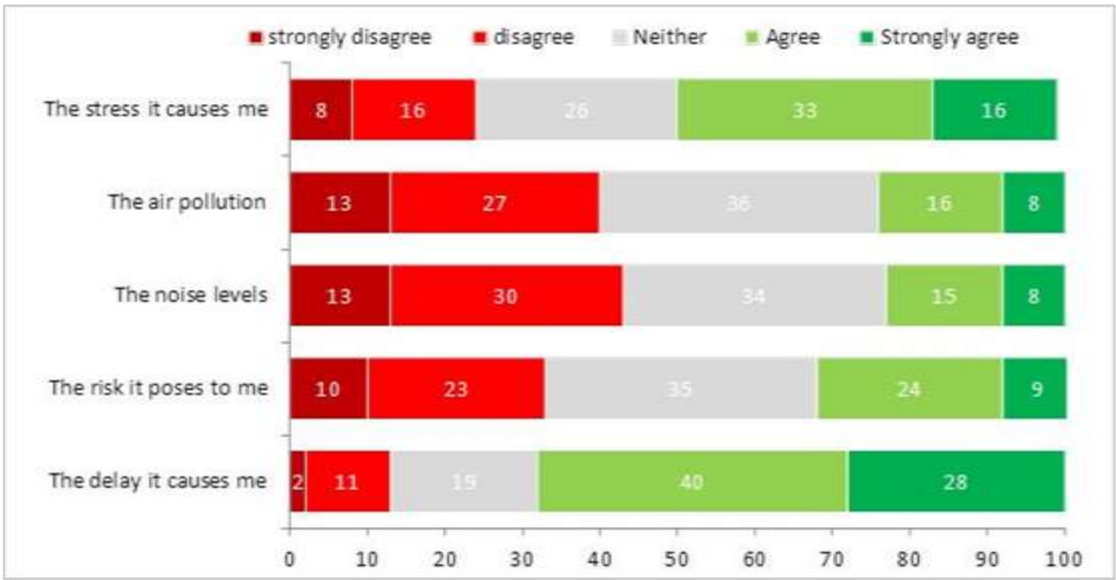
About half agreed that ‘The amount of motor traffic does not affect my route choice’ (53%) and ‘I find the safest routes, however far out of the way they take me’ (50%).

The factors which drew least agreement were ‘I choose routes with fewest crossings, however far out of the way they take me’ (19% agree), ‘I choose routes with the least crowded footpaths or pavements, however far out of the way they take me’ (29%) and ‘I find the most attractive routes, however far out of the way they take me’ (30%). See **Figure 18**.

The walk sample was asked to say whether they agreed or disagreed with possible reasons for why they avoided motor traffic.

By far the main reason for avoiding motor traffic was ‘the delay it causes me’ with 68% agreeing (28% strongly agreeing). ‘The stress it causes me’ was the second most important reason 49% agreeing. Risk, air pollution and noise were much less important with more disagreeing than agreeing that these were reasons for why they avoided motor traffic. See **Figure 19**.

**Figure 19: Reasons why avoid motor traffic**




Base: 208 walkers

### 10.2.4 Questions on specific walking trip

Walkers were asked some questions about the trip they were making when recruited, either a paid for bus trip or a car trip to a paid for car park with a walking egress trip of at least five minutes.

86% of the bus egress walk sample travelled with no other adults as did 65% of the car park walk sample.

- bus egress walk sample:
  - 86% no other adults, 13% one other adult
  - 94% no children aged 5-16
  - 97% no children aged 5 or under

- car park walk sample:
  - 65% no other adults, 34% one other adult
  - 95% no children aged 5-16
  - 92% no children aged 5 or under

For almost all (90%) the trip was on a weekday. For commuters 92% said it was on a weekday, as compared to 77% for other non-work.

The weather was good for the majority of walkers:

- 63% sunny, 28% cloudy and dry, 7% light rain and 1% heavy rain
- 70% still, 25% quite windy and 5% very windy
- 65% mild, 19% cold and 2% very cold

The walk trip was frequent, particularly for commuters:

- **Commuters**: 90% once a week or more including 19% 3-4 times a week and 65% five or more times a week
- **Other non-work**: 54% once a week or more including 25% 3-4 times a week and 12% five or more times a week

**Car park walk sample**

For the car park walk sample, the mean parking cost was £4.30. 83% of respondents paid all the costs and 10% shared the costs.

Half of the sample parked their car in a multi-storey car park, 36% in another car park and 7% on street with a parking meter.

Three-quarters said they decided where to park on that journey. 16% said it was a joint decision and 7% said they were informed or advised where to park.

Just under three-quarters had a choice of different locations to park:

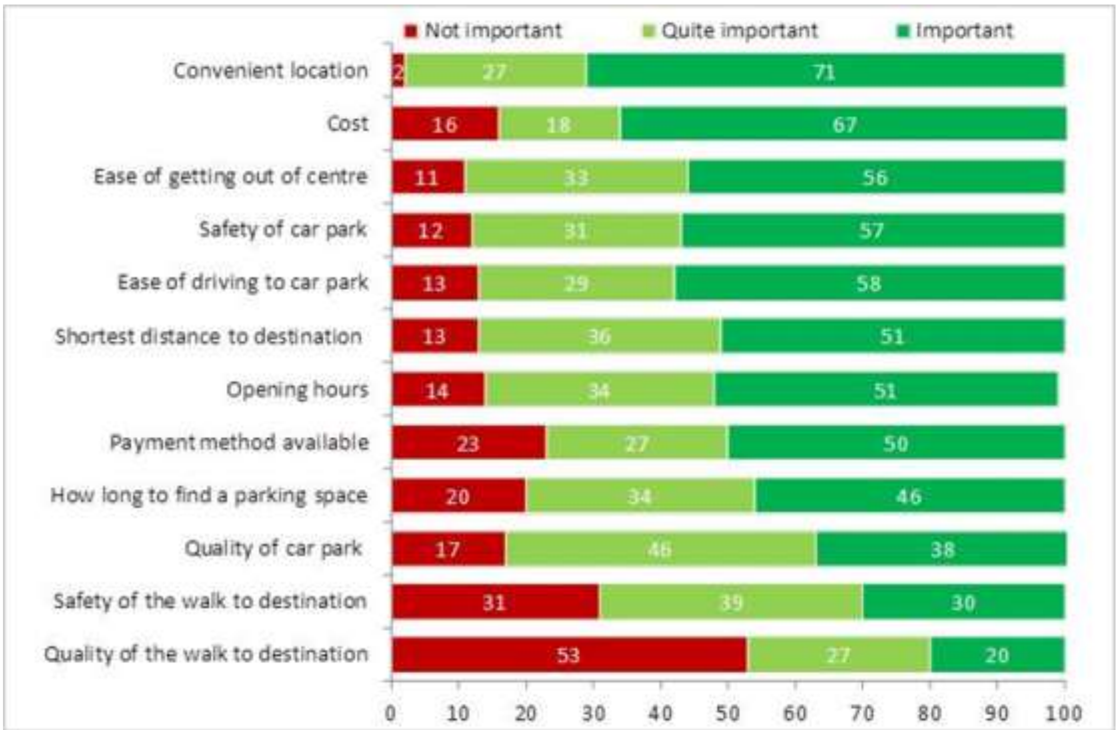
- No 26%
- Yes, 1 other location 18%
- Yes, 2 other locations 25%
- Yes, 3 other locations 14%
- Yes, 4 other locations 1%
- Yes, 5 or more other locations 16%

The most important factor by far in the choice of car park was ‘convenient location’ with 98% saying this was quite important or important.

Other important factors were cost (67% important), ‘ease of driving to car park’ (58%), ‘safety of car park’ (57%), ‘ease of getting out of centre’ (56%), ‘shortest distance to destination’ (51%) and ‘opening hours’ (51%).

Relatively unimportant were ‘quality of the walk to destination’ (20% important, 53% unimportant) and ‘safety of the walk to destination’ (30% important, 31% unimportant). See **Figure 20**.

**Figure 20: Importance of factors in the choice of parking site**




Base: 90 who parked and walked

### Bus egress walk sample

For the bus egress walk sample, the mean ticket cost was £2.83. 93% of respondents paid all the costs and 5% shared the costs.

89% said they decided where to get off the bus on that journey. 9% said it was a joint decision.

Nine-tenths said they had a choice of where to get off the bus:

- 58% said there were lots of stops depending on where they wanted to go
- 32% said the other stops were not convenient

## 10.2.5 SP diagnostics

The modelling of the SP exercises is reported in **Section 0** to follow.

Below, we show the answers to the diagnostic questions which were asked after each of the two exercises. Overall, these are encouraging and show relatively high levels of understanding, ease of undertaking the task, agreement that the options were realistic, and that they were able to make choices as in real life.

**Table 19: SP1 parking/bus stop choice diagnostics**

| | | Strongly agree % | Somewhat agree % | Neither % | Somewhat disagree % | Strongly disagree % |
|---|---|---|---|---|---|---|
| I was able to understand the choices I was faced with | Car park | 63 | 16 | 16 | 3 | 2 |
| | Bus stop | 61 | 25 | 6 | 5 | 3 |
| I found the options I was presented with realistic | Car park | 47 | 27 | 19 | 3 | 3 |
| | Bus stop | 30 | 43 | 14 | 7 | 6 |
| I was able to make choices as in real life | Car park | 51 | 23 | 19 | 3 | 3 |
| | Bus stop | 36 | 31 | 21 | 8 | 4 |
| I found it easy to choose between the options I was presented with | Car park | 50 | 31 | 15 | 3 | 1 |
| | Bus stop | 47 | 30 | 13 | 6 | 4 |

Base: 88 car park, 118 bus stop

**Table 20: SP2 route choice diagnostics**

| | | Strongly agree % | Somewhat agree % | Neither % | Somewhat disagree % | Strongly disagree % |
|---|---|---|---|---|---|---|
| I was able to understand the choices I was faced with | Car park | 38 | 38 | 14 | 9 | 2 |
| | Bus stop | 37 | 36 | 17 | 7 | 3 |
| I found the options I was presented with realistic | Car park | 28 | 39 | 25 | 5 | 3 |
| | Bus stop | 28 | 38 | 21 | 8 | 4 |
| I was able to make choices as in real life | Car park | 35 | 39 | 19 | 2 | 5 |
| | Bus stop | 34 | 34 | 15 | 13 | 4 |
| I found it easy to choose between the options I was presented with | Car park | 27 | 38 | 18 | 10 | 7 |
| | Bus stop | 33 | 26 | 20 | 14 | 6 |

Base: 88 car park, 118 bus stop

After both SP exercises respondents were asked which aspects they considered when making their choice. The main aspects were time waiting at crossings and level of motor traffic.

- Time waiting at crossings 54%
- Level of motor traffic 42%
- Footway shared with cyclists 39%
- Number of pedestrians 39%
- Pavement quality 29%
- Number of crossings 33%
- Other 7%

### 10.2.6 Accidents and health

The walkers in the sample had experienced a low level of road accidents.

4% of the walk commuter sample had been involved in a road accident when walking in the last three years, as had 2% of other non-work walkers.

Almost all walkers said that over the last twelve months their health has on the whole been good or fairly good: 63% good, 32% fairly good and 4% not good.

### 10.2.7 Respondent characteristics

#### Age

The modal age range was 21-29 years old both walk segments and for walk commuters. For other non-work walkers 17-20 years old was the modal age range.

**Table 21: Age by purpose and walk segment**

| | Purpose | | Walk segment | |
|---|---|---|---|---|
| | **Commute %** | **Other Non-Work %** | **Car park %** | **Bus egress %** |
| 17-20 | 8 | 35 | 9 | 31 |
| 21-29 | 35 | 30 | 26 | 38 |
| 30-39 | 21 | 11 | 19 | 14 |
| 40-49 | 22 | 8 | 22 | 8 |
| 50-59 | 12 | 11 | 17 | 8 |
| 60-69 | 3 | 5 | 7 | 2 |
| **Base** | **102** | **106** | **88** | **118** |

#### Gender

64% of the walk sample was female. 34% of walk commuters were male compared to 38% other non-work.

#### Employment status

77% of the car park sample and 61% of the bus egress sample were in employment. 3% were retired in both samples. See **Table 22**.

**Table 22: Employment status by purpose and walk segment**

| | Purpose | | Walk segment | |
|---|---|---|---|---|
| | **Commute** % | **Other Non-Work** % | **Car park** % | **Bus egress** % |
| Full time paid employment | 75 | 19 | 56 | 39 |
| Part time paid employment | 18 | 18 | 15 | 20 |
| Full time self-employment | 2 | 2 | 5 | 0 |
| Part time self-employment | 1 | 2 | 1 | 2 |
| Student | 3 | 34 | 7 | 27 |
| Waiting to take up a job | 1 | 3 | 2 | 2 |
| Unemployed | 0 | 8 | 2 | 6 |
| Unable to work | 0 | 2 | 2 | 0 |
| Retired | 0 | 6 | 3 | 3 |
| Looking after home/family | 0 | 5 | 6 | 0 |
| Other | 1 | 2 | 1 | 2 |
| **Base** | **102** | **106** | **88** | **118** |

## Household income

Commuters and the car park segment had higher household incomes than other non-work and the bus egress samples respectively: 50% of commuters and the car park segment had household incomes under £30,000 compared to about 70% for other non-work and bus egress.

**Table 23: Household income by purpose and walk segment**

| | Purpose | | Walk segment | |
|---|---|---|---|---|
| | **Commute** % | **Other Non-Work** % | **Car park** % | **Bus egress** % |
| Under £10K | 7 | 30 | 9 | 26 |
| £10-20K | 22 | 21 | 18 | 24 |
| £20-30K | 21 | 19 | 23 | 18 |
| £30-40K | 14 | 16 | 16 | 14 |
| £40-50K | 17 | 5 | 11 | 9 |
| £50-75K | 9 | 2 | 9 | 2 |
| £75-100K | 6 | 3 | 7 | 3 |
| More than £100K | 3 | 3 | 5 | 2 |
| Not stated | 3 | 2 | 2 | 3 |
| **Base** | **102** | **106** | **88** | **118** |
| | | | | |

# 11 Modelling results

## 11.1 Cleaning

The datasets from the extended pilot received by Accent on the 6th May 2015 contained the following number of respondents:

**Table 24: Number of respondents before and after cleaning**

| | **Number of respondents before (and after) cleaning** | |
|---|---|---|
| | Walk | Cycle |
| SP1 | 206 (190) | 199 (175) |
| SP2 | 208 (190) | 204 (175) |

The cleaning of the data was performed as follows:

1) **Incomplete respondents:** Due to a failure of the online survey, a few respondents observed an empty set of SP1 choice scenarios. Although data for SP2 was recorded, we considered it best to remove these few respondents from the analysis. In total, this removed:
   - Walk: 2 respondents
   - Cycle: 5 respondents
2) **Wrong completion:** Two individuals gave information about a car trip, completing the “walk_car” survey accordingly. Later on, they stated they had undertaken a “walk_bus” trip (see variable Q59_OTHR4 in the dataset).
   - Walk: 2 respondents
3) **Eliminating those individuals who reported a zero travel time or zero travel cost for their current trip**: These levels were incompatible with the research methods adopted for the study and would have prevented the presentation of meaningful choice scenarios, especially for SP1.
   - Walk: 5 respondents (zero cost), 4 respondents (zero time), and 3 respondents (zero egress, i.e. walking, time).
   - Cycle: 2 respondents (zero time)
4) **Applying rule-based mode-specific thresholds for the key variables:**
   - Walk – egress time > 30 minutes: 2 respondents
   - Cycle – cycling time > 60 minutes: 22 respondents

An additional level of cleaning was also tested. This involved the identification and exclusion of respondents who might have put insufficient effort into filling out the survey. Insufficient effort was defined as inconsistencies in the information about the trip given in different parts of the survey. For this, we created a variable EFFORT_CHECK. The additional numbers of exclusions were 20 for walk and 9 for cycle.

**Table 25** below summarises, by mode, the sample sizes resulting from application of the two alternative cleaning criteria. In addition, it summarises model results obtained from the SP1 data, using the multiplicative specification for walk data and the additive specification for cycle data outlined later in this section. We relied on SP1 for these tests. For model outputs, we give an indicative model fit measure (in the form of the adjusted $\rho^2$) along with the estimated value of travel walking time (VWT) from a model without additional covariates.

**Table 25: Testing the models with and without additional cleaning**

| | | Raw data | Cleaning | Additional cleaning |
|---|---|---|---|---|
| **Walk SP1 (multiplicative model)** | Individuals | 206 | 190 | 170 |
| | Adj. $\rho^2$ | 0.224 | 0.23 | 0.255 |
| | VWT (£/h) | 3.11 | 3.42 | 3.12 |
| **Cycle SP1 (additive model)** | Individuals | 199 | 175 | 166 |
| | Adj. $\rho^2$ | 0.182 | 0.218 | 0.218 |
| | N/A | N/A | N/A | N/A |

Given that the model fit and valuation were similar for both levels of cleaning, we decided not to implement the additional cleaning, and proceeded on the basis of basic cleaning.

## 11.2 Model development

The limited resources (small sample sizes) and the difficulties involved in stated choice experiments in the context of walk and cycle influence what can be achieved in the modelling stage.

The models estimated below for walk and cycle are consistent with those estimated for the mechanised modes in the Final Report. In particular, the SP1 games for walk and cycle are similar to the SP2 and SP3 games for the mechanised modes. The models applied to the SP1 game for the mechanised modes cannot be implemented here, since this would require a simple time-cost experiment with two attributes and two alternatives.

Random utility (RU) models are used to explain respondents' choices and infer valuation estimates. These models contain a deterministic and a random component (the error term). For SP1 cycle and SP2 walk and cycle, we use standard additive error structures, used in most VTT studies world-wide since the pioneering UK work[6], where $U = V + \varepsilon$, with $V$ and ε giving the deterministic and random components of utility respectively. For SP1 walk, the nature of the experiment also allows us to use a multiplicative error structure[7].

[6] Daly, A. and Zachary, S. (1975) Commuters' Values of Time, Report to Department of the Environment, LGORU report T55, January 1975.

[7] See Harris, A.J. and Tanner, J.C. (1974) Transport demand models based on personal characteristics, Transport and Road Research Laboratory Supplementary Report SR65UC,

In a multiplicative formulation, the error term component multiplies the deterministic component, such that $U = V.\varepsilon$, where $V$ and $\varepsilon$ are still defined as the deterministic and random components of utility respectively. The practical advantage given by the multiplicative approach is that it becomes much easier to make an assumption of constant variance for $\varepsilon$. In general, it is found that utility variance increases as utility increases and this is handled automatically in the multiplicative form of the model. This benefit is confirmed by the improved results given by multiplicative models in this context.

### 11.2.1 Additive specification for all games

The additive RU model can be expressed, in what is referred to as preference space, as follows:

$$V_j = \tau_{cost} cost_j + \sum_k \tau_k x_{jk}, \qquad (1)$$

where $x_{jk}$ refers to $K$ different non-cost attributes for alternative $j$, and where the $\tau$ parameters are the estimated marginal utilities. The $\tau$ parameters would be expected to be negative for undesirable attributes, and positive for desirable attributes.

The marginal monetary valuation of a change in attribute $K$ is given by $\omega_k = \tau_k/\tau_{cost}$. This can be obtained for SP1 experiments. For practical reasons, the model can be rewritten in valuation space to obtain direct estimates and standard errors of valuation measures (this is mathematically equivalent to equation (1)[8]):

$$V_j = -\mu\left(cost_j + \sum_k \omega_k x_{jk}\right) \qquad (2)$$

where $\mu$ is now a positive scale parameter, and where $\omega_k$ is now a directly estimated monetary valuation for changes in $x_{jk}$[9]. The negative sign on the entire utility means that the $\omega_k$ are positive for undesirable attributes, i.e. they relate to a willingness-to-pay for avoiding positive changes in an attribute. This model specification is applied for SP1 cycle.

For SP2, however, there is no monetary component in the choice scenarios. Therefore, only the relative weight of different marginal utilities for non-cost attributes can be calculated. Also, none of the time components offers a definitive basis to infer time valuation measures (e.g. sometimes in-vehicle travel time has been used as a reference in relation to other time components). We will proceed with equation (1) for both SP2 experiments.

---

Crowthorne, UK and Fosgerau, M. and Bierlaire, M. (2009) Discrete choice models with multiplicative error terms, Transportation Research Part B, 43, pp494-505.

[8] Train, K.E. and Weeks, M. (2006) Discrete choice models in preference space and willingness-to-pay space, in R. Scarpa and A. Alberini (eds), Applications of simulation methods in environmental and resource economics, Springer.

[9] Of course $\mu = -\tau_{cost}$ and $\omega_k = \tau_k/\tau_{cost}$.

### 11.2.2 Multiplicative specification for walk SP1

In the multiplicative model, it is practical[10] to work with $\log U = \log V + \varepsilon$, the log function having no impact on the ranking of utilities, since it is a monotonic transformation. Technically, the assumptions regarding the distributions of $\varepsilon$ are different in these cases. In practice, it is assumed that $\varepsilon$ follows a Gumbel distribution in the multiplicative model as in the additive model, so that the simple logit model can be used to calculate probabilities.

Taking the additive RU model, expressed in valuation space, the multiplicative model can be derived as follows:

$$V_j = -\mu \cdot \log\left(cost_j + \sum_k \omega_k x_{jk}\right) \qquad (3)$$

where $\omega_k$ remains the directly estimated monetary value (i.e. willingness-to-pay) for reductions in time components. The use of the log transform enables the estimation of the multiplicative model using software built for additive specifications.

Using a Gumbel distribution for $\varepsilon$, the probability for the observed sequence of choices for respondent *n* is given by:

$$P_n = \prod_{t=1}^{T} \prod_{j=1}^{2} \left( \frac{e^{V_{jnt}}}{e^{V_{1nt}} + e^{V_{2nt}}} \right)^{\delta_{jnt}} \qquad (4)$$

where $\delta_{jnt}$=1 if and only if alternative *j* is chosen by respondent *n* in task *t* in a given game.

It is not practical to apply a multiplicative model for SP2 data because there is no cost component. In the case of cycle SP1, there is a cost component, but it only applies to one of the two alternatives *j* and sometimes it is zero (i.e. no cost component in part of the sample).

### 11.2.3 Covariates for deterministic heterogeneity (Walk SP1)

The limited sample sizes do not offer great scope to study heterogeneity in preferences across the sample. A series of key covariates has been tested to account for the impact of person and trip characteristics on valuations.

**Person characteristics:**

- Income (household income and personal income)[11]

**Trip characteristics:**

- Purpose (commute vs. non-work)
- Distance of reference trip

[10] It is not difficult in practice to arrange that $V > 0$ and $\varepsilon > 0$.

[11] The categorical income variables were turned into continuous variables, using DfT agreed 'midpoints' of £5K for the lowest category (£7.5K in the case of household income), and then £15K, £25K, £35K, £45K, £62.5K, £87.5K and finally £130K for the upper bracket.

- Trip frequency

All covariates were introduced as multipliers on the valuation measure of interest ($\omega_k$): value of walking travel time and value of in-vehicle travel time in the case of SP1 walk. The influence of income and distance on valuation was introduced bearing in mind the continuous nature of these variables. The elasticity approach from the 2003 UK study is used. In particular, taking income as the example, the multiplier on $\omega_k$ would be given by:

$$\left(\frac{inc}{inc_{ref}}\right)^{\lambda_{inc}} \delta_{income\ reported} + \zeta_{not\ stated}\delta_{income\ not\ stated} \qquad (5)$$

With this specification, *inc* is a continuous income variable (expressed in £1,000s per annum), $\lambda_{inc}$ is an estimated income elasticity, $\zeta_{not\ stated}$ is a multiplier on $\omega_k$ for respondents with unreported income, and the two $\delta$ terms are dummy variables categorising the respondents according to whether income was reported or not. The value of $inc_{ref}$ chosen as a denominator is the sample average, and it simply means that the base valuation measure ($\omega_k$) relates to a respondent with an annual income equal to the sample average[12]. After testing both income variables, personal income was the only one with a significant impact in some of the models.

For the other covariates, multipliers on valuation measures were estimated with one category for the attribute being used as the base, for which the multiplier was then set to a value of 1. This means that the base estimates of $\omega_k$ relate to an individual and a trip at the base values for these covariates.

### 11.2.4 SP1 results

In this section we present the modelled results for SP1, for walk and cycle separately. **It is important to stress that the estimates of VTT presented here are behavioural values which have not been corrected for sample representativeness; they should not therefore be applied directly to appraisal.**

**Table 26** details the results from the 'base' models for SP1 walk, where we estimate separate models for bus and car main mode users.

[12] Note that the normalisation does not need to be adjusted when the income measure is changed, as it merely gives a rough scaling so that the multiplier is close to 1 for most people.

**Table 26: SP1 walk – base multiplicative model**

| | SP1 walk – bus | | | SP1 walk – car | | |
|---|---|---|---|---|---|---|
| **Respondents** | 109 | | | 81 | | |
| **Observations** | 545 | | | 405 | | |
| **Final LL** | -314.65 | | | -179.47 | | |
| **Adjusted $\rho^2$** | 0.159 | | | 0.35 | | |
| | Est | Rob.s.e. | t-rat (0) | Est | Rob.s.e. | t-rat (0) |
| VTT_Walk (p/min) | 5.13 | 1.29 | 3.97 | 6.58 | 1.65 | 4.00 |
| $\mu$ (scale) | 5.60 | 0.81 | 6.90 | 9.67 | 1.25 | 7.72 |
| VTT_In-vehicle time (p/min) | 3.59 | 0.98 | 3.65 | 6.81 | 1.32 | 5.17 |

**Table 27** then develops the models further to include relevant covariates of VTT.

**Table 27: SP1 walk – covariates model**

| | SP1 walk – bus | | | | SP1 walk – car | | | |
|---|---|---|---|---|---|---|---|---|
| **Respondents** | 109 | | | | 81 | | | |
| **Observations** | 545 | | | | 405 | | | |
| **Final LL** | -308.96 | | | | -178.07 | | | |
| **Adjusted $\rho^2$** | 0.164 | | | | 0.34 | | | |
| | Est | Rob. s.e. | t-rat (0) | t-rat (1) | Est | Rob. s.e. | t-rat (0) | t-rat (1) |
| VTT_Walk (p/min) | 7.16 | 2.62 | 2.73 | - | 7.27 | 2.35 | 3.10 | - |
| $\mu$ (scale) | 5.91 | 0.85 | 6.97 | - | 9.66 | 1.27 | 7.63 | - |
| VTT_In-vehicle time (p/min) | 5.84 | 1.93 | 3.02 | - | 6.70 | 1.47 | 4.57 | - |
| Income elasticity ($\lambda_{income}$) | 0.42 | 0.49 | 0.85 | - | 0.14 | 0.20 | 0.71 | - |
| Missing income multiplier | 0.24 | 0.21 | - | -3.60 | 1.35 | 1.00 | - | 0.35 |
| Non-work multiplier (base = commute) | 0.52 | 0.37 | - | -1.30 | 1.25 | 0.40 | - | 0.62 |
| Distance elasticity ($\lambda_{distance}$) | -0.07 | 0.28 | -0.24 | - | 0.18 | 0.17 | 1.08 | - |

Noting that the bus and car models in **Table 27** give similar results, we then estimated a covariate model on the combined sample of bus and car main mode users (**Table 28**).

**Table 28: SP1 walk – covariates model for bus & car data combined**

| | SP1 walk – bus & car | | | |
|---|---|---|---|---|
| **Respondents** | 190 | | | |
| **Observations** | 950 | | | |
| **Final LL** | -497.76 | | | |
| **Adjusted $\rho^2$** | 0.233 | | | |
| | Est | Rob.s.e. | t-rat (0) | t-rat (1) |
| VTT_Walk (p/min) | 7.63 | 1.95 | 3.92 | |
| $\mu$ (scale) | 7.15 | 0.71 | 10.04 | |
| VTT_In-vehicle time (p/min) | 6.56 | 1.34 | 4.89 | |
| Income elasticity ($\lambda_{income}$) | 0.38 | 0.20 | 1.87 | |
| Missing income multiplier | 0.70 | 0.48 | | -0.62 |
| Non-work multiplier (base = commute) | 0.78 | 0.26 | | -0.86 |
| Distance elasticity ($\lambda_{distance}$) | 0.16 | 0.18 | 0.89 | |

Drawing together the above results, the key findings for SP1 walk can be summarised as follows:

- As will become evident from the results which follow, SP1 walk is the experiment which has worked best. The model given in **Table 28** offers acceptable fit, and elicits significant and plausible VTT estimates.
- More specifically, we find that VTT_walk > VTT_IVT, but VTT_walk has the higher standard error, and the estimates are not actually significantly different from each other.
- The values of both walk time (7.6 p/min) and IVT (6.6 p/min) in **Table 28** are lower than the 'headline' WebTAG (perceived) values for non-work of 10.1-11,4 p/min, where the latter are of course applicable to all modes. However, it should be remembered that where walking and cycling are used as a means of inter-change between modes of transport, WebTAG advises that the non-work values of walking and cycling should be doubled.
- We were unable to discern significant differences between values for commute and other non-work, but this could have been a reflection of the modest size of the dataset (note that **Table 28** suggests a lower valuation for other non-work, as would be expected).
- An income effect is picked up by the final model, but this is only marginally significant. Note: VTTs were estimated at average personal income. Sample income averages in the samples were: for bus £13.2k/yr; for car £20.9k/yr; for both combined £16.5k/yr.
- We found no significant distance effect.
- Finally, it is interesting to note that analysis of the CV question for SP1 walk (**Table 29**) provides strong support for the SP valuations cited above. We report a range on the CV; this reflects the fact that we asked respondents to select a valuation band, thereby eliciting a bounded valuation.

**Table 29: SP1 walk – CV question**

| WTP to reduce 5 minutes of walking time | | |
|---|---|---|
| Min | Max | |
| 6.85 | 7.66 | pence/minute |
| 4.11 | 4.59 | £/hour |

**Table 30** details the results from the final model for SP1 cycle; unlike SP1 walk, this dataset did not lend itself to the estimation of different variants.

**Table 30: SP1 Cycle**

| | **SP1 cycle** | | |
|---|---|---|---|
| **Respondents** | 175 | | |
| **Observations** | 875 | | |
| **Final LL** | -467.43 | | |
| **Adjusted $\rho^2$** | 0.218 | | |
| | Est | Rob.s.e. | t-rat (0) |
| tt1_low_traffic_(VTT) | 1.180 | 0.491 | 2.405 |
| tt1_high_traffic_(VTT) | 2.004 | 0.770 | 2.602 |
| tt1_junctions_(VTT) | 4.534 | 1.281 | 3.539 |
| tt2_access_(VTT) | 0.800 | 0.657 | 1.218 |
| tt2_egress_(VTT) | 1.857 | 0.603 | 3.081 |
| tt2_cycleway_(VTT) | -0.240 | 0.863 | -0.278 |
| $\mu$ (scale) | -0.023 | 0.003 | -9.132 |

The key findings for SP1 cycle can be summarised as follows:

- The model given in **Table 30** offers acceptable fit, and elicits a number of significant and plausible VTT estimates.
- One important exception to the above is that the VTT for the cycleway is insignificant. It should be remembered that SP1 cycle was the only labelled experiment that we developed, and the indication here is that it has attracted a protest response.
- 40% did not trade and always chose the non-cycleway path. This rate was equal to 60% if we take only respondents who never saw a zero fee (i.e. SP design blocks 2 and 4). This suggests that people simply did not want to pay for a cycleway.
- The scale parameter in this model can be interpreted as the marginal utility of cost. The high t-value for this term reflects the points made above concerning protest response.
- Looking at the WTPs for the different conditions, we find that saving time at junctions is valued highest. This could partly reflect safety concerns, and may not therefore be a pure valuation of time saving.

- Whilst the coefficient for the cycleway is not significant (and we should therefore exercise caution in drawing inferences), a negative sign for VTT in this case would suggest that travel time on the cycleway is perceived as a benefit rather than as a cost.
- Three issues (namely sample size, the non-trading issue and having many different VTT measures involved) complicated the introduction of covariates to this model.
- Finally, it is interesting to note that analysis of the CV question SP1 cycle (**Table 31**) elicits a valuation close to the SP valuation for VTT at junctions (which is intuitive given the way in which the CV question was posed).

**Table 31: SP1 cycle – CV question**

| **WTP to reduce 5 minutes of cycling time, e.g. through fewer hold ups** | | |
|---|---|---|
| **Min** | **Max** | |
| 4.17 | 4.89 | pence/minute |
| 2.5 | 2.93 | £/hour |

### 11.2.5 SP2 results

Turning to SP2, this experiment was rather less successful than SP1. Final models estimated separately for walk and cycle are presented in **Table 32.**

The key findings for SP2, covering both walk and cycle, can be summarised as follows:

- The SP2 experiments simply did not work, as indicated by the extremely low adjusted rho-square – this implies that choices were essentially random.
- The experiments were found to be too complicated, as evidenced by responses documented in the survey.
- Little more can be inferred from **Table 32**.

**Table 32: SP2 walk & cycle**

| | **SP2 walk** | | | **SP2 cycle** | | |
|---|---|---|---|---|---|---|
| **Respondents** | 190 | | | 175 | | |
| **Observations** | 1,520 | | | 1,400 | | |
| **Final LL** | -1,026.16 | | | -938.02 | | |
| **Adjusted $\rho^2$** | 0.0165 | | | 0.023 | | |
| | Est | Rob.s.e. | t-rat (0) | Est | Rob.s.e. | t-rat (0) |
| tt1_(min) | -0.008 | 0.016 | -0.503 | -0.011 | 0.015 | -0.731 |
| tt2_(min) | -0.034 | 0.018 | -1.887 | -0.019 | 0.016 | -1.139 |
| tt3_(min) | -0.031 | 0.019 | -1.604 | -0.043 | 0.018 | -2.435 |
| tt4_(min) | -0.033 | 0.020 | -1.682 | 0.011 | 0.015 | 0.748 |
| tt5_(min) | -0.039 | 0.020 | -1.960 | -0.029 | 0.018 | -1.626 |

| | SP2 walk | | | SP2 cycle | | |
|---|---|---|---|---|---|---|
| tt6_(min) | -0.028 | 0.017 | -1.628 | 0.011 | 0.016 | 0.683 |
| tt7_(min) | -0.015 | 0.017 | -0.879 | 0.002 | 0.015 | 0.128 |
| tt8_(min) | -0.012 | 0.017 | -0.698 | 0.044 | 0.015 | 3.011 |
| wait_short_(times) | -0.038 | 0.010 | -3.678 | -0.040 | 0.011 | -3.709 |
| wait_long_(times) | -0.091 | 0.015 | -5.998 | -0.066 | 0.017 | -3.839 |

# 12 Implementation Issues

As was qualified at the beginning of **Section 10**, the VTT estimates presented in this report are behavioural values which have not been corrected for sample representativeness; they should not therefore be applied directly to appraisal.

However, it is worth remembering that the Department does not presently issue guidance on the use of bespoke walk and cycle VTTs in appraisal. With this mind, the present section considers some of the practicalities that would be encountered if the Department were to go down this road.

## 12.1 General points

For most transport appraisals, walk and cycle times will not change, so there are no time benefits and hence VTT are not needed. The principal exceptions are:

- bridges/underpasses across significant severance and, to a lesser extent;
- new PT options affecting access/egress by walk and cycle.

However, the latter could still be treated as a subset of the PT main mode results.

There is though interest in walk and cycle **conditions** as they affect VTT. The main impact of new cycle schemes is to transfer time from one set of conditions to another set of improved conditions. The VTT on, say, a completely segregated route could be appreciable lower than that relevant to travelling in heavy traffic without any segregation. Nonetheless, appraisal requires absolute monetary valuations for time spent in different conditions and not just estimates of their relative magnitudes. Similar reasoning applies to schemes that improve walking conditions even without impacting on the walking time itself.

All things considered, we are left questioning the apparent downside of using access/egress values. Might it underestimate VTT for walk and cycle (n.b. after controlling for covariates)? Is there sufficient commonality of budget to make this a big issue? Our feeling is that these are not significant problems.

## 12.2 Some practicalities

Provided at least one of the walk and cycle options is deemed to have delivered robust values, we do not see any new implementation problems, apart from short walks issue using NTS data.

If we had to use access/egress-based values, then there would be some “purist” issues, based on extrapolating between walk and cycle VTT as an aspect of (more important) PT journeys and walk and cycle in its own right. We do not see these as major concerns, especially given the likelihood that these values would be used only in specific cases, but it would nonetheless be prudent to prepare suitable arguments. To some extent, these arguments would be dictated by the degree of variation within the values from access/egress.

# 13 Recommendations

SP1 seems to have worked for walk, and partly worked for cycle – the problem in the latter case was strategic bias against paying for using a dedicated cycleway.

**R1:** We recommend that SP1 for walk is rolled out to a full field survey.

**R2:** We recommend that SP1 for cycle is further reviewed and revised, with the objective of eliminating strategic bias. If such bias can be mitigated, or better still eliminated, then SP1 for cycle should also be rolled out to a full field survey.

It is essential to be able to value time in different conditions, particularly for cycling. If SP1 is to be rolled out to a full field survey, the marginal costs of undertaking some form of SP2 exercise are minimal. Nonetheless, the SP2 exercise has not worked well, despite a number of successful applications in other studies. We therefore issue some recommendations concerning specific areas of further development for SP2, with a view to implementing alongside SP1.

**R3:** We recommend that the SP2 exercise restricts the number of conditions that any individual is presented with, placing a more clear cut emphasis on comparison of clearly different but limited number of situations.

For walking, the SP1 exercise is now based on egress time whereas the SP2 exercise is not.

**R4:** The SP2 exercise should be brought into line with the SP1 exercise and based around an actual trip with a limited number of different walking conditions offered to any one individual.

If SP1 valuations for walk (and/or cycle) were to be taken forward to appraisal, then there would be a practical need to re-weight valuations for representativeness against NTS. There would raise the practical question of whether this re-weighting would best be done through further development of the 'Implementation Tool' which presently covers the mechanised modes, or through a separate re-weighting exercise.

**R5:** We recommend that a short scoping study should be commissioned to explore the practicalities of translating behavioural values of travel time saving for walk and cycle into values appropriate for usage in appraisal.

# 14 References

Hopkinson, P.G. and Wardman, M. (1996) ‘Evaluating the demand for new cycle facilities’. Transport Policy, 3(4), pp241-249.

Wardman, M., Hatfield, R. and Page, M. (1997) ‘The UK national cycling strategy: can improved facilities meet the targets’. Transport Policy 4 (2), pp123-133.

Wardman, M., Tight, M. and Page, M. (2007) ‘Factors influencing the propensity to cycle to work’. Transportation Research A, 41, pp339-350.

Börjesson, M. and Eliasson, J. (2012) ‘The value of time and external benefits in bicycle appraisal’. Transportation Research Part A, 46, pp673-683.

Stangeby, I. (1997) ‘Attitudes towards walking and cycling instead of using a car’. TØI report 370/1997, Institute of Transport Economics, Oslo

Björklund, G. and Isacsson, G. (2013) ‘Forecasting the impact of infrastructure on Swedish commuters' cycling behaviour’. CTS Working Paper 2013:36, KTH, Stockholm.

Ortúzar, J.D., Iacobelli, A., Valeze, C., (2000) ‘Estimating demand for a cycle-way network’. Transportation Research A 34, pp353-373.

Rodriguez, D.A. (2004) ‘The relationship between non-motorized mode choice and the local physical environment’. Transportation Research Part D, Volume 9, Issue 2, March 2004, pp151-173.

# Appendix A

## Walking and cycling initial depths

# A1 Overall

Walkers and cyclists made numerous walking and cycling trips each week. There was a positive VTT in relation to cycling trips but not to walking trips. For both trip types safety rated higher than time savings. The implications for the quantitative stage were that there was a need to ensure that the context was described clearly in the SP introductions including road conditions, weather and the cycle parking facilities at destination.

# A2 Travel behaviour

For these respondents there was a proactive choice to walk/ or cycle over other forms of transport. Respondents choose to walk or cycle rather than taking the bus/tube "if the journey is less than three stops I'll make myself walk". Walking and cycling offered respondents considerable health benefits. Walking also offered 'thinking time'. For some, weather conditions did impact on their modal choice although for others who were highly committed walkers and cyclists they opted for these modes irrespective of the weather conditions. There were a variety of journey purposes mentioned but mainly these were for everyday/frequent trips such as to work, school, the shops and around town. There were some safety concerns surrounding cycling which sometime influenced the routes taken. For example, some mentioned that they would take a slightly longer route if the traffic conditions were more conducive to cycling.

# A3 VTT

These respondents felt less time squeezed than some of the other segments although it was apparent that they were also leading busy lives, with family pressure, work and social demands pressing upon their time. However, travel time (i.e. walking and cycling) were seen as "me time" and less time critical than when they were using other modes. It was felt to be hard to articulate the benefits of VTT when walking. Cycle trips were viewed as potentially more time critical and some desired to see reduction in the travel times. However, safety concerns override any potential time savings. Therefore, time savings would need to be seen in parallel with safer and, potentially, more attractive cycling conditions. There was a need to understand the travelling conditions when considering time savings in order to provide an informed response to these questions.

# A4 Walking experiment

There were high levels of comprehension for the walking experiment without the cost component. The language used was well understood. The main implication for the next stage was to ensure that the context for the journey is set including time of day and weather conditions.

**Figure 21: Walking experiment**

| Route A | Route B |
|---|---|
| 5 minutes walking impeded by other pedestrians alongside a quiet road | 10 minutes walking alongside a quiet road |
| 5 minutes walking alongside a busy road | 5 minutes walking along a pedestrian route |
| 30 seconds waiting to cross road | 1 minute waiting to cross road with pelican |
| **Time 10 minutes plus 30 seconds waiting** | **Time 15 minutes plus 1 minute waiting** |

Respondents offered the following interpretations to this namely that they were offered quicker journey but with less pleasant walking conditions and different waiting conditions and times.

The choice considerations were felt to be realistic choices. Furthermore, respondents liked the idea of pedestrian routes although there were some concerns over personal safety so they would need to understand issues such as the time of day, whether other walkers would be present etc.

The main issues identified were that the horizontal lines should be removed with single vertical lines included to divide the choices. Respondents were happy with the exercise being based on a hypothetical journey although it could work based on an actual journey.

Respondents struggled with the concept of paying for walking journeys. This dominated their choice as it was seen as unrealistic. Thus the research suggests that a non-cost exercise should be used.

**Figure 22: Walking experiment**

| Route A – Via Pedestrian Bridge | Route B Longer Route |
|---|---|
| 5 minutes walking alongside a quiet road | 5 minutes walking alongside a quiet road |
| 5 minutes walking along a pedestrian route (including pedestrian bridge) | 10 minutes walking along a pedestrian route |
| Plus 25 pence for toll bridge | |

The main interpretation for this was that this was a shorter journey but that you had to pay for it. There was some uncertainty as to why Route A had to take in the pedestrian bridge although it was assumed that this was to make the toll scenario believable.

The choice considerations were felt to be cost dominated. There was a strong push back to paying for walking journeys.

The main issues identified were that respondents assumed that Route B was zero cost but this needs to be explicitly stated in order to balance both options.

Furthermore, it would have to be based on a hypothetical trip as it was unrealistic for many to conceive of pedestrian toll bridges for their typical walking trips.

# A5 Cycling experiment

This SP was considered easy to understand but it would need to be based on hypothetical journey. The implications for next stage were that an introduction was required that stated that cycling storage facilities were the same at the destination for both routes (i.e. secure facilities). The journey also needs to be based on a hypothetical journey.

**Figure 23: Cycling experiment**

| Route A (CYCLEWAY) | Route B (TYPICAL ON-STREET JOURNEY) |
|---|---|
| 5 minutes to get to and from the cycleway on a busy road<br>10 minutes on cycleway | 10 minutes cycling on a quiet road<br><br>10 minutes cycling on a busy road in a bus lane<br>1 minute waiting at traffic lights<br>Junction manoeuvre - Straight on at traffic lights |
| | Junction manoeuvre - right turn at a roundabout where there are multiple lanes on the approach |
| 50 pence to use cycleway | |
| **Time 15 minutes** | **Time 20 minutes plus 1 minute waiting** |

The main interpretation for this was that it was a shorter journey with more attractive cycling conditions but that respondents had to pay. It was considered to be easy to understand the trade-off.

The main choice consideration was the time of day; respondents would need to understand whether there would be a high or low likelihood of other users in Route A.

The main issues identified were a need to balance up attributes if at all possible. There was a large number of elements in Route B which provide a visual short cut to a complicated journey. With Route A there was no waiting time at the lights and no junction manoeuvres. There was felt to be a need to state that there was zero cost for Route B.

# A6 Mode choice experiment

This was felt to be easily understood but that it should be based on hypothetical journey. The implications for the next stage were that there should be a clear context provided for each mode. Furthermore the cycle and walk options needed to state that they attracted “zero” cost.

**Figure 24: Cycling experiment**

| | Cycle | Bus | Taxi | Walk |
|---|---|---|---|---|
| Time | 5 minutes | 3 Minutes on Bus<br>2 minutes to and from bus stop<br>2 minutes waiting for bus | 2 minutes | 15 minutes |
| Cost | | £1.50 | £3.00 | |

This was interpreted as asking respondents to choose between paying for a journey that might be shorter or cycling/walking which might be longer but doesn't cost anything.

Regarding the choice considerations, respondent felt that they needed to know the following in order to make a choice namely the:

- Time of day
- Weather conditions
- Bike storage facilities at destination
- Time taken to walk from bike storage facilities to final destination
- Terrain/geography (flat, hilly etc.)
- Waiting time for taxi needs to be clear
- Distance to the bus stop from the origin location.

The issues identified were that cycling time can be quicker than by either bus or taxi. Walking time generally cannot be quicker than rather bus or taxi unless the area is very heavily congested. There needs to be a significant amount of contextual information (as indicated above) in order to make an informed decision.