Streets to wellbeing Investigating the relationship between Transport for London Healthy Streets projects, walking journey experience and associated wellbeing

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Streets to wellbeing?: Investigating the relationship between Transport for London Healthy Streets projects, walking journey experience and associated wellbeing

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Being a dissertation submitted to the faculty of The Built Environment as part of the requirements

for the award of the MSc Transport and City Planning at University College London: I declare that

this dissertation is entirely my own work and that ideas, data and images, as well as direct

quotations, drawn from elsewhere are identified and referenced.

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List of acronyms

CSL	Case Study Location
CWB	Cognitive Wellbeing
EWB	Eudaimonic Wellbeing
GIS	Geographical Information Systems
HSA	Healthy Streets Approach
HSCD	Healthy Streets Check for Designers
HSIs	Healthy Streets Indicators
HSP	Healthy Streets Project
HWB	Hedonic Wellbeing
ONS	Office for National Statistics
PAND	Positive Activation-Negative Deactivation
PDNA	Positive Deactivation-Negative Activation
PHR	Public Health Responsibility
SCAS	Swedish Core Affect Scale
SEF	Streetscape Experience Factors
SN	Stoke Newington
STS	Satisfaction with Travel Scale
SWB	Subjective Wellbeing
TfL	Transport for London
UK	United Kingdom

Abstract

Despite increasing interest in health and wellbeing in transport policy, there are no policy monitoring tools to measure the effects of streetscape projects on the mental wellbeing for walking. After establishing the two types of wellbeing (subjective and eudaimonic), a review of the literature suggested four ways streetscape environments can affect wellbeing: traffic domination, safety, pollution and street greenery. These were combined with urban design and journey experience approaches to create 16 streetscape factors which were integrated into a theoretical framework conceptualising how streetscape experience influences wellbeing. Given its progressive Healthy Streets Approach to streetscape projects, the case study location of London was chosen. A comparative approach was taken, comparing wellbeing associated with streetscape factors at Archway, where a Healthy Streets project has been completed, and Stoke Newington where a project is planned.

The results found whilst there is broad agreement with the most and least important streetscape factors, there were differences in the exact ranking which comes out more significantly when these importance ratings were used together with actual experience to plot 'disgruntlement'. Although no relationship was found with eudaimonic wellbeing, subjective wellbeing was positively related to streetscape experience with the subjective wellbeing element positive deactivation-negative deactivation most influenced by streetscape experience in both locations. The most significant streetscape experience factor was 'Easy to cross'. No mediating relationships were found with socio-demographic factors or visit frequency. The overall comparison of wellbeing at the two locations found a statistically significant relationship for positive deactivation-negative deactivation and a moderately significant for experience. Thus, it appears streetscape experience and Healthy Streets projects have a measurable impact on wellbeing and policymakers should look toinclude wellbeing in project appraisal.

1. Introduction

1.1 Research context

In the UK, media awareness of mental health issues has increased in the last few years in reaction to mental illness prevalence. Each year, one in four adults suffer from a mental health disorder in the UK (Mental Health Taskforce, 2016), which in England alone is attributed to an economic cost of at least £105.2 billion a year covering both treating patients and related lost economic productivity (Centre for Mental Health, 2010). Moreover, this is not just an issue within the UK; the overall costs of mental ill-health estimated to surpass 4% of European Union GDP (OECD, 2018). Therefore, there are significant problems with poor mental health in many developed nations, which cause both social and economic issues and threaten the continued prosperity of society at all levels.

The foundation of mental health is mental wellbeing, which has in itself long been recognised as a fundamental constituent of health (WHO, 1946). Mental wellbeing is associated with increased happiness and quality of life which creates greater resilience to mental health disorders. However, despite this, research and government policy have tended to focus only on treating mental health disorders when these are diagnosed, rather than taking the broader more holistic approach concentrating to preventing disease occurrence in the first place. This positive psychology approach would give greater importance to the concept of mental wellbeing and acknowledge the variety of domains which have positive and negative influences on wellbeing such as family, work and leisure (Schimmack and Oishi, 2005). Henceforth, for mental health issues to improve, the concept of mental wellbeing needs to be embraced via a more rounded understanding of what influences mental wellbeing.

1.2 Streets and mental wellbeing

Two domains which have a recognised influence on mental wellbeing but are under-theorised are the built environment (WHO, 2014) and travel (Ettema et al., 2010). These domains intersect to form the sub-domain of street travel. Street travel is one of the most important everyday activities for two reasons. Firstly, most people undertake some form of travel daily, because their daily activities (work, education, shopping and leisure) are distributed across space (Urry, 2000). Secondly, when individual journey stages are considered, the majority of travel is completed on-street, by walking, cycling, driving or road-based public transport (GLA, 2014). Of these modes, walking is arguably the most important, because it is used in almost every trip for the first and last mile of the journey, even if the majority of the journey is completed by another mode. These issues will only become more

pressing in coming decades as urbanisation continues to increase globally; almost 70 % of the population is projected to live in urban areas by 2050 (UN DESA, 2019). Therefore, it is important to understand how the experience of travelling on streets influences wellbeing and walking is the most important mode to understand this for.

Although in recent years there has been greater interest in the health effects of walking and street design, the academic interest in mental wellbeing has not yet translated to policy. For example, London has one of the most progressive active travel-led approaches to improving health through street design improvement (Healthy Streets Approach (TfL, 2017)) led by the transport authority, Transport for London (TfL). Whilst this has many indicators dedicated to measuring physical activity improvements and calculating associated physical health benefits, the effect on mental wellbeing is only given cursory consideration and not measured at all.

This betrays the idea improving wellbeing should be the ultimate transport social policy goal (Stanley and Stanley, 2007) and thus presents an obvious research gap in understanding how transport policy can help tackle the wider mental health issues. It could be addressed by introducing measurement of mental wellbeing into the monitoring of street improvement projects to fully understand how the wellbeing domain of street design can positively influence mental wellbeing. The policy context in London provide an ideal case study location to investigate a method to do this.

1.3 Research questions and objectives

Building on this backdrop, this dissertation seeks to answer the following research question:

> *Can improving street design using the Healthy Streets Approach improve the mental wellbeing of walking street users?*

It is hypothesised street design does impact mental wellbeing (hereafter referred to as wellbeing), and this can be related to specific features of the street walking streetscape experience. This hypothesis will be explored in relation to the case study of London, United Kingdom, focusing on the locations of Archway and Stoke Newington. This hypothesis will be tested by the following research objectives:

1. Establish the streetscape factors which are reported to affect mental wellbeing, based on a synthesis of academic literature and policy
2. Investigate whether these streetscape factors are considered important for walking streetscape experience from a wellbeing perspective
3. Establish where the biggest gaps in wellbeing provision exist

4. Understand if streetscape design influences both subjective and eudaimonic wellbeing of street users

5. Consider if there is a measurable difference in reported wellbeing and streetscape experience between an area which has had its streetscape improved and an area which is yet to be improved

6. Provide guidance for future policy and academic research

The dissertation which follows will thus begin with a literature review summarising the key themes and related policies on wellbeing and streets, before progressing to describe the research methodology. The results of this research will then be interrogated and discussed, before final conclusions and reflections for future policy and research are drawn.

2. Literature Review

This literature review considers the academic and policy background to wellbeing and street design, which will be used to create a theoretical framework for this dissertation.

2.1 Conceptualising Wellbeing

Wellbeing is a complex and multi-faceted concept which lacks a firm academic definition, but can best be understood as the equilibrium between the resources of an individual and the challenges they encounter (Dodge et al., 2012). Put simply, this can be articulated as: "how people feel and how they function, both on a personal and social level" (New Economics Foundation, 2012, p.6).

There are two main conceptions of wellbeing within the literature, both rooted in Ancient Greek philosophy: hedonic wellbeing (HWB) and eudaimonic wellbeing (EWB).

HWB is based on the idea satisfaction of individual preferences creates pleasurable or happy experiences, and individuals seek to maximise these experiences (Ryan and Deci, 2001). Consequently, HWB is associated with the balance of positive and negative emotions, with HWB achieved when predominantly happiness and positive emotions are experienced (Carruthers and Hood, 2004). The idea of HWB originates in the philosophy of Epicure and utilitarianism philosophers like Bentham (Brey, 2012), but within contemporary literature is most closely associated with Kahneman et al. (1999). HWB itself hangs from Diener (1984)'s broader conception of Subjective Wellbeing (SWB), which includes a cognitive evaluation of wellbeing based on life satisfaction in addition to positive and negative affect (Deci and Ryan, 2008). SWB provides the framework for measurement of HWB and consequently the two terms are often used interchangeably, with many HWB definitions including life satisfaction (McMahan and Estes, 2011a). However, as the focus of this dissertation is the measurement of wellbeing, the term SWB is preferred to describe this wellbeing perspective and will be used hereafter.

In contrast, EWB is a more psychological understanding of wellbeing. Rooted in the philosophy of Aristotle, EWB is based on "recognis[ing] and liv[ing] in accordance with the daimon or one's true self" (Waterman, 1993, p.41). The precise nature of this definition varies according to different authors but commonly associated ideas are: individual's meeting their potential and striving towards excellence (Ryff and Singer, 2008); and fulfilment and leading a purposeful life (MacMahan and Estes, 2011b). Measurement of EWB is usually based on a list of concepts associated with eudaimonic values, making EWB appear a more objective form of wellbeing measurement. However, as observed by Waterman (2008), these concepts are usually experienced subjectively so subjective assessment, albeit different to that of SWB, is appropriate.

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Historically, interest in the literature has favoured SWB, but over the past 20 years EWB has received growing attention (Waterman, 2008). Some authors argue EWB is more important than SWB (Steger et al., 2008), potentially because its effects considered more beneficial over longer timescales. However, increasingly research suggests both SWB and EWB are important for total wellbeing or flourishing state (Keyes and Annas, 2009; Huta and Ryan, 2010). Thus, it is important to take a multi-dimensional approach to measurement. Although attempts have been made to integrate measurement into one metric (McMahan and Estes, 2011b), overall it is still considered better to measure both separately as, although highly related, SWB and EWB are distinct states with distinct wellbeing outcomes (Henderson and Knight 2012).

In general, it is considered better to measure wellbeing directly via subjective self-report measures. With a narrow focus on HWB, in the past it was considered possible to measure wellbeing solely objectively, usually based on GDP and the assumption increased income leads to increased consumption and greater wellbeing utility (Conceição and Bandura, 2008). Research since has found GDP cannot fully explain the increases in wellbeing observed (Easterlin, 2005), and approaches have moved to using indicator indices to include broader wellbeing conceptions, though still not usually EWB (Sumner, 2004). Nonetheless, this still relies on global indicators to evaluate wellbeing which falsely presumes individuals all perceive objective life circumstances the same way (Eichhorn, 2014). Self-report indicators give a much richer understanding as they are based on individual's own opinions about their lives and, as correlation has been found with non-self-report measures (Lucas and Diener, 2009), self-report measures are preferred in academic studies.

2.2 Wellbeing Measurement and Policy

Most countries began developing national wellbeing measurements over the last decade (Exton and Shinwell, 2018). This follows the commissioning of the Stiglitz report which recommended countries begin measuring wellbeing subjectively to give a better understanding of factors beyond income and material conditions which impact wellbeing (Stiglitz, 2009).

In the UK, this led to the Office for National Statistics (ONS) creating new statistical survey questions for its Annual Population Survey, three to measure SWB and one to measure eudiamonic wellbeing as recommended by Dolan et al. (2011). These represent the UK Government's first committed questions reporting on wellbeing operationalised in a large-scale survey (Waldron, 2010), with these wellbeing measurements compared with other objective data to gain a richer understanding of Briton's wellbeing and enabling feedback into future policy-making (ONS, 2012). There have been discussions about integrating such SWB data into project evaluations using the cost-benefit analysis approach favoured by the UK Government, however so far this is still in early development stages

(Dolan and Fujiwara, 2016). More encouragingly, the Department for Transport's Transport Appraisal Guidance does cover assessment of issues which could be related to wellbeing including journey quality, and noise and air pollution (DfT, 2018). However, these are only given cursory treatment in the appraisal and framed within a broader discourse focusing on physical health and economic benefits, so are unlikely to inspire improved focus on wellbeing.

Moreover, in order to affect change and promote better wellbeing, the evidence base created through measurement needs to be translated to policy (Exton and Shinwell, 2018). In England, this manifested when in 2013 public health responsibility (PHR) was delegated to local authorities. This responsibility includes giving assistance to minimise health risks arising from individual's environments (Heath, 2014), which can be related to health risks associated with street travel. Looking at the transport strategies of the UK's five biggest urban areas, however, this has been translated purely as a responsibility for physical health, with a focus on increasing physical activity and reducing air pollution (GCC 2015; WMCA, 2016; TfGM 2017; WYCA 2017; GLA, 2018). Where wellbeing is referred to, it is either in a sweeping unspecific reference to health and wellbeing, or framed within the social exclusion discourse (Lucas, 2012). Even in London's progressive health-centred Mayors Transport Strategy only refers to physical health benefits (GLA, 2018). Whilst physical activity is associated with mental wellbeing improvements (Fox, 1999), this strategy omission contradicts the Public Health Outcomes Framework that guides the PHR, as self-reported wellbeing is listed as an indicator local authorities' public health improvements are measured against (DoH, 2013). Moreover, self-reported wellbeing has been recognised as related to transport and street environments (TfL, 2014), so local authorities should be integrating wellbeing into policy as well as measuring the direct effects transport has on wellbeing.

2.3 Streets and Wellbeing

Streets have a complex role within the built environment and consequently, how they impact wellbeing is not simple. Whereas buildings always have static functions, streets accommodate both movement and place functions, often expected to function highly in both roles (Jones et al., 2007). In cities, this is indicative of the common desire to accommodate ever increasing traffic volumes (Kenworthy, 2006) and the amount of public space streets provide in cities; streets typically provide 80% of city public space (NATCO, 2013). Generally, this clash of functions is won by movement, with the Streetscape guidance from the UK Government has generally supported this bias presenting residential streets and roads as a dichotomy (MoTSGWG, 1963; Taylor and Filmer-Sankey, 2002). This has continued to be supported in the most recent guidance (Manual for Streets), albeit with

greater emphasis on place function (DfT, 2007). This backdrop has implications for the wellbeing of those who use streets.

The street travel domain is affected by both meso- and micro-environmental factors. Meso-factors pertain to how streets relate to the wider neighbourhood and connectivity, covered by Ewing and Cevero (2010)'s 5 D's: density, design, diversity, distance to transit and destination accessibility. These create the broader frame for street walking experiences. Popular urban design theories have concentrated on these objective meso-factors (Jacobs, 1961; Gehl, 1987) and research backs these theories with evidence mixed use streets and walkable distances to local amenities promotes better wellbeing, primarily by encouraging social interaction (Leyden, 2003). However, the subjectively perceived micro-factors which sit beneath these meso-factors are also important (Kim et al., 2014) with evidence these factors are also important for wellbeing. The literature establishes four main micro-streetscape-elements important for wellbeing:

1) Traffic domination

Highly trafficked streets create physical and social barriers within communities and have corollary effects on wellbeing. Barriers depends on individual perceptions with evidence suggesting where streets are perceived to have heavy traffic and fast speeds, this can reduce individual's willingness to walk which lowers wellbeing (Anciaes et al., 2019). Such streets are intimidating and considered less safe because there is a greater risk of being involved in an accident, which promotes anxiety; this fear is justified by negative wellbeing responses of those involved in accidents (Mayou et al., 1993). Most accidents occur when crossing roads (Lassarre et al., 2007) so it is important for wellbeing roads are easy to cross. Moreover, as busier roads are hard to cross, those on opposite sides of the road are less likely to socialise which also reduces wellbeing (Appleyard and Lintell, 1972; Hart and Parkinson, 2011).

2) Safety

In addition to road safety, streets are associated with fear of crime and anti-social behaviour, despite actual crime rates declining since the mid-1990s (van Kesteren et al., 2014). This fear of crime has substantial impacts on wellbeing by creating cumulative stress and anxiety, but it is highly intangible so difficult to pinpoint which streetscape factors reduce or increase this fear (Lorenc et al., 2012); however, there are associations with neighbourhood incivilities like loitering teenagers and vandalism (Lewis and Maxfield, 1980). Aside building design, the biggest impact street design has on fear of crime is lighting, as this allows danger to be anticipated, reducing related anxiety (Blöbaum and Hunecke, 2005).

3) Pollution

There are three main pollution types which affect streets, the presence of which is associated with negative: environmental, air and noise. Ellaway et al. (2009) found environmental pollution, like rubbish, graffiti and vandalism, to increase frequent feelings of anxiety and depression by almost 200%. For noise pollution, whilst what constitutes noise is subjective, traffic noise is widely agreed to be an annoyance, with 40% of the European population exposed to high noise levels from road-traffic noise (SfEP, 2015). Exposure to traffic noise reduces wellbeing by disturbing sleep and annoyance (Bluhm et al., 2004) as well as increasing hypertension cases which is related to increased stress levels (Barregard et al., 2004). With air pollution, low air quality has been associated with both reduced happiness and EWB (Dolan and Laffan, 2016) as well as being linked to higher depressive symptoms (Zhang et al., 2017).

4) Street greenery

It is considered humans have a natural disposition towards nature due to preferences developed via evolution (Balling and Falk, 1982). Explanatory theories suggest nature is important for recovering from mental fatigue which reduces wellbeing (Kaplan and Kaplan, 1989) and reduces recovery time from stress (Ulrich, 1991). Whilst most studies concentrate on the impact of larger green spaces, studies also highlight the importance of street trees and planting on wellbeing. Street trees, grass and flowers were observed to increase street environment restoration potential by providing a source of involuntary attention (Lindal and Hartig, 2015). Street trees have also been associated with reduced anti-depressant prescription (Taylor et al. 2015) and helping people feel calmer (Lohr et al., 2004).

When executed favourably, these micro-factor elements coalesce to create environments people enjoy visiting which can be assessed via objective factors such as number and diversity of street users. Whilst these factors have been considered in isolation, in reality there are many interconnections between their wellbeing effects; for example, the presence of trees is linked to lower crime (Wolfe and Mennis, 2012). The different factors affect different individuals to differing extents; for instance, lower income areas are more likely to have poor air quality (Finkelstein et al., 2013). The relationship between the environment and wellbeing is not simple and there are complex feedback loops between micro-factors, environment use and individual's wellbeing (Caserio, 2005). This feedback is influenced by all senses, not just visual which is often overly-privileged within social science (Adams and Guy, 2007), as well as by individual memories and perceptions based on similar environmental experiences (Millman, 2012).

Academic research on streetscape experience measurement is split between urban design and travel satisfaction approaches. As discussed, urban design approaches focus on objective meso-factors,

many of which are beyond transport policymaker's scope to change. However, they do highlight the importance of understanding less tangible concepts such as street environments being attractive and enjoyable to visit with interesting sights (Rahimiashtiani and Ujang, 2013; Johansson et al., 2015).The travel satisfaction literature examines travel as an experienced-utility rather than a derived-utility, with people's decisions to travel influenced by both instrumental (cognitive) and affective/attitudinal (emotional/perception) factors (Hickman et al., 2015). Most studies compare experience between modes, with walking typically emerging as a preferential mode (Ye and Titheridge, 2017; Friman et al., 2013), being associated with positive affective states like relaxation and excitement (Gaterleben and Urzell, 2007). These studies all only examine SWB; consideration of the EWB effects on travel satisfaction has only begun being reported on very recently, again focusing on mode choice (Vaitis et al., 2019; Singleton, 2019). Journey experience features noted to led to satisfying walking journey experiences include: air quality and road safety (Stradling et al., 2007), and avoiding traffic domination and uncleanliness Bornioli et al. (2019). Alfonzo (2004)'s walking hierarchy emphasises the importance of basic factors like pavement provision before maximising safety, comfort and pleasurabilty.

2.4 London

As the case study, it is relevant to consider London's policy background in more detail. TfL responded quickly to their PHR, publishing their 'Improving the Health of Londoners' action plan in 2014 which set out how streets influence health, drawing on three of the elements established in Section 2.3 in addition to physical activity (TfL, 2014). Whilst most of the health improvements conceived relate to physical health, the impacts on mental wellbeing and mental health were acknowledged for access, severance and noise (TfL, 2014).

This action plan was followed in 2017 by the introduction of the Healthy Streets Approach (HSA) (TfL, 2017a), which became the core vision of the latest Mayors Transport Strategy (GLA, 2018). The purpose of the HSA is to improve streetscape experiences in London, encourage people to be more active and promote broader streetscape health benefits (TfL, 2017a). This sets a clear focus towards physical health, but not narrowly defining health suggests there is room to consider wellbeing benefits too. The HSA is based on the 10 evidence-based Healthy Streets indicators (HSIs), which highlight how streets can be made attractive places (TfL, 2017a). Table 1 briefly describes each indicator and its associated rationale:

Table 1: Summary of Healthy Streets indicators (based on TfL, 2017a)

Pedestrians from all walks of life	Streets should be welcoming to all and provide opportunities to engage in community life
Easy to cross	Encourages more walking and connects communities, direct routes preferred as more convenient, heavy traffic makes more difficult
Shade and shelter	Enables all weather street use
Places to stop and rest	Absence is a barrier to certain groups mobility, encourages social activity on streets
Not too noisy	Improves street ambience and encourages walking and social interaction
People choose to walk, cycle and use public transport	More sustainable travel modes, sign of successful transport system, requires improved street experience and reduced traffic dominance
People feel safe	Everyone should feel safe at all times, no fear for personal safety or from road danger
Things to see and do	Attractive streets are more likely to be used for walking; attractors include planting and other people
People feel relaxed	Clean streets in good repair which are not overcrowded or traffic dominated appeal to a wider range of people
Clean air	Benefits all, reduces health inequalities

Eight HSIs (excluding those in grey) can be measured subjectively, as they relate to individual's perceptions of streets (TfL, 2017b*). For each project, these ten indicators are assessed via 31 metrics, contained within the Healthy Streets Check for Designers (HSCD) (TfL, 2019), 19 of which are relevant for walking. These metrics enable a more detailed analysis of the street, including traffic

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speed/flow, lighting and pavement width, however assessment is largely objective or the subjective view of one individual. Overall policy progress was previously measured subjectively as part of the Healthy Streets Survey, which was designed to understand real-life experiences of London's streets by interviewing street users (TfL, 2017b*). However, due to high cost and thus small number of surveyed sites, results were not being generalisable (TfL, 2017c), and this method was discontinued after 2017. This has left overall progress against six of the ten indicators measured either through customer satisfaction surveys not designed for this purpose, or unmeasured due to no good objective measures (TfL, 2018) (note 'Clean Air' and 'People Feel Safe' can be measured both objectively and subjectively). Whilst there is currently attempts to create a new experience-based measure ('Mystery Shopper Survey') this uses a more systematic and objective methodology (TfL, 2018), so will not effectively capture perceptions of the street, which are important to understand wellbeing impacts.

The evidence presented in Section 2.2 concords with six of the eight subjective HSIs, which suggests these indicators could also be utilised to monitor wellbeing impacts. The two indicators not captured were 'Places to stop and rest' and 'Shade and shelter'. This is because these two indicators have the most profound impact on old, young or disabled people, as they are more easily fatigued (Burton and Mitchell, 2006) and affected by changes in thermal comfort (Gillner et al., 2015) which in turn affect wellbeing. Thus, whilst these factors do not affect all individuals or have an impact at all times, they are important to create inclusive street environments for the whole community, and should be assessed by wellbeing measurement.

2.5 Summary

The evidence in this literature review highlights a notable gap in assessing how both wellbeing types are related to walking streetscape experience, both within the academic literature and policy. There are four main street aspects which have been related to wellbeing, but despite the UK having general policy concern for wellbeing and increased recognition of the health impacts of transport policy, their influence has not been measured. Whilst current policy in London is focused on and only assesses physical health benefits, a review of the HSA suggests wellbeing measure fits well with the current indicators and could easily be integrated into appraisal.

The relationships established in this review have been synthesised into a theoretical framework (Figure 1), which summarises how streetscape factors relate to streetscape experience and how these interact with wellbeing and individual characteristics. Several feedback mechanisms are included and the framework is set within the context of visit purpose, frequency and familiarity.

To test this, a method needs to be developed which can measure how streetscape projects affect wellbeing. Based on the failings of previous subjective measures (TfL, 2018), this will need to be low cost and easy to operationalise over many sites for the method to be useful and add value.

It is hypothesised both SWB and EWB are related to street user's streetscape experience, and differences in wellbeing measured will be measurable between areas which have more wellbeing promoting features, which a Healthy Streets Project (HSP) should introduce, than wellbeing reducing features which may otherwise be present. It is also expected some streetscape factors may be considered more important than others, and this may differ between individuals due to their personal characteristics

Figure 1: Theoretical framework summarising the literature review findings

Strength of wellbeing influence mediated by trip context:

- Purpose
- Frequency
- Familiarity

Individual:

- Age
- Gender
- Disability
- Ethnicity
- Income

Wellbeing:
Subjective
Eudaimonic

Subjective measurement:

Environment: Specific

Traffic domination:
- Not too intimidating
- Not too fast
- Easy to cross

Safe:
- Fear of crime and antisocial behaviour
- Well-lit

Pollution:
- Environment cleanliness
- Noise
- Air

Street greenery:
- Presence of trees and plants

Other:
- Pavement width
- Shade and shelter availability
- Places to rest

Environment: Overall
- Attractive
- Enjoy visiting
- Relaxed
- Interesting sights

Objective measurement:

- Pedestrians of all walks of life
- Choose to walk
- Less mental health disorders
- Greater social contact

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3. Methodology

This section explains the methodological approach used to answer the research question: 'Do Healthy Streets projects increase reported mental wellbeing and improve streetscape experience from a wellbeing perspective?'.

The data collection method used was a survey which collected quantitative data for statistical analysis. The following sections give an overview of case study locations, survey design and data collection approach, before describing the data analysis. Lastly, ethical concerns and research limitations are reflected on.

3.1 Case study areas

This dissertation focuses on two case study locations (CSLs): Archway and Stoke Newington (SN). Archway and SN are both located in North London, around 5 miles by road from Central London in TfL fare zone 2 (Figure 2).

Figure 2: Map showing the case study area locations, Archway and SN, in relation to central London (Base map: TfL Surface Playbook)
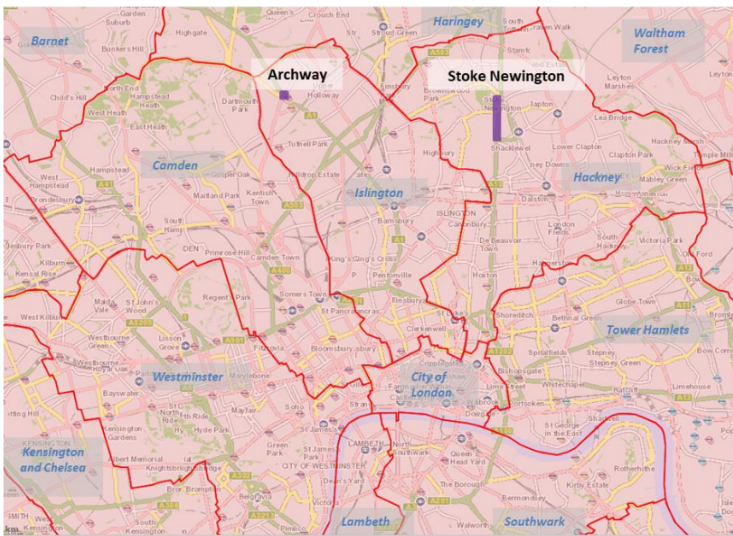
This similar proximity to central London, together with an analogous street type and streetscape heritage, were the main reasons these locations were chosen for this dissertation. With regard street type both Archway and SN are town centres located on major primary A-roads; Archway on the A1 and SN on the A10. According to TfL's street types matrix, both roads are categorised as High Roads as they have the highest movement function and medium place function (RTF 2013a; 2013b), thus are characteristic of the challenge of creating streetscapes which encompass both functions to a high-level.

As for streetscape heritage, both Archway and SN had gyratory systems built in the 1960s. According to the Oxford English Dictionary (2019), a gyratory is "a road junction or traffic system requiring the circulatory movement of traffic, and which is larger or more complex than an ordinary roundabout". Whilst there is little information detailing exactly when gyratory systems began being built in London, it appears they were originally proposed by the London Traffic Management Unit in the early 1960s with the aim of improving traffic flow (Collins and Pharoah, 1974). In the intervening years, as transport policy narrative has moved away from accommodating motor traffic towards more sustainable and active travel, gyratories have become increasingly considered unsuitable for contemporary London (NLA, 2016; Pickford, 2014). Plans to remove gyratories were first endorsed by TfL in 2014, with 50 junctions, including Archway and SN gyratories listed for improvement via the Better Junctions and Major Schemes programmes (TfL, 2014). However, to date only Archway gyratory has been removed, with the project completing in 2017 (TfL, 2017d). SN is still planned to be transformed, with TfL undertaking consultation on the project in 2018 (TfL, 2018). Consequently, SN's current pre-transformation status makes it an ideal comparator to Archway as a location which has already undergone drastic streetscape changes which should have a measurable impact on wellbeing (Figure X and X). Moreover, the HSCD shows a similar uplift in environmental quality expected in SN to the Archway project (Figure X), further aiding comparison.

Figure 3: Before (a) and after (b) images of Archway showing the new layout after the Healthy Streets project removed the gyratory (Source: (a) LondonAndProperty, 2015; (b) Author's photograph
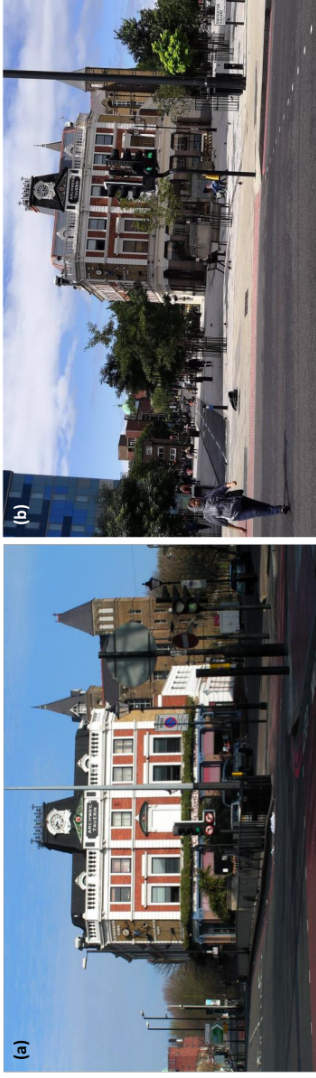

Figure 4: Before (a) and after (b) images of SN showing the changes planned under the Healthy Streets project (Source: TfL, 2018)

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(a)

Healthy Streets Check scores

Source: Lucy Saunders

Healthy Streets Indicators' scores (%)
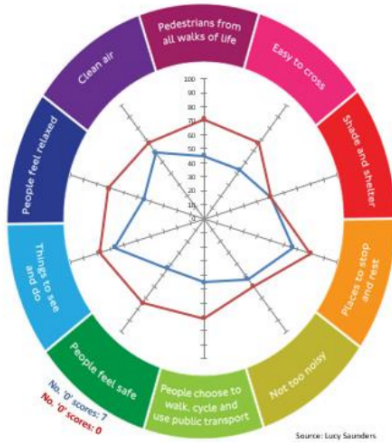
	Existing layout	Proposed layout
Pedestrians from all walks of life	45	71
Easy to cross	43	67
Shade and shelter	50	50
Places to stop and rest	67	80
Not too noisy	53	60
People choose to walk, cycle and use public transport	45	71
People feel safe	44	74
Things to see and do	67	78
People feel relaxed	45	71
Clean Air	58	67
Overall Healthy Streets Check score	47	71
Number of 'zero' scores	7	0

(b)

Healthy Streets Check scores

Source: Lucy Saunders

Healthy Streets Indicators' scores (%)
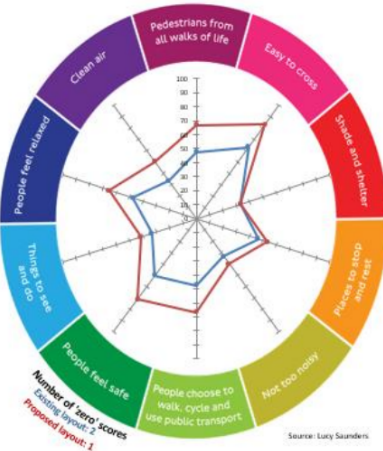
	Existing layout	Proposed layout
Pedestrians from all walks of life	48	67
Easy to cross	63	83
Shade and shelter	33	33
Places to stop and rest	47	53
Not too noisy	33	40
People choose to walk, cycle and use public transport	48	67
People feel safe	50	71
Things to see and do	33	42
People feel relaxed	47	65
Clean Air	33	50
Overall Healthy Streets Check score	48	65
Number of 'zero' scores	2	1

Figure 5: HSCD for (a) Archway and (b) Stoke Newington (Source: TfL)

3.2 Questionnaire design

Based on the theoretical framework (Figure 1), two questionnaires were used to collect data for the surveys: one focused on Archway, one focused on SN. Both questionnaires had the same structure and number of questions; the only difference was one question about knowledge of the area before the gyratory was removed for Archway, and awareness of the gyratory removal plans at SN. This meant the survey results could be compared to consider objective 5.

All questions were compulsory to reduce incomplete responses, but participants were given the option to 'Prefer not to say' where information requested may be considered sensitive. To aid understanding and enable wide participation, all questions were written in plain English. The survey was aimed at those who had visited either CSL in the last 6 months, to ensure memory of visiting the streetscape was relatively recent, whilst ensuring enough responses could be collected for analysis.

Both questionnaires had four sections, with 14 questions comprised of 57 question parts. Table 2 shows how this structure supported the objectives. The sections were ordered this way based on Krosnick and Presser (2010)'s recommendation to start with easier questions and put more sensitive questions at the end of the survey. Before commencing the survey, participants were given an overview of the research, questionnaire structure and anticipated survey completion time on the survey launch page.

Table 2: Survey sections and relationship to objectives

Section		Number of questions	Supports objective
1	General Details[i]	9	-
2	Your journey experience	2	2 and 3
3	Your feelings during visits	1	4
4	Your general feelings about life[ii]	2*	4

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[i] Basic demographics and relationship with case study location (for use as control variables of wellbeing effects)

[iii] The final question in section 4 provided a free-text comments box for participants to provide additional feedback

The questionnaire was piloted by 3 individuals to test survey legibility. Several changes were incorporated into the final questionnaire from this including improvements to question wording and case study areas maps. A copy of the questionnaire can be found in Appendix 1.1.

3.2.1 Streetscape Experience

To assess streetscape experience, perceived experience and importance were measured. MORI (2002) suggested measuring the desired level of each of these streetscape experience factors (SEF) as well would give a more complete idea of satisfaction, since not all important factors are expected to be delivered to a high-level. However, as this would have made the questionnaire prohibitively long to elicit a suitable number of responses for analysis the former approach was taken.

Based on Stradling et al. (2007), 16 SEF were identified from the literature review as relevant to wellbeing and walking streetscape experience. These were then converted to questions with 10 questions based on those previously used in TfL's Healthy Streets Survey (TfL, 2017b*). The other 6 questions reflected further elements not considered by these 10 questions but highlighted by the wider literature as important for wellbeing. Although journey experience questions are often categorised into instrumental and affective factors, Susilo and Cats (2014) found instrumental factors had little influence on walking journey experience. Consequently, only affective/attitudinal factors were included in this research.

Participants were asked to consider these factors from a wellbeing perspective. Question 10 provided a definition of wellbeing and defined the case study area with a pop-up map (see Appendix 1.2 and 1.3) to prime participants and ensure they correctly understood wellbeing, and were considering the relevant CSL streets. Each SEF was considered twice, once for perceived experience and once for importance to the participant. Each SEF was considered on a five-point likert scale, from 'Strongly Agree' to 'Strongly Disagree' for perceived experience and from 'Not Important' to 'Very Important' for importance.

3.2.2 Subjective Wellbeing

Measures of SWB related to transport usually utilise the domain-specific Satisfaction with Travel Scale (STS). Jakobsson Bergstadt et al. (2011) provided the first version of this tool; however, this only had five items and was heavily biased towards cognitive travel elements. The subsequent STS scale developed by Ettema et al. (2011), is far more widely used in transport research. It uses 9 adjective pairs covering both cognitive and affective elements, based on the Swedish Core Affect Scale (SCAS) (Västfjäll et al., 2002). One cognitive and two affective dimensions are considered, with the affective dimensions based on the psychological concepts of affect and valence: Positive

Activation-Negative Deactivation (PAND) (such as bored) and Positive Deactivation-Negative Activation (PDNA) (such as relaxed) (Ettema et al., 2011).

Since its creation, Ettema et al. (2011)'s STS has been tested and adapted numerous times. The questions in this survey are based on Ettema et al. (2012)'s STS with some additional adaption to the cognitive questions, to better suit this survey's walking context. Although the STS versions in the literature use either 7- or 9-point scales, this questionnaire used a 5-point scale for consistency with the other questions' scales.

3.2.3 Eudaimonic wellbeing

Whilst EWB is not domain-specific, measurement methods are far less numerous than for SWB. The three prevailing authors in this area (Ryff, 1989; Waterman et al., 2010; Diener et al., 2010) all take multi-dimensional approaches to measuring EWB, but build different conceptual frameworks of five or six items from the existing psychological and philosophical literature.

This research uses the Diener et al. (2010) Flourishing Scale rather than the Ryff (1989) and Waterman et al. (2010) scales as these are both longer (32 and 21 items respectively) than the 8 item Diener et al. (2010) scale, helping keep the survey a manageable length. Moreover, there are no examples of the Waterman et al. (2010) scale being operationalised in the transport sphere, and Diener et al. (2010) is able to show strong correlation with Ryff (1989)'s method. Again, a five-point likert scale was used, ranging from 'Strongly Agree' to 'Strongly Disagree'.

3.3 Data collection

An online survey was used to collect the data. The questionnaire was created using UCL's web-based survey tool, Opinio. This helped give the questionnaire a professional feel which helped ensure survey respondents could trust the data collection process given the sensitive nature of wellbeing. Using an online survey also helped respondents answer the survey genuinely, as they were not observed whilst answering the survey, which helps improve the response quality.

The online survey was distributed in several ways. Firstly, the survey link was shared via email to personal connections and local stakeholders at each CSL. Secondly the link was shared on the author's personal social media and via local community Facebook and Yammer[1] groups. Lastly the survey was distributed in person as a flyer which included a QR code[2] and a link to the survey. This

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[1] Yammer is a social network used for internal communication within TfL
[2] A QR code is a machine-readable code which directly links to a webpage when scanned with a smartphone camera

flyer was also distributed to local businesses, community buildings, within the authors workplace and placed in prominent local public locations. Distributing flyers allowed targeted distribution of the questionnaire at SN and Archway to those who may not come across the survey otherwise. Using several different approaches ensured a good spread of different groups were targeted and helped create a more representative sample. See Appendix 2 for a copy of the flyer.

All survey participants were encouraged to share the survey with others who may have visited the areas, an example of the snowball sampling technique. Hickman et al. (2017) also used this approach when undertaking similar area focused surveys and noted snowball sampling's merits for obtaining hard to reach respondents.

The survey was open for 12 days between the 2nd August and 14th August 2019. 50 responses were desired for each CSL to give an adequately-sized dataset. At the end of the survey period, 69 complete responses were collected for Archway and 81 for SN, bringing the total number of responses to 150. To keep the questionnaire length as short as possible, no question was included asking respondents where they heard about the survey. However, based on when responses were received, the most effective methods of data collection in Archway were emails to personal connections and stakeholder endorsement on social media, and for SN were local social media groups and in-person flyer distribution.

3.4 Data analysis

Following data collection, the data was cleaned to remove incomplete responses and exported for analysis using Excel and XLSTAT. To understand importance, using descriptive statistics, how much of the sample rated each SEF important or very important was considered. This fed into the Stradling et al. (2007) 'user disgruntlement' calculation, which finds the most important and most underperforming SEFs and highlights areas most urgently needing improving to improve satisfaction and thus wellbeing. This is done by cross-tabulating experience and importance, and plotting a 'user disgruntlement' graph which is divided into four zones around the data centroid, with zone 1 demarcating factors requiring most urgent improvements and zone 4 the least problematic factors.

For experience, scores for each factor were aggregated to create an experience score for each participant, which were then compared to the aggregated wellbeing scores for EWB and SWB. The relationship for SWB was then explored further by splitting the wellbeing scores into their constituent parts (Cognitive, PAND and PDNA), before using linear regression and Analysis of Covariance (ANCOVA) modelling to understand the strength of the wellbeing-experience relationship. These regression models were then tested for the influence of socio-demographic and

visit characteristics and each SEF was tested against each form of wellbeing to understand which factors had most influence. All methods were completed for both CSLs, allowing comparison of results. Finally, the CSLs wellbeing and experience relationships were tested for significance using t-tests, to answer the overall research question.

3.5 Ethical Considerations

This dissertation has met research ethical standards in the following ways. All participants were fully informed of the research purpose and what was required of them before participation in the survey via the survey launch page. As getting informed consent from children is difficult, under 18 years old were not sampled. The survey was anonymous and thus confidential, so potential harm and risk to respondents was minimised. Participants were free to choose when they undertook the survey and could leave the survey at any time if they no longer wished to participate. Research participation was not incentivised and participants were informed data would only be used for this research. Finally, whilst the survey collected data on some protected characteristics (Equality Act 2010), the questions did not discriminate any particular groups. All data was also collected in line with the General Data Protection Regulations (2018).

3.6 Limitations

Although attitudes are changing, mental wellbeing can still be a sensitive topic and participants may be unwilling to answer questions on this topic. This is a limitation of all mental wellbeing research and is very difficult to understand its significance as those uncomfortable with the nature of the research would be unlikely to participate. However, most participants who started surveys completed them, suggesting the survey questions did not trouble participants.

Using surveys to collect data, where the researcher is not present during answering, increases the potential participants misinterpret survey questions. This was mitigated as far as possible by using definitions of complex terms and CSL maps, but it is impossible to verify participants fully understood what was asked of them. Surveys also collect data retrospectively, so relied on participants accurately remembering their experiences. Whilst methods such as Experience Sampling Method, which collect data in-the-moment avoid this memory bias, they are too time-consuming and expensive for a dissertation and as reported by Kahneman et al. (2004) similar results can be obtained using a Day Reconstruction Method as used in this survey.

Despite the varied data collection approach, the focus on specific CSLs and limited time to complete the dissertation made it difficult to ensure the survey participants were representative. Data was

also collected in August when many people are away reducing potential participants; this was mitigated by targeting the survey at anyone who had visited the CSL in the last six months. Lastly, no data was collected on other domains which could influence wellbeing, so overlapping influences on wellbeing could be controlled.

4. Results

This section briefly reflects on the sample characteristics before analysing the survey findings using descriptive statistics and regression modelling, scrutinising the findings with respect to the theoretical framework and literature review.

4.1 Sample characteristics

Table 3 shows the socio-demographic characteristics of the sample. With regard age, whilst SN is overall more representative of London (ONS, 2016), both case study locations are biased towards younger age groups, with a particular over-representation of 25-34-year-olds. Gender wise, both samples are biased towards one gender, female for SN and, more heavily, male for Archway. For ethnicity, the sample oversamples the White population and has a particularly low proportion of Black ethnic groups, especially important to capture for SN as this group is higher here than the London average (GLA, 2014). Due to the categories used and a lack of government data, it's harder to ascertain income group representativeness, but participants appear to be clustered around the mean/median inner London income (GLA, 2014). For disability, only Archway lacks representation versus the London average (GLA, 2012).

Table 3: Socio-demographic characteristics of both case study locations

Age	18-24	25-34	35-44	45-54	55-64	65-74	75 and over
SN	7%	46%	23%	15%	6%	2%	0%
Archway	10%	45%	14%	10%	10%	7%	3%

Gender	Male	Female	Prefer not to say
SN	41%	57%	2%
Archway	64%	36%	0%

Ethnicity	White	Black British / Black African / Black Caribbean	Asian British / Asian	Mixed / Multiple Ethnic Groups	Hispanic	Other	Prefer not to say
SN	85%	2%	5%	5%	1%	1%	0%
Archway	78%	6%	6%	6%	0%	1%	3%

Income	Less than £12,000	£12,000 - £24,000	£24,000 - £36,000	£36,000 - £48,000	£48,000 - £60,000	More than £60,000	Prefer not to say
SN	5%	20%	20%	21%	17%	14%	4%
Archway	3%	13%	26%	17%	16%	14%	10%

(b) Visit purpose

(c) Area familarity
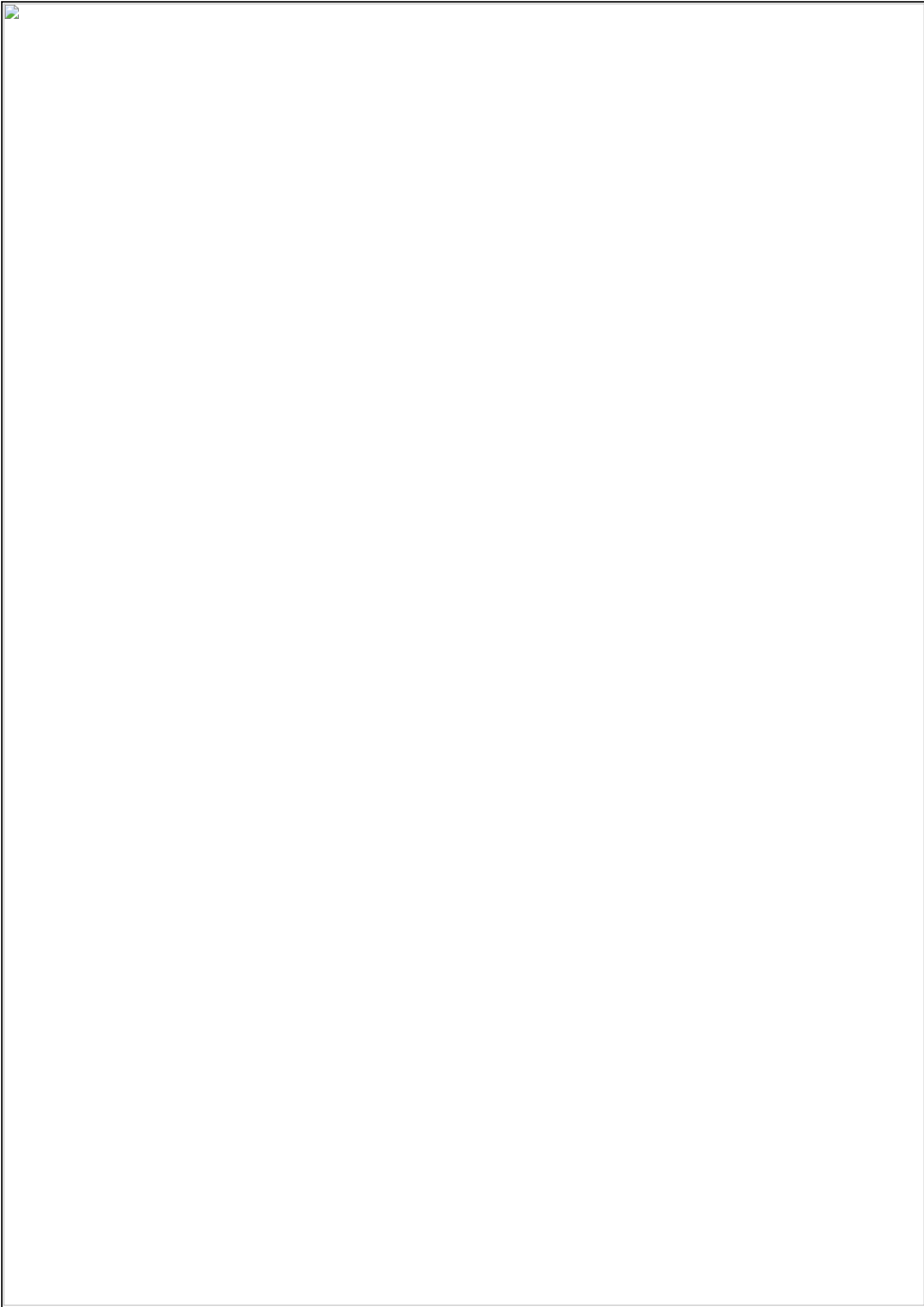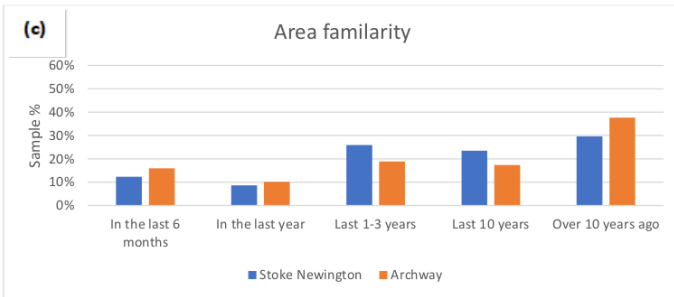
Table 4: Knowledge of gyratory removal (Archway) or plans to remove (SN)

	SN	Archway
Yes	48%	75%
No	49%	22%
Not sure	2%	3%

4.2 Important streetscape factors

Figure 7 shows in both CSLs, 'Feels safe' was considered the most important streetscape factor, scoring 88% for both locations. This fits with the idea safety is a basic need fundamental for wellbeing (Maslow, 1954) and the similarly high rating of 'Well-lit', supports Blöbaum and Hunecke (2005)'s findings that provision of lighting is important for safety. Given the much lower ranking of pavement width at both locations, this also suggests that the two lowest-order needs from Alfonzo

Figure 7: Percentage of participants who rated each streetscape experience factor important or very important in (a) SN and (b) Archway

(2004)'s walking hierarchy are generally met amongst the sample (the first automatically being met by use of the street) and thus focusing on safety should be the policy priority. The other notably high importance factor is 'Clean environment'. This would again seem to relate to Maslow's hierarchy of needs (1954) as a basic environmental requirement for health.

There is also convergence in importance at the bottom of the ranking, with 'Shade and shelter' and 'Places to sit and rest' occupying bottom positions in both CSLs, albeit with much lower rankings in Archway. Further interrogation of the results finds 'Places to sit and rest' is considered important by all +65-year-olds in SN and nearly half in Archway, confirming this factor has an associated age profile associated and supporting previous research on age and streetscape experience (Rosenberg et al., 2013). However, no significant socio-demographic link can be made for 'Shade and Shelter'; this could be due to not sampling children and a small older sample.

It is notable both 'Interesting and 'Attractive' score lowly. This probably relates to street travel generally being destination-orientated rather than experience-orientated for the pleasure of experience itself (Mokhatarian and Salomon, 2001). It also probably relates to the British relationship with public space, which is different to our European counterparts who more habitually 'hang-out' in public areas (Gehl, 2010); the UK discourse primarily associates this with negative connotations of danger and anti-social behaviour (Valentine, 2004).

Lastly, although there are many similarities between the CSLs, there are some differences in importance. Firstly 'Not too noisy' and 'Feel relaxed' are rated 10% more important in SN than Archway. This tentatively would seem to be related to the HSP not yet being implemented and thus these SEFs present more day-to-day issues. In Archway, 'Clean environment' and 'Easy to cross' are conversely rated 10% higher which could suggest how the importance of factors changes as streetscape improves.

4.3 Wellbeing gaps

Integrating these importance ratings with experience ratings via cross-tabulation adds a new dimension to these importance ratings (Figure 8). Whilst 'Feels safe' is still a significant factor, 'Clean Air' replaces it as the factor creating most 'disgruntlement' in Archway. 'Clean Air' also figures highly in SN but the most 'disgruntlement' spot is taken by 'Traffic not too fast' with 'Traffic not too intimidating' also scoring highly; 'Feels safe' is surprisingly relegated to Zone 2 for importance.

Figure 8: 'Disgruntlement' related to streetscape factors in (a) SN and (b) Archway. Note Zone 1 is high 'disgruntlement' and zone 4 low

(a)

Stoke Newington - % Disgruntled Users

(b)

Archway - Disgruntled users %
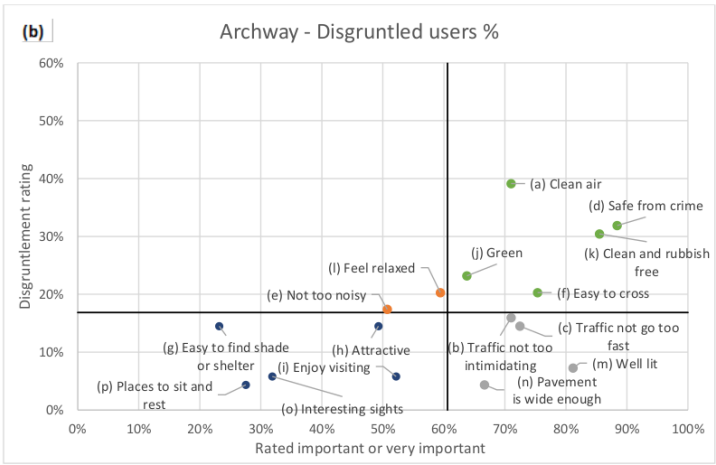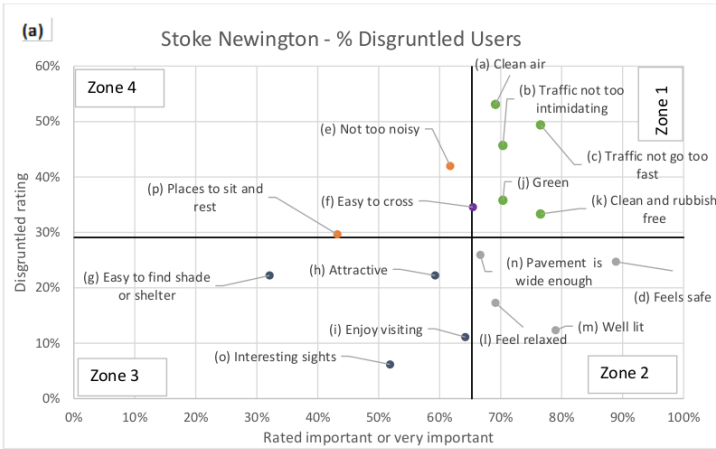
Looking at this in more detail, the high 'disgruntlement' related to 'Clean air' would appear to relate to the increasing public concern with air pollution over the past 3 years following the declaration of a air quality "public health emergency" (EFRA, 2016, p.3); this would explain the high 'disgruntlement' in both locations. The fall in significance of 'Feels safe' would seem to corroborate with fear of crime being far greater than experiences of crime (Davey and Wooton, 2014). The difference in zone of 'disgruntlement' related to 'Traffic not too fast' and 'Traffic not too intimidating' between the CSLs could be an important finding. It is suggested traffic negativities are a less significant issue in Archway, where the HSP has been completed, which could be postulated is related to the streetscape improvements. This suggestion is further given weight by 'Feels relaxed' scoring in Zone 2 in SN but Zone 4 in Archway.

The other factors scoring in Zone 1 for both CSLs are 'Green' and 'Clean environment'. This corroborates street greenery being drawn out in the literature review as having an important impact on health; the significance of 'Clean environment' has already been reflected on. 'Easy to cross' also scores in Zone 1 although only for Archway. However, given in SN it falls directly on the division line, this suggest it is of high significance in both locations. Whilst it may seem odd to still be considered a 'disgruntlement' factor in Archway, given the HSP, many of the free-text survey comments suggested there was a far greater requirement to cross roads to reach bus stops in the new design. Given how frustration with not being able cross roads relates to reduced wellbeing (Anciaes et al., 2019), this finding is thus unsurprising and needs to be considered carefully when designing transport projects.

All the items rated low for importance were found on the left side of the 'disgruntlement' graphs, confirming their low significance for streetscape experience, albeit with the previously noted caveats. The only notable addition is 'Not too noisy'; this is likely to be related to the fact despite both case study locations being on major roads, individuals habituate to noise levels over time (Kawada, 2011).

Comparing these SEF 'disgruntlement' scores with the existing HSIs suggests broadly the improvements/planned improvements will help increase wellbeing. In both cases, more focus should be placed on 'Clean Air'. Moreover, whilst most of the SEFs could be mapped to the HSIs, there was no logical way to include 'Clean environment', which seems a serious omission given the significance of this factor on 'disgruntlement'.

4.4 Influence of streetscape on wellbeing

Considering wellbeing and experience together (Figure 9) reveals at both CSLs there is a moderately positive upward correlation between SWB and experience. This corroborates with previous research on journey experience and SWB (Olsson et al. 2013; Friman et al. 2013). Although both graphs show the same relationship, the correlation is slightly steeper for Archway (r=0.671) than at SN (r=0.656).

However, no relationship can be seen for EWB. Whilst this is disappointing, this does not necessarily mean there is no link with EWB, as the cognitive wellbeing (CWB) element of SWB is considered to overlap with EWB (Mokhtarian, 2019). The experience of journeys has also been found to effect enjoyment of experiences at destinations, and these experiences may contribute to EWB (Archer et al., 2012). Moreover, the accumulation of SWB overtime is considered by some to result in increases in EWB (Schimmack, 2008); the results here could support that model. However, as there is no relationship found, the effect on experience on wellbeing will not be examined any further here.
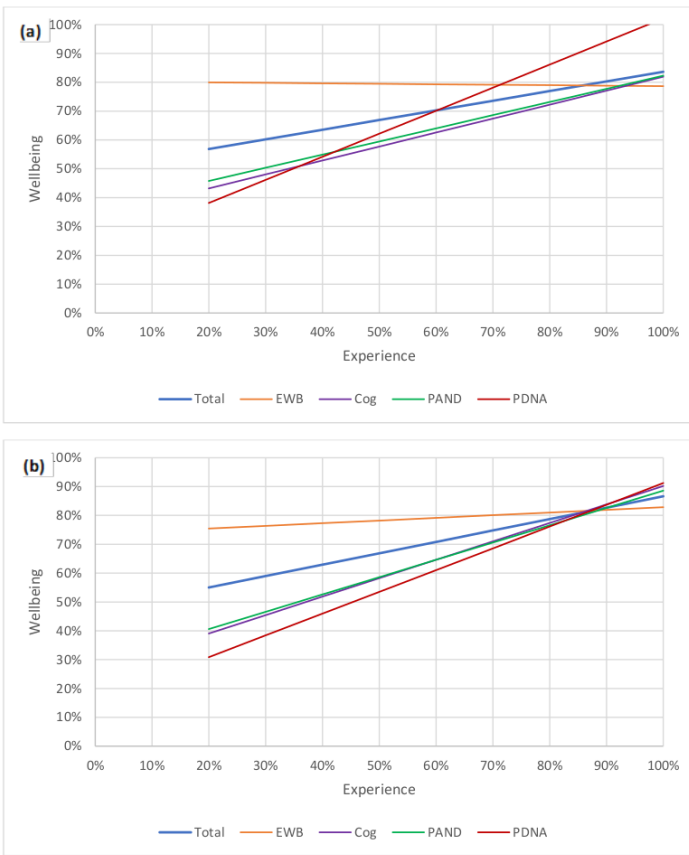
Figure 9: Comparison of SWB and EWB with experience in (a) SN and (b) Archway. Note, total wellbeing (SWB and EWB total) included for reference

(b)
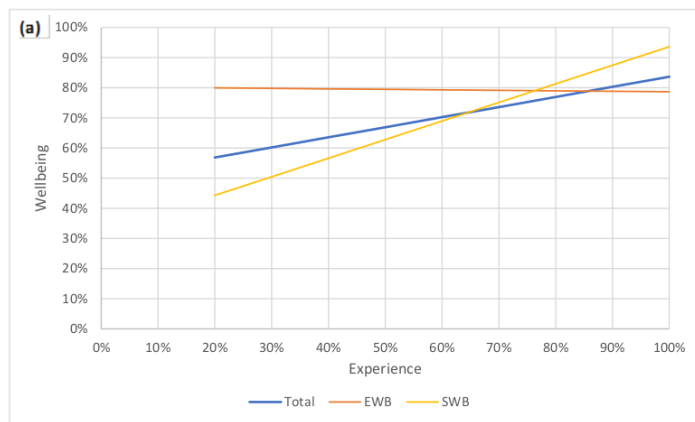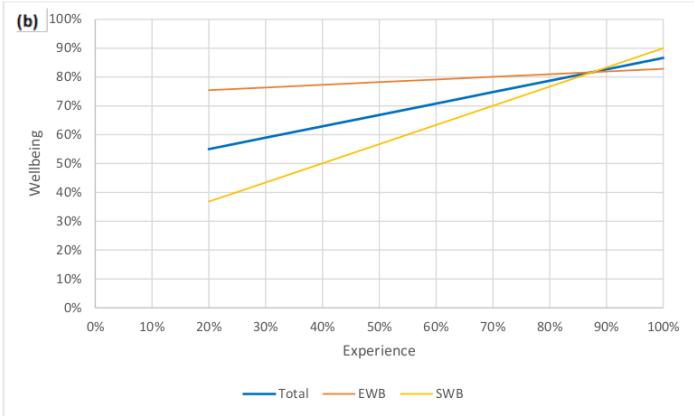
To understand the SWB and experience relationship in more detail, the constituent parts of the SWB (CWB, PAND and PDNA) were split out (Figure 10). This shows whilst in both CSLs CWB and PAND have very similar relationships, PDNA has a much steeper correlation for SN (r=0.611) compared to Archway (r=0.556). Given PDNA is associated with emotions such as stress, worried and relaxed, this would seem to fit well with the wellbeing effects SEFs were associated with in the Literature Review, validating this evidence with regard walking experience. It also sits well with the journey experience literature which associated walking with relaxation (Gaterleben and Urzell, 2007). Furthermore, this suggests SEFs which effect this dimension of wellbeing are most changed during HSPs, thus adding legitimacy to including wellbeing measurement into project appraisal.

(a)

(b)

When the robustness of these SWB elements-experience relationships was tested with linear regression modelling, whilst the models were equally strong for CWB, Archway has a stronger PAND relationship and weaker PDNA relationship (Table 5). As well as PNDA creating more relaxation, calm and less worry, the relationship with PAND suggests streetscaoe experiences in Archway are also more engaging and command greater attention from street users than SN. These characteristics

would also be associated positively with wellbeing and further support the hypothesis HSPs can improve wellbeing

Table 5: r2 values showing regression model fit for each SWB element

	SN	Archway
CWB	0.412	0.4
PAND	0.226	0.273
PDNA	0.374	0.309

Regression was then undertaken with the disaggregated SEFs to assess the importance of the individual SEFs for each wellbeing model (Table 6). In total, less significant experience factors were found for Archway compared to SN and in both CSLs most significant SEFs were found for PDNA.

f its relationship

with safety, a fundamental walking hierarchy need (Alfonzo, 2004)

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which suggests the HSP has enhanced the environment in Archway in terms safety which has corollary effects for levels of relaxation.

Finally, ANCOVA analysis was undertaken to understand if the socio-demographic and visit characteristics mediated these relationships. Regression was undertaken for each form of SWB, but no significant model fits were found. This seems surprising given the previous bias in importance noted for certain SEFs and suggest the theoretical framework proposed is not valid. However, this research only measured those who used the street. Statistics on trips in London find greater proportions of people who walk in London each day belong to White ethnic groups, are not disabled; have higher incomes and are younger (TfL, 2018). Thus, those who have wellbeing streetscape experiences which are significant enough to dissuade travel streetscape experiences were not captured; this could have made socio-demographic factors more significant. For visit characteristics, this is surprising as contextual factors are usually considered influential on travel experience, with leisure and commute trips split for assessment; however potentially the sample was too small to show a significant difference.

4.5 Comparison of Archway and Stoke Newington

Before testing the significance of the difference in wellbeing and experience at Archway and SN, it is first important to understand exactly how the two CSLs differ. Considering Figure 11, whilst the trends are broadly similar, Archway scores much higher for nearly all SEFs but especially 'Traffic not too intimidating', 'Traffic not too fast' and 'Places to sit and rest'. Whilst the first two factors are predictable given the removal of the gyratory which was primarily motivated around reducing speed, the latter is more surprising as the HSP did not increase seating; this suggests Archway was more well-equipped with seats to start with. Five factors are higher in SN which appear to group into two rationales: safety ('Well-lit' and 'Feels safe') and engagement ('Interesting' and 'Enjoy') with 'Feel relaxed' bridging the two, reasons for which have both been reflected on previously.

Figure 11: Comparison of mean experience ratings per experience factor
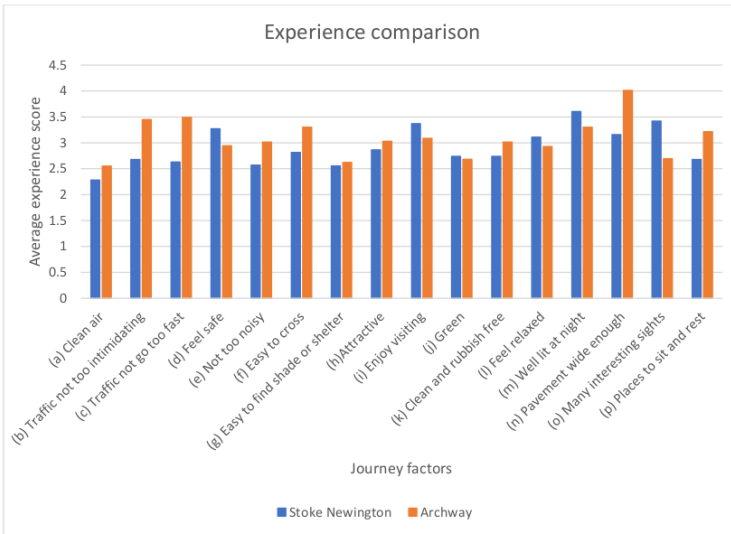
Turning to compare the aggregate experience and SWB results (Figure 12), the trendlines show a clear separation between the CSLs suggesting the relationship could be significant. Again, examining the underlying elements of SWB the gap is most pronounced for PDNA, fitting with the above findings.

36

(a)

(b)
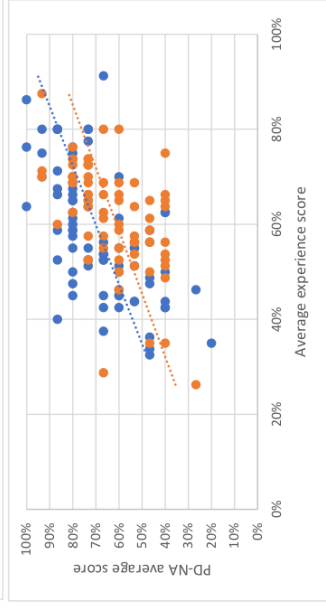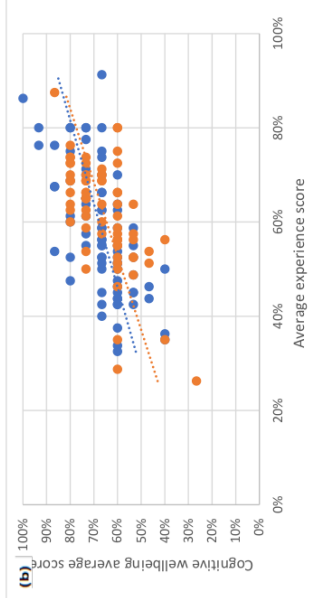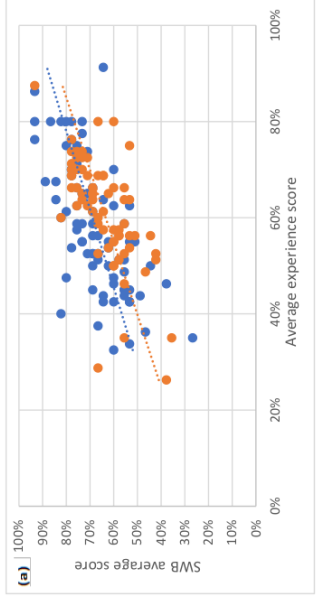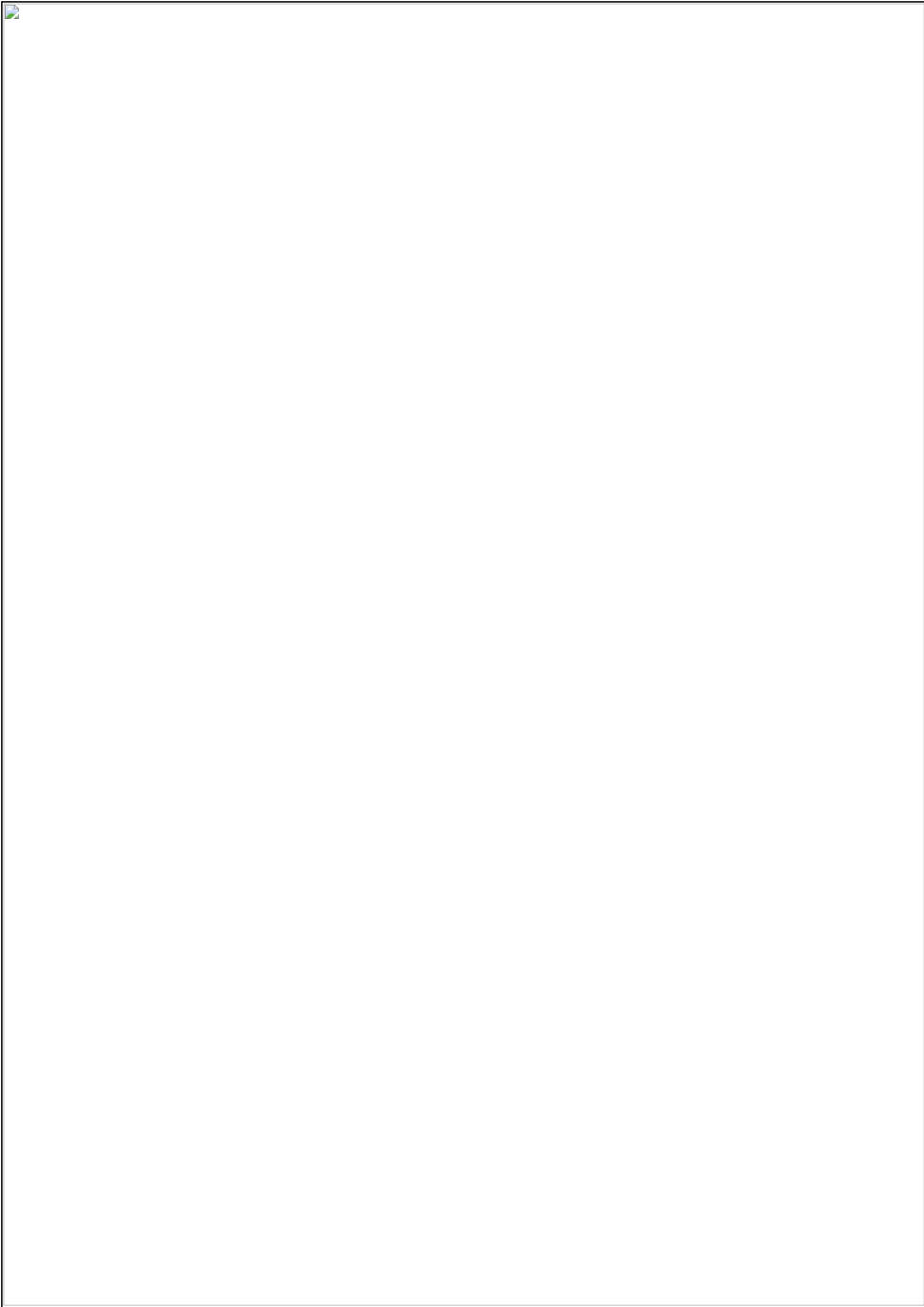
proposed the Scale of Positive and Negative Experience as an alternative to the commonly used SCAS, with his new scale being easier to understand as it uses less complex emotions and a binary scale. For EWB, Vaitsis et al. (2019) has recently developed an adapted version of the STS for use in surveys to measure EWB, noting a significant relationship with walking and eudaimonia. By directly linking EWB to travel, it is likely this will be easier for participants to understand, and may potentially mean stronger relationships between experience and EWB become apparent.

Additionally, whereas this survey focused exclusively on physical aspects of the street environment, a fuller picture of streets and wellbeing effect may have been gained by including questions on how the streetscape promotes social engagement, given the importance of social interaction for wellbeing.

5. Conclusions

5.1 Summary of findings

This dissertation has considered the relationship between SEFs and wellbeing, with a focus on London and the aim of understanding if wellbeing levels are influenced by HSPs. Considering 16 SEFs from a wellbeing perspective, whilst 'Feels safe' was found to be the most important factor, 'Clean Air' caused the most 'disgruntlement' with this relationship being true in both locations. Not all SEFs were considered equally important, with 'Places to Sit and Rest' and 'Shade and Shelter' scoring lowest importance and low disgruntlement in both CSLs; however, as they were found to be more important for older age groups, such factors should still be measured in relation to wellbeing. Although the two CSLs broadly showed similar patterns for importance and 'disgruntlement', there was a notable difference in the other high 'disgruntlement factors, in particular 'Traffic not too fast' and 'Traffic not too intimidating'. This finding supports the HSA which aims to redress the modal balance between vehicles and people. The designs appraised with the physical health-focused HSIs were generally found to contribute to where wellbeing gaps were greatest, however more focus is needed on 'Clean Air'.

Only SWB was found to be related to streetscape experience, with PDNA the wellbeing element most important for this effect. No mediating socio-demographic or visit characteristics were established, which was surprising because wellbeing is an individual-centric concept and poses a challenge to the theoretical framework proposed. 'Easy to Cross' was found to be the most important SEF in CSLs, with 'Enjoy' also being strongly related to wellbeing in SN. The difference in wellbeing measured at the two CSLs was found to be significant for PDNA with moderately different experience scores found because of this.

This important finding shows the street environment does play an important role in influencing both physical and mental wellbeing, and should be paid greater attention by policymakers and researchers alike. To answer the research question, streetscape projects, such as HSPs, do contribute to increasing wellbeing, but wellbeing needs to be routinely measured to ensure projects promote rather than reduce wellbeing. By considering walking as a mode in its own right, this dissertation has also found the associated wellbeing is still significant even when not compared to other modes, which should form the impetus for more walking-centric research.

5.2 Policy and research recommendations

It is now up to policymakers to translate these findings into measurement methods to allow wellbeing to routinely be appraised for transport projects. It is recommended this is done by

integrating SWB measurement into project appraisal methods. This will enable transport policymakers to focus new project designs on improving both physical and mental health outcomes, helping local authorities better address their public health duty and help tackle the growing problem of mental ill-health in the UK. This could be operationalised by integrating the survey questions into public consultation questionnaires, which, with participants permission, could also be used in the ex-post project benefits appraisal. Alternatively, this could be taken further by using participatory-GIS, which would enable individuals to pinpoint particular locations which especially promote or reduce wellbeing. Such methods promote deeper participation (Brown, 2011) which is important to ensure projects meet their aims and the best outcomes are achieved for the public.

Whilst this dissertation did not find a relationship between EWB and streetscape experience, it is still nonetheless considered important for policymakers to begin measuring EWB more routinely. It is suggested this could be done via customer satisfaction surveys, potentially using a similar question to ONS (Dolan et al., 2011). However, in the long-term, presuming future studies can find a robust relationship between transport and EWB, which is hopeful given recent research (Singleton 2019, Vaitsis et al., 2019), it should be aimed to routinely measure EWB alongside SWB to give the most complete information on wellbeing to policymakers.

With regard further research, whilst this dissertation has begun to investigate the relationship between wellbeing and streetscape experience, the proposed theoretical framework was not validated. This needs to be parameterised further to create a realistic model. It is suggested this is done via structural equation modelling, as has been done for other concepts in the transport wellbeing literature (Abou-Zeid and Ben-Akiva, 2012; Gao et al. 2017). Additionally, more empirical testing is required to confirm the relationship observed in this study is true both in other locations and through longitudinal studies, which there is a noticeable paucity of in wellbeing research (Cooper and Burton, 2014). If policymakers heed the above recommendation, such longitudinal research could advantage of this data collected, but it should also include non-western countries who may have different understandings of wellbeing (Bache and Scott, 2018). Lastly, more investigation is required to fully understand how socio-demographics and contextual factors affect experience, as despite this dissertation finding no significant effect, it is expected there is an interplay. This should target more than just age and trip purpose differences, which are the main cleavages in current research and could be done either by cohort studies or larger studies which would enable representative samples to be measured.

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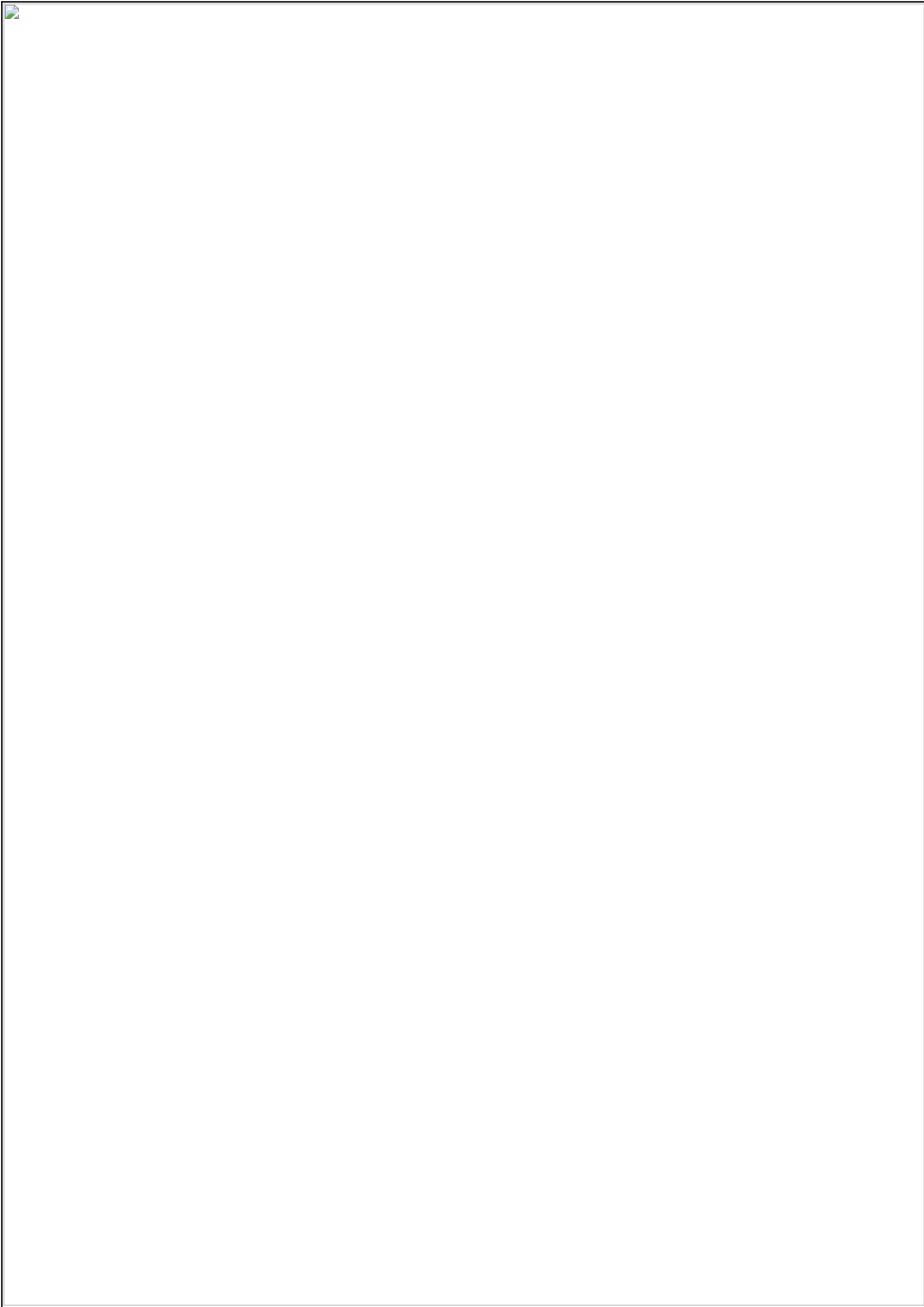
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Appendix 1: Survey questionnaire

1.1: Survey questionnaire screenshots

Note: these screenshots are from the Stoke Newington survey. In the Archway survey, all texts is identical except all references to Stoke Newington are replaced by Archway. The exception to this is Question 9 which has different wording reflecting the fact Archway has already had its gyratory removed, and the introduction to Section 2 which defines the relevant case tudy area. A copy of the different text for Archway is thus provided in this appendix at the appropriate place below for reference.

Walking journey experience and wellbeing - Stoke Newington

Hi, thank you for taking the time to fill out this survey. The responses of this survey will be used to complete my MSc dissertation looking at how street design affects walking journey experience and mental wellbeing.

This survey is focused on walking travel experiences at Stoke Newington, North East London. Please only answer this survey if you have visited Stoke Newington in the last 6 months.

The survey is split into four sections and will take around 10 -15 minutes to complete:

1. General details about you and your trips to Stoke Newington
2. Your journey experience when you visit Stoke Newington by foot
3. Your feelings during your visits to Stoke Newington
4. Your general feelings about life

All information provided will be collected anonymously and will only be used for the purposes of academic research. Further information can be found in the privacy notice in the following website:
https://www.ucl.ac.uk/information-security/sites/information-security/files/data-protection.pdf

Thank you once again, your time and help are greatly appreciated!

Start

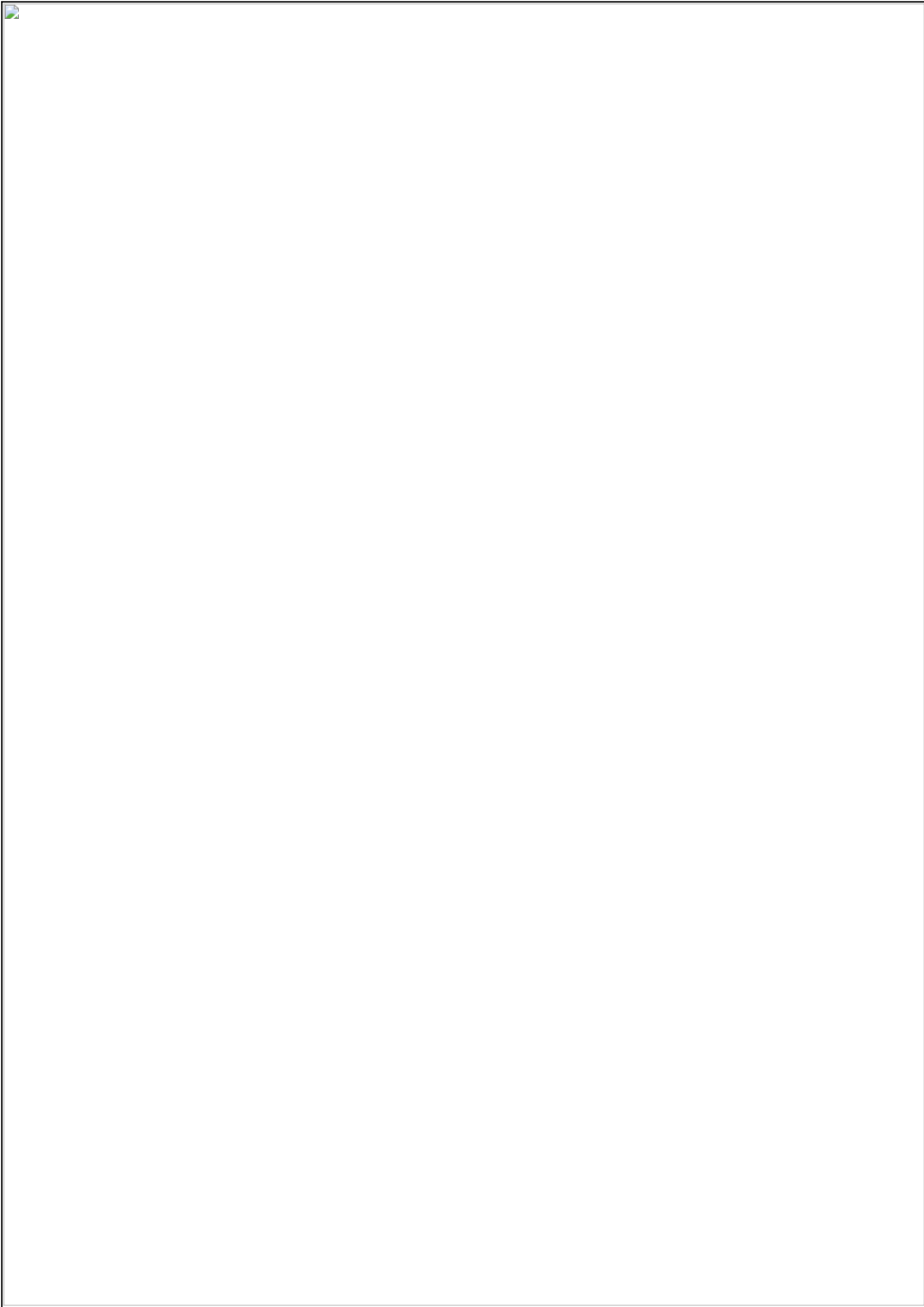## Walking journey experience and wellbeing - Stoke Newington

Section 1: General details about you and your trips to Stoke Newington

1. **How old are you?**

   ○ 18-24

   ○ 25-34

   ○ 35-44

   ○ 45-54

   ○ 55-64

   ○ 65-74

   ○ 75 and over

54

7. **What is the most common reason you visit Stoke Newington?**

○ Work

○ To access public transport (bus or Overground)

○ Shopping

○ Leisure

○ Other (please specify) [ ]

8. **When was the first time you visited Stoke Newington?**

○ In the last 6 months

○ In the last year

○ Last 1-3 years

○ Last 10 years

○ Over 10 years ago

For Stoke Newington only:

9. **Stoke Newington currently has a gyratory, a large circular one-way system, however there are plans to remove the gyratory and change the road layout. Are you aware of the plans to remove the Stoke Newington gyratory?**

○ Yes

○ No

○ Not sure

■■■■■■■■■■■□□□□□□□□ 9/14   [Back] [Next]

For Archway only:

9. **Archway used to have a gyratory, a large circular one-way system. Were you aware of Archway before the change in road layout which removed the gyratory?**

○ Yes

○ No

○ Not sure

■■■■■■■■■■■□□□□□□□□ 9/14   [Back] [Next]

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For Stoke Newington only:

Walking journey experience and wellbeing - Stoke Newington

Section 2: Your journey experience when you visit Stoke Newington by foot

This survey focuses on Stoke Newington. For the purposes of this survey, the area considered to be Stoke Newington is Stoke Newington High Street from the junction with Evering Road to the junction with Northwold Road. Please click here to see a map and images of the Stoke Newington study area.

For Archway only:

Walking journey experience and wellbeing - Archway

Section 2: Your journey experience when you visit Archway by foot

This survey focuses on Archway. For the purposes of this survey, the area considered to be Archway is the square created by the roads St John's Way, Archway Road and Highgate Hill, and the Navigator Square public space. Please click here to see a map and image of the Archway study area.

10. **Wellbeing is defined by the New Economics Foundation as: "how people feel and how they function, both on a personal and social level". Using this definition of wellbeing, please consider how the following aspects influence your wellbeing experience when you visit Stoke Newington by foot:**

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
The air on this street is clean	○	○	○	○	○
The traffic on this street is not too intimidating	○	○	○	○	○
The traffic on this street does not go too fast	○	○	○	○	○
I feel safe from crime and anti-social behaviour on this street	○	○	○	○	○
This street is not too noisy	○	○	○	○	○
This street is easy to cross	○	○	○	○	○
It would be easy to find shade or shelter on this street if it was hot or rainy	○	○	○	○	○
This street is attractive	○	○	○	○	○
I enjoying visiting this street	○	○	○	○	○
This street is green with trees and plants	○	○	○	○	○
This street is clean and rubbish free	○	○	○	○	○
I feel relaxed when I visit this street	○	○	○	○	○
This street is well lit at night	○	○	○	○	○
The pavement on this street is wide enough	○	○	○	○	○
There are many interesting sights to see whilst walking on this street	○	○	○	○	○

11. **Considering your answers to the previous question, how <u>important</u> are the following aspects in influencing your wellbeing when you visit Stoke Newington by foot:**

	Not important	Slightly important	Moderately important	Important	Very important
The air on this street is clean	○	○	○	○	○
The traffic on this street is not too intimidating	○	○	○	○	○
The traffic on this street does not go too fast	○	○	○	○	○
I feel safe from crime and anti-social behaviour on this street	○	○	○	○	○
This street is not too noisy	○	○	○	○	○
This street is easy to cross	○	○	○	○	○
It would be easy to find shade or shelter on this street if it was hot or rainy	○	○	○	○	○
This street is attractive	○	○	○	○	○
I enjoying visiting this street	○	○	○	○	○
This street is green with trees and plants	○	○	○	○	○
This street is clean and rubbish free	○	○	○	○	○
I feel relaxed when I visit this street	○	○	○	○	○
This street is well lit at night	○	○	○	○	○
The pavement on this street is wide enough	○	○	○	○	○
There are many interesting sights to see whilst walking on this street	○	○	○	○	○
There are places to sit and rest on this street	○	○	○	○	○

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Walking journey experience and wellbeing - Stoke Newington

Section 3: Your feelings during your visits to Stoke Newington

12. **Considering your visits to Stoke Newington by foot, which of the following best corresponds to how you feel when you visit Stoke Newington? Please read the whole row then select one option per row.**

Very hurried	Moderately hurried	Neutral	Moderately relaxed	Very relaxed
○	○	○	○	○

Very worried	Moderately worried	Neutral	Moderately confident	Very confident
○	○	○	○	○

Very stressed	Moderately stressed	Neutral	Moderately calm	Very calm
○	○	○	○	○

Very tired	Moderately tired	Neutral	Moderately alert	Very alert
○	○	○	○	○

Very bored	Moderately bored	Neutral	Moderately enthusiastic	Very enthusiastic
○	○	○	○	○

Very fed up	Moderately fed up	Neutral	Moderately engaged	Very engaged
○	○	○	○	○

Worst experience I can think of	Bad experience	Neutral	Good experience	Best experience I can think of
○	○	○	○	○

Very low quality	Low quality	Neutral	High quality	Very high
○	○	○	○	○

Visits work very poorly	Visits work poorly	Neutral	Visits work well	Visits work very well
○	○	○	○	○

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Walking journey experience and wellbeing - Stoke Newington

Your general feelings about life

13. **Considering your life in general, how much do you agree with the following statements?**

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
I lead a purposeful and meaningful life	○	○	○	○	○
My social relationships are supportive and rewarding	○	○	○	○	○
I am engaged and interested in my daily activities	○	○	○	○	○
I actively contribute to the happiness and wellbeing of others	○	○	○	○	○
I am competent and capable in the activities that are important to me	○	○	○	○	○
I am a good person and live a good life	○	○	○	○	○
I am optimistic about my future	○	○	○	○	○
People respect me	○	○	○	○	○

14. **Do you have any comments about the survey and its content?**

■■■■■■■■■■■■■■■■■■■■■ 14/14

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1.2: Map pop-up from survey for Archway (link found at the start of Section 2)

Archway study area: Walking journey experience and wellbeing

Roads in the study area are: St John's Way, Archway Road, Highgate Hill and Navigator Square (public space in front of the tube station)
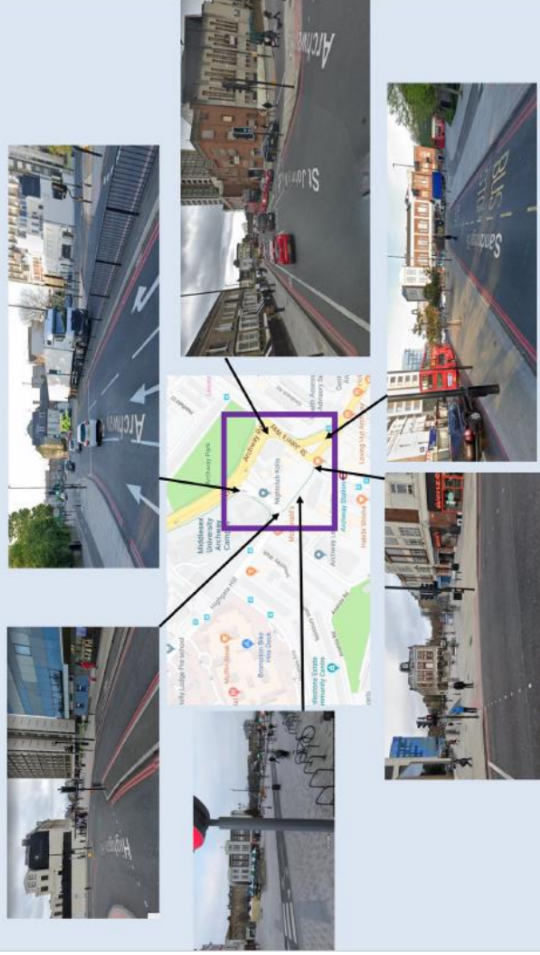
All images sourced from Google Maps

1.3: Map pop-up from survey for Stoke Newington (link found at the start of Section 2)

Stoke Newington study area: Walking journey experience and wellbeing

Study area covers Stoke Newington High Street from the junction with Evering Road to the junction with Northwold Road.

All images sourced from Google Maps

Appendix 2: Survey flyer
Note: all text is the same for the Archway flyer except the difference in case study location and survey web link.

Can you help?

I am a student studying an MSc in Transport and City Planning at UCL. As part of my dissertation, I am looking at how street design affects walking journey experience and mental wellbeing. If you visit Stoke Newington, I would be grateful if you could take 10 mins to fill out my survey.

Thank you in advance 😊

Or search:
https://opinio.ucl.ac.uk/s?s=63317

Appendix 3: Risk Assessment

| ✓ | OTHER CONTROL MEASURES: please specify any other control measures you have implemented: |

Will wear bright coloured clothing to ensure visible by traffic. Keep aware of environment for safety risks.

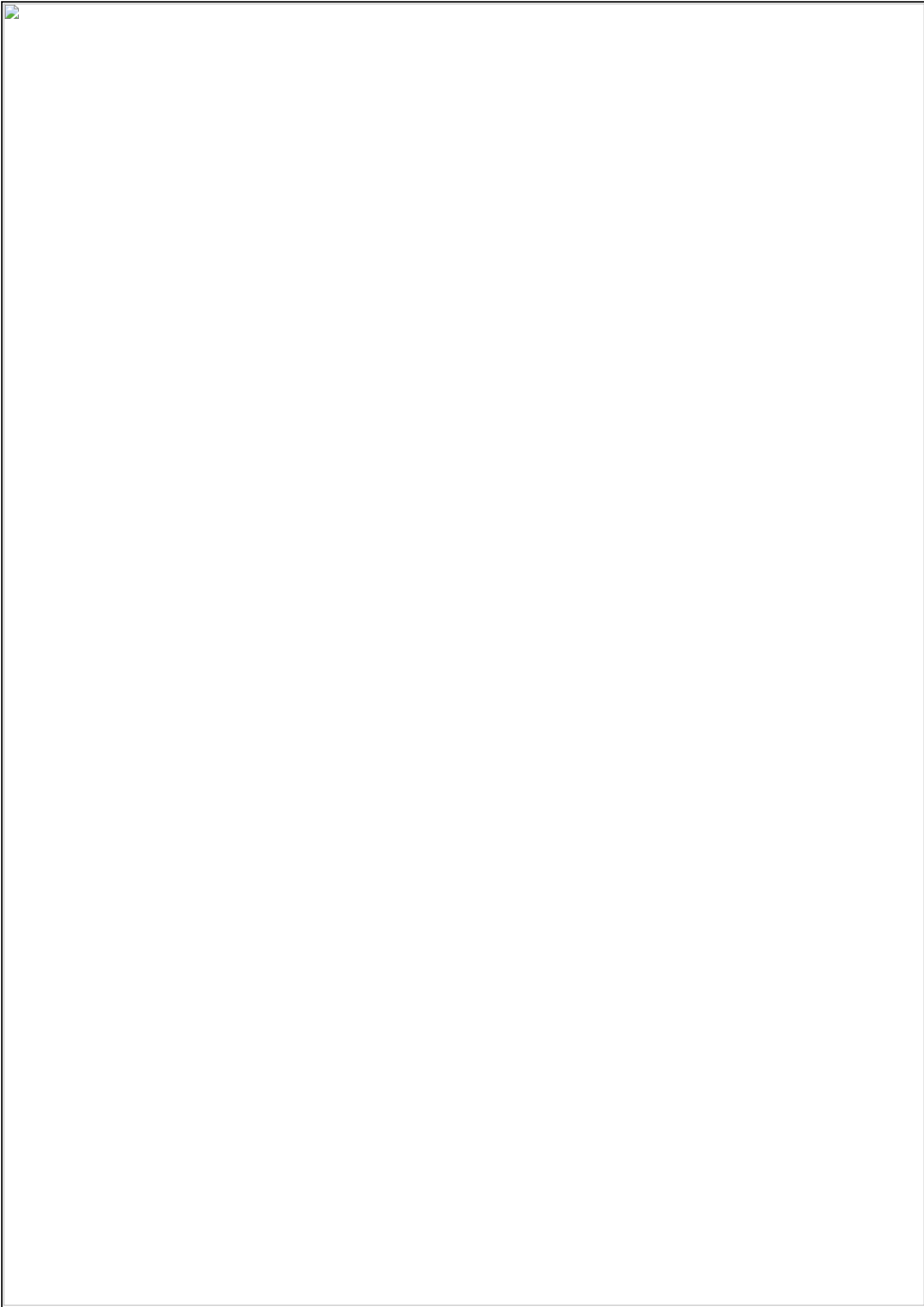| **EMERGENCIES**	**Where emergencies may arise use space below to identify and assess any risks**
e.g. fire, accidents	Examples of risk: loss of property, loss of life

Fieldwork will be carried out in a public space in students home country

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**

☐	participants have registered with LOCATE at http://www.fco.gov.uk/en/travel-and-living-abroad/
☐	fire fighting equipment is carried on the trip and participants know how to use it
✓	contact numbers for emergency services are known to all participants
✓	participants have means of contacting emergency services
☐	participants have been trained and given all necessary information
☐	a plan for rescue has been formulated, all parties understand the procedure
☐	the plan for rescue /emergency has a reciprocal element
✓	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

Will obey any instructions from the emergency services

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EQUIPMENT	**Is equipment used?**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any** **risks**
e.g. clothing, outboard motors.	Examples of risk: inappropriate, failure, insufficient training to use or repair, injury. Is the risk high / medium / low?		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk
☐	the departmental written Arrangement for equipment is followed
☐	participants have been provided with any necessary equipment appropriate for the work
☐	all equipment has been inspected, before issue, by a competent person
☐	all users have been advised of correct use
☐	special equipment is only issued to persons trained in its use by a competent person
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

LONE WORKING	Is lone working a possibility?	YES	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. alone or in isolation *lone interviews.*	Examples of risk: difficult to summon help. Is the risk high / medium / low?		

Surveys will be undertaken in public places close to shops and transport stops where there will be plenty of people around and are well lit. Risk is low.

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk
✓	the departmental written Arrangement for lone/out of hours working for field work is followed
☐	lone or isolated working is not allowed
✓	location, route and expected time of return of lone workers is logged daily before work commences
✓	all workers have the means of raising an alarm in the event of an emergency, e.g. phone, flare, whistle
☐	all workers are fully familiar with emergency procedures
✓	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

Only undertake fieldwork during daylight hours.

ILL HEALTH	The possibility of ill health always represents a safety hazard. Use space below to identify and assess any risks associated with this Hazard.
e.g. accident, illness, *personal attack, special personal considerations or vulnerabilities.*	Examples of risk: injury, asthma, allergies. Is the risk high / medium / low? **Researcher has no known allergies or health conditions / injuries at the time of risk assessment completion. Risk is low.** **For computer use, long periods of continuous computer usage can cause posture problems, visual problems, fatigue and stress.**
CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

☐	an appropriate number of trained first-aiders and first aid kits are present on the field trip
✓	all participants have had the necessary inoculations/ carry appropriate prophylactics
☐	participants have been advised of the physical demands of the trip and are deemed to be physically suited
☐	participants have been adequate advice on harmful plants, animals and substances they may encounter
☐	participants who require medication have advised the leader of this and carry sufficient medication for their needs
✓	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

Will return home if too unwell to complete fieldwork on the day, and in the event of chronic illness developing, will be able to just use online surveys.
Avoid working too many hours at a time on computer. Take care to sit correctly and have regular breaks.

TRANSPORT	Will transport be required	NO		Move to next hazard
		YES	✓	Use space below to identify and assess any risks
e.g. hired vehicles	Examples of risk: accidents arising from lack of maintenance, suitability or training. Is the risk high / medium / low? **Publicly-operated TfL services will be used to access field study locations. Risk is low.**			
CONTROL MEASURES	Indicate which procedures are in place to control the identified risk			

✓	only public transport will be used
☐	the vehicle will be hired from a reputable supplier
☐	transport must be properly maintained in compliance with relevant national regulations
☐	drivers comply with UCL Policy on Drivers http://www.ucl.ac.uk/hr/docs/college_drivers.php
☐	drivers have been trained and hold the appropriate licence
☐	there will be more than one driver to prevent driver/operator fatigue, and there will be adequate rest periods
☐	sufficient spare parts carried to meet foreseeable emergencies

	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

DEALING WITH THE PUBLIC	Will people be dealing with public	**YES**	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. interviews, observing	Examples of risk: personal attack, causing offence, being misinterpreted. Is the risk high / medium / low? **Surveys to be completed in-person will be carried out in a public location during daylight hours. Risk is low.**		
CONTROL MEASURES	Indicate which procedures are in place to control the identified risk		

☐	all participants are trained in interviewing techniques
☐	interviews are contracted out to a third party
☐	advice and support from local groups has been sought
✓	participants do not wear clothes that might cause offence or attract unwanted attention
✓	interviews are conducted at neutral locations or where neither party could be at risk
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

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WORKING ON OR NEAR WATER	Will people work on or near water?	**NO**	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. rivers, marshland, sea.	Examples of risk: drowning, malaria, hepatitis A, parasites. Is the risk high / medium / low?		
CONTROL MEASURES	Indicate which procedures are in place to control the identified risk		

☐	lone working on or near water will not be allowed
☐	coastguard information is understood; all work takes place outside those times when tides could prove a threat
☐	all participants are competent swimmers
☐	participants always wear adequate protective equipment, e.g. buoyancy aids, wellingtons
☐	boat is operated by a competent person

☐	all boats are equipped with an alternative means of propulsion e.g. oars
☐	participants have received any appropriate inoculations
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

MANUAL HANDLING (MH)	**Do MH activities take place?**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any** **risks**
e.g. lifting, carrying, moving large or heavy equipment, physical unsuitability for the task.	Examples of risk: strain, cuts, broken bones. Is the risk high / medium / low?		
CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**		

☐	the departmental written Arrangement for MH is followed
☐	the supervisor has attended a MH risk assessment course
☐	all tasks are within reasonable limits, persons physically unsuited to the MH task are prohibited from such activities
☐	all persons performing MH tasks are adequately trained
☐	equipment components will be assembled on site
☐	any MH task outside the competence of staff will be done by contractors
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

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SUBSTANCES	Will participants work with	NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any
	substances		risks
e.g. plants, chemical, biohazard, waste	Examples of risk: ill health - poisoning, infection, illness, burns, cuts. Is the risk high / medium / low?		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

- ☐ the departmental written Arrangements for dealing with hazardous substances and waste are followed
- ☐ all participants are given information, training and protective equipment for hazardous substances they may encounter
- ☐ participants who have allergies have advised the leader of this and carry sufficient medication for their needs
- ☐ waste is disposed of in a responsible manner
- ☐ suitable containers are provided for hazardous waste
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

OTHER HAZARDS	Have you identified any other hazards?	NO	If 'No' move to next section If 'Yes' use space below to identify and assess any risks
i.e. any other hazards must be noted and assessed here.	Hazard: Risk: is the risk		

CONTROL MEASURES	Give details of control measures in place to control the identified risks

| Have you identified any risks that are not adequately controlled? | NO | ✓ | Move to Declaration |
| | YES | ☐ | Use space below to identify the risk and what action was taken |

| Is this project subject to the UCL requirements on the ethics of Non-NHS Human Research? | NO |

If yes, please state your Project ID Number

For more information, please refer to: http://ethics.grad.ucl.ac.uk/

| **DECLARATION** | The work will be reassessed whenever there is a significant change and at least annually. Those participating in the work have read the assessment. |

Select the appropriate statement:

☐ I the undersigned have assessed the activity and associated risks and declare that there is no significant residual

risk

☐ I the undersigned have assessed the activity and associated risks and declare that the risk will be controlled by

the method(s) listed above

NAME OF SUPERVISOR: **Tim Pharoah**

**** SUPERVISOR APPROVAL TO BE CONFIRMED VIA E-MAIL ****

FIELDWORK   5   May 2010