

A Thesis Submitted for the Degree of PhD at the University of Warwick

Permanent WRAP URL:

<http://wrap.warwick.ac.uk/161149>

Copyright and reuse:

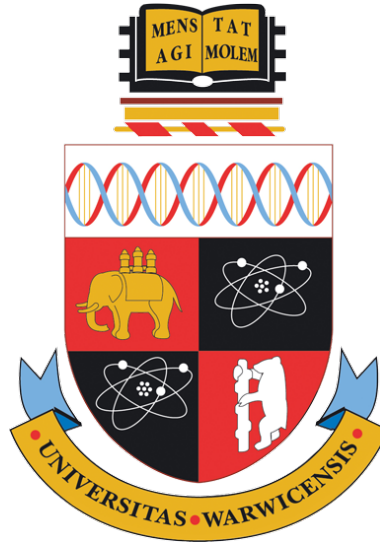
This thesis is made available online and is protected by original copyright.

Please scroll down to view the document itself.

Please refer to the repository record for this item for information to help you to cite it.

Our policy information is available from the repository home page.

For more information, please contact the WRAP Team at: wrap@warwick.ac.uk



Commuting: Perceptions and Subjective Well-Being

by

Zakiyya Adam

Thesis

Submitted to the University of Warwick

in partial fulfilment of the requirements

for admission to the degree of

Doctor of Philosophy

Department of Computer Science

April 2021

Contents

List of Tables	v
List of Figures	viii
Acknowledgments	x
Declarations	xii
Abstract	xiii
Acronyms	xv
Chapter 1 Introduction	1
1.1 Research Questions and Contributions	2
Chapter 2 Background	6
2.1 Subjective Well-Being	6
2.1.1 Defining Subjective Well-Being	6
2.1.2 Measuring Subjective Well-Being	8
2.2 Factors Affecting Commute Well-Being	12
2.2.1 Transport Mode	12
2.2.2 Commute Time	14
2.2.3 Other Commuting Characteristics	19
2.2.4 Socio-Demographic Factors	21
2.3 Value of Commuting	23
Chapter 3 Commuting Comparison to Other Daily Activities	26
3.1 Introduction	26
3.1.1 Chapter Structure	27
3.1.2 Contributions	29
3.2 Methods	29
3.2.1 Participants	29
3.2.2 Study Variables	30
3.2.3 Study Design	32

3.3	Results	33
3.3.1	How Commuting Compares To Other Daily Activities	33
3.3.2	Commuting Vs Non-Commuting and Enjoyment of Daily Activities	36
3.3.3	Level 1 Multilevel Analysis	36
3.3.4	Level 2 Multilevel Analysis	38
3.4	Discussion	45
3.4.1	How Commuting Compares To Other Daily Activities	49
3.4.2	Commuting vs Non-Commuting and Enjoyment of Daily Activities	53
3.4.3	Strengths and Limitations	54
3.5	Conclusion	55
Chapter 4 Subjective Commute Time and Commute Well-Being		56
4.1	Introduction	56
4.1.1	Chapter Structure	58
4.1.2	Contributions	58
4.2	Methods	59
4.2.1	Participants	59
4.2.2	Study Variables	59
4.2.3	Study Design	62
4.3	Results & Discussion	63
4.3.1	Comparison between Ratio and Difference Variables	68
4.3.2	Limitations and Further Work	71
4.4	Conclusion	72
Chapter 5 The Role of the Commute		73
5.1	Introduction	73
5.1.1	Chapter Structure	75
5.1.2	Contributions	75
5.2	Methods	76
5.2.1	Participants	76
5.2.2	Study Variables	77
5.2.3	Study Design	79
5.3	Results	80
5.3.1	Exploratory Analysis	80
5.3.2	Primary Analysis	82
5.4	Discussion	87
5.4.1	Limitations and Further Work	89
5.5	Conclusion	89

Chapter 6	Commuting and COVID-19	91
6.1	Introduction	91
6.1.1	Chapter Structure	92
6.1.2	Contributions	93
6.2	Methods	94
6.2.1	Participants	94
6.2.2	Study Variables	96
6.2.3	Study Design	99
6.3	Results	101
6.3.1	Pre-Registered Analysis	101
6.3.2	Refined Methodology	105
6.4	Discussion	108
6.5	Thematic Analysis	110
6.5.1	Commuting During COVID-19	112
6.5.2	Working From Home	119
6.5.3	Discussion	127
6.6	Overall Discussion	128
6.6.1	Limitations and Further Work	129
6.7	Conclusion	130
Chapter 7	Discussion	131
7.1	Research Summary and Discussion	131
7.2	Research Impact	135
7.3	Study Limitations	137
7.4	Recommendations for Future Research	138
Chapter 8	Conclusions	141
Appendix A	Datasets	142
A.1	UK Time Use Survey Data	142
A.1.1	Data Collection	142
A.1.2	Commuting Data	143
A.1.3	Sample Characteristics	145
A.1.4	Survey Questions	145
A.2	Role of Commuting Survey	149
A.2.1	Data Collection	149
A.2.2	Sample Characteristics	151
A.2.3	Survey Questions	151
A.3	COVID-19 Survey	159
A.3.1	Data Collection	159
A.3.2	Sample Characteristics	161
A.3.3	Survey Questions	161

Appendix B Additional Tables: Subjective Commute Time	166
Appendix C Additional Tables: The Role of the Commute	170
Appendix D Additional Tables: Commuting and COVID-19	175

List of Tables

2.1	Comparison of travel well-being measure items between Ettema et al. (2011), De Vos et al. (2015), Smith (2017) and Singleton (2019)	10
3.1	Key features of the previous studies that have compared daily activities based on their subjective well-being effects	28
3.2	UKTUS Sample Characteristics	31
3.3	Summary of the filtered data used in the present study	33
3.4	Descriptive statistics of the enjoyment ratings for Level 1 activities, for both commuting workdays and non-commuting workdays, for (1) passive modes of transport; (2) passive modes of transport; and (3) both passive and active modes of transport.	37
3.5	Descriptive statistics of the enjoyment ratings for Level 2 activities, for both commuting workdays and non-commuting workdays, for passive modes of transport.	42
3.6	Descriptive statistics of the enjoyment ratings for Level 2 activities, for both commuting workdays and non-commuting workdays, for active modes of transport.	43
3.7	Descriptive statistics of the enjoyment ratings for Level 2 activities, for both commuting workdays and non-commuting workdays on which commuting took place using both passive and active modes of transport.	44
3.8	Details of the measures and categories used to form comparative activities for the studies that compared daily activities based on their subjective well-being effects.	51
4.1	Sample characteristics for the 194 participants of the study on Subjective Commute Time and Commute Well-Being	60
4.2	Multiple regression models for commute well-being ratings for the commute to work	66
4.3	Multiple regression models for commute well-being ratings for the commute from work	66

4.4	Multiple regression models for commute well-being ratings for the commute to work, using commute time difference variables	69
4.5	Multiple regression models for commute well-being ratings for the commute from work, using commute time difference variables	69
4.6	Multiple regression models for commute well-being ratings for the commute to work, using commute time difference variables and log transformed variables	70
4.7	Multiple regression models for commute well-being ratings for the commute from work, using commute time difference variables and log transformed variables	70
5.1	Sample characteristics for the 194 participants of the study on The Role of the Commute	76
5.2	Multiple regression models for subjective divide and objective divide	86
6.1	Sample characteristics for the 138 participants of the study on Commuting and COVID-19	95
6.2	Multiple linear regression models and a multiple logistic regression model for Change in WFH Hours, Change Subjective Divide and Change Objective Divide	104
6.3	Multiple linear regression models and a multiple logistic regression model for Change in WFH Hours, Change Subjective Divide and Change Objective Divide using revised methodology	107
6.4	Development of themes for commuting during the COVID-19 pandemic	113
6.5	Development of themes for working from home, without a commute, during the COVID-19 pandemic	120
7.1	Variables tested in each of the studies presented in the thesis .	134
A.1	Number of recorded episodes for Level 3 commuting activities in UKTUS 2014–15	143
A.2	UKTUS Sample Characteristics	146
A.3	Sample characteristics for the 194 participants who commute by car	152
A.5	Sample characteristics for COVID-19 survey participants	161
B.1	Multiple regression models for commute well-being for the commute to work and the commute from work, using commute time ratio variables and log transformed variables, including all socio-demographic variables.	167

B.2	Multiple regression models for commute well-being for the commute to work and the commute from work, using commute time difference variables, including all socio-demographic variables.	168
B.3	Multiple regression models for commute well-being for the commute to work and the commute from work, using commute time difference variables and log transformed variables, including all socio-demographic variables.	169
C.1	Multiple linear regression models for subjective divide, including commute/work and socio-demographic control variables	171
C.1	Multiple linear regression models for subjective divide, including commute/work and socio-demographic control variables	172
C.2	Multiple linear regression models for objective divide, including commute/work and socio-demographic control variables	173
C.2	Multiple linear regression models for objective divide, including commute/work and socio-demographic control variables	174
D.1	Multiple regression models and multiple logistic regression model for Change in WFH Hours	176
D.2	Multiple linear regression models and multiple logistic regression model for Change in Subjective Divide	177
D.3	Multiple linear regression models and multiple logistic regression model for Change in Objective Divide	178
D.4	Multiple linear regression models and multiple logistic regression model for Change in WFH Hours using revised methodology	179
D.5	Multiple linear regression models and multiple logistic regression model for Change in Subjective Divide using revised methodology	180
D.6	Multiple linear regression models and multiple logistic regression model for Change in Objective Divide using revised methodology	181

List of Figures

3.1	Mean enjoyment ratings by Level 1 activity.	34
3.2	Mean enjoyment ratings by Level 2 activity.	35
3.3	Mean enjoyment ratings by Level 3 activity.	35
3.4	Proportion of episodes attributed to each Level 1 activity category.	38
3.5	Difference in enjoyment ratings for Level 1 activities between non-commuting workdays and workdays on which commuting is undertaken using passive modes of transport, based on multilevel analysis.	39
3.6	Difference in enjoyment ratings for Level 1 activities between non-commuting workdays and workdays on which commuting is undertaken using active modes of transport based on multilevel analysis.	40
3.7	Difference in enjoyment ratings for Level 1 activities between non-commuting workdays and workdays on which commuting is undertaken using both active and passive modes of transport based on multilevel analysis.	41
3.8	Difference in enjoyment ratings for Level 2 activities between non-commuting workdays and workdays on which commuting is undertaken using passive modes of transport, based on multilevel analysis.	46
3.9	Difference in enjoyment ratings for Level 2 activities between non-commuting workdays and workdays on which commuting is undertaken using active modes of transport, based on multilevel analysis. Error bars indicate bootstrapped confidence intervals.	47
3.10	Difference in enjoyment ratings for Level 2 activities between non-commuting workdays and workdays on which commuting is undertaken using both active and passive modes of transport, based on multilevel analysis. Error bars indicate bootstrapped confidence intervals.	48
3.11	Mean positive affect ratings for comparative activity categories for three previous studies and the present study.	50

4.1	Scatter-plots of (1) acceptable versus actual commute time, (2) ideal versus actual commute time, and (3) ideal versus acceptable commute time.	64
4.2	Commute well-being for, clockwise from top left (1) AAR for commute to work, (2) AAR for commute from work, (3) AIR for commute from work, and (4) AIR for commute to work. . .	65
4.3	The mediating effect of AAR in the relationship between duration and commute well-being for commutes to work (top) and commutes from work (bottom).	67
5.1	Distribution plots for objective divide (left) and subjective divide (right)	80
5.2	Scatter-plots of objective divide versus subjective divide.	81
5.3	Distribution plots for commute well-being to work (top left), value of the commute to work (top right), commute well-being from work (bottom left) and value of the commute to work (bottom right).	82
5.4	Scatter-plots of commute well-being versus value of the commute, for commutes to work (left) and commutes from work (right).	83
5.5	Distribution plots for separate domain (top left), mindset (top right), value of the commute to work (middle left), value of the commute from work (middle right), teleport to work (bottom left) and teleport from work (bottom right).	85
6.1	Scatter-plots of (1) subjective divide before the pandemic versus subjective divide during the pandemic (left), (2) objective divide before the pandemic versus objective divide during the pandemic (right).	102
6.2	Thematic map of the derived themes for commuting during COVID-19.	114
6.3	Thematic Map of the derived themes for working from home during COVID-19.	121
A.1	Instructional example diary entry provided to participants as a guide	144

Acknowledgments

The foundations for this thesis were unknowingly laid through the late Prof. Libby Burton before I had even completed my undergraduate studies. She inspired me to look beyond the structural and operational integrity of engineering design, and to consider its impact on the lives of those that it intended to serve, to design for people and their well-being.

Similarly, Prof. Ian Guymer planted the idea of undertaking the challenge of a PhD after he supervised my undergraduate dissertation project. At the time, I thought it was a crazy idea; turns out past-me was right but I have since learnt that crazy can also be wonderful. After serendipitously bumping into Prof. Guymer at a conference that I was attending through work, we stayed in touch and a year or so later he mentioned this fascinating new CDT in Urban Science that was accepting applications. And, as they say, the rest is (very recent) history.

Sticking on the theme of academic mentors, I am extremely grateful to Prof. Caroline Meyer and Dr. Lukasz Walasek for being truly amazing supervisors. Lukasz and Caroline, your guidance throughout the last few years has been invaluable. Thank you for being inspiring, engaged, patient, encouraging, and human. I always walked out of our meetings feeling invigorated and with a renewed sense of purpose. Knowing that I had your support along this journey was incredibly reassuring and you have both been more meaningful and instrumental in getting me to this point than I could ever express. I feel very grateful to have had the fortune of having the two of you as my supervisors.

Life as a PhD-er would not have been the same without the following peeps to exchange nervous “it’ll-be-fine”s with as we muddled our way through the various obstacles that unexpectedly appeared in our paths: John, Neha, Vikki,

Corrinne, Mo and Henry. Thanks also to Yvonne who kept everything in the CDT office ticking over, everyone topped up with biscuits and caffeine, and all the last minute travel arrangements somehow always falling into place.

And finally, so grateful for the support of my family, who figured out what a PhD entailed in real time with me. There have been many changes over the last few years but you have been my steady constant. Never underestimate the importance of 5-hour long conversations about philosophy/ morality/ psychology/ all the good stuff, having a never ending supply of mum-cooked meals in the freezer, absurdly competitive games of Uno, sibling trips abroad, so many lifts to and from Coventry, days spent coffee shop hopping...

The last few years have been the most transformative of my life so far. I feel unbelievably grateful for the experiences and friendships that have enriched my everyday, and the opportunities to challenge my ideas and evolve as a person. So, to everyone who I've named above, and to everyone who I've inevitably failed to mention... *thank you!*

Declarations

Part of this thesis has previously been published by the author in the following:

Zakiyya Adam, Lukasz Walasek, and Caroline Meyer. Workforce commuting and subjective well-being. *Travel Behaviour and Society*, 13:183–196, 2018. doi: <https://doi.org/10.1016/j.tbs.2018.08.006>

Abstract

Commuting is a routine part of everyday working life for millions around the world. Repeated and obligatory parts of the day are often overlooked, viewed as vacuous tasks, void of any intrinsic value and with no impact on well-being. On the contrary, these seemingly menial parts of the day have the ability to act both as a daily stressor or as a therapeutic respite from life. Unraveling the complex relationship that individuals have with their commute, and the subjective well-being effects of commuting, is key to understanding how to direct the commuting experience towards the latter.

The research presented in this thesis was undertaken in this vein. Shedding light on areas largely unexplored in the literature and on the impact of emerging trends or phenomena on commuting. Commuting was found to be amongst the least enjoyable activities in the day; however, active commuting is significantly more enjoyable than passive commuting. Commuting has little impact on the enjoyment of other daily activities. A new subjective measure of commute time, the Actual-Acceptable Ratio (AAR), is introduced for inclusion in studies on commute well-being. Attitudes regarding the commute during the pandemic did not differ significantly to those expressed pre-COVID. Increases in working hours spent working from home were found to be positively correlated to an individual's desire to work from home in the future. Thematic analysis further unveiled the complex, and often contradictory, nature of an individual's relationship with their commute.

This thesis looks to spark discussion and inspire further work in areas yet to be comprehensively understood. Whilst the limitations of the studies prevent the findings from informing policy in their current form, they lay foundations that may be built upon by others and highlight the potential for insight.

Sponsorships and Grants

The research presented in this thesis was made possible by the support of the Engineering and Physical Sciences Research Council (EPSRC) Centre for Doctoral Training in Urban Science (EP/ L016400/ 1), 2015 - 2019.

Acronyms

AAD Actual-Acceptable Difference.

AAR Actual-Acceptable Ratio.

AID Actual-Ideal Difference.

AIR Actual-Ideal Ratio.

ATUS American Time Use Survey.

BHPS British Household Panel Survey.

CFPS China Family Panel Studies.

CLDS China Labour-Force Dynamics Survey.

CWB Commute Well-Being.

DRM Day Reconstruction Method.

E-RGM Employment-Related Geographical Mobility.

GHQ General Health Questionnaire.

GSOEP German Socio-economic Panel Study.

HSE Health Survey for England.

ONS Office for National Statistics.

PANAS Positive and Negative Affect Schedule.

PSID Panel Study of Income Dynamics.

PWI Personal Well-Being Index.

SCAS Swedish Core Affect Scale.

SPANE Scale of Positive and Negative Experience.

SSD Seoul Survey Data.

STS Satisfaction With Travel Scale.

SWB Subjective Well-Being.

SWEMWBS Short Warwick-Edinburgh Mental Well-Being Scale.

SWLS Satisfaction with Life Scale.

UKTUS United Kingdom Time Use Survey.

WEMWBS Warwick-Edinburgh Mental Well-Being Scale.

Chapter 1

Introduction

Whatever creates or increases happiness or some part of happiness, we ought to do; whatever destroys or hampers happiness, or gives rise to its opposite, we ought not to do

Rhetoric, Aristotle

Happiness. Contentment. The Good Life. Humans have long strived for optimisation of the lived experience, with personal happiness often viewed as the ultimate goal [55]. A goal to be achieved in all aspects of an individual's life.

Commuting is part of daily life for the majority of the British workforce. The latest census data reported that over eighty percent of workers in the UK regularly commute to work. This equated to 21.5 million people in 2011, a 5.8% increase on the 20.3 million reported in the 2001 census [51]. Both the distance and duration travelled are also increasing, with the average one-way commute at just under ten miles long and lasting over thirty minutes in 2014, compared to roughly eight miles and 24 minutes in 1988 [155]. In 2015, the Trades Union Congress reported that 3.7 million people commute for over two hours each day, an increase of almost a third since 2010 [152]. Thus, commuting is an increasingly prevalent part of daily life for the working population in the UK; it forms a significant portion of the day for millions of people.

Commuting can be considered to be a daily stressor, a routine challenge of day-to-day living that is minor but occurs frequently [119]. Compared to major life events and crises, daily stressors have a more immediate, same-day effect on well-being, causing short-term spikes in arousal or psychological distress [6] [7]. Recurrence of these daily stressors may also cause an accumulation of frustrations and persistent overloads, leading to more serious stress reactions, such as depression or anxiety [163]. Thus, daily stressors exacerbate existing health conditions, give rise to new physical health symptoms, and the on-going physiological changes may result in biological wear-and-tear increasing

susceptibility to illness later in life [16]. In his book, *Stress and Emotion: A New Synthesis*, Lazarus posits that daily stressors are even more important factors in negative health outcomes than major life events [85]. Seemingly innocuous activities, such as commuting, could potentially have significant impacts on health, both physically and mentally.

Numerous studies have investigated the specific health impacts of the commute to work. In 2020, Norgate and colleagues carried out a systematic review of the extent to which commuting using public transport affects health; they reported links to absenteeism, mental health risk, reduction in sleep quality, commuting stress, mood, motivation, and musculoskeletal and gastrointestinal complaints [106]. Conversely, commuting has been found to be therapeutic [64] and valued as both transition time - preparing for the anticipated demands at the destination - and time out - escape from obligations - as well as creation of time for engagement with other activities, such as reading [75]. Focusing on happiness and subjective well-being, a study conducted in Sweden showed that satisfaction with the work commute contributes to overall happiness [114].

The activity of commuting to work has both the potential to act as a daily stressor with significant adverse health impacts and as a means for enhancing an individual's overall happiness. In order to ensure the latter occurs, it is important to understand the role that commuting plays in peoples lives, what value it intrinsically holds and how different aspects of the journey affect the commuting experience. The research presented in this thesis explores commuting behaviours and attitudes towards commuting, with a view to informing efforts to optimise the commuting experience and, by extension, the attainment of personal happiness.

1.1 Research Questions and Contributions

The overall aim of this thesis was to explore commuting behaviours and attitudes. This was achieved by conducting a series of studies, each focused on a different aspect of the commuting experience.

In the context of the research presented in this thesis, commuting *behaviours* refers to the manner in which individuals commute, such as the frequency, duration and mode of the commute. Commuting *attitudes* encompasses the internal thought processes and beliefs of an individual, accounting for their perceptions, preferences and judgements.

The specific research questions addressed in this thesis are detailed below, with an overview of the studies carried out to address them and the key contributions.

RQ1: How does commuting compare with, and impact on, the enjoyment of other daily activities?

Research has shown that commuting, in comparison to other daily activities, is ranked amongst the least positive in affect, if not the worst, and ranks highly for negative affect [78] [158] [147] [15]. None of the existing studies were conducted on a representative sample of the UK population.

The effect of commuting on the experienced well-being of other daily activities had not previously been explored.

Contributions to RQ1: Chapter 3 presents a study that compares (1) experienced well-being, in terms of enjoyment, across a range of daily activities, including commuting, using data that is representative of the UK population, and (2) experienced well-being, in terms of enjoyment, for a range of daily activities between workdays on which commuting is undertaken and workdays on which participants did not commute. The study was conducted using the UK Time Use Survey (UKTUS) data from 2014-15, which differentiated between 276 different activities and contained 101,505 participant ratings for enjoyment of activities carried out during their day.

Using a series of multilevel analyses, commuting using passive modes of transport was found to be the least enjoyable daily activity in the UK. Commuting using active modes, namely walking and cycling, was found to be enjoyed significantly more than passive commuting.

Commuting was found to have little impact on the enjoyment of other daily activities.

Further details on the study are provided in Chapter 3. The study has been published in the journal *Travel Behaviour and Society* [4] and was presented at the 16th Annual Conference of the International Society For Quality-Of-Life Studies (ISQOLS) in June 2018 in Hong Kong.

RQ2: What is the relationship between commute duration and commute well-being?

It is well established that trip duration is one of the main characteristics of the commute that impacts on commute well-being [147] [137] [148] [88] [60]. Only a couple of studies, however, had broadened this to include subjective evaluations of commute time, accounting for dissonance between actual commute time and ideal commute time [162] [72]. The significance of the relation between actual commute time and other subjective evaluations of commute time, such as what an individual deems to be an *acceptable* commute time, had not previously been explored.

Contributions to RQ2: Chapter 4 details a study exploring the relation

between commute duration and commute well-being using a range of nuanced commute time measures: actual commute time, ideal commute time, and acceptable commute time. Survey responses obtained from 194 car commuters were assessed using multiple regression.

The relation between actual and acceptable commute times was found to be positively correlated to commute well-being for both the commutes to work and from work, and to mediate the effect of actual duration on commute well-being. The relation between actual and ideal commute times was not found to be significantly correlated with commute well-being for either journey.

The study highlighted the importance of including measures of subjective commute duration in studies looking at commute well-being. It also demonstrated the significance of the form of these relational variables, proposing ratios to be a more accurate representation than the currently adopted differences approach. It was the first study to explore how the relation between acceptable commute duration and actual commute duration correlates to commute well-being.

Further details on the study are provided in Chapter 4.

RQ3: Will the commute still play a role in peoples' lives as technological advancements make working remotely an increasingly viable option?

Commuting has been shown to be valued as both a means of separating the domains of work and personal life and as time to transition between the home and work roles [96] [73]. As technology advances and takes a more prominent role in individual's lives, working from home outside of working hours - for example, checking work emails - becomes a more common practice. Understanding how the potential for changing work behaviours interplays with the role of the commute in peoples' lives will shed some light on what the work landscape of the future may look like.

Contributions to RQ3: Chapter 5 presents a study that investigates how the divide between an individual's personal life and work life (both objective divide and perceived divide) correlates to their attitudes towards commuting. The attitudes included in the study are: value placed on the activity of commuting, desire to teleport, alignment with the idea that the commute is a device for separating the different life domains, and agreement with the notion that the commute enables them to get into the right mindset for work or home. Survey responses obtained from 194 car commuters were assessed using a series of multiple regression models.

The findings of this study suggest that despite technological advancements leading to an increased blurring of the objective divide between work and home,

neither this nor the perceived divide are correlated to an individual's judgment on the role that the commute plays in their life or their assessment of the value or desirability of their commute.

Further details on the study are provided in Chapter 5.

RQ4: How do significant changes in commuting behaviours affect attitudes towards commuting?

The COVID-19 pandemic imposed working from home practices on many UK residents. This unique scenario allowed us to explore how experiencing working life without the usual commute alters perspectives of those who may never have opted into a working from home scheme. The retrospective value of the commute may be different to previous valuations now that it no longer features (or features less frequently) in peoples' lives; some may not have realised the importance of their commute to them until they experienced balancing work and their personal life without it.

Contributions to RQ4: Chapter 6 presents a study that looks at the impact of COVID-19 on attitudes towards working from home and commuting to/ from work. The study utilised primary data collected for an earlier study prior to the outbreak of the coronavirus in the UK and widespread implementation of working from home. A follow-up study was distributed to the same participants - UK-based individuals that commute to/ from work by car - and responses were compared to those previously provided. Participants were asked a series of questions on attitudes towards commuting, including the value they place on it and the role it plays in their day. Survey responses from 138 individuals were assessed using multiple regression models.

Increases in working hours spent working from home were found to be positively correlated to an individual's desire to work from home in the future. With regards to the comparative variables, individual's attitudes towards commuting were not found to have altered significantly despite pandemic-related changes to their commute and work behaviours. Thematic analysis highlighted the nuanced and complex nature of attitudes towards commuting, with individuals often simultaneously expressing positive evaluations of their previous commute and a lack of desire to return to it.

Further details on the study are provided in Chapter 6.

Chapter 2

Background

Subjective Well-Being (SWB) is complex and multi-faceted, this chapter begins by exploring the different dimensions of the construct, and detailing the two measures adopted in the studies presented in this thesis. The numerous factors that affect SWB during the commute are then discussed. The chapter concludes by outlining the various ways in which the commute has been shown to hold inherent value for the individual.

2.1 Subjective Well-Being

Subjective Well-Being refers to *how people experience and evaluate their lives and specific domains and activities in their lives* [26]. The various components that comprise this construct are outlined in this section, as well as the measures of SWB utilised in the research presented within this thesis.

2.1.1 Defining Subjective Well-Being

There are at least three conceptual approaches to evaluating subjective well-being which are commonly used: evaluative well-being, experienced well-being, and eudaimonic well-being [153]. Evaluations of SWB can be viewed to exist on a temporal spectrum, with real-time assessments on one end and overall evaluations on the other. Whilst the three concepts within SWB are distinct, some overlap on the temporal continuum does exist [26].

Evaluative Well-Being

Evaluative well-being, also referred to as life satisfaction or life evaluation, refers to individual's perceptions regarding the quality and goodness of their life and their overall satisfaction with their life [143]. It also includes evaluations of specific aspects of an individual's life, such as their relationships, health or work [42].

Evaluative well-being is based on the standards of the individual to determine what constitutes the good life. Subjective evaluations of well-being can be traced back several millennia, with Marcus Aurelius writing that *“no man is happy who does not think himself so”* [40]. Shin and Johnson [134] defined this form of well-being as *“a global assessment of a person’s quality of life according to his own chosen criteria”* (p.478).

With regards to the temporal spectrum, evaluative well-being features on the end where judgments are based on long reference periods [26].

Experienced Well-Being

Experienced well-being relates to individual’s emotional states. It also includes effects associated with sensations, such as pain or arousal. Other factors that are closely related to emotional states, or assessments of those states, would also fall under experienced well-being (e.g. feelings of purpose or pointlessness) [26]. It encompasses both negative emotions/ affect, such as worry and stress, as well as positive emotions/ affect, such as pleasure and enjoyment. Experienced well-being is more concerned with how individuals experience their lives rather than how they assess them more generally [63].

Hedonic well-being is a term often used interchangeably with experienced well-being. There is, however, a clear distinction between them. Hedonic well-being specifically focuses on moment-to-moment emotional states, whereas experienced well-being is a more broad concept that extends to also include sensations and other factors beyond emotions, such as pain or arousal. The two concepts are closely related, especially as the additional aspects of experienced well-being often directly impact the individual’s emotional state [26].

With regards to the temporal spectrum, on the opposing end of evaluative well-being is the point-in-time reference period that is purely hedonic. Experienced well-being ranges from these momentary assessments of affect to global-day assessments or day reconstructions at the longer end. As the reference period lengthens, measures of experienced well-being take on more characteristics of evaluative well-being [26].

Eudaimonic Well-Being

Eudaimonic well-being is concerned with an individual’s perceptions of meaningfulness and whether they feel that they have attained self-realisation, are fully functioning and have a sense of purpose [153]. The concept of eudaimonic well-being derives from Aristotle’s assertion that the highest of all goods achievable by human action was *eudaimonia*, growth towards realisation of one’s true and best nature [127]. It embodies two Greek imperatives, to *“know thyself”* and to *“become what you are”* [129].

Whilst evaluative and experienced well-being are well researched and established dimensions of SWB, eudaimonic well-being is not as widely recognised and is often omitted [80] [79].

With regards to the temporal spectrum, eudaimonic sentiments can be relevant to both point-in-time experienced well-being (e.g. the worthwhileness of a specific activity) as well as the much longer temporal reference periods of evaluative well-being (such as the role of purpose in judgements of overall satisfaction with life) [26].

Components of Subjective Well-Being

SWB comprises of three facets: positive affect, negative affect and cognitive evaluations [39]. Positive affect and negative affect relate to experienced well-being, whilst cognitive evaluations assess the evaluative aspect of SWB [132].

2.1.2 Measuring Subjective Well-Being

Several well-established psychometric instruments for measuring SWB exist, these include: the Positive and Negative Affect Schedule (PANAS) [156], the Swedish Core Affect Scale (SCAS) [154], the Scale of Positive and Negative Experience (SPANE) [38], the Satisfaction with Life Scale (SWLS) [37], and the Personal Well-Being Index (PWI) [28].

The development and composition of the two SWB measures used in the studies presented in this thesis are detailed in this section.

Commute Well-Being

Studies exploring the relationship between specific aspects of the commute and commute well-being primarily adopt a variation of the widely accepted travel-specific subjective well-being measure, the Satisfaction with Travel Scale (STS).

The first iteration of the STS was a five-item self-report scale developed by Jakobsson Bergstad and colleagues in 2011 [12]; the scale comprised of one affective and four cognitive evaluation items. This scale was effective in investigating the relationships between general SWB and domain specific well-being in the context of activities and travel. As it predominantly consisted of cognitive items, however, it was limited in measuring the affective components of travel. Thus, Ettema and colleagues [43] adapted this version of STS, also in 2011, extending it to more comprehensively capture the affective dimension of SWB.

Ettema and colleagues [43] developed their nine-item self-report STS to include both affective and cognitive components related to daily travel. The

first part of the scale - affective component - derives from the SCAS [154]. Under this framework, emotions or moods are represented on two dimensions. The first dimension, *valence*, ranges from pleasure to displeasure or positive to negative. The second dimension, *arousal*, ranges from activation to deactivation. Feeling excited or enthusiastic would be positive activation, while feeling relaxed or serene would be positive deactivation [120]. STS comprises of six affective scales, three which distinguish between positive deactivation (e.g. relaxed) and negative activation (e.g. time pressed), and three which distinguish between positive activation (e.g. alert) and negative deactivation (e.g. tired).

The second component of the STS measures overall cognitive evaluations regarding travel. This element consists of three scales referring to general quality and efficiency of the transport service. Thus, STS comprises of three scales: positive deactivation – negative activation, positive activation – negative deactivation, and cognitive evaluation. Earlier versions of STS were measured on nine-point scales, however, recent adaptations favour a seven-point scale (-3 to +3) [137].

Use of this scale was validated by Friman and colleagues in 2013 [56], with various forms of the STS being utilised in subsequent studies. One such study shortened the STS to a three-item scale by combining the end-point statements that define each of the three separate scales which comprise the STS [57].

Based on their tests of the underlying structure and reliability of the STS, De Vos and colleagues [33] identified two of the nine scales as poorly fitting the affective dimension, recommending that these be replaced or omitted. They also found the use of two scales – emotions and cognitive evaluation – to be a better fit for their data than a three-dimensional STS. Implementing these recommendations, Smith [139] developed the Commute Well-Being (CWB) measure, an adaptation of the STS specific to the commute journey. As well as utilising a two scale structure, Smith also omitted three items, changed the wording on four items (the items utilised by Ettema et al. [43] and De Vos et al. [33] were translated into English by the authors) and added an additional item related to enjoyment. For his recent study on commuters in the United States, Singleton [137] [138] adopted the STS revisions suggested by Smith [139] and De Vos et al. [33] and also revised the wording of the items slightly to better align with opposing ends of core affect and for an American and English-language context. Thus, the STS scale adapted by Singleton currently provides the most appropriate measure of travel satisfaction for commute specific studies carried out in the English language. The questions utilised in each of these studies are presented in Table 2.1.

Table 2.1: Comparison of travel well-being measure items between Ettema et al. (2011), De Vos et al. (2015), Smith (2017) and Singleton (2019)

Ettema et al. (2011)	De Vos et al. (2015) Utilised the same question as Ettema (2011). Made the following recommendations:	Smith (2017)	Singleton (2019)
<p>Positive Deactivation - Negative Activation Time pressed - Relaxed Worried I Would Not/ Confident I Would Be In Time Stressed - Calm</p>	<p>Emotions Highly Correlated Can Omit/ Replace Highly Correlated</p>	<p>Affective Evaluation Tense - Relaxed Worried/ Confident That You Would Arrive On Time</p>	<p>Positive Deactivation - Negative Activation Tense - Relaxed ↓ Included under Cognitive Evaluation Distressed - Content</p>
<p>Positive Activation – Negative Deactivation Tired - Alert Bored - Enthusiastic Fed Up - Engaged</p>	<p>Can Omit/ Replace Highly Correlated Highly Correlated</p>	<p>Tired - Excited Bored - Enthusiastic</p>	<p>Positive Activation – Negative Deactivation Tired - Energized Bored - Enthusiastic Sad - Happy ↓ Included under Cognitive Evaluation</p>
<p>Cognitive Evaluation Travel was Worst/Best I Can Think Of Travel was Low/High Standard Travel Worked Well - Worked Poorly ↑ Included Under Positive Deactivation</p>	<p>Cognitive Evaluation Highly Correlated Highly Correlated Highly Correlated ↑ Included Under Positive Deactivation</p>	<p>Cognitive Evaluation Trip Was The Worst/ Best I Can Imagine Trip Went Poorly/ Smoothly ↑ Included Under Affective Evaluation ↑ Included Under Positive Deactivation</p>	<p>Cognitive Evaluation Trip was the Worst/Best I can Imagine Trip went Poorly - Smoothly Trip was Displeasing - Enjoyable Worried I Wouldn't/Confident I Would Arrive on Time</p>

NOTE: The wording used for each of the well-being measure items, for the four most relevant uses of the STS to the studies included in this thesis, are presented so that (1) direct comparisons may be made on the wording utilised for each item; (2) distinctions may be made on the inclusion/omission of particular items (omissions indicated using -); (3) the number of scales used in each is made apparent; and (4) there is clarity on the allocation of items to each of the scales (where an item is allocated under a different scale, this is indicated using ↑ or ↓ as appropriate).

Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS)

The two studies presented in this thesis that did not focus on how SWB relates to commuting did, however, account for the individual's overall SWB in the regression models. The Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS) was utilised in these studies.

The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) was developed as a tool to evaluate the impact of mental health promoting policies. It was developed in 2007 by the Universities of Warwick and Edinburgh on behalf of the Scottish Government, and intended to be a short instrument which was easily understood, accepted by the public as a measure of mental health, practical, and inexpensive, to be included in large-scale health surveys [145]. Since 2010, it has been included in the national Health Survey for England (HSE) [108].

WEMWBS is a comprehensive measure of SWB, including eudaimonic aspects of SWB as well as affective assessments and cognitive evaluations [126]. By focusing wholly on the positive, the scale is able to support mental health promotion initiatives and be free of ceiling effects in population samples [151].

WEMWBS comprises of 14 items, with individuals instructed to tick the box that best describes their experience of each statement over the past two weeks using a 5-point Likert scale (none of the time, rarely, some of the time, often, all of the time). All items are scored positively and the Likert scale represents a score for each item from 1 to 5 respectively. The overall score for the WEMWBS is calculated by totalling the scores for each item, with equal weights, giving a minimum score of 14 and maximum score of 70. A higher WEMWBS score therefore indicates a higher level of mental well-being.

A couple of years after the development of WEMWBS, a short version of the scale was created, the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS) [146]. Seven items were removed from the 14-item WEMWBS to produce the 7-item SWEMWBS. Scores range from a minimum of 7 and maximum score of 35 [47].

SWEMWBS presents a more restricted view of mental well-being than WEMWBS, with the majority of items representing aspects of eudaimonic well-being, and few covering experienced or evaluative well-being. However, robust measurement properties combined with brevity make SWEMWBS preferable to WEMWBS for monitoring mental well-being in populations [146]. In the studies presented in this thesis, SWEMWBS was included as a model control, representing an individual's overall mental health and subjective well-being; therefore, the specific composition of the measure, with regards to the prominence of affective items, was not of concern.

2.2 Factors Affecting Commute Well-Being

Various aspects of the commuting experience, as well as individual characteristics, have been shown to be associated with SWB. This section outlines the key studies and findings for each of these.

2.2.1 Transport Mode

The transport mode used for the commute has been found to significantly impact on commute related SWB. This section presents an overview of the literature that explores this relationship. Associations between different transport modes and SWB are often made in relation to other modes of transport. Within the literature, grouping of modes is common, with bus, tram and train often assessed all together and classified as public transport. Walking and cycling are also usually grouped together and referred to as either active modes [165] [95] or slow modes [114] [56].

Most studies agree that commuting using active modes of transport is correlated to the highest levels of SWB. Those commuting using active modes score higher on the STS than those commuting (1) using public transport [56] and (2) by car or public transport [137] [114], are happier with their commutes compared to (1) bus and car commuters [139] [165] and (2) those commuting using scooter, car and public transport [84], and enjoy their commute more than those commuting by car or public transport [137].

A few exceptions have been found, however, with one study conducted in China reporting that those who walk or cycle to work derive significantly less sense of happiness than commuters using motor vehicles [166]. They attribute this finding to a range of possible location-specific reasons including the imperfect walkways and bicycle lanes in China (where many cities give priority to motor vehicles), the mixed motorway and pedestrian/ bike lanes (raising safety concerns), and the country's particularly high levels of traffic pollution (posing a health risk).

Assessing walking and cycling separately, a UK based study [59] on affective appraisals of the commute found cycling to be the most interesting and exciting means of commuting compared to walking, using a car or using public transport; walking was found to be the most relaxing. The study also assessed each of the modes based on the two-dimensional framework for emotions proposed by Russell [128], the Circumplex Model of Affect, which posits that emotions derive from valence and arousal, as described in Section 2.1.2. Each of the four travel modes elicited a different affective response: driving was found to be relatively unpleasant and arousing, public transport was unpleasant and not arousing, cycling was pleasant and arousing, and walking was pleasant and not arousing.

Commuting by car was found to be associated with higher scores on the STS than public transport in a study carried out in Sweden [56]. However, a study comparing car and train commuting in New York found those commuting by car to experience greater levels of stress and more negative mood [157]. The contrast in findings may be due to differences in the transport networks between the two geographical locations.

Singleton [137] distinguished between *operating* modes of transport (i.e. cycling and driving), that require the individual to consciously navigate the vehicle, and *non-operating* modes of transport (i.e. walking, public transport, and being a car passenger). The study found operating modes to score more highly on *attentiveness* and levels of *distress* and lower on positive deactivation scores. The paper suggests that whilst *attentiveness* might typically relate to positive affect, in a travel context it may be more negative, with those operating a vehicle and interacting with other road users undergoing a stressful experience, potentially degrading their well-being. Singleton posits that this may explain why SWB is often found to be highest for those walking/ cycling and lower for drivers; walking is both a non-operating and a physically active mode (a positive), while driving is both an operating and a physically inactive mode (a negative).

Intervention studies on commuting and well-being predominantly focus on changes to the mode of transport used. A large-scale UK-based study that utilised the British Household Panel Survey (BHPS) data found switching from car to active travel to be associated with improvements in SWB when compared to maintaining car travel [95]. The BHPS collected data over 18 years; when it came to an end in 2009, participants were invited to partake in the successor project, Understanding Society [140]. Chatterjee and colleagues analysed six years of Understanding Society data and found that there are short-term SWB benefits of switching from driving to active commuting, but that these effects were not sustained long-term (at 12 and 24 months) [20]. A smaller scale intervention carried out at one UK-based workplace found that employees who changed their behavior from passive commuting to active commuting for a few weeks - using electrically assisted bikes (e-bikes) provided to them for the intervention - reported more positive affect than those who continued to commute using passive modes [116].

Focusing on promoting public transport, a small scale intervention study carried out amongst the staff at the Massachusetts Institute of Technology involved providing 74 habitual car commuters with a one-month public transport pass [2]. They found that immediately after the intervention, the average satisfaction of those that switched to public transport increased significantly. The increase was not completely maintained several months after the intervention, however, commute satisfaction did remain at a higher level than before it began.

The greatest effect was found to occur with those who were initially dissatisfied with their commute; even six months after the switch, dissatisfaction with the commute was found to have been almost eliminated.

A similar intervention [3] carried out in Sweden found that none of the participants - who had used public transport two or three times during a given week for the study - completely switched from their usual car commute to public transport. Some participants did, however, continue to use public transport occasionally. Schemes designed to shift behaviours from car commuting to a more sustainable mode of transport found greater success with active modes of transport. In a study of 547 participants in the Netherlands, 62% of commute trips were undertaken by car prior to the e-bike intervention; this dropped to 28% after one month and 24% after six months of the intervention [30].

Whilst there are some differences in the findings regarding associations between different commuting modes and SWB, the principle that commute mode is an important factor in determining SWB is undisputed in the literature. Therefore, all of the studies presented in this thesis account for commute mode; the data is either split into appropriate transport mode groups, such as active and passive modes, and analysed separately, or the study focuses on individuals who commute using a single mode.

2.2.2 Commute Time

Associations between commute time and commute well-being have been assessed in numerous ways. This section begins by providing an overview of studies that focus on actual commute time, before then discussing the concepts of ideal commute time and teleporting, and concluding with an exploration of relative commute times.

Commute Time and SWB

Commute time has largely been shown to be negatively correlated to SWB. This has been found to be true in studies conducted across varying geographical locations and utilising a broad range of SWB measures. Some of these studies are outlined in this section; this is not an exhaustive overview of the extensive literature, rather it highlights the key findings and nuances in the discussion regarding the relationship between commute time and SWB.

In Korea, the Seoul Survey Data (SSD) which consisted of 185,100 participant responses was found to show negative correlation between commute time and life satisfaction [76]. A study of 713 commuters in Sweden found negative correlation between commute time and scores for the STS [114]. A second study carried out in Sweden, using 520 survey responses, also found that commute time was negatively correlated to STS scores, however, whilst

this was found to be true for all three components of the STS for the journey to work, it was only significant for the cognitive evaluation component for the commute home from work [44]. Assessing Statistics Canada’s General Social Survey (Cycle 24), consisting of 3409 participants after filtering to those in employment and who commute by car, found that longer commute times were correlated to lower levels of life satisfaction [69]. Similarly, Stutzer and Frey [148] also found that those with longer commute times report lower life satisfaction in their study that utilised data from the German Socio-economic Panel Study (GSOEP).

In China, the 2014 China Labour-Force Dynamics Survey (CLDS 2014), containing data from 13,261 individuals, was used to show that longer commute times were correlated to lower levels of happiness [166]. Another study conducted in China, using the China Family Panel Studies (CFPS) which contained 4117 entries that included commute time data, found longer commute times to be associated with a decrease in both happiness and life satisfaction [105]. Using the Daily Activity and Travel Survey of Beijing 2012, Mao and colleagues [94] found longer commute times to be correlated to lower commute satisfaction for those using motorised vehicles; however, the relationship was insignificant for those using active modes of transport, this could be due to individuals’ enjoyment of the mode of transport itself [142], with one study finding active commuters to express a desire to commute for longer [122].

Numerous studies have focused on the United States. One study carried out using the American Time-Use Survey (ATUS) data, containing 2367 commuting episodes that met the study’s criteria for inclusion, found longer commutes to be associated with higher levels of stress, lower levels of happiness and greater reported sadness [147]. Another study, which also utilised the ATUS data, found more time spent commuting to relate to higher levels of stress and fatigue during the commute [62]. A study conducted using the Gallup–Healthways survey, which consisted of data from 338,172 individuals, tested the relationship between commute time and two separate measures of SWB: happiness, and a more comprehensive index that accounted for both cognitive evaluations and experienced well-being. Both measures of SWB were found to be negatively correlated to commute time [22].

One United States based study, however, found commute time not to correlate to SWB. Analysing 3800 commuting episodes from the ATUS dataset, Morris and Zhou [102] found commute time to not be associated with the composite affect metric that they created using the six individually recorded ratings for happiness, sadness, stress, fatigue, pain, and a sense of meaning. The methods used in this study differed to those that used the same dataset and found significant associations between commute time and SWB; in the studies mentioned earlier, the six affect measures were assessed individually

whereas in this study they were combined to form a single variable. This may account for the difference in findings.

In the UK, in 2011, Roberts and colleagues [125] used the Understanding Society data to find commute time to be negatively correlated to psychological health, using the 12-item General Health Questionnaire (GHQ) score. In 2014, Feng and Boyle [48] also used the Understanding Society data and GHQ scores to demonstrate the negative correlation, however, they found this to only hold true for female commuters. They suggested that this may be due to women undertaking a greater share of household duties and child care, making them more sensitive to delays caused by long journeys. A third study to use the Understanding Society dataset, conducted by Dickerson and colleagues in 2014 [36], did not find commute time to be associated with SWB. They had used responses to a question regarding life satisfaction as their measure of SWB, rather than the GHQ, and attributed the disparity in findings to this difference in methodology. Similarly, in their study using the Understanding Society data in 2020, Clark and colleagues found commute time to be negatively correlated to GHQ scores but longer commute times were not associated with lower overall life satisfaction [23].

Whilst some nuance exists, overall, commute time has been found to be a significant characteristic of the commuting experience that should be accounted for when considering SWB.

Ideal Commute Time and Teleporting

Time spent commuting is not viewed as being wholly undesirable by commuters. Numerous studies that asked commuters to indicate their ideal commute time found non-zero averages. The first study to introduce the concept of the ideal commute time and determine what this figure might be was carried out by Redmond and Mokhtarian in 2001 [124]. They discussed the importance of distinguishing between an individual's desired or ideal commute time and the amount they are willing to commute. The ideal commute time was intended to represent the individual's desired commute time without regard to their existing constraints. The wording of the question was chosen to reduce response bias: *"Some people may value their commute time as a transition between work and home, while others may feel it is stressful or a waste of time. For you, what would be the ideal one-way commute time?"*

The study assessed survey responses from 1300 individuals within the San Francisco Bay Area and found the average ideal commute time to be 16 minutes. Only 1.2% of their sample reported an ideal commute time of zero minutes, with another 0.6% reporting an ideal commute time from one to four minutes. Redmond and Mokhtarian considered that these findings may affirm

their concern that participants were disclosing a *realistic ideal* rather than an unconstrained ideal. To explore this, they held two focus groups in which they again asked participants to express their ideal commute time and then probed those with non-zero responses to elaborate on their preference. Some of the participants mentioned that they did not realise that zero would be an acceptable answer, but few indicated that they would change their answer to zero if given the chance. On the contrary, after hearing some individuals describe why they provided a non-zero response, some participants who had originally indicated an ideal commute time of zero requested to change their answer. This study introduced the concept of the ideal commute time, as well as some of the main issues with collecting this data; the authors posit that the conceptual idea of the ideal commute time holds but that care should be taken to clarify its remit to study participants.

In the same year, Mokhtarian published a second paper - this time with Saloman [99] - that included the earlier study reporting 16 minutes as the ideal commute time and extended the discussion. This study introduces the “teleportation test”, expressed as “*if you could snap your fingers or blink your eyes and instantaneously teleport yourself to the desired destination, would you do so?*” Whilst the test is not included in the survey reported on in the paper, the authors suggest that it could aid in determining which of the three distinct elements the individual’s expressed affinity for travel derives from: the activity at the destination, activities carried out whilst travelling, or the activity of travelling itself.

The teleportation test was employed by Jain and Lyons in 2008 when they put it to the six focus groups that comprised their study sample [75]. They reported that the majority of those who had rejected the opportunity of zero travel time explained that they did so because they valued the transition time provided by the commute. Similarly to Redmond and Mokhtarian, they found that some of the participants who had initially espoused the idea of teleportation reviewed their position, agreeing that the transition time was a benefit that they too enjoyed.

A study of 832 employees in North Carolina in 2012 reported an average ideal commute time of 19 minutes [83]. They had asked the survey participants the open ended question: “*How much time would it ideally take to get from your home to your main place of work (in minutes)?*” In 2015, Milakis and colleagues found the ideal commute time to be 18 minutes on average in their study conducted in Berkeley, California [98]; this study did not specify the wording of the survey question. In 2020, survey responses from 833 employees in Xi’an, China were assessed to find an ideal commute time of 20 minutes [162]; this study did not specify the wording of the survey question. Humagain and Singleton [72] reported an ideal commute time of 14 minutes in their survey

of 628 commuters in Portland, Oregon, in 2020. They had posed the question: *“Suppose that you could live as close to work (or work as close to home) as you want to, and use any transportation mode. For example: You could live where you work and have a 0-min commute. For you, what would be your ideal one-way commute travel time?”* The wording makes it clear that zero is a valid response to the question.

Ideal commute time, and the teleportation test, provide insights into the desirability of the commute and where an individual’s expressed affinity for travel derives from. The literature emphasises the importance of clearly defining the concept of the ideal commute time, and explicitly instructing participants not to take into account the feasibility of their preference.

Relative Commute Time

Attitudes regarding commute times have been shown to be related to an individual’s previous experiences, as well as comparison to others.

A study that assessed survey data collected from 1300 commuting workers in three San Francisco Bay Area neighbourhoods found that an individual’s perception of the amount of commute travel they undertake may be influenced by what proportion of their overall travel it constitutes. In other words, those who often spend a lot of time travelling long distances will be less sensitive to the amount of commute travel they experience [115].

In New York City, a study of 56 commuters found that the more unpredictable the commute to work by train, the greater the levels of stress experienced by commuters [46]. Past experiences of the commute informs an individual’s expectations for the future; when the commute fails to meet these expectations - is unpredictable - this has been shown to negatively impact their experienced well-being.

Using the US-based household survey, the Panel Study of Income Dynamics (PSID), Simonsohn [136] showed that when people move home, the average commute time that an individual experienced in the city from which they have moved affects their choice of commute in the new city that they move to.

The idea that an individual’s preferences are influenced by their previous experiences is not novel. Seventeenth century philosopher, John Locke [87], was one of the first to document the basic logic of the contrast effect; he noted that lukewarm water can feel cold or hot depending on whether one’s hand has previously touched hot or cold water. The studies presented above demonstrate some of the ways in which this effect is observed within the commuting context.

Individuals’ evaluations being made in comparison to others is a well-established concept in psychology, with Leon Festinger first proposing social comparison theory in 1954 [49]. Using survey data collected from 594 individuals

residing across numerous countries (with the majority from the United States), Abou-Zeid and Ben-Akiva [1] assessed how perceived differences between an individual's own commute attributes and those of others affects their comparative happiness and, consequently, their overall commute satisfaction. They found that people whose commute was shorter than others' commutes viewed their situation more favorably (downward comparison) and feel happier or less stressed. This greater comparative happiness led to increased commute satisfaction. Based on semi-structured telephone interviews with 24 commuters in the United States, Wilhoit [159] found that participants framed their commutes relative to other commutes; for example, being grateful that theirs was shorter than a friend's or a previous commute they had experienced.

A study of 3377 commuters in Montreal, Canada, explored the determinants of commute satisfaction [142]. They found that individuals who agreed more with the statement *"my family and I have similar travel habits"* were significantly more satisfied with their commute. In other words, how one's family travels can influence an individual's commute experience. The authors suggest that this may be due to people rating their satisfaction in relation to what other people around them do.

Commute time is an important characteristic to consider when evaluating SWB. Perceptions of this commute time, based on relative appraisals, have been shown to also warrant consideration.

2.2.3 Other Commuting Characteristics

The relationships between a range of other commute-related factors and SWB have been explored in the literature. This section provides a brief overview of some of these.

Activities Whilst Commuting

Productive use of commute time was found to increase CWB in a study of 828 commuters in Portland, Oregon, in the United States [139]. Similarly, another study conducted in Portland, using 682 survey responses, found the perceived usefulness of the journey to be positively associated with scores on the STS and commute affect [137].

Ettema and colleagues [44] discuss how the relationship between activities carried out during travel and travel satisfaction (measured using the STS) is not straightforward, based on their study of 520 commuters in Sweden. Activities may be undertaken not to make the trip more pleasant but to achieve satisfaction in other life domains at other times, such as working on the commute home to save time for more enjoyable activities in the evening. The impact of different activities may also depend on the individual's mindset.

For example, talking to other passengers was found to be correlated to only a higher cognitive evaluation on the trip to work but to higher scores on all three STS dimensions (cognitive evaluation, positive activation and positive deactivation) on the way back home; in other words, talking to others did not make commuters more relaxed or enthusiastic on the way to work, but it did do so on the way back home. Activities associated with entertainment during the commute to work (reading, gaming, listening to music), and relaxation during the commute from work (sleeping, resting, gazing outside or at fellow travelers), were found to be correlated with lower scores on all three of the STS dimensions. The authors suggest the most likely explanation to be that engagement in these activities is an indicator of boredom or stress, which these activities partially alleviate.

Activities that facilitate multitasking benefits were found to potentially also simultaneously yield disadvantages in a study using data from a travel survey of approximately 2500 commuters in Northern California [133]. For example, using a phone was found to increase the likelihood of having both hedonic and productive advantages while also increasing the probability of experiencing cognitive disadvantages. The authors speculate that the negative effect may stem from a range of different sources including dissatisfaction with the activities being performed, dissatisfaction with the quality with which they are being performed, dissatisfaction with the way the time is being used, or fragmented attention.

Wilhoit [159] describes how commuting provides valuable and meaningful time that allows individuals both time to themselves and time to pursue activities they cannot otherwise do. During the semi-structured telephone interviews with 24 commuters living in metro areas of major cities within the United States, Wilhoit found that individuals engaged in chosen activities that were personal and that they felt they had no time for at work or home. Commuting was found to serve an important function by providing an excusable outlet for activities such as reading for pleasure, listening to the radio, or daydreaming, which may be important for upholding work and social structures but often do not have a place within them. Activities undertaken during the commute were found to often be different, or framed as being different, to those carried out during the rest of the day, and to represent *“a sense of control, autonomy, routine, and pleasure”*.

Travel Companion

There is general consensus within the literature that travelling with a companion is beneficial to the commuting experience. Kahneman and colleagues [77] [78] showed that the morning and evening commutes ranked as two out of the

three lowest activities for overall affect, out of a total of 19 daily activities. If commuting with a companion, however, the average net affect experienced during episodes of commuting was found to rise to that of the overall average level, indicating the influence of social contact.

Schaeffer and colleagues [131] conducted a series of tests on 46 workers residing in the United States finding that commuters who drove alone experienced significantly greater feelings of anxiety and hostility after their commute than carpool drivers. A study of 2720 diaries from commuters in the Netherlands found happiness when commuting with someone to be higher on average compared to mood when commuting alone [84]. Using data from 4412 survey responses in Davis, United States, Handy and Thigpen [66] showed that driving with others offers a higher quality commute; whilst it is equally as stressful as driving alone, time spent commuting is less likely to be seen as wasted time. In their critical overview of the literature, Chatterjee and colleagues conclude that commute-related SWB increases when travelling with company [21].

2.2.4 Socio-Demographic Factors

A range of socio-demographic characteristics have been shown to be associated with SWB and commuting behaviours. Many are included as control variables in commuting studies. Differences in the commuting experience between men and women has been the focus of numerous studies. Thus, these are presented first, followed by a discussion of papers regarding the other key factors.

Sex

Numerous studies have focused on differences to the commuting experience between men and women. Some have found these differences to be related to preferences; for example, a study that surveyed 432 workers in Iran found that women had a greater desire to walk to and from work than men [67]. Others have found the differences to be related to the composition of the commute, with women typically making shorter commutes. Dissanayake found this to be true using data for 6175 commute trips conducted over a nine year period in Iran [41]. Sandow [130] came to the same conclusion in their study conducted using longitudinal data collected by Statistics Sweden across four years: 80,869 commuters in 2003, 79,940 in 2001, 66,606 in 1996 and 67,925 in 1991. Sandow goes on to suggest that women's shorter commutes reflect the different set of constraints that they make decisions under compared to those of men; by choosing a workplace close to home, women may be attempting to combine wage earning with the ability to deal with emergencies, such as a child falling ill and needing to be picked up from school.

Commuting was shown to have a detrimental effect on the psychological

health (measured using the GHQ) of women, but not men, in a study conducted using observations from 15,077 individuals taken from the BHPS dataset in the United Kingdom [125]. Roberts and colleagues explored some of the potential explanations for the gender difference and suggested that it was not due to women's shorter working hours or weaker occupational position since the finding still holds for samples restricted to full-time workers, those in professional or managerial and skilled occupations, and those who are primary wage earners. Considering family circumstances, the study found that women are adversely affected whether or not they are single or living as a couple, and also even when they do not have children, although the size of the estimated effect is smaller in the latter case. The study attributes the adverse affect of commuting on the psychological health of women to their greater responsibility for day-to-day household tasks - including childcare and housework - that makes them more sensitive to time spent commuting.

Similarly, a study using data from 5,216 participants from the BHPS dataset found that long journeys to work were associated with increased risks of mental distress (measured using the GHQ), but only for women [48]. Feng and Boyle also found that women who live with children, either as lone parents or as a couple, reported elevated stress levels in comparison with their peers living only with a partner and spending a similar amount of time commuting. They suggest that this provides support for their proposition that household responsibilities are likely to be a major reason why long commuting has detrimental effects on mental health for women.

A study comprising of 4412 survey responses in Davis, United States, found that women experience lower quality commutes and break this down to three dimensions: more stress, more sense that travel time is wasted time, and less liking of their transport mode [66].

Age

Increases in age were found to correlate to greater likelihood of an individual having a longer commute, in a study carried out using survey data from 1187 residents in London, United Kingdom [164]. Zhao and colleagues suggest that this might be related to the different stages in an individual's life and their evolving lifestyle.

Commute satisfaction was shown to increase with every additional year in age for pedestrians, cyclists, drivers and metro users, although the effect sizes were small, in a study of 3377 commuters in Montreal, Canada [142]. Conversely, drivers were found to be more likely to report higher stress levels for every year increase in age in a study using data from 879 residents across the United States [71].

Other Factors

For male, older, higher-income and higher-educated people, using active modes of transport for commuting - walking and cycling - was found to be conducive for mood, specifically happiness; this did not hold true for the female, younger, lower-income and lower-educated study participants. Lancée and colleagues [84] speculate that this finding from their study, conducted using 2720 diaries from commuters in the Netherlands, can be explained by differences in lifestyle and location of residence.

A study conducted in Portland, Oregon, with 682 survey respondents, assessed the modal determinants of multidimensional commute well-being, utilising three types of travel well-being measures: travel affect, travel eudaimonia and the STS [137]. People of "non-white, including multiple, races or ethnicities" were found to have higher scores for the travel affect measure of "fear" on average. In contrast, the travel eudaimonia "confidence" construct was positively associated with low-income and non-white race/ ethnicity variables. The study also found younger travelers, those with graduate degrees, and people living with a greater number of older adults had lower ratings for the travel eudaimonia measure of "autonomy".

Hilbrecht and colleagues [69] found that more highly educated workers had longer commutes than individuals with a high school education or less; the study was conducted using a subsample of 3563 individuals from the Statistics Canada's General Social Survey, Cycle 24. Using survey data from 1140 individuals in Switzerland, Beige and Axhausen [11] found that respondents who held a college or university degree tended to change their mode of transport for commuting more frequently; they were also found to relocate, both the places of residence and occupation, more often. Additionally, the size of the household was found to have an overall stabilizing effect on the likelihood of the occurrence of variations in the place of residence, place of employment, ownership of mobility tools (taken to be a car or public transport season ticket with a long-term commitment), and the mode of transport used for the commute.

2.3 Value of Commuting

Time spent commuting is not a disutility to be minimised, but rather there is an optimum that should be achieved, concluded Redmond and Mokhtarian [124], based on their study using 1300 survey responses in the San Francisco Bay Area; it is possible to commute too little as well as too much. Thus, there exists some value to the activity of commuting. One study described commuting as "therapeutic" [64] whilst another found its study participants to

frame their commute as being “*meaningful and invaluable*” [159]. This section explores the numerous ways in which the commute has been shown to play a role in individuals’ lives and to hold value.

Based on focus group discussions in the UK, Jain and Lyons [75] posit that positive utility may be derived from two forms of travel time experience: travel as transition time, and as time out. Each of these areas is explored in turn. In their paper, Jain and Lyons found the commute to manifest as **transition time** in two ways: (1) physical distance covered and time elapsed to achieve a sense of distance and difference, and (2) time to mentally prepare and undergo the role change. A study of 1900 San Francisco Bay Area residents found that more than a third view their commute trip to be a useful transition [99]. Using diary studies, in-depth interviews, accompanied journeys and group discussions, the Connected Places Catapult [18] found the commute to be a “*valuable marker of change*”, a differentiator or buffer between work and home life. They suggest that the commute provides time to ease into and out of different mindsets. Based on semi-structured interviews with 24 commuters in the United States, Wilhoit [159] describes the commute as being transition time that allows individuals to switch between the roles and identities associated with work and home, intentionally process the day, decompress and mentally transition between the events of their “*first life*” to their “*second life*”, and to de-stress during this characteristically routine and predictable daily activity.

In the commuting context, Jain and Lyons [75] explain that **time out** refers to the time and space away from obligations associated with either work life or home life. The commute protects and legitimises time out; time that can be spent on an activity, such as reading or calling a friend, or doing “*nothing*” by just resting or daydreaming. The authors conclude that whilst their participants experienced the commute as time out in different ways, it was clearly enjoyed and desired for this role. A study utilising responses from semi-structured interviews with 18 commuters in the UK highlighted the importance of the commute providing personal space, time alone without intrusions [93]. The Connected Places Catapult study describes the commute as a chance to “*get away from work, family, or worries and enjoy some ‘me time’*” [18]. Wilhoit [159] reports that many attributed their enjoyment of the commute to the opportunity it provides for alone time. The commute represented a break from “*the need to perform an identity*” and the social altogether.

Conversely, others valued their commute precisely because of the **social time** it provides. Wilhoit reports [159] that the protected nature of commute time, with no other obligations, allowed individuals to develop strong friendships with fellow commuters, or to strengthen their existing relationships over the phone. This was also found to be a valuable aspect of commuting in the

Connected Places Catapult study [18]; the commute facilitated relationship building by providing time for catching up, getting to know one another better, team building, or for squeezing in conversation with family into otherwise busy schedules.

During their commute, individuals reported that they partake in **activities** that they *choose* to do [159]; the activities represented “*a sense of control, autonomy, routine, and pleasure*”. Often these activities reflected the transitional nature of the commute, belonging neither to the purview of the individual’s role at home nor at work, making it difficult to find time for them in either of these spaces. Lyons and colleagues found that 42% of commuters spend most of their travel time reading for leisure, and only 13% spend most of their time working or studying; their survey used data from over 11,500 commuters in Great Britain in 2004 [90]. Mokhtarian and Salomon [99] propose that an individual’s expressed affinity for travel is a composite of the positive utility of three distinct but related elements: (1) activities that can be conducted whilst travelling - engaging in activities or “*anti-activity*” (the absence of activity), such as relaxing or mentally preparing for what lies ahead; (2) activities conducted at the destination - confounding the appeal of the destination with the journey undertaken to reach it; and (3) the activity of travelling itself.

The activity of **travel itself** has some intrinsic value. Mokhtarian and Salomon [99] describe the sensation of speed, scenic beauty, and movement through - and exposure to - the environment as possible explanations. Individuals sometimes choose to extend their travel time to enjoy these benefits. The Connected Places Catapult [18] study refers to this value area as “*exposure to the wild*”. It explores the excitement of travelling - the “*hubbub*” of a busy train station - as well as exposure to people that an individual may not normally encounter and to different aspects of society. Study participants described how they enjoy people-watching, listening in on other peoples’ conversations, or observing how people dress.

It would be remiss for a discussion on the value of commute time to not mention the subset of commuters who find no value in the activity, and view it simply as **wasted time** [18] [75]. Lyons and colleagues [90] found commuters are more likely to consider their time to be wasted than those travelling for business or leisure. A study using ATUS data from 10,031 commuters in the United States found commuting to be viewed as having “*very little meaning*” [147].

Chapter 3

Commuting Comparison to Other Daily Activities

3.1 Introduction

In recent years, much insight into the psychological consequences of commuting has been generated by studies utilising variants of Day Reconstruction Methods (DRMs) for data collection [78]. In a typical DRM methodology, respondents are asked to recall activities and experiences of the preceding day and then rate them on a range of affective-evaluative dimensions. Unlike most global measures of subjective well-being, DRMs reduce retrospective bias, which can occur if people are merely asked to describe their “typical” commuting experience [147]. Similarly, DRMs reduce practical difficulties associated with fully experiential methods, in which data are collected from participants in real time. Crucially, data collected with DRMs allow for comparisons of the psychological impact of distinct events that occupy one’s day.

Collectively, DRM studies have shown that commuting, in comparison to other daily activities, is detrimental to one’s psychological well-being. Using a convenience sample of 1018 women, Kahneman et al [78] found that out of 28 daily activities, commuting events were rated as the least positive in affect. In another study, White and Dolan [158] showed that out of 18 daily activities, only shopping, housework and work were found to be less pleasurable than commuting. Stone and Schneider [147] utilised the American Time Use Survey (ATUS) data and showed that commuting episodes were rated highly on stress and tiredness but low on meaningfulness dimensions. Finally, Bryson and MacKerron [15] found that commuting ranked as 34th and 35th out of 40 activities in terms of happiness and feelings of relaxation. In this particular study, data were collected using experiential sampling, where participants were asked to report on their feelings of happiness, relaxation and alertness when prompted to do so by a mobile app. Out of all four studies reported

above, only the work of Bryson and MacKerron [15] was conducted with the UK population. As discussed in their paper, however, their sample was not representative of the UK population; those using the mobile phone application were wealthier and younger than the general public, with greater proportions being in full time employment or education. Key features of these four studies are summarised in Table 3.1.

To date, no research has investigated whether carrying out the activity of commuting affects the enjoyment of other activities. A related study carried out in Sweden found that emotional responses during commutes have residual effects on mood immediately after the commute but not later in the day [57]. In this study, participants completed three questionnaires: before the commute, immediately afterwards and one hour after the commute. Thus, the study assessed the time duration for which the residual effects are experienced; the study did not relate the effect of commuting to other specific daily activities.

The overall aim of the present study was to examine the experienced well-being effects of commuting in the United Kingdom, in terms of how it compares to, and impacts on, other daily activities. This aim was addressed by two objectives. The first was to compare experienced well-being, in terms of enjoyment, across different daily activities reported on by the respondents in the UKTUS. By doing so, previous findings were replicated using a new dimension of well-being (i.e. enjoyment) with a representative sample of the UK population. The second objective was to compare how the experienced well-being of various activities differs between workdays on which commuting is undertaken and workdays on which participants did not commute to/ from work.

3.1.1 Chapter Structure

Section 3.2 details the methods, defining the study variables and describing the plan for analyses. Section 3.3 presents the results of both sets of analyses and these are discussed in Section 3.4. Section 3.5 concludes the chapter, summarising the key findings and contributions of the study.

Table 3.1: Key features of the previous studies that have compared daily activities based on their subjective well-being effects

Paper Authors; Year	Sample	Items
Kahneman <i>et al.</i> ; 2004	Convenience sample of 1018 employed women in Texas, USA	12 Affect Descriptors Grouped Into Five Categories: (1) Positive: Happy, Warm/Friendly, Enjoying Myself, (2) Negative: Frustrated/Annoyed, Depressed/Blue, Hassled/Pushed Around, Angry/Hostile, Worried/Anxious, Criticised/Put Down, (3) Competent, (4) Impatient, (5) Tired
White and Dolan; 2009	625 participants recruited via Web-based Internet panel run from a German university	Six Feeling Items: (1) Happy, (2) Nervous/Anxious, (3) Sad/Depressed, (4) Content/Relaxed, (5) Frustrated, (6) Impatient For It To End. Six Thoughts/Evaluations Items: (1) Focused, (2) Engaged, (3) Competent/Able. Felt the Activity Was (4) Worthwhile and Meaningful, (5) Useful to Other People, (6) Helped Me Achieve Important Goals. One Overall Episode Satisfaction Question
Stone and Schneider; 2016	American Time Use Survey. Representative sample of 37,088 individuals living in the US	Six Well-Being Variables: Happy, Sad, Tired, Pain, Stress, Meaning
Bryson and MacKerron; 2017	Mappiness smartphone app. More than one million observations from tens of thousands of individuals in the UK	Three Dimensions of Momentary Well-Being: How Happy, How Relaxed, How Awake

NOTE: Kahneman *et al.* utilised five measures of subjective well-being: the items listed under positive were averaged to obtain an overall indication of how positive the experience was, and similarly, the items listed under negative were averaged to obtain an overall indication of how negative the experience was. White and Dolan created a measure of how pleasurable the experience was by subtracting the mean of the four negative feeling items from the mean of the two positive feeling items; a reward scale was also created by averaging the scores for the six thoughts/evaluations items. Stone and Schneider, and Bryson and MacKerron, did not combine items in their studies.

3.1.2 Contributions

The study presented in this chapter addresses Research Question 1 outlined in Section 1.1: How does commuting compare with, and impact on, the enjoyment of other daily activities?

This study was conducted in two parts. Firstly, the study aimed to understand how commuting compares to a range of other daily activities in terms of experienced subjective well-being, namely enjoyment. This was the first study to carry out this analysis with a sample that was representative of the UK population. Secondly, the study assessed differences in the enjoyment of other daily activities between workdays on which individuals commuted to work and workdays on which individuals did not commute to work. This was the first study to investigate whether carrying out the activity of commuting affects the enjoyment of other activities.

The study presented in this chapter was published in the peer-reviewed Elsevier journal, *Travel Behaviour and Society*, in 2018 [4] and has since been cited by six papers.

3.2 Methods

3.2.1 Participants

The UK Time Use Survey (UKTUS) was utilised for this study. It was conducted by NatCen and the Northern Ireland Statistics and Research Agency (NISRA) on behalf of the University of Oxford's Centre for Time Use Research (CTUR). UKTUS data was collected between April 2014 and December 2015 from a representative sample of individuals and private households across the UK.

The data consisted of three main components: household interviews, individual questionnaires and diaries. Participants' diaries contained records for every ten minutes over a 24-hour period. They were asked to note down their primary and secondary activities, who they were with, where they were, whether they were using a smartphone/ tablet/ computer, and their enjoyment rating for each activity.

Both objectives of the study focused on the subgroup of the UK population who are employed; the sample was therefore limited to individuals who stated that they were in employment. The entire UKTUS dataset was also filtered to include only those episodes (1) for which an enjoyment rating had been noted, (2) that took place on a weekday, and (3) that took place on a day classified as a *workday*. Full details on the UKTUS dataset are provided in Section A.1.

In summary, the study was conducted on data from 1944 participants, corresponding to 3078 workdays and 101,505 episodes. Sample characteristics,

for both the full UKTUS sample and the filtered dataset, are presented in Table 3.2.

3.2.2 Study Variables

Subjective Well-Being

The diaries, DRM data, contained an enjoyment rating for each episode undertaken by the participant, on a scale from 1 (not at all) to 7 (very much). Details on the collection of this data are provided in Section A.1. The enjoyment ratings were taken to be the measure of subjective well-being utilised in this study. UKTUS only contains ratings for this one positive affect measure. The scope of the study, therefore, does not extend beyond positive experienced well-being to include negative affect or the other aspects of subjective well-being, namely evaluative well-being and eudaimonic well-being.

Commuting Episodes

Commuting episodes were grouped into those undertaken using passive (non-physically exerting) modes of transport (i.e. car driver, car passenger, train, bus, van and tram/ underground) and those using active modes of transport (i.e. walking and cycling). Categorising commutes based on the transport mode provides a more nuanced understanding of the activity than just a single broad commuting category. The use of passive and active modes of transport to split the commutes creates easily understandable groups and actionable findings that would allow, for example, individuals to adapt their own behaviour and for organisations to promote transport plans that enhance well-being amongst their employees. Splitting the data in this way makes results regarding other activities more meaningful, for example, the level of exertion required in the commute may have a direct impact on the level of engagement in other active activities, such as *Sports and Outdoor Activities*.

Control Variables

The multilevel models controlled for the fixed effects of age, sex, educational attainment, country of birth, relationship status, self-reported disability, self-reported health, interview mode, economic activity status and UK region [52] [101].

The models also controlled for the participant’s usual working location, time spent on commuting during the day, duration of the episode being rated and time spent on the activity during the day up to the current point. The final variable accounts for changes in enjoyment that may occur due to the episode representing, for example, the 100th minute of the activity; this would not

Table 3.2: UKTUS Sample Characteristics

	UKTUS	Filtered UKTUS for Present Study
Number of Participants	9,388	1,944
Age		
Age Range	8–99	17–83
Average Age	44	43
Education Level		
Degree or Higher	2,082	633
Higher Education	1,309	350
A-Level or Equivalent	1,525	381
Secondary	2,266	465
Employment Status		
Self Employed	701	327
Paid Employment	3,879	1,617
Unemployed	324	–
Retired	2,032	–
Full-Time Student	619	–
Marital Status		
Single, Never Married	1,948	392
Married/Cohabiting	5,071	1,359
Divorced/Widowed	1,321	190
Number of Children		
No Children	5,767	1,190
1 Child	1,440	340
More than 1 Child	2,181	414
Self-Reported Health		
Very Good	3,414	776
Good	3,818	864
Fair	1,591	272
Bad	439	27
Very Bad	117	2
Long Term Health Problems or Disabilities		
No	6,203	1,431
Yes	3,154	506

NOTE: Number of participants in each of the demographic categories in the full UKTUS dataset and the filtered dataset used for the present study.

be captured by episode duration if the activity is split into multiple episodes throughout the day.

3.2.3 Study Design

There were two parts to the study: (1) comparison of experienced well-being between commuting and other daily activities, and (2) assessing differences in enjoyment of other daily activities between workdays on which individuals commuted to work and workdays on which individuals did not commute to work.

When conducting the first set of analyses, active commuting and passive commuting are treated as two separate activities to be compared with other daily activities. This part of the study focused on activity episodes; each activity episode was considered independently, the composition of the day on which each episode occurred was insignificant. The analysis comprised of comparisons in mean experienced well-being values across the different activities.

In the second part of the study, episodes occurring on commuting workdays were split into those occurring on days when the commute was carried out using passive modes of transport, those occurring on days when the commute was carried out using active modes of transport and those occurring on days when the commute was carried out using both passive and active modes of transport. Details of the data split up in this way are presented in Table 3.3.

Regression analysis was carried out for the second set of analyses, using R [123]. Multilevel models were adopted to account for the nested nature of the data, as multiple individuals could originate from the same household. There were three sets of models, one for each of the three commuting workday groups, and separate models were built for each activity (e.g. employment, study, volunteering). A variable indicating whether the activity was conducted on a day when the individual commuted was added to the dataset. Thus, for each activity, the model indicated the effect of commuting (as opposed to not commuting) on the enjoyment rating.

The models took the form:

$$Y_{ij} = \beta_{0j} + \beta_{1j}X_{ij} + \beta_{2j}C_{ij} + u_{ij}$$

where

- Y_{ij} = Enjoyment Rating for the i^{th} Individual from the j^{th} Household;
- X = Whether the Individual Commuted on that Day;
- C = Control Variables;
- u = Regression Error Term.

Table 3.3: Summary of the filtered data used in the present study

Number of:	Commuting Workdays	Non-Commuting Workdays	Total
Passive Modes			
Workdays	1,282	435	1,717
Episodes	40,227	13,141	53,368
Commuting Episodes	3,112	–	3,112
Active Modes			
Workdays	227	435	662
Episodes	7,091	13,141	20,232
Commuting Episodes	508	–	508
Both Active & Passive Modes			
Workdays	264	435	699
Episodes	9,689	13,141	22,830
Commuting Episodes	1,465	–	1,465

NOTE: Table presents a breakdown of the (1) number of workdays; (2) total number of episodes; and (3) specifically the number of commuting episodes, that were included in the final dataset. These are split by whether they occurred on commuting workdays or non-commuting workdays, and whether they were attributed to individuals who normally commute using (1) passive modes of transport; (2) active modes of transport; or (3) both passive and active modes of transport.

3.3 Results

3.3.1 How Commuting Compares To Other Daily Activities

The first objective of this study was to compare the subjective ratings of enjoyment of all activities within the UKTUS dataset. Each Level of activity categorisation was assessed in turn. Results for the Level 1 analysis addressing this objective are plotted in Figure 3.1.

The results show that commuting by passive modes of transport ranked as the least enjoyable daily activity with the mean enjoyment rating of 4.45 ($SD = 1.51$). Commuting carried out using active modes of transport, however, ranked fourth from the lowest. More significantly, the mean enjoyment rating of 4.77 ($SD = 1.46$) was 0.32 points higher, on the scale of 1 to 7, than the corresponding figure for passive modes.

Travel, for non-work related purposes, was rated as considerably more enjoyable than commuting; 0.56 points and 0.24 points higher than passive and active commuting respectively. *Employment* ranked second from the lowest, 0.27 points higher than worst placed passive commuting but not significantly lower, in terms of average rating, than active commuting.

Mean enjoyment ratings for Level 2 and Level 3 activities, for which there

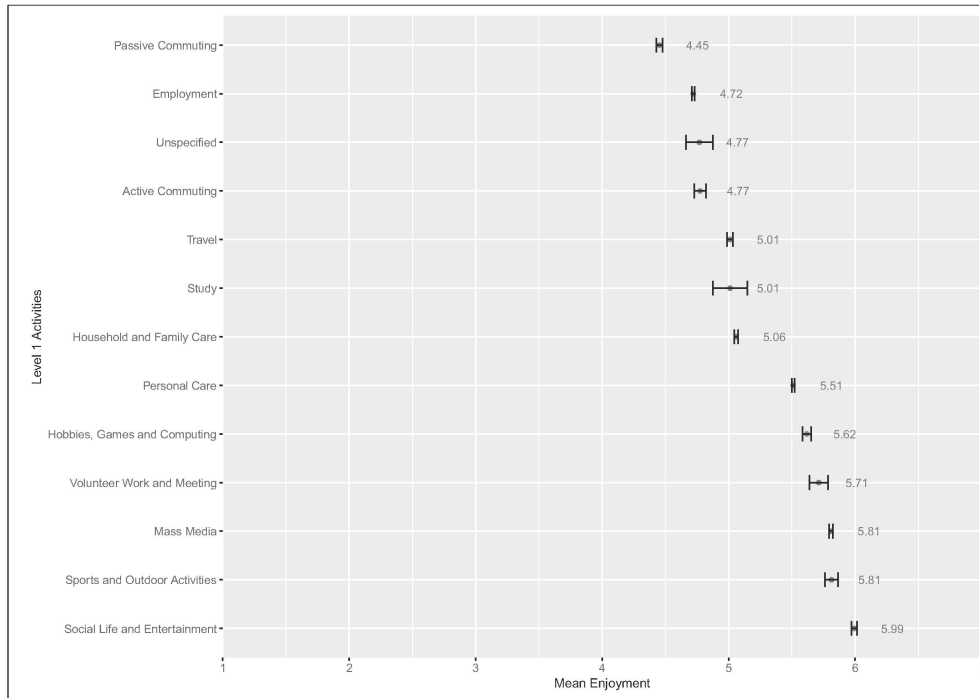


Figure 3.1: Mean enjoyment ratings by Level 1 activity.

NOTE: Error bars indicate one standard error. Enjoyment was measured on a scale from 1 (not at all) to 7 (very much). Plot includes all Level 1 activities, as well as the categories of *Passive Commuting* and *Active Commuting* (combinations of the three commuting Level 3 activities), for which there were at least 100 recorded episodes. The activity *Travel* does not include commuting trips.

were at least 100 recorded episodes, are presented in Figure 3.2 and Figure 3.3 respectively. At Level 2 analysis, only the *Making and Care for Textiles* – which includes laundry and ironing – and *Unspecified Household and Family Care* categories, ranked lower than passive commuting; mean enjoyment ratings for all remaining activities were higher. Active commuting ranked seventh from the lowest.

At Level 3 analysis, all three passive commuting categories had at least 100 recorded episodes and were included in the analysis; only one of the active commuting categories was included in the analysis. The lowest ranking Level 3 commuting activity was for passive modes of transport and ranked third from lowest, with *Personal Services* and *Ironing* ranking lower, as can be seen in Figure 3.3. The other two Level 3 passive commuting activities ranked as 8th and 14th from the worst. The Level 3 active commuting category ranked 19th from the worst, out of a total of 57 activities.

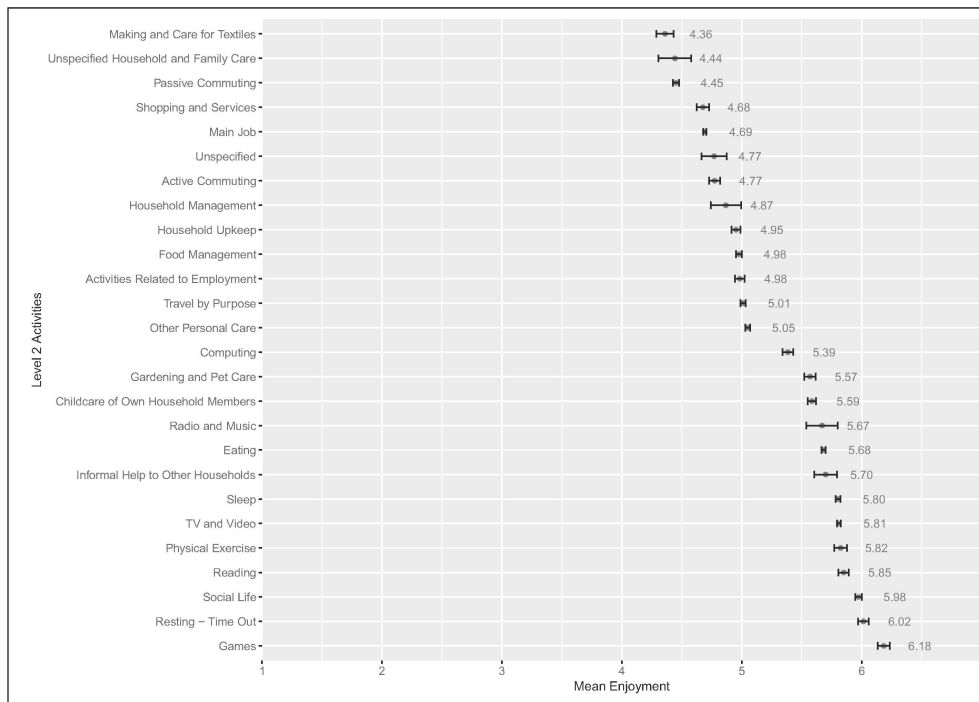


Figure 3.2: Mean enjoyment ratings by Level 2 activity.

NOTE: Error bars indicate one standard error. Enjoyment was measured on a scale from 1 (not at all) to 7 (very much). Plot includes all Level 2 activities for which there were at least 100 recorded episodes.

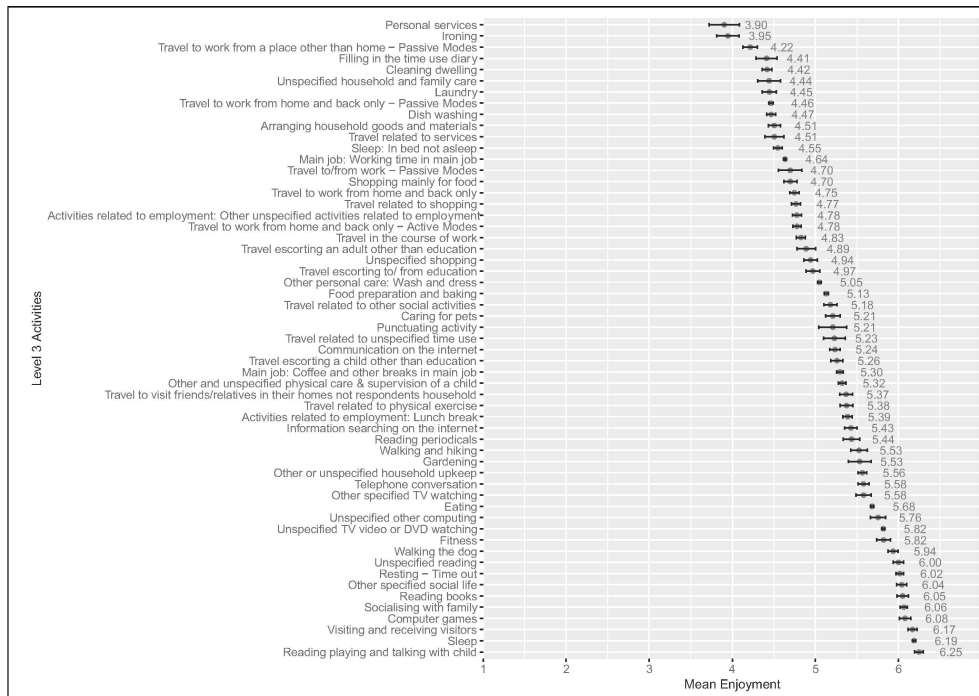


Figure 3.3: Mean enjoyment ratings by Level 3 activity.

NOTE: Error bars indicate one standard error. Enjoyment was measured on a scale from 1 (not at all) to 7 (very much). Plot includes all Level 3 activities for which there were at least 100 recorded episodes.

3.3.2 Commuting Vs Non-Commuting and Enjoyment of Daily Activities

In order to compare the effect of commuting against the effect of not commuting on the enjoyment ratings for all other daily activities, a series of multilevel analyses using R [123], lmerTest [82] and boot [17] were conducted. This section presents the results of this analysis for activities that were coded on Level 1 and Level 2 only; Level 3 activities were not included in this analysis because of the small number of observations in individual activity categories.

Workday Composition For Level 1 Activities

To gain a better understanding of the typical day on which (1) no commuting took place, (2) commuting took place using passive modes of transport, (3) commuting took place using active modes of transport, (4) and commuting took place using both passive and active modes of transport, the frequency of each Level 1 activity occurring for each of these groups was plotted in Figure 3.4. Visibly, the proportion of overall activities accounted for by each Level 1 activity is relatively equal for all four groups. The most notable differences are that (1) a greater proportion of activities occurring on non-commuting workdays are classified as travel, and (2) commuting workdays (especially those workdays on which commuting took place using both passive and active modes of transport) comprise of a larger proportion of employment related activities.

3.3.3 Level 1 Multilevel Analysis

Mean enjoyment ratings for each of the Level 1 activities for episodes occurring on days on which the commute was carried out using passive modes, active modes and both passive and active modes are presented in Table 3.4. Only Level 1 activities that have at least 100 recorded episodes for both commuting workdays and non-commuting workdays were included in the analysis.

Using a series of multilevel analyses, the impact of commuting to/ from work on the enjoyment of each of the other Level 1 activities was analysed. The results of the analyses for episodes occurring on days when commuting was carried out using passive modes, on days when commuting was carried out using active modes and on days when commuting was carried out using both passive and active modes are presented in Figure 3.5, Figure 3.6 and Figure 3.7 respectively.

The values in the figures are the estimated coefficients for commuting; they indicate the size of the effect that commuting has on the enjoyment rating when all other variables are held constant. Non-commuting workdays were assigned as the reference group in the models; thus, the bars indicate how much higher or lower the enjoyment ratings for each activity are for workdays when

Table 3.4: Descriptive statistics of the enjoyment ratings for Level 1 activities, for both commuting workdays and non-commuting workdays, for (1) passive modes of transport; (2) passive modes of transport; and (3) both passive and active modes of transport.

Level 1 Activities	Number of Episodes		Mean (Standard Error) of Enjoyment Ratings		Difference
	Commuting	Non-Commuting	Commuting	Non-Commuting	
Passive Modes of Transport					
Employment	9556	2591	4.73 (0.01)	4.95 (0.03)	0.21*
Hobbies, Games and Computing	787	352	5.55 (0.05)	5.44 (0.07)	0.12
Household and Family Care	6439	2710	5.08 (0.02)	5.01 (0.03)	0.06
Mass Media	3582	1185	5.80 (0.02)	5.81 (0.03)	-0.01
Personal Care	11,651	3783	5.51 (0.01)	5.64 (0.02)	0.13*
Social Life and Entertainment	1630	610	5.97 (0.03)	5.92 (0.05)	0.05
Sports and Outdoor Activities	355	137	5.83 (0.06)	5.96 (0.09)	-0.13
Travel	2686	1580	5.00 (0.03)	4.99 (0.04)	0.02
Volunteer Work and Meeting	200	109	5.85 (0.09)	5.39 (0.16)	0.46*
Active Modes of Transport					
Employment	1436	2591	4.74 (0.04)	4.95 (0.03)	0.20*
Hobbies, Games and Computing	204	352	5.99 (0.08)	5.44 (0.07)	0.55*
Household and Family Care	1294	2710	5.05 (0.04)	5.01 (0.03)	0.04
Mass Media	663	1185	5.87 (0.05)	5.81 (0.03)	0.06
Personal Care	2156	3783	5.53 (0.03)	5.64 (0.02)	0.10*
Social Life and Entertainment	368	610	6.08 (0.06)	5.92 (0.05)	0.16*
Travel	346	1580	4.96 (0.08)	4.99 (0.04)	-0.03
Both Passive and Active Modes of Transport					
Employment	2156	2591	4.69 (0.03)	4.95 (0.03)	0.26*
Hobbies, Games and Computing	157	352	5.33 (0.10)	5.44 (0.07)	0.11
Household and Family Care	1348	2710	4.92 (0.04)	5.01 (0.03)	0.09
Mass Media	723	1185	5.68 (0.04)	5.81 (0.03)	0.13*
Personal Care	2630	3783	5.32 (0.03)	5.64 (0.02)	0.32*
Social Life and Entertainment	379	610	5.93 (0.06)	5.92 (0.05)	0.01
Travel	657	1580	4.92 (0.06)	4.99 (0.04)	0.06

* indicates statistical significance at the $p < 0.05$ level

NOTE: Only activities that have at least 100 recorded episodes for both commuting workdays and non-commuting workdays are included in the table.

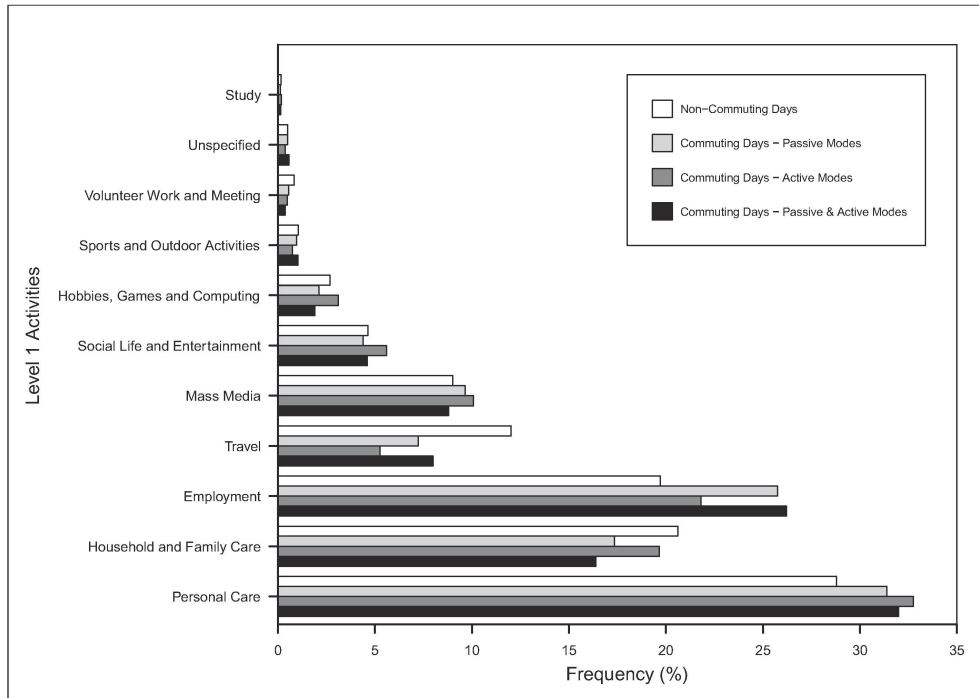


Figure 3.4: Proportion of episodes attributed to each Level 1 activity category. NOTE: For each of the four subsets of the UKTUS data utilised in the present study, the proportion of the overall episodes that are classified as each of the Level 1 activities are presented. For example, across the episodes that comprise the Non-Commuting Days dataset, approximately 12% are categorised as Travel and 20% as Employment.

passive and active transport modes were used for commuting compared to non-commuting workdays. The values are based on the same 1–7 scale as the enjoyment ratings. When looking at the activity *Personal Care*, for example, this activity is enjoyed 0.19 points less, on a rating scale of 1–7, on workdays when both passive and active modes of transport are used for commuting than on workdays on which no commuting takes place, when all other factors (age, sex, employment etc.) are held constant. This was the only meaningful difference that resulted from the model analysis at Level 1.

3.3.4 Level 2 Multilevel Analysis

Mean enjoyment ratings for each of the Level 2 activities for episodes occurring on days on which the commute was carried out using passive modes, active modes and both passive and active modes are presented in Table 3.5, Table 3.6 and Table 3.7. Only Level 2 activities that have at least 100 recorded episodes for both commuting workdays and non-commuting workdays were included in the analysis.

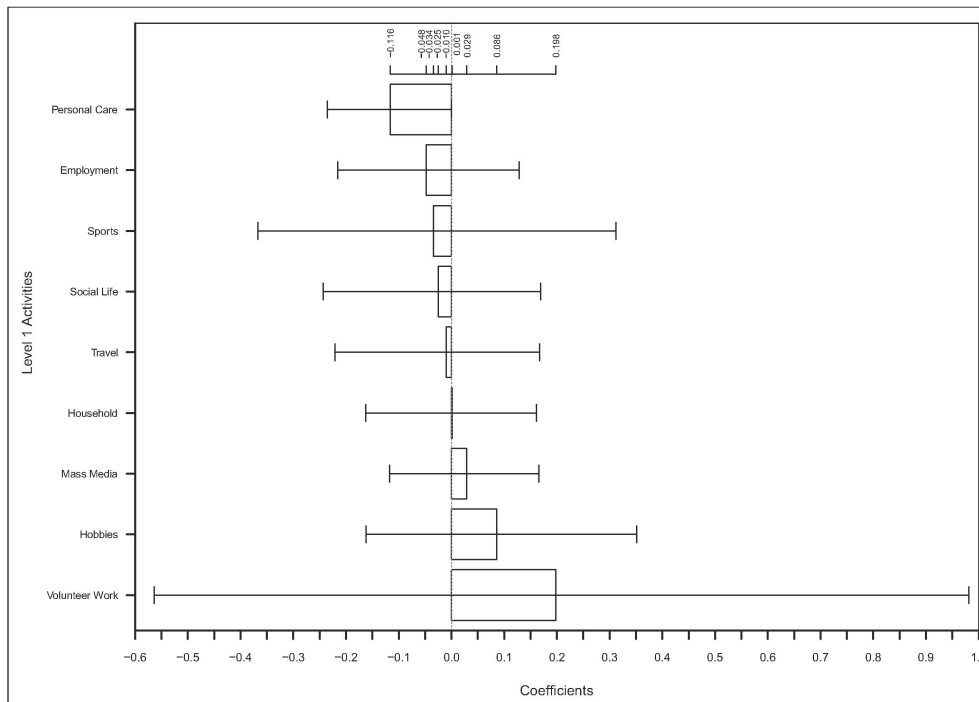


Figure 3.5: Difference in enjoyment ratings for Level 1 activities between non-commuting workdays and workdays on which commuting is undertaken using passive modes of transport, based on multilevel analysis.

NOTE: Error bars indicate bootstrapped confidence intervals. The estimated coefficients for commuting are presented; they indicate the size of the effect that commuting has on the enjoyment rating when all other variables are held constant. Non-commuting workdays were assigned as the reference group in the models; thus, the bars indicate how much higher or lower the enjoyment ratings for each activity are for workdays when passive transport modes were used for commuting compared to non-commuting workdays. The values are based on the same 1–7 scale as the enjoyment ratings. Meaningful differences are indicated by grey-shading of the bars.

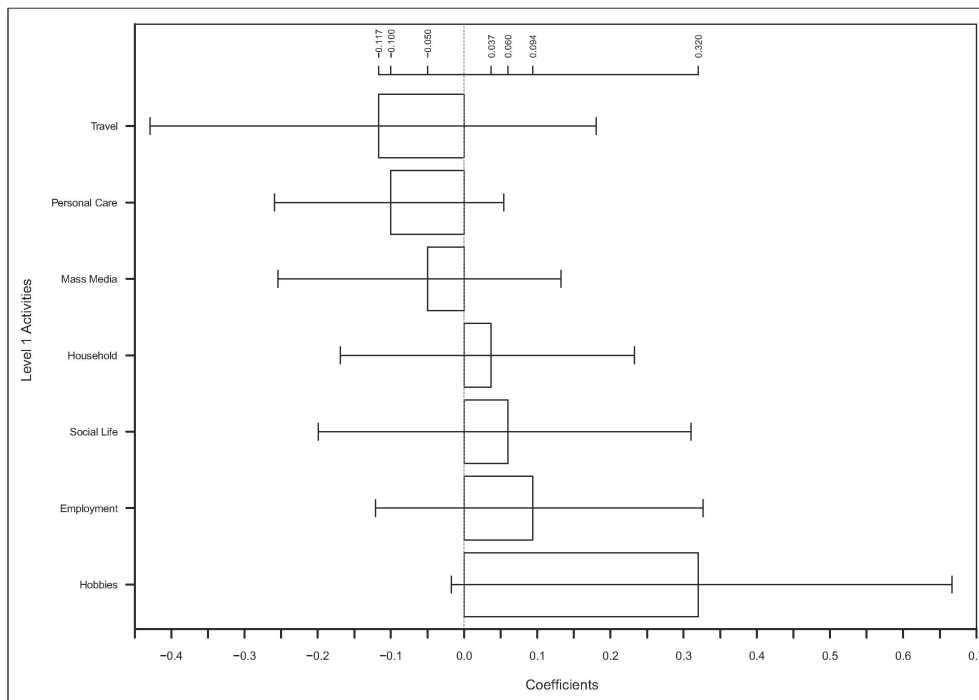


Figure 3.6: Difference in enjoyment ratings for Level 1 activities between non-commuting workdays and workdays on which commuting is undertaken using active modes of transport based on multilevel analysis.

NOTE: Error bars indicate bootstrapped confidence intervals. The estimated coefficients for commuting are presented; they indicate the size of the effect that commuting has on the enjoyment rating when all other variables are held constant. Non-commuting workdays were assigned as the reference group in the models; thus, the bars indicate how much higher or lower the enjoyment ratings for each activity are for workdays when active transport modes were used for commuting compared to non-commuting workdays. The values are based on the same 1–7 scale as the enjoyment ratings. Meaningful differences are indicated by grey-shading of the bars.

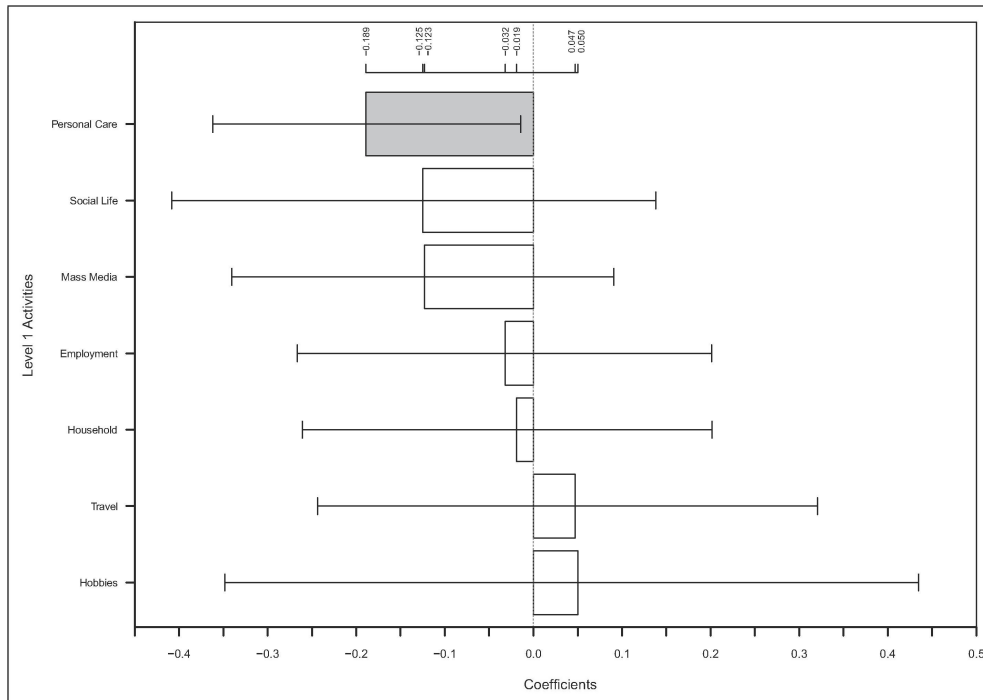


Figure 3.7: Difference in enjoyment ratings for Level 1 activities between non-commuting workdays and workdays on which commuting is undertaken using both active and passive modes of transport based on multilevel analysis. NOTE: Error bars indicate bootstrapped confidence intervals. The estimated coefficients for commuting are presented; they indicate the size of the effect that commuting has on the enjoyment rating when all other variables are held constant. Non-commuting workdays were assigned as the reference group in the models; thus, the bars indicate how much higher or lower the enjoyment ratings for each activity are for workdays when both active and passive transport modes were used for commuting compared to non-commuting workdays. The values are based on the same 1–7 scale as the enjoyment ratings. Meaningful differences are indicated by grey-shading of the bars.

Table 3.5: Descriptive statistics of the enjoyment ratings for Level 2 activities, for both commuting workdays and non-commuting workdays, for passive modes of transport.

Level 2 Activities	Number of Episodes		Mean (Standard Error) of Enjoyment Ratings		Difference
	Commuting	Non-Commuting	Commuting	Non-Commuting	
Activities Related to Employment	855	133	4.98 (0.05)	5.01 (0.14)	-0.03
Childcare of Own Household Members	1010	458	5.66 (0.04)	5.38 (0.07)	0.28*
Computing	556	265	5.32 (0.06)	5.26 (0.08)	0.06
Eating	3511	1290	5.67 (0.02)	5.79 (0.03)	-0.12*
Food Management	2345	880	4.99 (0.03)	5.03 (0.05)	-0.04
Gardening and Pet Care	622	256	5.62 (0.06)	5.57 (0.08)	0.06
Household Upkeep	1272	491	4.96 (0.05)	4.83 (0.07)	0.13
Main Job	8690	2446	4.71 (0.02)	4.95 (0.03)	-0.24*
Making and Care for Textiles	328	135	4.45 (0.09)	4.57 (0.14)	-0.12
Other Personal Care	3933	1104	5.05 (0.03)	5.12 (0.05)	-0.08
Physical Exercise	343	134	5.83 (0.07)	6.02 (0.09)	-0.18
Reading	399	132	5.78 (0.06)	6.05 (0.08)	-0.26*
Resting - Time Out	484	176	6.05 (0.06)	5.75 (0.10)	0.30*
Shopping and Services	572	280	4.63 (0.06)	4.58 (0.10)	0.05
Sleep	4205	1389	5.82 (0.02)	5.91 (0.04)	-0.09
Social Life	1107	408	5.93 (0.04)	5.96 (0.06)	-0.03
Travel by Purpose	2686	1580	5.00 (0.03)	4.99 (0.04)	0.02
TV and Video	3096	1026	5.81 (0.02)	5.79 (0.03)	0.02

* indicates statistical significance at the $p < 0.05$ level

NOTE: Only activities that have at least 100 recorded episodes for both commuting workdays and non-commuting workdays are included in the table.

Table 3.6: Descriptive statistics of the enjoyment ratings for Level 2 activities, for both commuting workdays and non-commuting workdays, for active modes of transport.

Level 2 Activities	Number of Episodes		Mean (Standard Error) of Enjoyment Ratings		Difference
	Commuting	Non-Commuting	Commuting	Non-Commuting	
Activities Related to Employment	147	133	4.99 (0.11)	5.01 (0.14)	-0.02
Childcare of Own Household Members	250	458	5.58 (0.09)	5.38 (0.07)	0.20
Computing	127	265	5.60 (0.11)	5.26 (0.08)	0.34*
Eating	656	1290	5.77 (0.05)	5.79 (0.03)	-0.02
Food Management	468	880	5.04 (0.06)	5.03 (0.05)	0.01
Household Upkeep	270	491	4.84 (0.09)	4.83 (0.07)	0.01
Main Job	1281	2446	4.71 (0.04)	4.94 (0.03)	-0.23*
Other Personal Care	733	1104	5.06 (0.06)	5.12 (0.05)	-0.06
Resting - Time Out	138	176	6.05 (0.10)	5.75 (0.10)	0.30*
Sleep	766	1389	5.79 (0.06)	5.91 (0.04)	-0.12
Social Life	215	408	6.14 (0.07)	5.96 (0.06)	0.18
Travel by Purpose	346	1580	4.96 (0.08)	4.99 (0.04)	-0.03
TV and Video	562	1026	5.86 (0.05)	5.79 (0.03)	0.07

* indicates statistical significance at the $p < 0.05$ level

NOTE: Only activities that have at least 100 recorded episodes for both commuting workdays and non-commuting workdays are included in the table.

Table 3.7: Descriptive statistics of the enjoyment ratings for Level 2 activities, for both commuting workdays and non-commuting workdays on which commuting took place using both passive and active modes of transport.

Level 2 Activities	Number of Episodes		Mean (Standard Error) of Enjoyment Ratings		Difference
	Commuting	Non-Commuting	Commuting	Non-Commuting	
Activities Related to Employment	203	133	5.05 (0.10)	5.01 (0.14)	0.04
Childcare of Own Household Members	256	458	5.44 (0.09)	5.38 (0.07)	0.06
Computing	110	265	5.09 (0.12)	5.26 (0.08)	-0.17
Eating	785	1290	5.58 (0.04)	5.79 (0.03)	-0.21*
Food Management	490	880	4.82 (0.06)	5.03 (0.05)	-0.21*
Household Upkeep	252	491	4.81 (0.09)	4.83 (0.07)	-0.02
Main Job	1937	2446	4.64 (0.03)	4.95 (0.03)	-0.30*
Other Personal Care	932	1104	4.89 (0.05)	5.12 (0.05)	-0.23*
Shopping and Services	139	280	4.65 (0.12)	4.58 (0.10)	0.07
Sleep	913	1389	5.54 (0.06)	5.91 (0.04)	-0.37*
Social Life	278	408	6.03 (0.06)	5.96 (0.06)	0.07
Travel by Purpose	657	1580	4.92 (0.06)	4.99 (0.04)	-0.07
TV and Video	615	1026	5.65 (0.04)	5.79 (0.03)	-0.14*

* indicates statistical significance at the $p < 0.05$ level

NOTE: Only activities that have at least 100 recorded episodes for both commuting workdays and non-commuting workdays are included in the table.

A series of multilevel analyses were carried out for each of the Level 2 activities that had at least 100 recorded episodes for both commuting workdays and non-commuting workdays. The model covariates were the same as those used for the Level 1 analysis. The results of the analyses for episodes occurring on days when commuting was carried out using passive modes, on days when commuting was carried out using active modes and on days when commuting was carried out using both passive and active modes are presented in Figure 3.8, Figure 3.9 and Figure 3.10 respectively.

Level 2 analysis echoed the results of Level 1 analysis, finding that activities in the category of *Other Personal Care* were enjoyed less on workdays on which commuting took place using both passive and active modes of transport than on non-commuting workdays. At Level 2 analysis, this is also true for workdays on which commuting occurred using only passive modes of transport. The more granular Level 2 analysis also found *Sleep* to be enjoyed less on workdays on which the commute took place using both passive and active modes of transport than on non-commuting workdays. No meaningful difference in enjoyment, across any of the daily activities, was found between workdays on which commuting took place using active modes of transport and non-commuting workdays.

Finally, in order to test whether commuting leads to a decrement of the overall enjoyment one derives from all activities in a day, the average enjoyment rating across all activities that occurred on non-commuting workdays, workdays on which passive commuting took place, workdays on which active commuting occurred and workdays on which commuting occurred using both passive and active modes were compared. Non-commuting workdays had an average enjoyment rating of 5.31, passive commuting workdays had an average rating of 5.19, active commuting workdays had an average rating of 5.29 and workdays that comprised of both passive and active commuting had an average rating of 5.01 (standard errors of .013, .008, .017 and .015 respectively). The median values for the enjoyment ratings were 5 for all four groups. As such, overall enjoyment was lower on workdays on which both active and passive commuting occurred than the other groups. Active commuting workdays and non-commuting workdays were found to be the most enjoyable overall with negligible differences between the two.

3.4 Discussion

This study explored the relationship between commuting and experienced well-being in the context of other daily activities in the UK. Firstly, the activity of commuting was compared to other daily activities, in terms of their experienced well-being, here represented by the enjoyment ratings of those

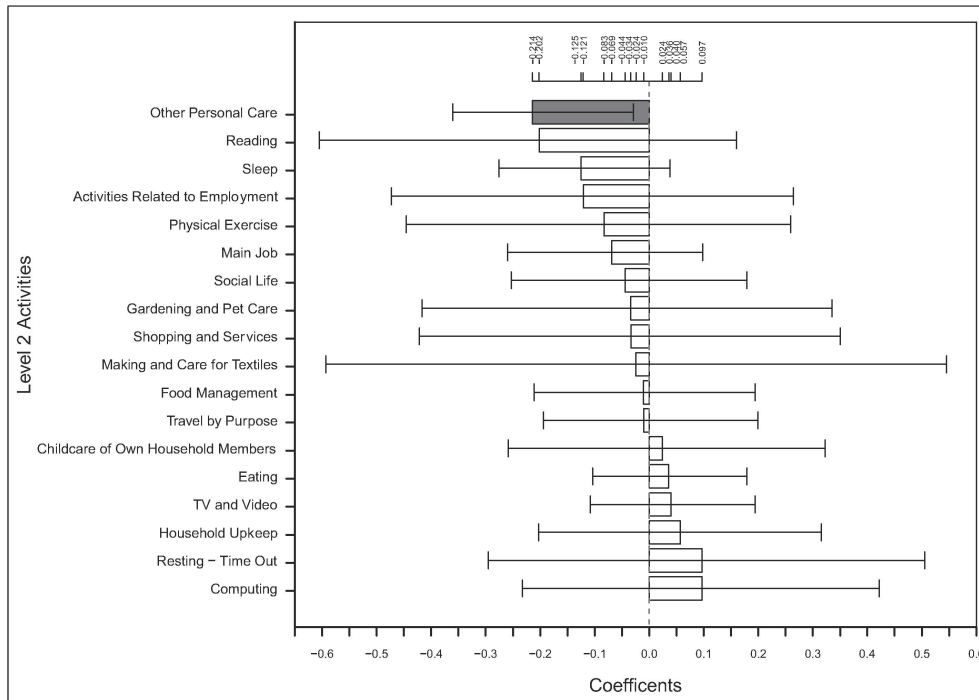


Figure 3.8: Difference in enjoyment ratings for Level 2 activities between non-commuting workdays and workdays on which commuting is undertaken using passive modes of transport, based on multilevel analysis.

NOTE: Error bars indicate bootstrapped confidence intervals. Analysis was carried out for each of the Level 2 activities that had at least 100 recorded episodes for both commuting workdays and non-commuting workdays. The estimated coefficients for commuting are presented; they indicate the size of the effect that commuting has on the enjoyment rating when all other variables are held constant. Non-commuting workdays were assigned as the reference group in the models; thus, the bars indicate how much higher or lower the enjoyment ratings for each activity are for workdays when passive transport modes were used for commuting compared to non-commuting workdays. The values are based on the same 1–7 scale as the enjoyment ratings. Meaningful differences are indicated by grey-shading of the bars.

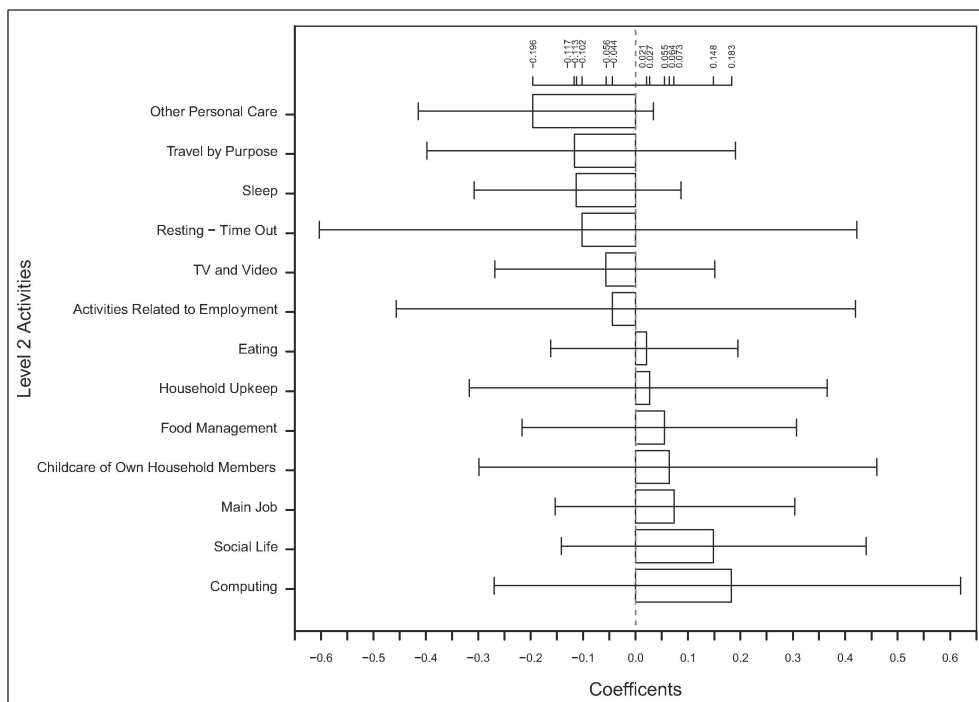


Figure 3.9: Difference in enjoyment ratings for Level 2 activities between non-commuting workdays and workdays on which commuting is undertaken using active modes of transport, based on multilevel analysis. Error bars indicate bootstrapped confidence intervals.

NOTE: Error bars indicate bootstrapped confidence intervals. Analysis was carried out for each of the Level 2 activities that had at least 100 recorded episodes for both commuting workdays and non-commuting workdays. The estimated coefficients for commuting are presented; they indicate the size of the effect that commuting has on the enjoyment rating when all other variables are held constant. Non-commuting workdays were assigned as the reference group in the models; thus, the bars indicate how much higher or lower the enjoyment ratings for each activity are for workdays when active transport modes were used for commuting compared to non-commuting workdays. The values are based on the same 1–7 scale as the enjoyment ratings. Meaningful differences are indicated by grey-shading of the bars.

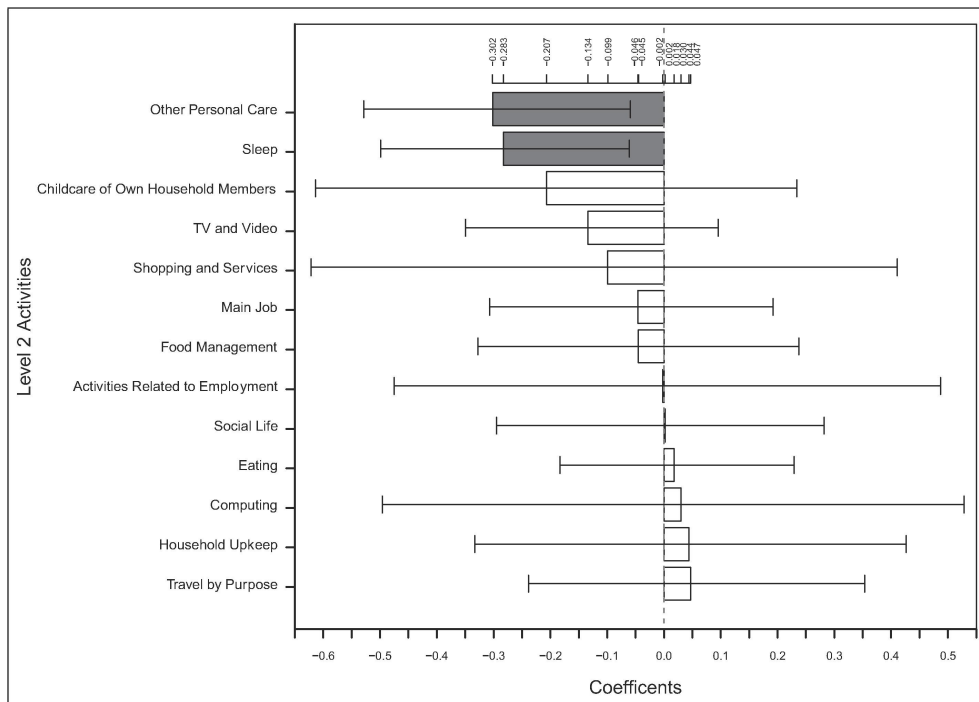


Figure 3.10: Difference in enjoyment ratings for Level 2 activities between non-commuting workdays and workdays on which commuting is undertaken using both active and passive modes of transport, based on multilevel analysis. Error bars indicate bootstrapped confidence intervals.

NOTE: Error bars indicate bootstrapped confidence intervals. Analysis was carried out for each of the Level 2 activities that had at least 100 recorded episodes for both commuting workdays and non-commuting workdays. The estimated coefficients for commuting are presented; they indicate the size of the effect that commuting has on the enjoyment rating when all other variables are held constant. Non-commuting workdays were assigned as the reference group in the models; thus, the bars indicate how much higher or lower the enjoyment ratings for each activity are for workdays when both active and passive transport modes were used for commuting compared to non-commuting workdays. The values are based on the same 1–7 scale as the enjoyment ratings. Meaningful differences are indicated by grey-shading of the bars.

activities. Secondly, the effect of commuting was assessed by comparing the experienced well-being of other daily activities between workdays on which commuting took place using passive modes of transport, on which commuting took place using active modes of transport, on which commuting took place using both passive and active modes of transport and on which commuting did not take place. The results for each part of the study are discussed in turn.

3.4.1 How Commuting Compares To Other Daily Activities

Commuting was found to be the least enjoyable daily activity, when using passive modes of transport and when assessed at the most coarse level of activity categorisation. This is in agreement with Kahneman and colleagues [78], who also found commuting to be the least enjoyable daily activity, and with Stone and Schneider [147] who found commuting to be the worst ranked activity for the meaningfulness and happiness dimensions. Here, active commuting ranked fourth from the lowest; and whilst this ranks commuting as one of the least enjoyed activities, the mean enjoyment rating for the activity was significantly greater than that for passive commuting.

Taking a more granular look, *Passive Commuting* ranked 24th out of 26 daily activities. Whilst this is similar to the findings of White and Dolan [158], in our study only *Making and Care for Textiles* and *Unspecified Household and Family Care* ranked lower. Both of these activities correspond to the single activity of *Housework* within the White and Dolan study, who also found *Shopping and Work* to rank lower than commuting for ratings of pleasurable-ness. *Active Commuting* ranked 20th out of the 26 daily activities in our study.

In the previously reported results based on UK data, Bryson and MacKerron [15] found commuting to rank 34 out of 40 activities on their measure of happiness. The results of the present study, with commuting workdays split into passive and active modes, highlight the negative role of passive commuting. This is significant as this study was the first to carry out this analysis using data that is representative of the UK population. However, this result should be interpreted with caution since our dependent variable was different from that used by Bryson and MacKerron.

Each of the four papers that assessed the experienced well-being effects of daily activities used different, albeit related, activity categories; these were listed in Table 3.1. Three of the papers included a table of mean affect ratings for each activity. For comparative purposes, the activities included for each of these three papers have been grouped, where possible, to produce broader categories that are present across all three studies, detailed in Table 3.8; each of the studies contained additional activities that did not correspond to activities contained within the other studies and were omitted from this exercise. The

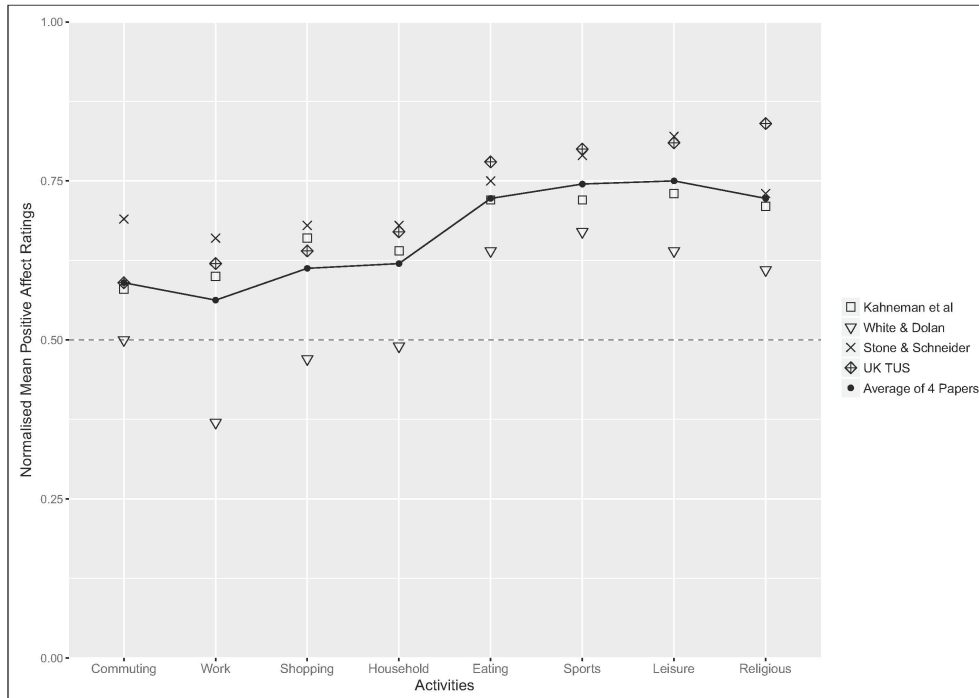


Figure 3.11: Mean positive affect ratings for comparative activity categories for three previous studies and the present study.

NOTE: Normalised mean positive affect ratings are presented for each of the eight newly formed activity categories detailed in Table 3.8. The average of the scores from all four studies is also plotted. The activities are ordered based on the ratings achieved according to our UKTUS study.

mean positive affect ratings for the eight newly formed activity categories for the three studies, as well as the present UKTUS study, are presented in Figure 3.11. The average of the scores from all four studies is also plotted. The activities are ordered based on the ratings achieved according to our UKTUS study. To keep the data structure in line with the other studies, the UKTUS ratings were not split into passive commuting and active commuting for this analysis.

Each of the studies posed the question assessing the degree to which the emotion was experienced on a scale from *not at all* to *very much/ very strongly*. Thus, the mean positive affect rating of 0.5 represents a neutral response to the question. The majority of the affect ratings were greater than 0.5 and only ratings obtained from the White and Dolan study fell below 0.5, as can be seen in Figure 3.11. This indicates that the individuals surveyed in these studies generally enjoyed/ took pleasure in/ were happy carrying out the activities in their day. The resultant rankings, therefore, allow us to identify the comparative positive affect of each activity, they do not suggest that those ranked at the bottom constitute a negative part of an individual's day.

Table 3.8: Details of the measures and categories used to form comparative activities for the studies that compared daily activities based on their subjective well-being effects.

Paper Authors Year	Measures Used for Comparison	Categories Used to Form Activities Used for Comparison
Kahneman et al. 2004	Average of descriptors within the Positive descriptors category, figures provided in the paper	Commuting: Commuting Work: Working Shopping: Shopping Household: Housework and Preparing Food Eating: Eating Sports: Exercising Religious: Pray/Worship/Meditate Leisure: Relaxing, Watching TV, Computer/Email/Internet, and Socialising
White and Dolan 2009	Average pleasure scores which were derived through affect-balance tradition using the Feeling items, figures provided in the paper	Commuting: Commute Work: Work Shopping: Shopping Household: Housework and Cook Eating: Eat Sports: Exercise and Outdoor Activities Religious: Pray, Meditate Leisure: Rest/Relax, Listen to Music, Watch TV, Read/Use Internet, and Socialise

Paper Authors Year	Measures Used for Comparison	Categories Used to Form Activities Used for Comparison
Stone and Schneider 2016	Happy, figures provided in the paper	Commuting: Work-Bound Commuting, and Home-Bound Commuting Work: Work Shopping: Consumer Purchases Household: Household Activities Eating: Eat Drink Sports: Sports Recreation Religious: Religion Spiritual Leisure: Socialise/Leisure/Relax
Present Study	Enjoyment Ratings	Commuting: Travel to/from Work, Travel to Work from Home and Back Only, and Travel to Work from a Place Other Than Home Work: Employment Shopping: 6 Level 3 Activity Codes Household: 6 Level 2 Activity Codes Eating: Eating Sports: Sports and Outdoor Activities, and Sports Events Religious: Religious Activities, and Resting-Time Out Leisure: 3 Level 1 Activity Codes: (1) Social Life & Entertainment (Except For One Level 3 Activity Code Referring to Telephone Conversations), (2) Hobbies, Games & Computing, and (3) Mass Media

The absolute figures for the ratings achieved, when normalised, are quite similar for three of the studies; only the ratings from the White and Dolan study are significantly lower for each activity category. The lower ratings may be due to cultural differences as it is the only study conducted in Germany; Kahneman *et al.* and Stone and Schneider used data obtained within the US, and the present study is based in the UK. Additionally, each of the studies focused on different subjective well-being dimensions, as detailed in Table 3.1. Differences in affect ratings, therefore, could simply be attributed to the fact that participants were asked to rate their activities on a different dimension.

The rankings obtained from the present study are most similar to those from the earliest study conducted by Kahneman and colleagues. All of the studies ranked *Commuting*, *Work*, *Shopping* and *Household* as the four worst activities in the day in terms of positive affect ratings. The average affect rating for each activity, represented by the line on the graph, shows that, collectively, the studies broadly agree with the rankings obtained in the present study.

3.4.2 Commuting vs Non-Commuting and Enjoyment of Daily Activities

Personal Care is enjoyed more on workdays on which commuting does not take place than on workdays on which commuting takes place using passive modes of transport, according to the multilevel analyses conducted in the second part of this study. The same is true for workdays on which commuting takes place using both passive and active modes of transport; however, in this case, *Sleep* is also found to be less enjoyable than on non-commuting workdays. No meaningful difference was found in the enjoyment experienced on non-commuting workdays compared to workdays on which commuting takes place using active modes of transport for any of the daily activities. Notably, for the vast majority of activities, with the exception of only *Personal Care* activities and *Sleep*, there were no meaningful differences in enjoyment between any of the three commuting workday groups and non-commuting workdays, including *Employment*.

The link between working from home and greater employment related well-being has been well researched with respect to evaluative well-being. Studies have shown that the enhanced perceived autonomy achieved through telecommuting leads to greater job satisfaction [58] [50]. Investigating this relationship at the experienced well-being level has only recently become the focus of research. Anderson, Kaplan and Vega conducted the first of these studies in 2015, finding that employees experience more job-related positive affective well-being and less job-related negative affective well-being on days when teleworking, compared to days when they worked in the office [8]. The

findings of the present study contribute to the growing literature in this field.

This was the first study to compare the experienced well-being effects of daily activities between commuting workdays and non-commuting workdays. The only other similar comparative study was between commuters and non-commuters, conducted by the Office for National Statistics (ONS), which looked at four well-being questions that did not relate to specific activities throughout the day, focusing instead on the day, or life, taken as a whole [52]. One of the findings of that study stated that commuters were less happy than non-commuters. The ONS study grouped participants based on their usual working location whereas the focus of the present study was on workdays on which commuting did, or did not, take place; non-commuting workdays consisted of both those that usually commute to work and those that usually telecommute. Despite the difference in focus, the present study provides findings consistent with the ONS study but also offers a more nuanced perspective: higher levels of enjoyment are experienced on non-commuting workdays than on commuting workdays, however, this only applies to some parts of the day and for workdays that include passive modes of transport for at least part of the commute.

Research has recently begun to focus on employment-related geographical mobility (E-RGM). Cresswell and colleagues [27] explain how this term within *mobilities* research corresponds to “who and what are impacted and implicated” by patterns and variabilities of mobility. Numerous mobilities studies have discussed the theoretical implications of travel; for example, Brömmelstroet and colleagues [150] explored the exposure to social and spatial diversity afforded by different modes of transport and related this to feeling a sense of connectedness. The results of the present study offer quantitative findings that could enrich the research on E-RGM, contributing to a richer understanding of the role of transport for people’s well-being.

3.4.3 Strengths and Limitations

This is the first study to compare the experienced well-being effects of daily activities between commuting workdays and non-commuting workdays, and the first study that is representative of the UK population to explore how commuting compares to other daily activities in terms of experienced well-being. This study is the second study to use Time Use Survey data but the first to use the UK based data; unlike the American dataset, the UKTUS included affect ratings for each activity recorded throughout the day.

Commuting was assessed as a whole in this study, however, distinguishing between the commute to work and the commute from work would have been a useful and informative extension of this work. Previous studies that looked at this more refined classification of commuting, such as the one carried out by

Stone and Schneider [147], found significant differences between the experiential well-being effects of these two activities. This level of analysis was not possible for the present study as the UKTUS data does not contain separate activity codes for each. It is also important to note that whilst the random intercept models used for analysis in this study controlled for observed demographic characteristics, there may be systematic differences that were unaccounted for. The UKTUS queried only one measure of experienced well-being for the daily activities recorded; complimenting this with an additional dimension, preferably a dimension measuring negative affect, would provide a much richer data source for future research.

3.5 Conclusion

The findings of this study add to the growing literature on the relationship between commuting and experienced well-being. Whilst commuting to and from work has been found to be the least enjoyable part of the day when using passive modes of transport and one of the least enjoyable activities when using active modes of transport, significantly more enjoyment is derived from this time when actively commuting. Commuting has been shown to have little impact on an individual's enjoyment of the other daily activities in which they partake. Enjoyment across all daily activities was found to be just as high on active commuting workdays as on non-commuting workdays. With the exception of only *Personal Care* activities and *Sleep*, there were no meaningful differences in enjoyment of any daily activities between any of the three commuting workday groups and non-commuting workdays, including, most notably, *Employment*.

Chapter 4

Subjective Commute Time and Commute Well-Being

4.1 Introduction

One of the key determinants of the impact of commuting on subjective well-being is the commute duration [142] [137] [139]. The average two-way daily commute lasts 57 minutes in the United Kingdom [152] and the relationship between commute duration and associated subjective well-being is inconsistent. Some research has shown that longer commute duration is associated with higher levels of stress, lower subjective well-being, more negative affect and decreased happiness [147] [148] [137]; [105]. On the other hand, Lorenz [88] found affective well-being to be barely influenced by commuting distance, and Gerber et al. [60] showed that commute travel time does not significantly correlate with life satisfaction.

The inconsistent nature of the relationship between commute duration and commute well-being may reflect the importance of relative as well as absolute considerations. It is now well established that evaluative judgments are highly context dependent [121]. That is, most value judgments do not occur in a vacuum, rather they are made in relation to some reference point or comparison set stored in one's memory [144]. Accordingly, satisfaction with the commute duration may depend on how it compares with other commutes that a person has experienced. For example, an individual who commutes for 200 minutes will be more positive about the prospect of a 150 minute long commute than someone whose typical commute lasts 20 minutes.

Understanding the impact of these relative judgements regarding commute time has formed the focus of recent studies. The first study to explore this idea was carried out by Ye and colleagues [162] using survey data from Xi'an, China. In their exploration of the difference between actual and ideal commute time, they found that the size of this difference negatively correlates with

commute well-being, and that this commute time dissonance partially mediates the effect of actual commute time on travel satisfaction. They also found that individuals with negative attitudes towards travel tended to prefer shorter ideal commute times. In a similar vein, Humagain and Singleton [72] found commute time dissonance (actual – ideal) to be significantly negatively associated with satisfaction among commuters in Portland, United States.

Both studies assessed the impact of subjective commute duration on well-being by eliciting individuals' judgement of an ideal commute time. However, the judgment of ideal duration is likely a composite of two separate considerations. On the one hand, most people want to minimize the duration of their commute as they regard it to be the least enjoyable part of their day [78] [4]. On the other hand, judgment of the length of the ideal commute is likely to be relative and scaled in accordance to the actual duration, specific to an individual's personal circumstances.

In the present study, we propose an alternative method of eliciting judgments regarding commute duration. As well as asking participants about their ideal commute time, we also ask what they deem to be an acceptable commute time. Our expectation is that this measure will more accurately reflect the relative considerations that underpin their commute well-being judgements. In other words, acceptable commute time will be less skewed towards the idealised scenario in which the commute is eliminated (ideal duration = 0). Our reasoning is that since acceptable commute time better reflects the realities of the individual's circumstances, it will also be a better indicator of commute well-being. In order to test this hypothesis, we directly compared how the relationship between actual and ideal commute times, and actual and acceptable commute times, correlates with an individual's satisfaction with their commute.

The concept of an acceptable commute time was first introduced by Zhao and colleagues in 2012 [164] who referred to it as the tolerable commute time. In their London based study, they found actual commute time shapes judgements on ideal and tolerable commute times, whilst judgements on tolerable and ideal commute time influence decisions that result in the actual commute time. The concept was further explored by Milakis and colleagues in their study carried out in Berkeley, CA, in 2015 [98]. They described the acceptable commute time to be a travel time threshold taken into consideration when people make travel decisions, which varies in relation to external considerations regarding the journey (the distribution and density of destinations) as well as internal judgements (the individual's perceptions, feelings and attitudes about their travel). Milakis and Wee [97] later replicated the study in Delft, further validating the acceptable commute time concept as being distinct from the ideal commute time.

He and colleagues [68] explored the concept of the acceptable commute

time, finding age, gender, education level, household income, the presence of children, travel mode and residential location to be significant predictors of an individual's acceptable commute time threshold in their study conducted in China. Additionally, a recent study concluded that participants experienced little or no confusion between acceptable travel time and ideal travel time [86]. Thus, the existing evidence strongly suggests that acceptable commute time and ideal commute time are distinct commute time concepts, and it is important to better understand the relationship between each one's contribution to commute well-being.

In summary, previous studies have shown the difference between ideal commute time and actual commute to be correlated with commute well-being. This study seeks to extend this by considering the relation between actual commute time and acceptable commute time. Thus, this study explores how the relationships between actual commute time and both ideal commute time and acceptable commute time correlate with commute well-being on both the journey to work and from work in the United Kingdom.

4.1.1 Chapter Structure

Section 4.2 details the methods, defining the study variables and describing the plan for analyses. In section 4.3, the results of the analysis are presented and discussed. The analysis is also repeated using the methodology adopted by previous studies, the findings of which are presented and discussed in Section 4.3.1. The main findings and contributions of the study are summarised in Section 4.4.

4.1.2 Contributions

The study presented in this chapter addresses Research Question 2 outlined in Section 1.1: What is the relationship between commute duration and commute well-being?

The duration aspect of the commuting experience was the focus of this study, with a view to further refining the current understanding of its relationship with commute well-being by accounting for subjective evaluations. It was the first study to assess how the relation between an individual's actual commute time and what they deem to be an acceptable commute time relates to commute well-being.

4.2 Methods

4.2.1 Participants

The study utilised primary data collected via an online survey over six weeks, between 8 February and 21 March 2020. Participants were all: (1) in employment/ self-employed; (2) over the age of 18; (3) commuters (at least once a week); (4) English speaking; and (5) living in the UK. Only data obtained from individuals who commute by car was utilised in this study. Based on power analysis a minimum sample size of 183 participants was required. 194 completed survey responses were analysed in this UK based study, and sample characteristics are presented in Table 4.1.

Full details on the data collection process, power analysis calculation, and sample characteristics are provided in Appendix A.

4.2.2 Study Variables

The study variables are presented in this section, with further detail on all of the survey questions provided in Appendix A.2.

Commute Time Difference Ratios

Differences between an individual's actual commute time and both their acceptable and ideal commute times was the focus of this study. All three durations were self-reported and recorded in response to the following questions (questions 2.18, 2.19 and 2.20, respectively, presented in Appendix A): for actual commute time, *"please estimate, in minutes, the duration of your typical one-way commute?"*; for acceptable commute time, *"please estimate, in minutes, what you consider to be an acceptable duration for your one-way commute?"*; for ideal commute time, *"disregarding the feasibility of whether this is actually achievable (based on practical elements such as distance), what would be the duration of your ideal one-way commute?"*

Previous studies assessing differences between actual and ideal commute times created a dissonance measure by subtracting the duration of the ideal commute time from the actual commute time. This approach overlooks the relative nature of evaluative judgements. One issue with the difference score is that it does not normalise the difference relative to the actual duration. For example, a person whose actual duration is 20 minutes and ideal is 15 (thus score of 5) would appear equally happy with their commute as a person whose actual duration is 150 minutes and the ideal is 145 (also score of 5). Utilising a ratio of acceptable/ ideal commute time to actual commute time would account for the commuting context, and is the approach adopted in this study.

Table 4.1: Sample characteristics for the 194 participants of the study on Subjective Commute Time and Commute Well-Being

	Number	Percent
Sex		
Female	150	77%
Age		
Age Range	21-66	-
Average Age	38	-
Education Level		
Ph.D	2	1%
Master's Degree	28	14%
Undergraduate Degree	83	43%
College (A-Levels/BTEC/IB etc)	60	31%
Secondary School	21	11%
Marital Status		
Single, Never Married	47	24%
Married	78	40%
Living with Partner	55	28%
Divorced/Separated	13	7%
Widowed	1	1%
Number of Children in Household		
None	123	63%
One	35	18%
Two	31	16%
Three	5	3%
Daily Activity Limitations Due to Health Problems or Disabilities		
No	174	90%
Yes, Limited A Little	18	9%
Yes, Limited A Lot	2	1%

NOTE: The survey questions used to obtain details on sample characteristics are presented in Appendix A.

The two variables measuring the relative relationships between commute times, Actual-Acceptable Ratio (AAR) and Actual-Ideal Ratio (AIR), were calculated by dividing the acceptable commute time and ideal commute time by the actual commute time, respectively.

For comparative purposes, the analysis was also conducted using variables created following the methodology of the previous papers [162] [72]. Actual-Acceptable Difference (AAD) and Actual-Ideal Difference (AID) were calculated by subtracting the acceptable commute time and ideal commute time from the actual commute time, respectively.

Commute Well-Being

Commute Well-Being scores ranged from -3 to 3, with larger scores indicating a more positive experience. Commute Well-Being was measured using the Satisfaction with Travel Scale (STS) as adapted by Singleton [137]; further details on the selection of this measure are provided in Section 2.1.2. The questions asked in this 7-item scale are detailed in Appendix A. Separate scales were used for the commute to work and the commute from work.

Job Satisfaction

Job satisfaction has been shown to impact commute satisfaction [139]. Ratings of job satisfaction were captured by asking survey participants to indicate their valuations on a scale from 1 (Completely Dissatisfied) to 7 (Completely Satisfied), question 2.15 presented in Appendix A.

Commuting Attitudes

Subjective preferences and attitudes regarding travel have been shown to affect evaluative judgements about the journey: positive attitudes towards travel in general are positively correlated with travel satisfaction [32] [161] [31].

Attitudes towards commuting were captured by asking participants to indicate the extent to which they agree or disagree with the following two statements on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree): “*my commute helps me to separate my personal life and work life*” and “*my commute give me time to get into the right mindset for home/ work*”, questions 2.5 and 2.6 respectively, presented in Appendix A.

To test whether the two variables could be combined to create one variable representing commuting attitudes, the correlation between the two variables was tested. They were found to be highly correlated ($r(192) = .76$, $p = <2.2 \times 10^{-16}$). Thus, a new variable was created by taking the average of the two scores for each individual, referred to in this study as Commuting Attitudes.

Socio-Demographic Controls

The regression models controlled for the fixed effects of age, sex, educational attainment and self-reported disability. The specific questions asked of survey participants are detailed in Appendix A.

4.2.3 Study Design

The analysis was carried out using multiple regression models in R [123]. Separate models were created for commutes to work and commutes from work. Five models were assessed for each journey, the models contained: (1) only commute time, (2) commute time and AIR, (3) commute time and AAR, (4) commute time and both AIR and AAR, and (5) commute time, both AIR and AAR, and socio-demographic variables. All of the models also included the commuting attitudes variable and job satisfaction ratings.

The models took the form:

$$N_i = \beta_0 + \beta_1 T_i + \beta_2 I_i + \beta_3 A_i + \beta_4 J_i + \beta_5 C_i + \beta_6 S_i + u_i$$

where

N = Commute Well-Being for the i^{th} Individual;

T = Commute Time;

I = AIR;

A = AAR;

J = Job Satisfaction;

C = Commuting Attitudes;

S = Socio-Demographic Controls;

u = Regression Error Term.

The main analysis was carried out using the AAR and AIR variables. The analysis was also repeated using the AAD and AID variables in order to ascertain if the method used to create the commute time difference variable impacts the findings. The main analysis results are presented first, in Section 4.3. The results obtained using the difference variables (AAD and AID), instead of the ratio variables (AAR and AIR), are then presented in Section 4.3.1 with a discussion comparing the different sets of findings.

The natural logarithm of actual duration plus one, calculated using the log1p function in R, was utilised in the models. The AAR and AIR variables were calculated by dividing the log1p transformed acceptable commute time and ideal commute time values by the log1p transformed actual commute time, respectively.

4.3 Results & Discussion

Actual commute times ranged from 4 to 152 minutes, acceptable commute times ranged from 5 to 100 minutes and the respective range for ideal commute time was 0 to 50 minutes. The average reported durations for actual, acceptable and ideal one-way commutes were 32 minutes, 28 minutes, and 14 minutes respectively. The average one-way ideal commute time (14 minutes) matches that found by Humagain and Singleton [72] in their Oregon based study in which just under half of their sample population commuted by car. It is similar to the 18 minutes ideal commute time reported by car drivers in a study conducted in North Carolina [83] but considerably shorter than the average 21 minutes for one-way commutes made by car reported by Ye and colleagues [162]; cultural and societal disparities between China and the United Kingdom may partially account for the difference.

The correlations between actual commute time, acceptable commute time and ideal commute time are presented in Figure 4.1; for presentation purposes, the non-transformed values are utilised for the plots. For the plots with actual commute time on the x-axis, data points above the line indicate that the individual's acceptable/ ideal commute time is longer than their actual commute time; conversely, points that fall below the line signify actual commuting times longer than the acceptable/ ideal commute time. Acceptable commute time was found to equal the actual commute time for 25% of respondents, to be longer than the actual commute time for 34% of respondents, and interestingly, 41% of respondents currently commute for a duration longer than they deem acceptable. In line with Zhao and colleagues' finding of two-way causal effects of acceptable commute time with actual commute time, the expectation would be for most people to commute for a duration either equal to or shorter than their acceptable commute time.

Ideal commute time was equal to actual commute time for 11% of respondents, shorter than actual commute time for 84% of respondents, but 5% of respondents would prefer to commute for longer than they currently do. For those commuting by car, Ye and colleagues [162] reported similar findings, with the same proportion (16%) of respondents content with their commute duration. In their study, however, these respondents were equally split between no dissonance and the desire to commute for longer.

Thus, overall 59% of the survey respondents consider their existing commute duration to be acceptable. Additionally, a notable proportion (16%) of respondents would describe their current commute time as ideal or would prefer to commute for longer.

The relationships between AAR, AIR and commute satisfaction are presented in Figure 4.2. In each case, commute well-being increases as the commute

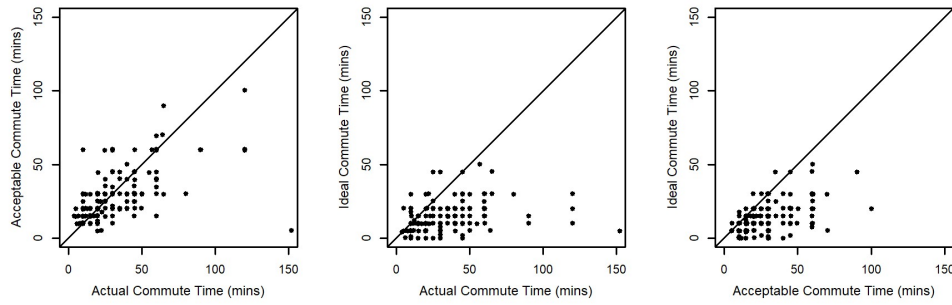


Figure 4.1: Scatter-plots of (1) acceptable versus actual commute time, (2) ideal versus actual commute time, and (3) ideal versus acceptable commute time.

NOTE: For presentation purposes, non-transformed commute time values are utilised for the plots. For the plots with actual commute time on the x-axis, data points above the line indicate that the individual's acceptable/ ideal commute time is longer than their actual commute time; conversely, points that fall below the line signify actual commuting times longer than the acceptable/ ideal commute time.

time ratio increases.

Five separate multiple regression models were built for the commute to work and the commute from work respectively, and are presented in Tables 4.2 and 4.3. Adding the socio-demographic controls to the models did not result in any significant changes; therefore, these results are not presented within this chapter but are included as part of Appendix B for completeness.

Actual commute time was found to be negatively correlated with commute well-being for both journeys to work and from work. The magnitude of the effect reduced when AAR was added to the models for commute well-being on the commute to work, and it became statistically insignificant when AAR was added to the models for commute well-being on the journey from work. Thus, AAR may act as a mediator of the relationship between actual commute time and commute well-being. AAR was positively correlated with commute well-being for both commuting journeys. Conversely, AIR was not found to be correlated with commute well-being in any of the models.

Results from simple mediation analysis indicated that actual duration is indirectly related to commute well-being through its relationship with AAR. As shown in Figure 4.3, for commutes to work, longer actual durations were related to smaller AAR values ($a = 0.18$, $p = <.001$), and larger AAR values were subsequently related to greater commute well-being ($b = 1.89$, $p = <.001$). A 95% confidence interval based on 500 bootstrap samples indicated that the indirect effect ($ab = -0.34$) was entirely below zero (-0.532 to -0.17). For commutes from work, longer actual durations were related to smaller AAR values ($a = 0.18$, $p = <.001$), and larger AAR values were subsequently related

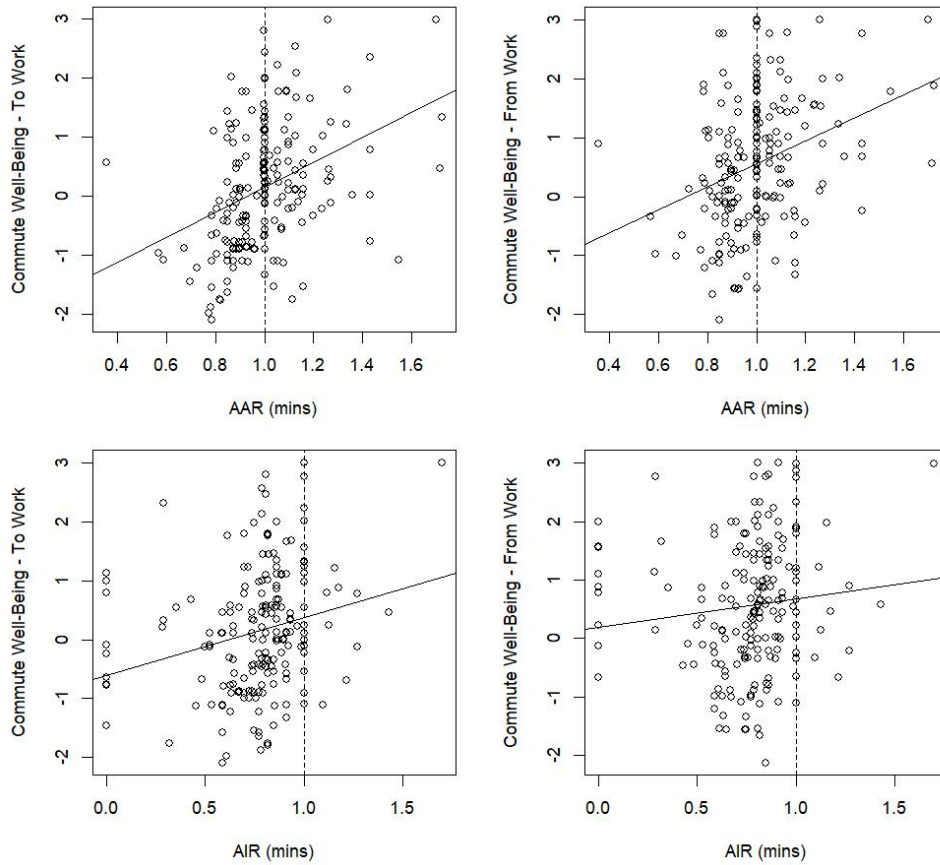


Figure 4.2: Commute well-being for, clockwise from top left (1) AAR for commute to work, (2) AAR for commute from work, (3) AIR for commute from work, and (4) AIR for commute to work.

NOTE: Commute Well-Being scores ranged from -3 to 3, with larger scores indicating a more positive experience. Solid line indicates multiple regression line and dashed line indicates points at which actual commute time equals the acceptable/ideal commute time.

Table 4.2: Multiple regression models for commute well-being ratings for the commute to work

	AIR				AAR				AIR & AAR							
	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t				
Log Commute Duration	-0.517	0.105	-4.922	<.001	-0.496	0.110	-4.508	<.001	-0.272	0.133	-2.047	.042	-0.269	0.134	-2.004	.046
AIR					0.190	0.291	0.652	.515					0.046	0.290	0.160	.873
AAR									1.345	0.462	2.909	.004	1.332	0.471	2.829	.005
Commute Attitudes	0.178	0.040	4.497	<.001	0.169	0.042	4.034	<.001	0.169	0.039	0.039	<.001	0.167	0.041	4.059	<.001
Job Satisfaction	0.203	0.047	4.344	<.001	0.201	0.047	4.305	<.001	0.183	0.046	0.046	<.001	0.182	0.046	3.930	<.001
Adjusted R-Squared	.25				.28				.28							

NOTE: Outputs for four multiple regression models for the commute from work are presented, each of the models included a different combination of commute time variables: (1) Log Commute Duration; (2) Log Commute Duration and Actual Ideal Ratio (AIR); (3) Log Commute Duration and Actual Acceptable Ratio (AAR); and (4) Log Commute Duration, Actual Ideal Ratio (AIR) and Actual Acceptable Ratio (AAR). The results of a model that also contained socio-demographic results are presented in Appendix B.

Table 4.3: Multiple regression models for commute well-being ratings for the commute from work

	AIR				AAR				AIR & AAR							
	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t				
Log Commute Duration	-0.487	0.117	-4.168	<.001	-0.525	0.122	-4.298	<.001	-0.255	0.149	-1.711	.089	-0.284	0.150	-1.899	.059
AIR					-0.343	0.323	-1.061	.290					-0.495	0.322	-1.535	.126
AAR									1.277	0.517	2.468	.015	1.418	0.524	2.707	.007
Commute Attitudes	0.193	0.044	4.384	<.001	0.210	0.047	4.492	<.001	0.184	0.044	4.237	<.001	0.207	0.046	4.519	<.001
Job Satisfaction	0.064	0.052	1.224	.223	0.066	0.052	1.268	.206	0.044	0.052	0.857	.393	0.046	0.052	0.885	.377
Adjusted R-Squared	.16				.18				.19							

NOTE: Outputs for four multiple regression models for the commute from work are presented, each of the models included a different combination of commute time variables: (1) Log Commute Duration; (2) Log Commute Duration and Actual Ideal Ratio (AIR); (3) Log Commute Duration and Actual Acceptable Ratio (AAR); and (4) Log Commute Duration, Actual Ideal Ratio (AIR) and Actual Acceptable Ratio (AAR). The results of a model that also contained socio-demographic results are presented in Appendix B.

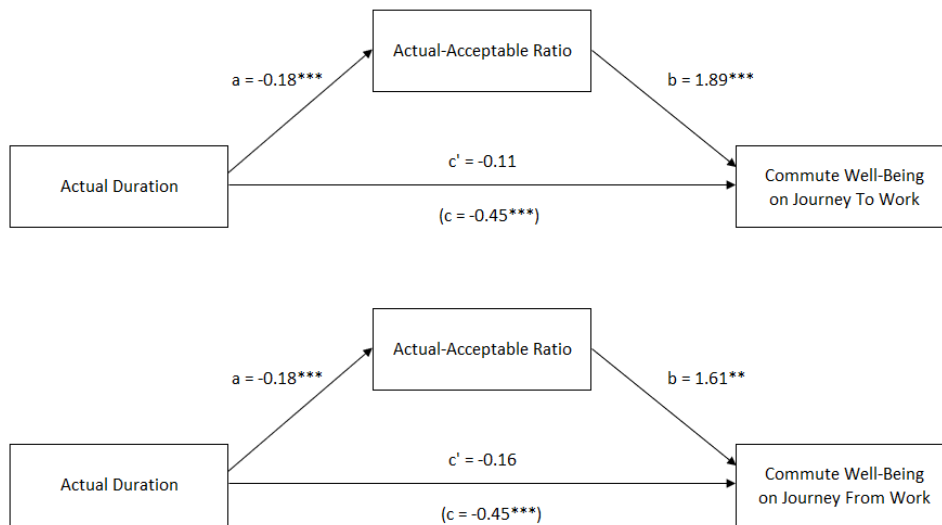


Figure 4.3: The mediating effect of AAR in the relationship between duration and commute well-being for commutes to work (top) and commutes from work (bottom).

NOTE: * $p < .05$, ** $p < .01$, *** $p < .001$. a is effect of duration on AAR, b is effect of AAR on commute well-being, and c' is direct effect of duration on commute well-being.

to greater commute satisfaction ($b = 1.61$, $p = .003$). A 95% confidence interval based on 500 bootstrap samples indicated that the indirect effect ($ab = -0.29$) was below zero (-0.502 to -0.07).

AAR was found to both be directly correlated with commute well-being and to mediate the effect of actual duration on commute well-being. Additionally, the correlation between AIR and commute well-being was not found to be statistically significant. This finding reveals a need to revise approaches to studies of commute well-being; inclusion of Actual-Acceptable Ratio would provide a more complete consideration of the effects of commute duration. Previous studies have predominantly solely focused on actual commute times, and the two studies that have included subjective measures of commute time have limited the scope of this to ideal commute times.

These findings are in contrast to those of Ye and colleagues [162] who showed that commute well-being decreases as the difference between actual and ideal commute time increases. Additionally, they reported that actual commute time also exhibited independent effects on commute well-being; however, further inspection of the model outputs of their study suggests this only stands if statistical significance is considered for p values exceeding 0.05 and for very small effect sizes. Differences in the findings may be due to the methods used - this is further explored in Section 4.3.1 - and the cultural context of the populations. Also, whilst the present study introduces a new commute time measure, AAR, and demonstrates the importance of its inclusion in future

analysis of commute well-being, the findings are based on a small sample size; replication using a larger scale study is recommended.

Commute attitudes were found to be positively correlated with commute well-being. The more strongly that an individual believes that their commute helps them to separate their personal life and work life, and that their commute gives them time to get into the right mindset for home/ work, the more satisfied they are with their commute. Job satisfaction was also found to be positively correlated with commute well-being; however, this was only true for commutes to work. This distinction between the contribution of job satisfaction to commute well-being for the journeys to work and from work supports the notion that both of these trips should be assessed separately.

4.3.1 Comparison between Ratio and Difference Variables

The analysis was also repeated using the methodology adopted by previous papers [162] [72]. Commute time difference variables, AAD and AID, were utilised in place of the ratio variables, AAR and AIR. These were calculated by subtracting the acceptable commute time and ideal commute time from the actual commute time, respectively.

In their recent study, Ye and colleagues [162] did not log transform the duration variables. Thus, two sets of analyses conducted using the difference variables is presented in this section. Firstly, analysis carried out in line with Ye et al. [162] in which the AAD, AID and actual duration variables are not log transformed. Secondly, analysis carried out using log transformed duration variables; commute duration was taken as natural logarithm of actual duration plus one, (calculated using the `log1p` function in R), and the AAD and AID variables were calculated by subtracting the `log1p` transformed acceptable commute time and ideal commute time values from the `log1p` transformed actual commute time, respectively.

The model results are presented in Tables 4.4 and 4.5 for the first set of analyses, and Tables 4.6 and 4.7 for the second set of analyses. Adding the socio-demographic controls to the models did not result in any significant changes; therefore, these results are not presented within this chapter but are included as part of Appendix B for completeness.

When conducting the analysis following the methodology of Ye and colleagues [162], only actual duration was found to have a significant correlation with commute well-being, and this became insignificant when either of the two difference variables, AAD and AID, were added to the models; this was true for both commutes to work and from work. Neither of the two difference variables were found to correlate with commute well-being.

Ye et al. showed differences between actual and ideal commute times to

Table 4.4: Multiple regression models for commute well-being ratings for the commute to work, using commute time difference variables

	AID				AAD				AID & AAD							
	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t				
Commute Duration	-0.011	0.003	-3.535	.001	-0.012	0.008	-1.494	.137	-0.006	0.004	-1.479	0.141	-0.011	0.008	-1.399	.164
AID					0.001	0.008	0.140	.889					0.006	0.009	0.703	.483
AAD									-0.008	0.005	-1.432	.154	-0.009	0.006	-1.588	.114
Commute Attitudes	0.171	0.041	4.200	<.001	0.172	0.042	4.061	<.001	0.165	0.041	4.056	<.001	0.173	0.042	4.092	<.001
Job Satisfaction	0.196	0.048	4.093	<.001	0.197	0.048	4.081	<.001	0.185	0.049	3.809	<.001	0.185	0.049	3.814	<.001
Adjusted R-Squared	.21				.22				.21							

NOTE: Outputs for four multiple regression models for the commute to work are presented, each of the models included a different combination of commute time variables: (1) Commute Duration; (2) Commute Duration and Actual Ideal Difference (AID); (3) Commute Duration and Actual Acceptable Difference (AAD); and (4) Commute Duration, Actual Ideal Difference (AID) and Actual Acceptable Difference (AAD). The results of a model that also contained socio-demographic results are presented in Appendix B.

Table 4.5: Multiple regression models for commute well-being ratings for the commute from work, using commute time difference variables

	AID				AAD				AID & AAD							
	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t				
Commute Duration	-0.011	0.003	-3.392	.001	-0.014	0.009	-1.586	.114	-0.007	0.005	-1.451	.148	-0.013	0.009	-1.493	.137
AID					0.003	0.009	0.298	.766					0.008	0.010	0.833	.406
AAD									-0.008	0.006	-1.326	.186	-0.010	0.006	-1.536	.126
Commute Attitudes	0.186	0.045	4.167	<.001	0.190	0.047	4.074	<.001	0.180	0.045	4.030	<.001	0.190	0.046	4.104	<.001
Job Satisfaction	0.059	0.053	1.126	.262	0.060	0.053	1.142	.255	0.048	0.053	0.892	.374	0.048	0.053	0.903	.367
Adjusted R-Squared	.13				.14				.14							

NOTE: Outputs for four multiple regression models for the commute from work are presented, each of the models included a different combination of commute time variables: (1) Commute Duration; (2) Commute Duration and Actual Ideal Difference (AID); (3) Commute Duration and Actual Acceptable Difference (AAD); and (4) Commute Duration, Actual Ideal Difference (AID) and Actual Acceptable Difference (AAD). The results of a model that also contained socio-demographic results are presented in Appendix B.

Table 4.6: Multiple regression models for commute well-being ratings for the commute to work, using commute time difference variables and log transformed variables

	AID				AAD				AID & AAD			
	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t
Log Commute Duration	-0.517	0.105	-4.922	<.001	-0.508	0.120	-4.241	<.001	-0.309	0.133	-2.328	.021
AID					-0.016	0.098	-0.159	.874				
AAD									-0.390	0.156	-2.502	.013
Commute Attitudes	0.178	0.040	4.497	<.001	0.175	0.042	4.169	<.001	0.165	0.039	4.200	<.001
Job Satisfaction	0.203	0.047	4.344	<.001	0.202	0.047	4.313	<.001	0.182	0.047	3.888	<.001
Adjusted R-Squared	.25				.27				.27			

NOTE: Outputs for four multiple regression models for the commute to work are presented, each of the models included a different combination of log transformed commute time variables: (1) Log Commute Duration; (2) Log Commute Duration and Actual Ideal Difference (AID); (3) Log Commute Duration and Actual Acceptable Difference (AAD); and (4) Log Commute Duration, Actual Ideal Difference (AID) and Actual Acceptable Difference (AAD). AID and AAD were calculated by subtracting the log1p transformed acceptable commute times and ideal commute times from the log1p transformed actual commute times. The results of a model that also contained socio-demographic results are presented in Appendix B.

Table 4.7: Multiple regression models for commute well-being ratings for the commute from work, using commute time difference variables and log transformed variables

	AID				AAD				AID & AAD			
	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t
Log Commute Duration	-0.487	0.117	-4.168	<.001	-0.555	0.133	-4.177	<.001	-0.296	0.148	-1.996	.047
AID					0.116	0.108	1.071	.286				
AAD									-0.358	0.174	-2.054	.041
Commute Attitudes	0.193	0.044	4.384	<.001	0.210	0.047	4.490	<.001	0.181	0.044	4.121	<.001
Job Satisfaction	0.064	0.052	1.224	.223	0.067	0.052	1.291	.198	0.044	0.052	0.849	.397
Adjusted R-Squared	.16				.16				.18			

NOTE: Outputs for four multiple regression models for the commute from work are presented, each of the models included a different combination of log transformed commute time variables: (1) Log Commute Duration; (2) Log Commute Duration and Actual Ideal Difference (AID); (3) Log Commute Duration and Actual Acceptable Difference (AAD); and (4) Log Commute Duration, Actual Ideal Difference (AID) and Actual Acceptable Difference (AAD). AID and AAD were calculated by subtracting the log1p transformed acceptable commute times and ideal commute times from the log1p transformed actual commute times. The results of a model that also contained socio-demographic results are presented in Appendix B.

be correlated with commute well-being, and reported that actual commute time exhibited independent effects on commute well-being. Only the latter of the two findings was found to be true using our data. Thus, the disparity in results is not due to methodological differences in terms of creating the commute duration variables. They may be attributed to other factors such as the cultural context of the studies or small variations in the version of the STS scale used during data collection (for the commute well-being variable).

Carrying out the analysis using log transformed duration variables and commute time difference variables allowed the direct effects of utilising difference variables rather than ratio variables to be assessed. As with the analysis conducted using ratios, actual duration was found to be negatively correlated with commute well-being for both journeys to work and from work. The magnitude of this effect reduced when AAD was added to the models of commute well-being on the journey to work, suggesting that AAD acts as a mediator of the relationship between actual commute time and commute well-being; this was also the case when carrying out the analysis using AAR. However, when using AAD rather than AAR, the correlation between actual duration and commute well-being remains statistically significant on the journey home from work despite AAD being added to the model. AAD was found to be correlated with commute well-being for both journeys, regardless of the other variables included in the models, and conversely, AID was not correlated with commute well-being in any of the models.

There was only one difference in the model outputs, therefore, between using difference variables and ratio variables when accounting for subjective concepts of commute time. The correlation between actual duration and commute well-being remained significant when the models for the journey home accounted for the acceptable commute time. When utilising the ratio variables, for journeys home from work, any models that accounted for the acceptable commute time found it to be the only duration variable to be correlated with commute well-being.

Whilst the two sets of results may seem similar, the sole difference between them is important. Analysis carried out using the difference variable method suggested that actual duration and acceptable duration are both equally important, and that acceptable duration partially mediates the effect of actual duration. The ratio variable method, however, identifies acceptable duration as the more significant variable for journeys home from work.

4.3.2 Limitations and Further Work

The most significant limitation of the study was the sample. Despite satisfying the required sample size stipulated by power analysis for the planned regression,

194 participants is too small a sample to make the findings of this study conclusive. Similarly, the use of a convenience sample means that the findings can not be generalised to the entire population. The sample was sufficient, however, to begin to explore the significance of subjective concepts of commute time and to establish the importance of further testing their use for inclusion - in a suitable form - in studies of commute well-being.

This study posits that acceptable commute time is a more important subjective commute time variable than ideal commute time in studies of commute well-being, and should replace ideal commute time in regression models. This study also proposes that the relation between actual commute time and subjective commute time variables should be considered as ratios rather than differences. Both of these proposals have the potential to significantly change the methodology of commute-related research moving forward. It is crucial, therefore, that these recommendations are rigorously tested with larger sample sizes.

4.4 Conclusion

Refinement of the broad concept of commute time, and assessing the significance of these distinct nuanced facets – Actual Commute Time, Actual-Acceptable Ratio (AAR) and Actual-Ideal Ratio (AIR) - when exploring commute well-being, was the focus of this study.

AAR was found to be positively correlated with commute well-being and to mitigate the effects of actual commute time on commute well-being. AIR was not found to be significantly correlated with commute well-being for either journey. Accounting for subjective commute times as ratio, rather than difference, variables was also discussed and recommended.

This study introduces a novel commute time variable for inclusion in future studies of commute well-being, demonstrating its relative significance compared to the established and widely adopted concepts of commute time. Inclusion of commute duration in models of commute well-being is common practice. The findings of this study highlight the importance of also including the concept of Actual-Acceptable Ratio. The small scale of the current study warrants further assessment of the validity and significance of AAR as a predictor of commute well-being; this study does, however, provide the foundations for others to build upon.

Chapter 5

The Role of the Commute

5.1 Introduction

As technology advances and takes a more prominent role in individuals' lives, it enables more varied working environments and behaviours. Work is no longer limited to a physical location or temporal framework; it is not uncommon to work from home or from a coffee shop, or to check work emails in the evenings. Understanding the role of commuting within the evolving work landscape is the focus of this study.

Teleworking, carrying out a portion of the working hours outside of a central workplace, is an increasingly common practice [5]. Effective management of the boundaries between the domains of work and personal life is important in facilitating performance in each of these spheres. These boundaries may take physical, temporal, emotional, cognitive, and/ or relational form [104]. The ubiquitous connectivity that enables telework may lead to the encroachment of work into private time and space. When telework is carried out at home, as is often the case, or in spaces also used for social interactions, such as local coffee shops, the physical demarcation between work and personal life is removed. Similarly, the technological tools enabling individuals to remain connected to their work at all times also blur the temporal work-home boundary [112]. Thus, telework has the potential to, and is likely to, erode the separation between an individual's work and personal life domains [91] [113] [104].

Boundary permeability is *the degree to which a role allows one to be physically located in the role's domain but psychologically and/ or behaviorally involved in another role* [113]. This permeability may lead to blurring between the roles and potential conflict with regards to different role expectations [70]. Specifically, it has been shown to be associated with higher family-to-work conflict [81] [113] [34]. Hall and Richter [65] claimed that "*boundary permeability epitomizes role conflict*" as individuals are simultaneously interacting in both domains, with their separate roles and expectations. Boundary permeability

introduces a series of issues: unannounced interruptions, increased confusion about what role to enact at a given time, and difficulty fully disengaging from one role in order to be immersed in the current role [10].

The potential impact of telework on blurring the spatial and temporal divide between the two life domains is clear. This study, however, focuses on working behaviours, enabled by the same technological advancements that make telework possible, that exemplify the erosion of this divide: working outside of working hours and outside of the office. Tasks undertaken during an individual's personal time - for example, in the mornings before work, in the evenings after work, or at weekends - *and* within non-work environments - such as at home or in local coffee shops - violate the sanctity of the two domains. In this study, we take both subjective and objective measures of the extent to which individuals partake in work-related activities during this time to represent the blurriness of the divide between their personal life and work domains.

Traditionally, the commute has played a pivotal role in separating the domains of work and personal life, *a valued buffer between role identities* [10]. During the commute to work, individuals exit from their home role, enter the transition during which the role switch occurs, and then assume their work role [73]. Jain and Lyons [75] posit that positive utility can be derived from two forms of travel time experience: travel as transition time and as time-out. Transition time manifests in two ways: (1) physical distance covered and time elapsed to achieve a sense of distance and difference, and (2) time to mentally prepare and undergo the role change. In the commuting context, time-out refers to the time and space away from obligations associated with either work life or home life. The commute is a physical activity that literally transports individuals across external environments beginning in one space and time - that is dedicated to one life domain - and ending in another. It marks out parts of the day reserved for each life domain.

This study aims to investigate whether the clarity of the divide between an individual's work domain and personal life domain is correlated to the value that they place on their commutes to and from work. Commuting has traditionally been found to be valued as a buffer between the domains of work and personal life. If this holds true for those working from home outside of office hours, then it might imply that individuals would choose to continue to commute to work despite technological advancements that further enable remote working.

5.1.1 Chapter Structure

Section 5.2 details the methods, defining the study variables and describing the plan for analysis. The results are presented in Section 5.3 and discussed in Section 5.4. Section 5.5 concludes the chapter, summarising the key findings and contributions of the study.

5.1.2 Contributions

The study presented in this chapter partially addresses Research Question 3 outlined in Section 1.1: Will the commute still play a role in peoples' lives as technological advancements make working remotely an increasingly viable option?

Technological advances have changed working behaviours, making it possible to work remotely outside of working hours. Understanding how the associated impact of these working behaviours - weakening of the divide between the personal life domain and the work domain - is linked to attitudes towards commuting will shed some light on the role that commuting might play in the future work landscape.

Specifically, this study tested the hypotheses that:

1. Those who have a clearer divide between their work domain and personal life domain (both perceived and objective) will feel more strongly that their commute helps them to separate their personal life and work life
2. Those who have a clearer divide between their work domain and personal life domain (both perceived and objective) will feel more strongly that their commute gives them time to get into the right mindset for home/work
3. Those who have a clearer divide between their work domain and personal life domain (both perceived and objective) will express less desire to teleport to work
4. Those who have a clearer divide between their work domain and personal life domain (both perceived and objective) will express less desire to teleport from work
5. Those who have a clearer divide between their work domain and personal life domain (both perceived and objective) will place greater value on their commute to work
6. Those who have a clearer divide between their work domain and personal life domain (both perceived and objective) will place greater value on their commute from work

Table 5.1: Sample characteristics for the 194 participants of the study on The Role of the Commute

	Number	Percent
Sex		
Female	150	77%
Age		
Age Range	21-66	-
Average Age	38	-
Education Level		
Ph.D	2	1%
Master's Degree	28	14%
Undergraduate Degree	83	43%
College (A-Levels/BTEC/IB etc)	60	31%
Secondary School	21	11%
Marital Status		
Single, Never Married	47	24%
Married	78	40%
Living with Partner	55	28%
Divorced/Separated	13	7%
Widowed	1	1%
Number of Children in Household		
None	123	63%
One	35	18%
Two	31	16%
Three	5	3%
Daily Activity Limitations Due to Health Problems or Disabilities		
No	174	90%
Yes, Limited A Little	18	9%
Yes, Limited A Lot	2	1%

NOTE: The survey questions used to obtain details on sample characteristics are presented in Appendix A.

5.2 Methods

5.2.1 Participants

The study utilised primary data collected via an online survey over six weeks, between 8 February and 21 March 2020. Participants were all: (1) in employment/ self-employed; (2) over the age of 18; (3) commuters (at least once a week); (4) English speaking; and (5) living in the UK. Only data obtained from individuals who commute by car was utilise in this study. Based on power analysis a minimum sample size of 183 participants was required. 194 completed survey responses were analysed in this UK based study, and sample characteristics are presented in Table 5.1.

Full details on the data collection process, power analysis calculation, and sample characteristics are provided in Appendix A.

5.2.2 Study Variables

This study utilised a range of variables which are categorised and detailed in this section: dependent variables, independent variables, commute/ work variables and socio-demographic variables.

Independent Variables

The study had two independent variables, which resulted in two sets of analysis being carried out. Both variables measured the divide that an individual has between their work domain and personal life domain: one variable accounted for the objective divide whilst the other represented the individual's subjective perception of the divide.

Objective Divide

The number of days per week that the individual works outside of the office and outside of working hours, ranging from 0 to 7, question 2.17 presented in Appendix A.

Subjective Divide

The level to which the individual feels as though their work and personal life merge based on the amount of effort/ time they spend working outside of the office and outside of working hours, on a scale from 1 to 7, question 2.16 presented in Appendix A.

Dependent Variables

Six dependant variables, corresponding to the six hypotheses, were tested using separate models for both sets of analysis:

Separate Domains

Belief that the commute acts as a means to separate the work domain and personal life domain, on a scale from 1 to 7, question 2.5 presented in Appendix A.

Mindset

Belief that the commute provides time to get into the mindset for what follows, on a scale from 1 to 7, question 2.6 presented in Appendix A.

Teleport To

The desire to be able to teleport home from work, negating the need for the commute. Values ranged from 0 to 10 and were obtained using question 2.7 presented in Appendix A.

Teleport From

The desire to be able to teleport home from work, negating the need for the commute. Values ranged from 0 to 10 and were obtained using question 2.8 presented in Appendix A.

Value To

The value that individuals attribute to their commute to work, on a scale from 1 to 7, question 2.1 presented in Appendix A.

Value From

The value that individuals attribute to their commute home from work, on a scale from 1 to 7, question 2.2 presented in Appendix A.

Commute/Work Variables

Three work and commute related variables were included as control variables in the regression models:

Commute Time

The duration of the individual's typical one-way commute, in minutes, question 2.18 in Appendix A.

Commute Time Difference

The difference between the duration of the individual's typical one-way commute and their ideal commute time, questions 2.18 and 2.20 in Appendix A. The Commute Time Difference figure was calculated by subtracting the actual commute time from the ideal commute time, in minutes [162].

Job Satisfaction

The level of job satisfaction felt by the individual, on a scale from 1 to 7, question 2.15 in Appendix A.

Socio-Demographic Variables

Three socio-demographic variables were included as control variables in the regression models:

Sex

Information obtained using question 2.25 in Appendix A.

Age

Information obtained using question 2.26 in Appendix A.

Income

Information obtained using question 2.11 in Appendix A.

5.2.3 Study Design

The study was pre-registered on Open Science Framework (<https://osf.io/gkzt3>) prior to data collection.

The analysis was carried out using multiple regression models in R [123], and consisted of two sets of six models; one set for each of the independent variables - Objective Divide and Subjective Divide - and six models per set for each of the dependent variables: Separate Domains, Mindset, Teleport To, Teleport From, Value To and Value From. All of the models also contained Commute Time, Commute Time Difference, Job Satisfaction, Sex, Age and Income as control variables.

The models took the form:

$$Y_i = \beta_0 + \beta_1 X_i + \beta_2 T_i + \beta_3 D_i + \beta_4 J_i + \beta_5 S_i + \beta_6 A_i + \beta_7 I_i + u_i$$

where

Y = Dependent Variable for the i^{th} Individual;

X = Independent Variable;

T = Commute Time;

D = Commute Time Difference;

J = Job Satisfaction;

S = Sex;

A = Age;

I = Income;

u = Regression Error Term.

Prior to conducting the primary analysis detailed above, two sets of exploratory analysis were planned. The findings would inform the subsequent analysis.

The first was intended to check that the objective divide and subjective divide variables were distinct and not capturing the same concept. It was considered that the more days that an individual carries out work-related tasks outside of the office and outside of working hours (i.e. the weaker the objective divide), the weaker they may perceive the divide between their work domain and personal life domain to be (i.e. the subjective divide). If the two variables – objective divide and subjective divide – were found to be highly correlated, then the primary analysis would only be carried out using the ratings for subjective divide. Thus, the analysis would require one set of regression models, rather than two.

Secondly, our study utilised a variable that represented individuals' evaluations of the value of their commute. The survey used to collect the data also

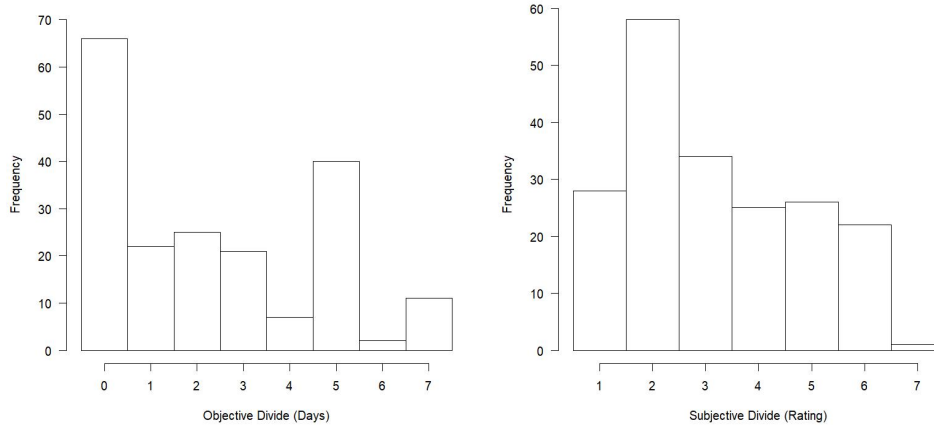


Figure 5.1: Distribution plots for objective divide (left) and subjective divide (right)

NOTE: Objective divide was measured as the number of days per week that the individual works outside of the office and outside of working hours, ranging from 0 to 7. Subjective divide was measured as the level to which the individual feels as though their work and personal life merge based on the amount of effort/ time they spend working outside of the office and outside of working hours, on a scale from 1 to 7.

obtained ratings of commute well-being, question 2.9 in Appendix A. In order to confirm that evaluations of the value of the commute would be distinct from ratings of commute well-being, the correlation between the two was tested. If the two measures were found to be highly correlated, then evaluations of commute well-being would replace the value variable in the primary analysis (hypotheses five and six).

5.3 Results

This section begins by presenting the exploratory analysis which informed the design of the primary analysis, Section 5.3.1. The results of the primary analysis are then presented in Section 5.3.2.

5.3.1 Exploratory Analysis

Objective Divide and Subjective Divide

In order to determine which correlation test to use, the distribution of the data for both variables was assessed both visually, presented in Figure 5.1, and using a normality test. The Shapiro-Wilk test of normality was carried out for each variable using the `shapiro.test` function in R [123]. For both variables, p was found to be smaller than 0.05, indicating non-normality: 1.59×10^{-12} for objective divide and 5.36×10^{-10} for subjective divide.

Therefore, correlation between the two variables was assessed using the

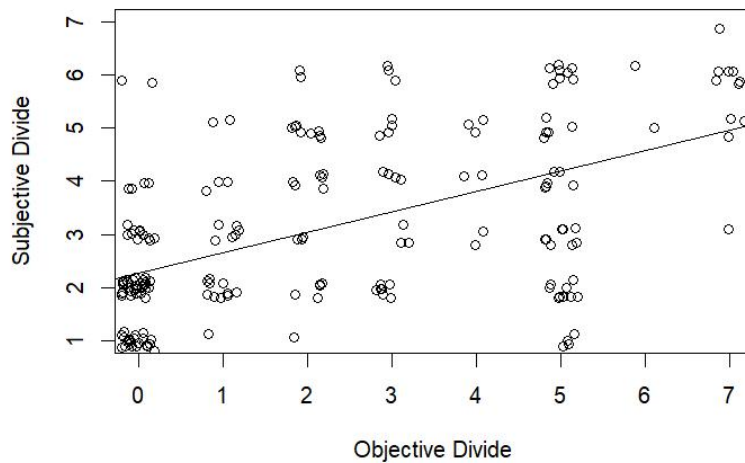


Figure 5.2: Scatter-plots of objective divide versus subjective divide.

NOTE: Objective divide ranged from 0-7 days. Subjective divide was a rating from 1-7. For both variables, a higher score indicated less of a divide between the personal life and work domains. Solid line on the plot indicates OLS regression line.

non-parametric Kendall rank correlation, provided by the `cor.test` function in R. According to the guidance provided by Dancy and Reidy [29], objective divide was found to be only moderately positively correlated to subjective divide ($\tau_b = .443$, $p = 6.89 \times 10^{-15}$). The correlation plot is presented in Figure 5.2. Thus, the study design remained unchanged and both variables were assessed separately in the primary analysis.

Value of the Commute and Commute Well-Being

Ratings of commute value and commute well-being were collected separately for journeys to work and from work. Therefore, two sets of correlation analyses were conducted.

The distribution of the data for the value and well-being variables was assessed both visually, presented in Figure 5.3, and using the Shapiro-Wilk test of normality. For both journeys, at least one of the variables was found to have a p value smaller than 0.05, indicating non-normality. For journeys to work: 1.34×10^{-8} for value of the commute and 0.049 for commute well-being. For journeys from work: 1.45×10^{-8} for value of the commute and 0.146 for commute well-being. Therefore, correlations for both journeys were assessed using the non-parametric Kendall rank correlation. Value of the commute was found to be weakly positively correlated to commute well-being for both journeys to work ($\tau_b = .336$, $p = 1.75 \times 10^{-10}$) and from work ($\tau_b = .319$, $p = 1.14 \times 10^{-9}$). The correlation plots are presented in Figure 5.4.

As the variable measuring value of the commute was found to be distinct from commute well-being, the study design remained unchanged. Value of the

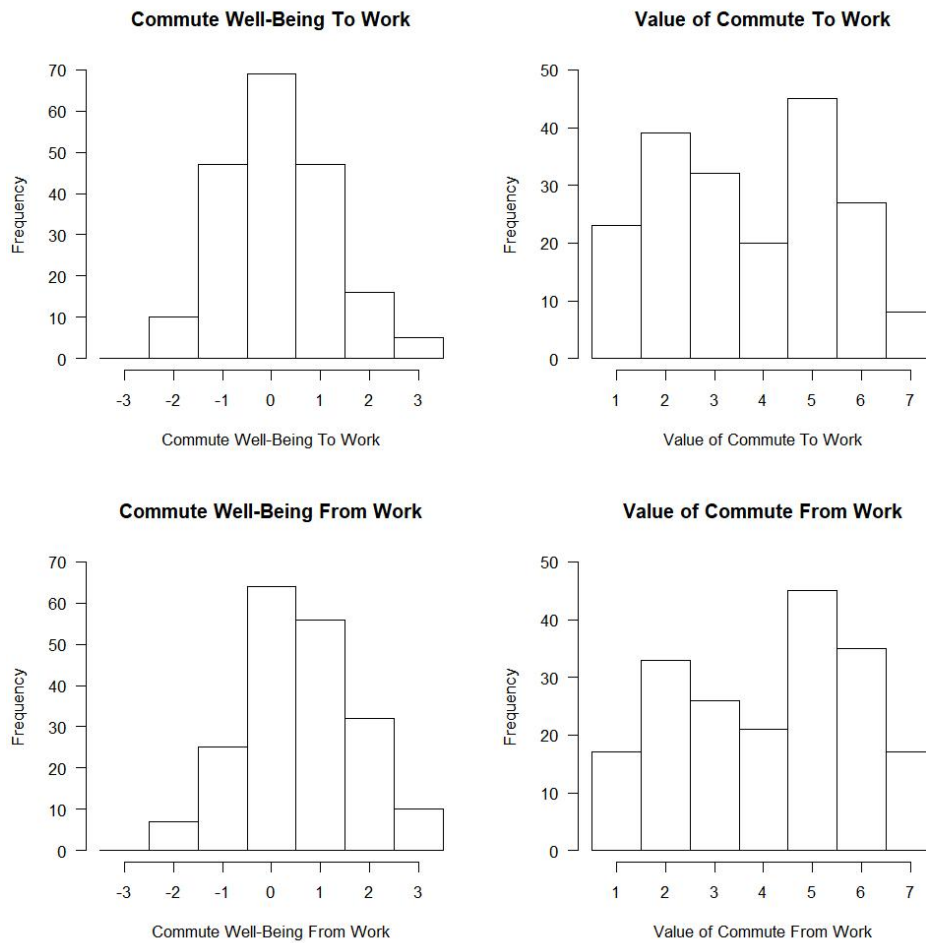


Figure 5.3: Distribution plots for commute well-being to work (top left), value of the commute to work (top right), commute well-being from work (bottom left) and value of the commute to work (bottom right).

NOTE: Commute well-being scores ranged from -3 to 3, with larger scores indicating a more positive experience. Value of commute ratings ranged from 1 to 7.

commute was retained for the analyses testing hypotheses five and six.

5.3.2 Primary Analysis

Objective divide and subjective divide are related but distinct concepts. The reality of the divide between the work domain and personal life domain differs from the perception and felt experience of this divide. The distribution of the two variables was presented in Figure 5.1. The scales used to measure the two variables differed: objective divide ranged from 0 to 7 and subjective divide ranged from 1 to 7; for both variables, higher ratings indicated less of a divide between the work and personal life domains. For comparative purposes, both variables were scaled on a range from 0 to 10. The mean rating for objective divide was found to be 3.33 ($SD = 3.22$) whilst subjective divide averaged

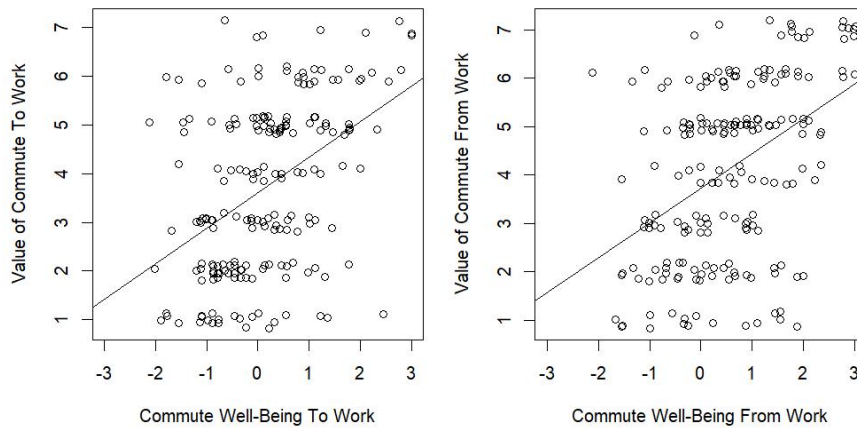


Figure 5.4: Scatter-plots of commute well-being versus value of the commute, for commutes to work (left) and commutes from work (right).

NOTE: Commute well-being scores ranged from -3 to 3, with larger scores indicating a more positive experience. Value of commute ratings ranged from 1 to 7. Solid line on the plot indicates OLS regression line.

3.62 ($SD = 2.70$). Thus, on a scale from 0 (clear divide) to 10 (no divide), individuals have some blurring between the two life domains but the divide is greater than the blurriness (values <5); individuals also *feel* this to be the case. The raw, unscaled, figures were utilised for the subsequent analysis.

The six dependent variables in the study represented various attitudes towards commuting; the distribution of each of the variables is presented in Figure 5.5. When rating level of agreement with the notion that their commute helps them to separate their personal life and work life, the mean response across the sample was 4.18 ($SD = 1.83$) on a scale from 1 (Strongly Disagree) to 7 (Strongly Agree), with 4 (Neither Agree Nor Disagree) as the midpoint. On the same scale, when asked to rate their agreement with the statement that their commute gives them time to get into the right mindset for home/work, the average rating was 4.57 ($SD = 1.84$). Both the mode and the median for both variables was 5, suggesting that across the sample there was greater agreement with the two statements than disagreement.

The value placed on the commute was measured on a scale from 1 to 7, with individuals asked to rate their agreement with the statement that they do value their commute. Overall, participants neither agreed nor disagreed with the statement, with the mean sample values being close to the mid-point of the scale (Commute To Work: $M = 3.71$, $SD = 1.77$; Commute From Work: $M = 4.12$, $SD = 1.83$). The commute home from work was found to be valued marginally more than the commute to work ($t(194) = 2.23$, $p = .026$).

Individuals would like to be able to teleport (i.e. eliminate the need for the commute) to work on 7 days out of 10 ($SD = 3.709$) and from work on 8 days out of 10 ($SD = 3.203$; $t(194) = 2.08$, $p = .038$) on average. The

small preference for retaining more commutes to work than from work suggests that the former provides some additional function or role to the latter, despite being valued less overall. The distribution plots show that the vast majority of participants would ideally like to teleport for all 10 commutes on both legs of the journey, and that the average values reflect the desire of some individuals for either an equal split between commuting and teleporting, or to solely commute. Teleport To

The desire to be able to teleport home from work, negating the need for the commute. Values ranged from 0 to 10

Regression Analysis

The study consisted of two sets of regression analysis, one for the objective divide and the other for the subjective divide. Each set contained six multiple regression models, one for each of the dependent variables. The regression results are presented in Table 5.2. For simplicity, only the effect of the independent variable on the dependent variable is presented. The full model results, including the model outputs for all of the variables included in the models, is presented in Appendix C. The columns represent the six dependent variables corresponding to the regression models. The rows present the effects of the two independent variables on the dependant variables, and the adjusted r-squared figures for each of the 12 models are also presented.

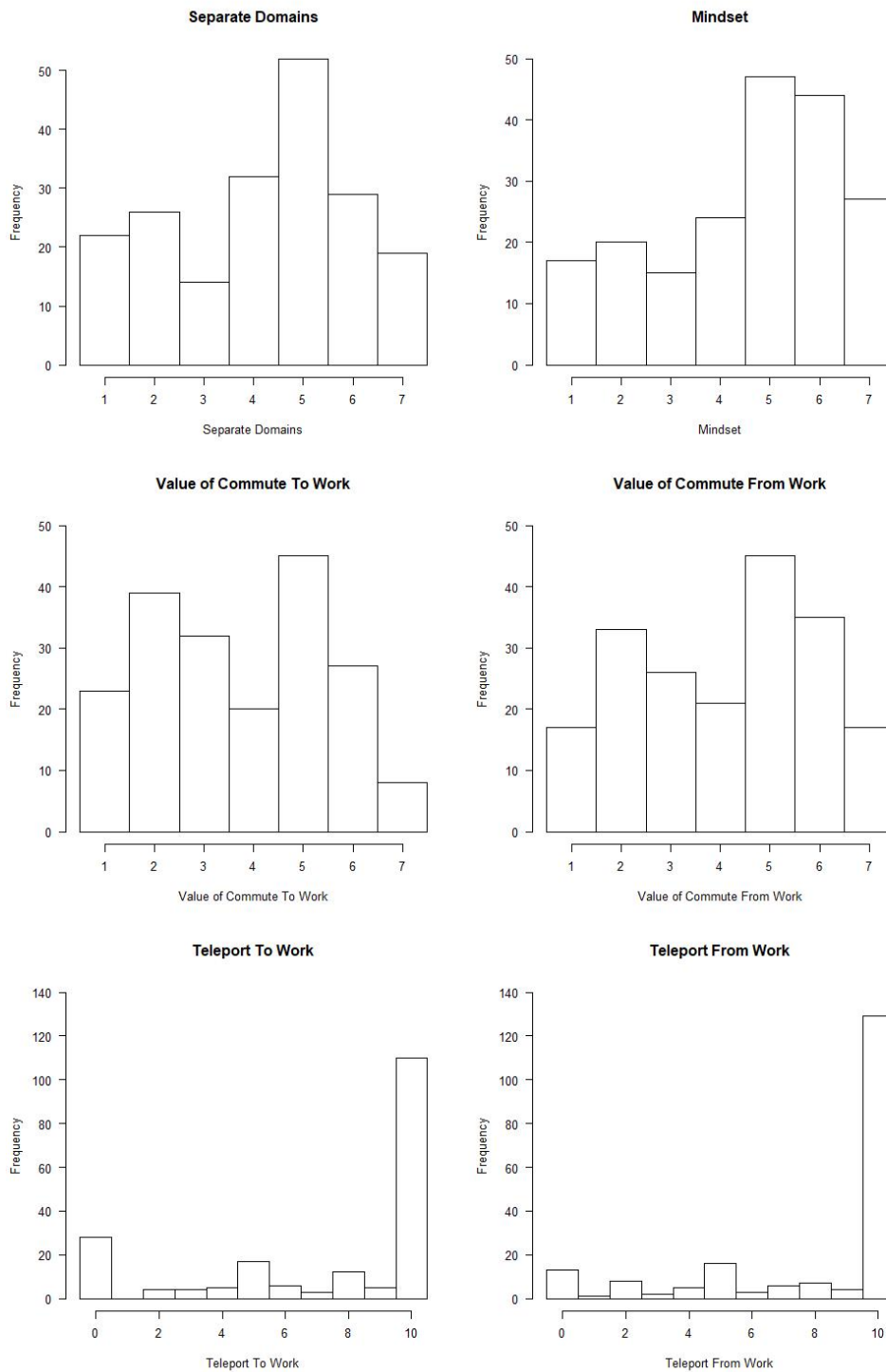


Figure 5.5: Distribution plots for separate domain (top left), mindset (top right), value of the commute to work (middle left), value of the commute from work (middle right), teleport to work (bottom left) and teleport from work (bottom right).

NOTE: Separate Domains (belief that the commute acts as a means to separate the work domain and personal life domain) and Mindset (belief that the commute provides time to get into the mindset for what follows) were measured on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree), with 4 (Neither Agree Nor Disagree) as the midpoint. Value of Commute ratings ranged from 1 to 7. Desire to Teleport To/From Work ranged from 0 to 10 days.

Table 5.2: Multiple regression models for subjective divide and objective divide

	Separate Domains			Mindset			Teleport To					
	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p
Objective Divide	-0.125	0.059	-2.113	.036	-0.124	0.058	-2.127	.035	0.058	0.119	0.482	.631
Adjusted R-Squared	.090				.123				.098			
Subjective Divide	-0.071	0.082	-0.869	.386	-0.087	0.080	-1.084	.280	0.151	0.162	0.933	.352
Adjusted R-Squared	.071				.106				.102			

	Teleport From			Value To			Value From					
	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p
Objective Divide	0.010	0.096	0.103	.918	-0.020	0.056	-0.356	.722	-0.079	0.057	-1.376	.170
Adjusted R-Squared	.215				.138				.150			
Subjective Divide	0.072	0.130	0.553	.581	-0.017	0.075	-0.232	.817	-0.112	0.077	-1.441	.151
Adjusted R-Squared	.216				.138				.151			

NOTE: Only the effect of the independent variable on the dependent variable is presented for each of the 12 multiple regression models. The full model results, including the model outputs for all of the variables included in the models, are presented in Appendix C. The columns represent the six dependent variables corresponding to the regression models. The rows present the effects of the two independent variables on the dependent variables, and the adjusted r-squared figure for each of the models is also presented. Objective Divide ranged from 0-7 days; Subjective Divide ranged from (Clear Divide Between Work and Personal Life) 1 - 7 (No Divide Between Work and Personal Life); Separate Domains, Mindset, Value To and Value From ranged from (Strongly Disagree) 1 - 7 (Strongly Agree), with 4 (Neither Agree Nor Disagree) as the midpoint; and Teleport To and Teleport From ranged from 0-10 days.

An individual's perception of the divide between their work domain and personal life domain has no relation to the value that they place on their commute, to their desire to teleport, to whether they feel that their commute helps them to separate their personal life and work life, or to whether they feel that their commute gives them time to get into the right mindset for home or work.

The actual divide between their work domain and personal life domain is, however, correlated to how strongly they feel that their commute helps them to separate their personal life and work life, and how strongly they feel that their commute gives them time to get into the right mindset for home or work. The more blurry, or less clear, the divide between the two life domains, the less the individual agrees with either of the statements; this is in agreement with the study hypotheses. Every additional day that an individual spends time working outside of the workplace and outside of working hours during the week was found to correspond to a 0.125 and 0.124 decrease in agreement with the Separate Domains and Mindset statements respectively, both measured on a scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), with 4 (Neither Agree Nor Disagree) as the midpoint. Therefore, conversely, those who have a clearer objective divide between their work domain and personal life domain feel more strongly that their commute helps them to separate their personal life and work, and gives them time to get into the right mindset for work and home.

The clarity of the objective divide was not found to correlate to (1) their desire to teleport to work, (2) their desire to teleport from work, (3) the value that they place on their commute to work, and (4) the value that they place on their commute from work.

5.4 Discussion

As technology advances and working behaviours evolve, it is likely that employees will spend more of their time working outside of the office and outside of working hours. Being accessible at all times is currently common practice, with a YouGov survey of 2224 UK employees finding that 15% of employees say that they *always* check their work mobile/ emails outside of their working hours and 25% do so *occasionally* (i.e. at least five times a day) [109]. This practice, along with others, will become more prevalent, further blurring the divide between work and personal life. The physical and temporal demarcation afforded by the commute to distinguish between the two domains was thus expected to be viewed as a means of sanctifying the divide between them.

Therefore, the lack of association between an individual's perceived distinction between their work and personal life and their attitudes towards

commuting was unexpected. The *objective* clarity of the divide between the domains was, however, found to be positively correlated to the two commute role attitudes. Thus, whilst the reality of the divide correlates to attitudes regarding the role of the commute, the individual's perception of the divide does not. Changes to the work environment will directly affect the objective divide. As the divide between work and home blurs - with individuals increasingly carrying out work-related tasks outside of working hours and outside of the office - the less strongly individuals feel that their commute helps them to separate the work domain and personal life domain, and that it helps them to get into the right mindset for each domain.

In other words, those who have a clearer objective divide between the two domains feel more strongly that their commute helps them to separate the two domains. Whilst the correlation is clear, whether the commute itself aids in creating the clear divide between personal life and work life, or individuals attribute their existing established boundaries to their commute, is unknown.

The idea that those who have a more blurred objective divide between the two domains are less aligned with the notion that their commute provides them with time to get into the right mindset for home or work, may be because a lesser physical and temporal demarcation between work and personal life reduces the need to transition mentally for each role and domain.

This study assessed how working behaviours during non-working hours relate to commuting. As individuals spend more time working during these hours (outside of the workplace), they may hold less favourable attitudes towards their continued commute. Interestingly, despite viewing the commute to play less of a role, evaluations on the desirability of the commute and the value that they place on it are unlikely to change. This may be because those with a less clear divide between the two domains find their commute to play a role unexplored within this study.

In summary, as the work landscape evolves and the divide between an individual's work domain and personal life domain becomes more blurred, individuals will regard their commute less favourably in terms of the role that it plays. Their judgements on its desirability and value were found to be unrelated to the objective divide between the two life domains.

Multiple Comparisons

As the number of tests conducted on the same dependant variable using the same data increases, so does the likelihood of a type I error, i.e. falsely rejecting the null hypothesis and arriving at a false-positive inference [89] [9]. In the present study, each of the six dependent variables was tested for both of the independent variables, objective divide and subjective divide.

To account for this, the Bonferroni Correction adjusts the p value at which findings are deemed significant. The adjusted value is obtained by dividing the original single test significance level by the number of tests performed [74]. For the present study, this would be calculated by dividing the threshold of 0.05 by 6 to obtain an adjusted p value of 0.008.

Reassessing the model outputs against the adjusted significance threshold alters the study findings. The two commute role attitudes - Separate Domains and Mindset - are no longer found to correlate to the objective divide. Thus, accounting for the multiple comparisons problem results in neither the objective divide nor the subjective divide being found to correlate to the (1) commute role attitudes, (2) desire to teleport to/from work, (3) value placed on the commute to/from work.

5.4.1 Limitations and Further Work

The most significant limitation of the study was the sample size. Whilst the 194 participants was sufficient in exceeding the required number of participants for the planned regression analysis according to power analysis, it is too small to make the findings of this study conclusive. The study design introduced the multiple comparisons problem; accounting for this rendered the findings of the study to be insignificant. The study does, however, introduce an interesting and pertinent research question that warrants further investigation, especially in light of recent COVID-19 related changes to working behaviours that have acted as a catalyst in projecting the workforce at large towards greater adoption of remote working practices. This study demonstrates the importance of understanding how evolving work behaviours may affect attitudes towards commuting and begins to uncover some of the complexity of this relationship. Further exploration would allow us to consider and predict the future role/place of the commute and whether commuting will continue to feature as part of the working day for the majority of the workforce.

5.5 Conclusion

An individual's perception of the divide between their personal life domain and work domain differs from the reality, or objective measure, of this divide. As technology advances and working behaviours evolve, the objective divide between the domains increasingly blurs. This study suggests that as this occurs, individuals will regard their commute less favourably in terms of the role that it plays in helping them to separate the work domain and personal life domain, and in getting in the right mindset for each domain. Despite a lesser association with these notions that the commute serves a positive role,

individuals do not alter their judgements on the value or desirability of their commute.

An individual's *perception* of the clarity of the divide between these life domains was not found to be associated with their attitudes towards commuting.

When accounting for the multiple comparisons problem, however, neither the objective divide nor the subjective divide were found to be correlated to any of the attitudes towards commuting assessed in this study.

Understanding how the objective and subjective divide between the personal life domain and work domain relate to various aspects of commuting - specifically, the roles that commuting may play and attitudes towards it - would enable speculation as to the purpose and prevalence of commuting in the future as increased remote working behaviours further blur the divide between the domains.

Chapter 6

Commuting and COVID-19

6.1 Introduction

Intervention studies explore the impact of changed commuting behaviours on subjective well-being outcomes and long-term behavioural changes. They typically rely on voluntary participation, and therefore, introduce an inherent level of selection bias. Occasionally, circumstances arise that alter the conventional order of society, bringing about unprecedented adaptations. The COVID-19 pandemic is one such disruptive event. Individuals who would not normally opt-in to working from home schemes or commuting behaviour intervention studies were forced to forgo their commute or make changes to their routine commute. This study explored how these unique circumstances caused by the pandemic affected attitudes towards commuting.

Switching to active or public modes of transportation has been the most widely researched intervention with regards to commuting. In their UK-based study, Page and Nilsson [116] found that individuals who switched from commuting by car to travelling by e-bike reported more positive affective well-being. A study of car commuters in Sweden found that utilisation of public transportation for two or three of the commutes within a given week affected an individual's perceptual and attitudinal ratings towards car and public transportation [3]. A similar study conducted at MIT in the United States, also requiring the habitually car commuting participants to commute using public transport for two or three days during a specified week, observed an increase in the average level of satisfaction with the commute [2].

A few studies have explored adaptations to other aspects of the commuting experience. For example, extending the duration of the commute was found to result in both short term and long term negative effects on subjective well-being [20]. Utilising techniques such as mindful movement and guided breathing during commutes made by car has been shown to enhance the commuting experience by reducing stress and increasing psychological wellness

[118] [117]. Engaging in role-clarifying prospection - thinking about career-related or personal goals and plans for the day or week ahead - was found to attenuate the negative effects of lengthy commute times on job satisfaction and turnover intention [73].

The on-going coronavirus pandemic has transformed working practices globally. In mid-March 2020 in the UK, government guidelines imposed working from home on all employees except in exceptional cases where this was not possible, and enforced the closure of certain workplaces [110]. Despite some easing of the lockdown restrictions in June, employees were encouraged to continue to work from home where possible. Thus, some individuals lost their daily commute, some spent more time working from home and commuted to their workplace less frequently, and others who continued to commute found their usual journey to be quite different, with far fewer people using the transport networks and safety restrictions in place.

Prior to the outbreak of the coronavirus pandemic, the study exploring the role of the commute (Chapter 5) was carried out, which involved collecting data via a survey as detailed in Section A.2. By asking those same survey participants to again evaluate their perceptions about commuting, the effects of COVID-19 related changed behaviours on these attitudes were captured.

This study explored how attitudes regarding commuting to/ from work have been affected by COVID-19, an event that changed working behaviours and the routine commute for employees across the UK. The effects of three work related changes on a wide range of attitudes and perceptions were explored. The primary analysis focused on the effects of changes to the number of hours worked from home. The secondary analysis explored the effects of changes to the divide between an individual's work and personal life domains, in terms of both the objective and perceived divide.

6.1.1 Chapter Structure

Section 6.2 details the methods, defining the study variables and describing the plan for the regression analysis, both following the pre-registered study design and the refined methodology. Section 6.3 presents the results of the regression analysis, for both sets of analysis. These findings are discussed in Section 6.4; this led to some additional, qualitative, analysis being conducted. The thematic analysis is presented in Section 6.5. An overall discussion, combining the findings of both the quantitative and qualitative elements of this study, is presented in Section 6.6. And finally, Section 6.7 concludes the chapter, summarising the key findings and contributions of the study.

6.1.2 Contributions

The study presented in this chapter addresses Research Question 4 outlined in Section 1.1: How do significant changes in commuting behaviours affect attitudes towards commuting?

Most intervention studies on commuting have explored the effect that switching the mode of transport used have on subjective well-being. This is the first study to explore how changes to working from home behaviours and to the divide between personal life and work - both subjectively and objectively experienced - affect attitudes towards commuting.

Specifically, this study tested the hypotheses that:

Primary Analysis: Change in Working From Home Hours

1. Those who have a greater increase in their working from home hours will place greater **value** on their commute **to** work
2. Those who have a greater increase in their working from home hours will place greater **value** on their commute **from** work
3. Those who have a greater increase in their working from home hours will express less desire to **teleport to** work
4. Those who have a greater increase in their working from home hours will express less desire to **teleport from** work
5. Those who have a greater increase in their working from home hours will feel more strongly that their commute helps them to **separate their personal life and work life**
6. Those who have a greater increase in their working from home hours will feel more strongly that their commute gives them time to get into the **right mindset** for home/ work
7. Those who have a greater increase in their working from home hours will express less desire to **work from home in the future**
8. Those who have a greater increase in their working from home hours will be more likely to state that they **miss their previous commute**

Secondary Analysis: Change in Divide Between Work and Personal Life Domains (both subjective and objective)

9. Those who have a greater negative change to the divide between their work domain and personal life domain (less clear/more blurred divide) will place greater **value** on their commute **to** work
10. Those who have a greater negative change to the divide between their work domain and personal life domain (less clear/more blurred divide) will place greater **value** on their commute **from** work

11. Those who have a greater negative change to the divide between their work domain and personal life domain (less clear/more blurred divide) will express less desire to **teleport to** work
12. Those who have a greater negative change to the divide between their work domain and personal life domain (less clear/more blurred divide) will express less desire to **teleport from** work
13. Those who have a greater negative change to the divide between their work domain and personal life domain (less clear/more blurred divide) will feel more strongly that their commute helps them to **separate their personal life and work life**
14. Those who have a greater negative change to the divide between their work domain and personal life domain (less clear/more blurred divide) will feel more strongly that their commute gives them time to get into the **right mindset** for home/ work
15. Those who have a greater negative change to the divide between their work domain and personal life domain (less clear/more blurred divide) will express less desire to **work from home in the future**
16. Those who have a greater negative change to the divide between their work domain and personal life domain (less clear/more blurred divide) will be more likely to state that they **miss their previous commute**

6.2 Methods

6.2.1 Participants

The study utilised primary data collected via two online surveys. The first survey was conducted over a six week period, between 8 February and 21 March 2020, and received responses from 194 individuals who commute by car. Participants were all: (1) in employment/ self-employed; (2) over the age of 18; (3) commuters (at least once a week); (4) English speaking; and (5) living in the UK.

These individuals were invited to participate in a second survey, conducted over a four week period, between 10 June and 8 July 2020. Based on power analysis a minimum sample size of 136 participants was required. 138 completed survey responses were analysed in this UK based study, and sample characteristics are presented in Table 6.1.

Full details on the data collection processes for both surveys, power analysis calculation, and sample characteristics are provided in Appendix A.

Table 6.1: Sample characteristics for the 138 participants of the study on Commuting and COVID-19

	Number	Percent
Sex		
Female	107	78%
Age		
Age Range	21-66	-
Average Age	39	-
Education Level		
Ph.D	2	1%
Master's Degree	22	16%
Undergraduate Degree	61	44%
College (A-Levels/BTEC/IB etc)	37	27%
Secondary School	16	12%
Marital Status		
Single, Never Married	37	27%
Married	59	43%
Living with Partner	33	24%
Divorced/Separated	8	6%
Widowed	1	1%
Number of Children in Household		
None	89	65%
One	23	17%
Two	23	17%
Three	3	2%
Daily Activity Limitations Due to Health Problems or Disabilities		
No	125	91%
Yes, Limited A Little	12	9%
Yes, Limited A Lot	1	1%

NOTE: The survey questions used to obtain details on sample characteristics are presented in Appendix A.

6.2.2 Study Variables

This study utilised a range of variables which are categorised and detailed in this section: independent variables, dependent variables, commute/ work variables and socio-demographic variables.

Independent Variables

The study had three independent variables, which resulted in three sets of analysis being carried out:

Change WFH Hours

Change in the number of hours the individual works from home, questions 3.2 and 3.4 presented in Appendix A. The Change WFH Hours figure was calculated by subtracting the previous number of hours spent working from home from the number of hours spent working from home during the pandemic.

Change Subjective Divide

Change in the level to which the individual feels as though their work and personal life merge based on the amount of effort/ time they spend working outside of the office and outside of working hours, questions 2.16 and 3.15 presented in Appendix A. The Change Subjective Divide figure was calculated by subtracting the previous perceived level of divide from the perceived level of divide during the pandemic.

Change Objective Divide

Change in the number of days the individual works outside of the office and outside of working hours, questions 2.17 and 3.16 presented in Appendix A. The Change Objective Divide figure was calculated by subtracting the previous number of days from the number of days during the pandemic.

Dependent Variables

Eight dependant variables, corresponding to the eight hypotheses, were tested using separate models for each of the three sets of analysis:

Change Value To

Change in how valuable the individual perceives their commute to work to be. Individuals were asked for a rating prior to the outbreak of COVID-19 and then again during the pandemic, questions 2.1 and 3.9 presented in Appendix A, respectively. The Change Value To figure was calculated by subtracting the previous value placed on the commute from the value rating assigned during the pandemic.

Change Value From

Change in how valuable the individual perceives their commute from work to be. Individuals were asked for a rating prior to the outbreak of COVID-19 and then again during the pandemic, questions 2.2 and 3.10 presented in

Appendix A, respectively. The Change Value From figure was calculated by subtracting the previous value placed on the commute from the value rating assigned during the pandemic.

Change Teleport To

Change in the desire to be able to teleport to work, negating the need for the commute. Individuals were asked to indicate the degree of their inclination to teleport to work prior to the outbreak of COVID-19 and then again during the pandemic, questions 2.7 and 3.13 presented in Appendix A, respectively. The Change Teleport To figure was calculated by subtracting the previous number of days that the individual would have liked to teleport to work from the number of days indicated during the pandemic.

Change Teleport From

Change in the desire to be able to teleport from work, negating the need for the commute. Individuals were asked to indicate the degree of their inclination to teleport from work prior to the outbreak of COVID-19 and then again during the pandemic, questions 2.8 and 3.14 presented in Appendix A, respectively. The Change Teleport From figure was calculated by subtracting the previous number of days that the individual would have liked to teleport home from work from the number of days indicated during the pandemic.

Change Separate Domains

Change in the belief that the commute acts as a means to separate the work domain and personal life domain. Individuals were asked to indicate their level of agreement with the notion that the commute helps to separate their work domain and personal life domain prior to the outbreak of COVID-19 and then again during the pandemic, questions 2.5 and 3.7 presented in Appendix A, respectively. The Change Separate Domains figure was calculated by subtracting the previous rating from the level of agreement with the statement indicated during the pandemic.

Change Mindset

Change in the belief that the commute provides time to get into the mindset for what follows. Individuals were asked to indicate their level of agreement with the notion that the commute provides time to get into the right mindset for work/ home prior to the outbreak of COVID-19 and then again during the pandemic, questions 2.6 and 3.8 presented in Appendix A, respectively. The Change Mindset figure was calculated by subtracting the previous rating from the level of agreement with the statement indicated during the pandemic.

Choose WFH

Attitudes towards working from home in the future, post COVID-19. Individuals were asked how many hours a week they would choose to work from

home once the pandemic is over and work life returns to normal, question 3.5 in Appendix A.

Miss Commute

Whether individuals miss their previous commute. Individuals were asked whether they miss their typical commute, question 3.11 in Appendix A.

Commute/ Work Variables

Three work and commute related variables were included in the regression models:

Commute Time

The duration of the individual's typical one-way commute, in minutes, question 2.18 in Appendix A.

Commute Time Difference

The difference between the duration of the individual's typical one-way commute and their ideal commute time, questions 2.18 and 2.20 in Appendix A. The Commute Time Difference figure was calculated by subtracting the actual commute time from the ideal commute time, in minutes [162].

Change Job Satisfaction

Change in the individual's job satisfaction, questions 2.15 and 3.6 in Appendix A. Controlling for the change in job satisfaction, rather than a snapshot at one point in time, was important as it accounted for the impact of pandemic-related changes to the individuals usual work behaviour and attitudes. The Change Job Satisfaction figure was calculated by subtracting the previous level of job satisfaction from the rating assigned during the pandemic.

Socio-Demographic Variables

The study had three socio-demographic variables:

Sex

Information obtained using question 2.25 in Appendix A.

Age

Information obtained using question 2.26 in Appendix A.

Change SWEMWBS

The SWEMWBS mental well-being measure was issued as part of both surveys allowing the study to account for a change in well-being rather than a snapshot rating capturing well-being at a single moment in time, questions 2.24 and 3.17 in Appendix A. This was particularly important and beneficial as the study was focusing on changes that arose as a result of a global pandemic, an uncertain and stressful event that may impact mental well-being. The Change SWEMWBS figure was calculated by subtracting the previous score from that

obtained during the pandemic.

6.2.3 Study Design

The study was pre-registered on Open Science Framework (<https://osf.io/xkg7f>) prior to data collection.

The analysis was carried out using multiple linear regression models in R [123], and consisted of three sets of eight models; one set for each of the independent variables, and eight models per set for each of the dependent variables.

One of the independent variables addressed the primary analysis - Change WFH Hours - and the remaining two variables - Change Subjective Divide and Change Objective Divide - assessed the secondary analysis. The eight dependent variables were Change Value To, Change Value From, Change Teleport To, Change Teleport From, Change Separate, Change Mindset, Choose WFH and Miss Commuting. All of the models also contained the Commute Time, Commute Time Difference, Change Job Satisfaction, Sex, Age and Change SWEMWBS variables.

The models took the form:

$$Y_i = \beta_0 + \beta_1 X_i + \beta_2 T_i + \beta_3 D_i + \beta_4 J_i + \beta_5 S_i + \beta_6 A_i + \beta_7 W_i + u_i$$

where

Y = Dependent Variable for the i^{th} Individual;

X = Independent Variable;

T = Commute Time;

D = Commute Time Difference;

J = Change Job Satisfaction;

S = Sex;

A = Age;

W = Change SWEMWBS;

u = Regression Error Term.

The pre-registration stated that all of the analysis would be carried out using multiple regression models. This was an oversight that failed to account for the binary nature of the Miss Commute variable, for which people indicated whether they did, or did not, miss their previous commute. It would not be possible to model this dependant variable using a multiple regression model. A multiple logistic regression model was adopted for this analysis; overall, three multiple logistic regression models were included in the study, one for the Miss Commute model in each of the sets of the analysis.

In the regression tables in Section 6.3, figures for adjusted R-squared are presented. For multiple regression, these are generated in R as part of the model summary. However, for multiple logistic regression, the `glm` command in R does not produce pseudo R-squared values; thus, approximations of the model fit were obtained using McFadden's R squared, as follows:

```
WFH MC <- glm(Miss Commute ~ Change WFH Hours +
              Commute Time + Commute Time Difference +
              Change Job Satisfaction +
              Sex + Age + Change SWEMWBS,
              data = COVID,
              family = binomial)
nullmod <- glm(Miss Commute ~ 1,
              data = COVID,
              family="binomial")
1-logLik(WFH MC)/logLik(nullmod)
```

Refined Methodology

The pre-registration did not state that the commute time and commute time difference variables would be included in the models in log transformed form. Thus, the analysis was carried out using the raw values and the results are presented in Section 6.3. The analysis was also repeated, however, using the natural logarithm of commute time plus one - calculated using the `log1p` function in R - as the commute time, and commute time difference calculated by dividing the `log1p` transformed ideal commute time values by the `log1p` transformed actual commute time; these results are presented in Section 6.3.2.

For the analysis conducted using the refined methodology, the Commute Time Difference figure was taken as a ratio of ideal commute time to actual commute time, rather than subtracting the duration of the ideal commute time from the actual commute time. The ratio approach accounts for the relative nature of the variable, as explained in Section 4.2.2. Whilst the Subjective Commute Time and Commute Well-Being study, Chapter 4, exposed the significance of considering acceptable commute time in explorations of commute well-being, the role of this variable with regards to commuting attitudes is unknown; therefore, it was not included in the revised regression models.

The analysis carried out with the refined methodology also amended the figures for the Choose WFH variable. The main analysis, based on the pre-registration, utilised the figures provided by participants indicating the number of hours per week that they would like to work from home in the future. The revised analysis converts these figures into a percentage of the individual's total weekly working hours to obtain a proportion of the work hours the individual

would like to work from home. This accounts for the variability in the total working hours per week across the sample.

Similarly, the Change WFH Hours figures were converted from a change in the number of hours to a change in the percentage of total working hours spent working from home. This was possible as individuals were asked for their total weekly working hours pre-COVID, question 3.1, and during the pandemic, question 3.3. Accounting for the total working hours provides a more meaningful measure. The importance of this amendment is best demonstrated with an example. Two individuals who find themselves working an additional five hours from home during the week will experience this change quite differently if for one of them this represents a 50% increase in their total working hours spent working from home and for the other it represents a 10% increase.

6.3 Results

This section begins by presenting the regression analyses carried out in accordance with the pre-registered methodology, Section 6.3.1. The analysis was then repeated using a refined methodology, as described in Section 6.2.3, and the results are presented in Section 6.3.2.

6.3.1 Pre-Registered Analysis

Most of the study participants experienced changes to their working hours as a result of the COVID-19 pandemic. 26 individuals, or 19%, worked more hours during the pandemic than before; conversely, 48 people (35%) reported working fewer hours during the pandemic. Working hours for 64 individuals (46%) remained unchanged despite the pandemic.

The primary analysis assessed how changes to the number of hours spent working from home affected attitudes towards commuting. Before the COVID-19 outbreak, 84 participants did not spend any of their working hours working from home. 6 participants spent more than half of their working hours working from home and no-one worked from home full-time. During the pandemic, 27 individuals did not spend any of their working hours working from home and 75 participants worked from home full-time.

The majority of participants, 103 or 75%, spent more hours working from home during the pandemic than they did before the outbreak. 30 individuals, or 22%, worked the same number of hours from home during the pandemic as they did before. The remaining 5, or 4%, worked fewer hours from home during COVID-19.

Changes to the divide between an individual's work life and personal life was the focus of the secondary analysis. Individuals reported both feeling

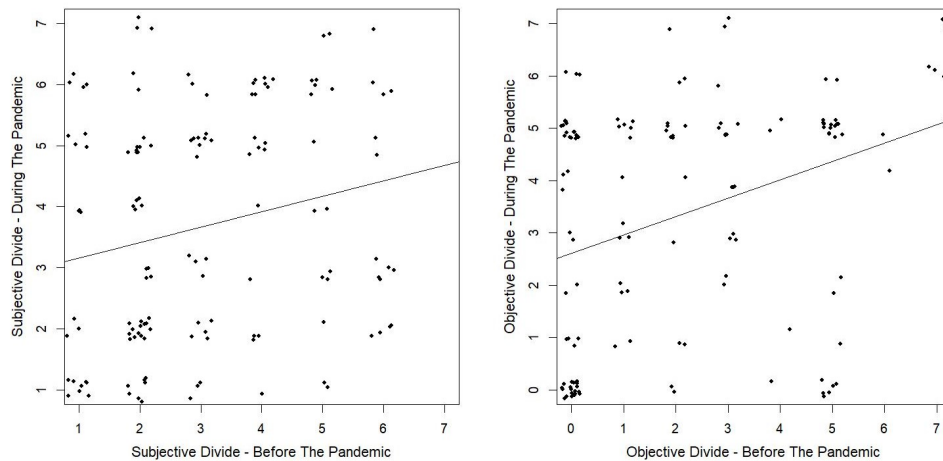


Figure 6.1: Scatter-plots of (1) subjective divide before the pandemic versus subjective divide during the pandemic (left), (2) objective divide before the pandemic versus objective divide during the pandemic (right).

NOTE: Subjective divide was a rating from 1-7. Objective divide ranged from 0-7 days. For both variables, a higher score indicated less of a divide between the personal life and work domains. Solid line on the plot indicates OLS regression line.

as though the divide between the two life domains was less clear during the pandemic than before, subjective divide, and that they spent time working outside of the office and outside of working hours on more days of the week, objective divide. The reported values of subjective and objective divide are plotted in Figure 6.1.

Bayesian *t*-Tests

The majority of the variables included in this study were differences; for example, change in the number of hours worked from home. To test whether the population means for both groups - before the pandemic and during the pandemic - for each of the variables significantly differed, Bayesian paired sample *t*-tests were performed using the statistical package BayesFactor [100] in R.

Change WFH Hours: 7:1 odds in favour of alternative hypothesis (i.e. reject null hypothesis that there is no difference in means)

Change Objective Divide: 14495:1 odds in favour of alternative hypothesis (i.e. reject null hypothesis that there is no difference in means)

Change Subjective Divide: 15:1 odds in favour of alternative hypothesis (i.e. reject null hypothesis that there is no difference in means)

Population means for the three independent variables were found to be statistically different between the two groups. In other words, survey participants experienced changes in the number of hours they worked from home,

the objective divide between their home and work lives, and their subjective experience of this divide.

Of the eight dependant variables, six were based on differences. The results of the Bayesian t-tests were as follows:

Change Value To: 1.4:1 odds in favour of null hypothesis

Change Value From: 7.6:1 odds in favour of null hypothesis

Change Teleport To: 8.2:1 odds in favour of null hypothesis

Change Teleport From: 1.7:1 odds in favour of null hypothesis

Change Separate Domains: 215:1 odds in favour of alternative hypothesis (i.e. reject null hypothesis that there is no difference in means)

Change Mindset: 1.5:1 odds in favour of null hypothesis

Of the dependent variables only agreement with the idea that the commute helps to separate personal life and work life was found to have statistically significant population mean differences between pre-COVID and during-COVID ratings. Interestingly, there were no significant differences in evaluations of the value of the commute, desire to teleport, or agreement with the statement that commuting gives individuals time to get into the right mindset for home/work.

Regression Analysis

The study consisted of three sets of analysis, each set containing eight models that all had the same independent variable. The regression results are presented in Table 6.2. For simplicity, only the effect of the independent variable on the dependent variable is presented. The full model results, including the model outputs for all of the variables included in the models, is presented in Appendix D. The columns represent the eight dependent variables corresponding to the regression models. The rows present the effects of the three independent variables on the dependant variables, and the adjusted r-squared figures for each of the 24 models are also presented.

Increases in the number of hours spent working from home were found to positively correlate to the individual's desire to work from home in the future: every additional hour spent working from home during the pandemic, compared to before the pandemic, correlated to a desire to work from home for an additional 0.27 hours in the future. There was found to be no correlation between changes to hours spent working from home and (1) the value placed on the commute, (2) the desire to teleport to/from work, (3) agreement with the notion that the commute acts as a means to separate the work domain and personal life domain, (4) the belief that the commute provides time to get into

Table 6.2: Multiple linear regression models and a multiple logistic regression model for Change in WFH Hours, Change Subjective Divide and Change Objective Divide

	Change Value To			Change Value From			Change Teleport To			Change Teleport From		
	Estimate	Std. Err.	t	Estimate	Std. Err.	t	Estimate	Std. Err.	t	Estimate	Std. Err.	t
Change WFH Hours	-0.008	0.011	-0.722	0.008	0.011	0.693	-0.039	0.024	-1.646	-0.022	0.022	-0.975
Adjusted R-Squared	.008		.472	-.016		.490	.089		.102	.027		.331
Change Subjective Divide	0.044	0.086	0.511	-0.059	0.084	-0.702	-0.071	0.178	-0.397	-0.157	0.167	-0.942
Adjusted R-Squared	-.010		.610	-.016		.484	.071		.692	0.026		.348
Change Objective Divide	0.038	0.071	0.525	-0.036	0.140	-0.257	-0.099	0.148	-0.665	-0.036	0.140	-0.257
Adjusted R-Squared	-.010		.600	.020		.798	.073		.507	.020		.798

	Change Separate Domains			Change Mindset			Choose WFH			Miss Commute		
	Estimate	Std. Err.	t	Estimate	Std. Err.	t	Estimate	Std. Err.	t	Estimate	Std. Err.	t
Change WFH Hours	0.000	0.010	0.037	-0.005	0.010	-0.536	0.269	0.063	4.263	0.026	0.013	1.921
Adjusted R-Squared	.010		.970	-.011		.593	.150		<.001	.139		.054
Change Subjective Divide	0.036	0.072	0.495	0.025	0.076	0.332	0.035	0.501	0.071	0.235	0.101	2.334
Adjusted R-Squared	.012		.622	-.013		.740	.031		.944	.151		.020
Change Objective Divide	-0.029	0.060	-0.488	-0.000	0.064	-0.003	-0.104	0.417	-0.250	0.043	0.080	0.533
Adjusted R-Squared	.011		.626	-.014		.997	.032		.803	.117		.594

NOTE: Only the effect of the independent variable on the dependent variable is presented for each of the 23 multiple linear regression models and the multiple logistic regression model. The full model results, including the model outputs for all of the variables included in the models, are presented in Appendix D. The columns represent the eight dependent variables corresponding to the regression models. The rows present the effects of the three independent variables on the dependent variables, and the adjusted r-squared figure for each of the 24 models is also presented. Change WFH Hours was measured in hours; Change Subjective Divide was a difference variable measured on a scale from (Clear Divide Between Work and Personal Life) 1 - 7 (No Divide Between Work and Personal Life); Change Objective Divide ranged from 0-7 days; Change Value To, Change Value From, Change Separate Domains and Change Mindset were difference variables measured on a scale from (Strongly Disagree) 1 - 7 (Strongly Agree), with 4 (Neither Agree Nor Disagree) as the midpoint; Change Teleport To and Change Teleport From ranged from 0-10 days; Choose WFH was measured in hours; and Miss Commute was a binary variable, with the options yes and no.

the right mindset for what follows the journey, or (5) whether the individual misses their previous commute.

Decreases in subjective divide were found to be positively correlated to whether the individual misses their previous commute. A unit increase in subjective divide - which was measured on a scale from 1 (clear divide between work and personal life) to 7 (no divide between work and personal life) - was found to be correlated to a 26.5% ($\exp(0.235) = 1.265$) increase in the odds of missing the commute compared to not missing the commute. No correlation was found between changes to subjective divide and (1) the value placed on the commute, (2) the desire to teleport to/from work, (3) agreement with the notion that the commute acts as a means to separate the work domain and personal life domain, (4) the belief that the commute provides time to get into the right mindset for what follows the journey, or (5) the desire to work from home in the future.

Changes to objective divide was found to not be correlated to (1) the value placed on the commute, (2) the desire to teleport to/from work, (3) agreement with the notion that the commute acts as a means to separate the work domain and personal life domain, (4) the belief that the commute provides time to get into the right mindset for what follows the journey, (5) the desire to work from home in the future, or (6) whether the individual misses their previous commute.

The lack of correlation between the Change Value variables, Change Teleport variables or Change Mindset variable and any of the three dependent variables, may be explained by the fact that the Bayesian *t*-tests found there to be no discernible difference in the population means between pre-COVID and during-COVID values for any of these five independent variables. Interestingly, no correlation was found between the Change Separate Domains variable and any of the three dependent variables despite there being a statistically significant difference in the population means between pre-COVID and during-COVID values.

The two statistically significant correlations - (1) Change WFH Hours & Choose WFH, and (2) Change Subjective Divide & Miss Commute - were with independent variables that were only measured during the pandemic.

6.3.2 Refined Methodology

As detailed in Section 6.2.3, a number of changes were made when carrying out the refined analysis:

- Change WFH Hours: converted to a change in the percentage of total working hours spent working from home

- Choose WFH: converted to a percentage of the individual’s weekly working hours
- Commute Time: natural logarithm of actual duration plus one utilised, calculated using the log1p function in R
- Commute Time Difference: log1p transformed ideal commute time values were divided by the log1p transformed actual commute time

A Bayesian *t*-test was carried out using the revised values for WFH hours, with WFH hours taken as a percentage of total working hours. The revised result was 2.3:1 odds in favour of the alternative hypothesis, as opposed to the previous 7:1 odds in favour of the alternative. This is a notable difference as Bayes Factor values between 0.33 and 3 are considered to be inconclusive, or only anecdotal evidence for any hypothesis [13]. Thus the population means for WFH Hours before-COVID and during-COVID were not found to statistically differ.

Changes to the remaining variables would not affect the Bayesian *t*-tests results as they were not included in that analysis. The updated regression analysis is presented in Table 6.3.

Increases in the proportion of hours spent working from home were found to positively correlate to the individual’s desire to work from home in the future. This was also found to be the case in the initial analysis. The magnitude of the effect is similar for both sets of analysis, however, as the variables Change WFH Hours and Choose WFH were revised, the results are interpreted differently. In the revised analysis, every additional 1% increase in the total working hours spent working from home was found to be correlated to a desire to spend an additional 0.25% of the working week working from home. When carrying out the analysis using the revised methodology, increases in the proportion of hours spent working from home was also found to be correlated to whether the individual misses their previous commute. The odds of missing the previous commute were found to be 1.4% ($\exp(0.014) = 1.014$) higher than not missing the commute with every additional 1% increase in the total working hours spent working from home. For example, an individual who now spends an extra 20% of their working hours working from home (previously 10% and now 30% of their working hours), will have a 28% increase in the odds of them missing their commute as opposed to not missing their commute. There was found to be no correlation between changes to hours spent working from home and (1) the value placed on the commute, (2) the desire to teleport to/from work, (3) agreement with the notion that the commute acts as a means to separate the work domain and personal life domain, or (4) the belief that the commute provides time to get into the right mindset for what follows the journey.

Table 6-3: Multiple linear regression models and a multiple logistic regression model for Change in WFH Hours, Change Subjective Divide and Change Objective Divide using revised methodology

	Change Value To			Change Value From			Change Teleport To			Change Teleport From		
	Estimate	Std. Err.	t	Estimate	Std. Err.	t	Estimate	Std. Err.	t	Estimate	Std. Err.	t
Change WFH Hours	-0.005	0.004	-1.177	.241	0.001	0.004	0.337	.737	-0.011	0.009	-1.187	.238
Adjusted R-Squared	.006				-.013				.060			
Change Subjective Divide	0.026	0.086	0.299	.765	-0.081	0.084	-0.972	.333	-0.058	0.180	-0.321	.749
Adjusted R-Squared	-.004				-.006				.050			
Change Objective Divide	0.027	0.071	0.387	.700	-0.029	0.070	-0.415	.679	-0.116	0.150	-0.778	.438
Adjusted R-Squared	-.004				-.012				.054			

	Change Separate Domains			Change Mindset			Choose WFH			Miss Commute		
	Coef.	Std. Err.	t	Coef.	Std. Err.	t	Coef.	Std. Err.	t	Coef.	Std. Err.	t
Change WFH Hours	-0.004	0.004	-0.957	.340	-0.005	0.004	-1.403	.163	0.250	0.062	4.004	<.001
Adjusted R-Squared	.015				-.008				.138			
Change Subjective Divide	0.032	0.072	0.440	.661	0.014	0.077	0.178	.859	0.345	1.285	0.269	.789
Adjusted R-Squared	.009				-.023				.032			
Change Objective Divide	-0.029	0.060	-0.476	.635	-0.006	0.064	-0.091	.927	-0.246	1.067	-0.231	.818
Adjusted R-Squared	.010				-.023				.032			

NOTE: Only the effect of the independent variable on the dependent variable is presented for each of the 23 multiple linear regression models and the multiple logistic regression model. The full model results, including the model outputs for all of the variables included in the models, are presented in Appendix D. The columns represent the eight dependent variables corresponding to the regression models. The rows present the effects of the three independent variables on the dependant variables, and the adjusted r-squared figure for each of the 24 models is also presented. Change WFH Hours was measured as the change in the percentage of total working hours spent working from home; Change Subjective Divide was a difference variable measured on a scale from (Clear Divide Between Work and Personal Life) 1 - 7 (No Divide Between Work and Personal Life); Change Objective Divide ranged from 0-7 days; Change Value To, Change Value From, Change Separate Domains and Change Mindset were difference variables measured on a scale from (Strongly Disagree) 1 - 7 (Strongly Agree), with 4 (Neither Agree Nor Disagree) as the midpoint; Change Teleport To and Change Teleport From ranged from 0-10 days; Choose WFH was measured as a percentage of the individual's weekly working hours; and Miss Commute was a binary variable, with the options yes and no.

As with the initial analysis, decreases in subjective divide were found to be positively correlated to whether the individual misses their previous commute; the magnitude of the effect is similar for both sets of analysis. In the revised analysis, a unit increase in subjective divide - which was measured on a scale from 1 (clear divide between work and personal life) to 7 (no divide between work and personal life) - was found to be correlated to a 26% ($\exp(0.231) = 1.260$) increase in the odds of missing the commute compared to not missing the commute. No correlation was found between changes to subjective divide and (1) the value placed on the commute, (2) the desire to teleport to/from work, (3) agreement with the notion that the commute acts as a means to separate the work domain and personal life domain, (4) the belief that the commute provides time to get into the right mindset for what follows the journey, or (5) the desire to work from home in the future.

Changes to objective divide was found to not be correlated to (1) the value placed on the commute, (2) the desire to teleport to/from work, (3) agreement with the notion that the commute acts as a means to separate the work domain and personal life domain, (4) the belief that the commute provides time to get into the right mindset for what follows the journey, (5) the desire to work from home in the future, or (6) whether the individual misses their previous commute. This is unchanged from the initial analysis.

6.4 Discussion

Both sets of analysis - initial analysis and carried out using the revised methodology - found (1) increases in the number/proportion of working hours spent working from home to be positively correlated to the desire to work from home in the future, and (2) individuals feeling as though the divide between their work and personal lives was less clear to be positively correlated to whether they missed their previous commute. The revised analysis also found increases in the proportion of hours spent working from home to be correlated to whether the individual missed their previous commute.

In the initial analysis, every additional hour spent working from home during the pandemic, compared to before the pandemic, was found to be correlated to a desire to work from home for an additional 0.269 hours in the future. In the revised analysis, every additional 1% increase in the total working hours spent working from home was found to be correlated to a desire to spend an additional 0.25% of the working week working from home. The study hypothesis had predicted that those with a greater increase in their working from home hours would express less desire to work from home in the future. This was anticipated based on the idea that working from home without a commute would lead to blurring of the divide between the personal

life and work domains [135], and a newfound appreciation for the time afforded by the commute, resulting in the individual looking unfavourably at working from home in the future. On the contrary, the data indicates that our study participants had a positive experience of working from home. This may have been due to the timing of the follow-up survey; data collection began (10 June) 7 weeks after completion of data collection for the first survey (21 March) and just under 7 weeks after national lockdown was announced in the UK (23 March). Our findings may have differed had the question been asked after a longer period of time.

Some individuals, however, do find working from home to work for them and an individual's adaptability to this practice has been linked to factors such as personality [24] and relationship status [160]. And whilst some studies have highlighted the negative aspects of working from home, such as isolation, higher levels of stress than office-based workers and lower quality sleep [45], others have found numerous benefits. A comprehensive review of telecommuting literature undertaken by Allen and colleagues in 2015 [5] found working from home to be associated with a range of positive outcomes including higher job satisfaction, greater perceived autonomy, lower work exhaustion and higher job performance. Whilst the methodology may have influenced the findings, it is also reasonable to conclude that the study participants were amongst those suited to working from home and enjoyed the benefits that working from home has to offer.

Both increases in the proportion of hours spent working from home and increased blurriness of the subjective divide between an individual's personal life and work domains were found to be positively correlated to whether the individual misses their previous commute. Both of these findings were consistent with the study hypotheses. The link with increases in proportion of hours spent working from home suggests that as the commute features less prominently in an individual's life, the role that it previously played - and the importance of this role - becomes more apparent. The correlation between an individual's perception of the divide between their different life domains and missing their previous commute implies that the commute may have played a role in helping to separate these domains. It is interesting, therefore, that no direct correlation was found between subjective divide and the variable representing the notion that the commute acts as a means to separate the work domain and personal life domain, even though this was the only dependent variable taken as a difference between pre-COVID and during-COVID figures that was found to exhibit statistically significant population mean differences according to the Bayesian *t*-tests. One reason for this might be that individuals are unaware of the commute playing the role of helping to keep the life domains separate, or that they are unwilling to admit it, but it nonetheless emerges elsewhere

in the analysis. Alternatively, the commute may be missed not because it helps to separate the life domains but rather as it has now taken on a new veneer of, for example, being a respite from the more murky amalgamation of work life and personal life. The specific circumstances around the COVID-19 pandemic make this a unique experience beyond a simple intervention study in which individuals work from home, and may have altered attitudes towards commuting, and the role that the commute plays, in ways previously unseen. The commute may be missed for newfound reasons that were not explored in this study.

The lack of correlation between variables can be as interesting and insightful as uncovering associations. Despite individuals experiencing both objective and perceived changes to their working and commuting behaviours, there were no statistically significant differences between their pre-COVID and during-COVID evaluations, according to the Bayesian t -tests (except for the Change Separate Domains variable). They did not significantly change their perception of the value of the commute, their desire to teleport to/from work, or their feeling that the commute gives them time to get into the right mindset for home/work. In order to attempt to understand the experience of the study participants more comprehensively, and with a hope of uncovering some potential reasons for the lack of change in attitudes towards commuting despite the COVID-19 related changes to the work landscape, some additional analysis was carried out. This analysis took the form of a qualitative study; thematic analysis allowed for user identified concepts to emerge from the data.

6.5 Thematic Analysis

The COVID-19 survey included the following open-ended question (question 3.12): *Please write a few sentences explaining your answer. Have your attitudes towards commuting changed since the outbreak of the COVID-19 pandemic? Think specifically about the value you place on commuting.*

Inductive thematic analysis was conducted on the 138 responses to this question, using the six-phase methodology established by Braun and Clarke [14]. Inductive analysis allows themes to emerge from the data without influence from existing theoretical models. Phase one of the process was familiarisation with the data. This involved reading through all of the responses numerous times and making notes on initial ideas and patterns that became apparent. It quickly became clear that a significant proportion of the participants were still commuting to work. Conducting the analysis on the full corpus of responses would not be appropriate due to the vast differences in the experience. Thus, the data was split into two: those who continued to commute to work during the pandemic and those who worked from home. Both cohorts provided

interesting, and distinct, insights into their unique experience and attitudes towards commuting during the global pandemic. Therefore, two sets of thematic analysis were carried out, the results of which are presented in this section.

Of the 138 study participants, 60 continued to commute to some degree during the pandemic and 78 worked from home. The fact that 43% of the sample continued to commute may account for the lack of difference between pre-COVID and during-COVID ratings for most of the commuting attitude variables tested in the quantitative study, such as value of the commute and desire to teleport. The study was not assessing the impact of losing the commute to the degree that had been anticipated and intended.

Both of the thematic analyses conducted in this section followed the six-phase framework outlined by Braun and Clarke [14]. Other researchers have added to the literature on conducting a thorough thematic analysis and the analysis conducted in this study also benefited from the guidance of Nowell and colleagues [107], and Maguire and Delahunt [92].

The first step, as described earlier, involved becoming familiar with the data and documenting initial observations, thoughts and insights. At the next stage, coding of the data took place, beginning the process of organising the data in a systematic and meaningful way. This entailed assigning labels/ codes to sections of participant responses (words, phrases or sentences) to describe the feeling or idea expressed; it broke the responses down into small chunks of meaning. Further details and quotes were also noted to add context and depth to the coding.

At the third stage, themes began to take form. DeSantis and Ugarriza [35] provide the following definition of a theme based on their review of the literature: *a theme is an abstract entity that brings meaning and identity to a recurrent experience and its variant manifestations. As such, a theme captures and unifies the nature or basis of the experience into a meaningful whole.* Thus, at the third stage, coded data extracts from the second phase were sorted and collated into relevant themes. This was carried out in two stages. Firstly, a comprehensive list of all of the codes used across the dataset was created, compiling the additional notes and quotes from the various responses. Secondly, the codes were grouped into relevant themes; some themes encompassed multiple codes whereas others formed from a single code.

The fourth stage involved reviewing the themes. The coded data extracts within each theme were assessed to ensure that they formed a cohesive pattern. Additionally, the validity of individual themes was reviewed to ensure that they accurately reflected the content of the dataset as a whole. At this stage, themes may be combined, discarded, created or broken down into separate themes. The aim of this stage is to obtain a set of themes where the data within each theme coheres together meaningfully and there are clear and identifiable

distinctions between the themes. Thematic maps are a useful visual tool to present the themes and review how they work together to represent the dataset.

The fifth stage finalises the themes. This stage involves the final refinement of the themes, with the essence of each theme being clearly defined; the researcher reviews what each theme represents, how the subthemes interact and relate to the main theme, and how the themes relate to each other. The themes are not deemed finalised until they are compared to the original set of participant responses and deemed to be an accurate representation of the entire corpus. Names are then assigned to the themes and the sixth, and final, phase of the process, writing up the analysis, may be carried out.

The thematic analysis for both of the datasets - (1) commuting during the pandemic and (2) working from home - are presented in Sections 6.5.1 and 6.5.2 respectively.

6.5.1 Commuting During COVID-19

Phase 1 involved reading through the 60 responses multiple times and making notes of initial observations and thoughts. This allowed patterns across the dataset to begin to emerge and informed Phase 2 during which the initial notes were transformed into codes. 24 separate codes were assigned across the dataset. At Phase 3, these 24 codes formed 10 themes. On reviewing the themes during Phase 4, these were further refined to produce the final 4 themes that were deemed to accurately represent the responses describing the experience of commuting during the COVID-19 pandemic.

The formation of the themes from codes at Phase 2 through to the final themes at Phase 4 are presented in Table 6.4. A thematic map visually presenting the final four themes is provided in Figure 6.2. The remainder of this section defines each of the themes, outlining what each of the themes encompasses and how they are distinct from each other.

Role of Commuting

The *Role of Commuting* theme encompasses all of the various roles that the commute plays. Firstly, *Commute as Time* covers the idea that the commute provides time; individuals did not just mention that they carried out other activities during their commute but explicitly mentioned that the commute provided them with the time to carry these out. Here the emphasis is on the commute providing time. For example, one individual stated that they “*particularly value the commute to work as I have time to get in to work mode*” whilst another noted that it provides “*time to switch off from work and to listen to a podcast.*” One individual highlighted the personal nature of this time, as time to “*do something for myself.*” Here the activity itself is not mentioned, the time created to carry out this activity is emphasised and valued.

Table 6.4: Development of themes for commuting during the COVID-19 pandemic

Phase 2 Codes	Phase 3 Themes	Phase 4 Final Themes
Commute as Time	Commute as Time	Role of Commuting
Commute as Time-Out		
Commute as Agent	Commute as Agent	
Exhausting	Commute as Work	
Concentration		
Safety		
Part of the Working Day		
Mindset	Commute as Tool	
Separate		
Getting To Work		
Environment	Environment	Impact of Commuting
Emotion/Affect	Emotional Impact	
Well-Being		
Unpredictability		
Better Than Before	Better Than Before	Reflecting on Change
Change	Changes	
Extreme Experiences		
“COVID Hasn’t Affected Me”		
Opportunity Cost	Opportunity Cost	Waste of Time
Redundant Capacity		
Waste of Time	Wasted Time	
Too Short		
Desire To Eliminate Commute		
Necessity		

NOTE: Analysis of the 60 responses from individuals who continued to commute during COVID-19 led to the development of 24 codes, presented in the left column. The 24 codes formed 10 themes, presented in the middle column. Further refinement produced the final 4 themes, presented in the right column.

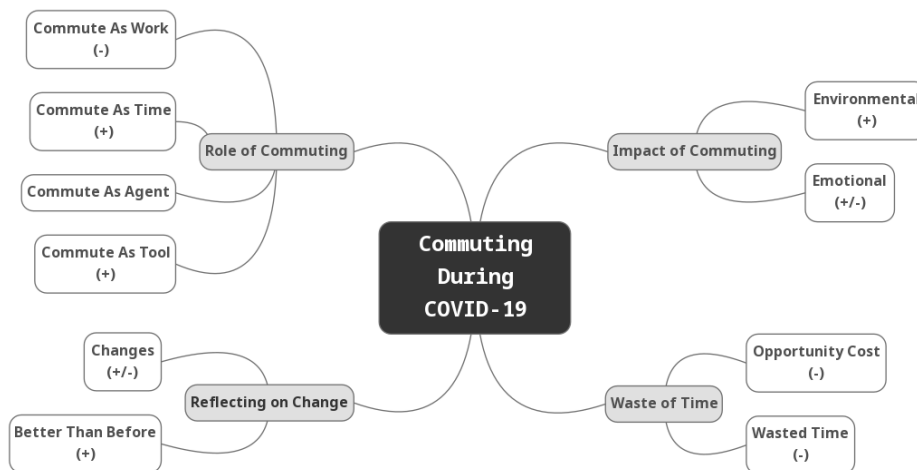


Figure 6.2: Thematic map of the derived themes for commuting during COVID-19.

NOTE: The sentiment expressed within each theme is indicated to be positive [+], negative [-], or mixed [+/-], where appropriate.

Commute as Agent accounts for individuals referring to their commute as an active agent in their experience. It acknowledges the distinction between the commute as time for other activities that instigate change and the commute itself as the instigator of change. One individual claimed that their commute “*motivates me and wakes me up*”. Similarly, another stated that theirs “*puts me in an okay mood*”; they did not simply say that they are in an “*okay mood*” by the end of their commute but rather that the commute actively put them in this state, the commute was the active agent of change.

Commute as Work covers two broad ideas: the commute as a tiring activity and that the commute should be considered to be part of the working day. The former breaks down further into three nuanced concepts. Firstly, the commute as an exhausting activity: “*I find the commute exhausting and, after already hard days, it ensures I have little energy for anything [in] the evenings.*” The individual is not tired from a long day at work in general, he explicitly attributes the exhaustion to the commute itself: “*it*”, the commute, is the reason he has no energy in the evenings. Secondly, the commute requires high levels of concentration, making it taxing on the individual: “*I have to concentrate on driving... because the roads are so busy*”. And lastly, driving has risks attached and, for some, safety is a conscious concern whilst commuting: “*concentration is needed for safety.*” These three aspects - the commute itself being an exhausting activity, the commute requiring concentration which is tiring, and the vigilance necessary to alleviate safety concerns - cover the first of the two broad ideas that make up the sub-theme of *Commute as Work*.

The second idea is that the commute is not only work - an activity requiring

physical or mental effort - but that it should be recognised as being part of the working day. One individual suggests that it *“should at least be compensated, if not included into the typical 9-5, for example if my work starts at 9am, then I will leave my home at 9am to get to the office.”* The individual not only identifies the issue but offers two solutions, compensation for the commute or inclusion of it within working hours, suggesting that this is a real concern for them and may have elicited previous thought.

Commute as Tool encompasses the many roles that the commute plays in enabling the commuter to achieve some goal. The first of these is providing the individual time to get into the right mindset for either work or home: *“headspace to process work stuff and home stuff”*. The journey into work was seen as *“time to get my head in gear on the way in”*. The commute to work was used by many to plan the day ahead, mentally sort through work-related issues, think about their goals for the day and prepare for any potential changes that may disrupt their plans. The commute home was considered to be a *“good chance for me to relax from work before I get home”*, with some individuals mentioning activities they like to use to achieve this, such as listening to a podcast. One individual described their afternoon commute to be a chance to *“digest”* what had occurred during the work day, a sentiment shared by others. Conversely, another individual explicitly mentioned that they do not require the commute for the purpose of getting into the right mindset for work or home as the nature of their work makes this *“unnecessary”*. The design of the survey was such that individuals were asked to rate their commute specifically on its role in providing time for them to get into the right mindset for work/home prior to being asked the open-ended question. This may have prompted some to consider the commute playing this role in their lives when answering the qualitative question who otherwise would not.

The same situation occurred regarding asking individuals about the part the commute plays in keeping their personal life and work life separate. Thus, whilst some individuals mentioned their commute as a useful aid in achieving this goal, and that they felt that there was a *“risk for work and home life to become blurred”* without their commute, it is important to be mindful of the fact that the survey design may have influenced these responses.

Finally, and expectedly, the commute was seen as simply a means of getting to work, with one individual claiming that they would like for it to be nothing more than *“straightforward, efficient and direct”*.

Overall, the commute emerged from the data as playing four distinct roles for those individuals commuting to and from work during the COVID-19 pandemic. It created **time** for the individual, was an active **agent** of change, was viewed as **work** and considered to a useful **tool**.

Impact of Commuting

The *Impact of Commuting* theme covers the perceived impacts of commuting; these were classified as being related to either the environment or the individual's emotional state. With regards to the environment, numerous participants mentioned the reduction in the number of cars on the road during lockdown, and there was explicit mention of pollution. One participant also mentioned noticing "*more wildlife around*". Overall, the pandemic was seen to have had a beneficial impact on the environment.

The emotional impact of commuting during the pandemic was addressed in three ways through the responses. Firstly, the unpredictability of the commute - with regards to traffic levels - was identified as a cause of emotional distress. Secondly, there was a general awareness of the impact of commuting on subjective well-being: "*...which wouldn't be good for my wellbeing*". And finally, the myriad ways in which the commute elicits an affective response. Both ends of the spectrum of emotion were expressed; whilst some individuals found their commute to be "*peaceful*" and time to "*relax*", others reported that it "*frustrates*" them and that it is "*stressful*". Often terms that are exact opposites were used, in contrast to the previous response, another explicitly stated that they "*don't get stressed*", and the commute is described by two different individuals as giving them time to "*relax*" and being "*not relaxing*". As well as the actual words and phrases used as descriptors within the responses, it is interesting to acknowledge that these individuals chose to speak about their commute in this way. Instead of relaying practical information about their commute, they chose to use emotive language and express how they feel during the commute.

Overall, the responses highlighted two key areas affected by commuting during the pandemic. The responses concerning the environment focused on observed changes as a result of the pandemic. In contrast, whilst some of the emotional responses to the commute were based on pandemic-related changes, the majority were with regards to the commute in general and expressed feelings that have remained constant despite the pandemic.

Reflecting on Change

The *Reflecting on Change* theme envelopes all responses that focused on marked differences. These were grouped into two broad categories. The first was a sentiment repeated throughout the corpus of responses, that the commute during the pandemic was better than it had been before. One individual stated that they "*like commuting now*" whilst another expressed this more strongly with "*now I love it*". A number of reasons as to what has made for the "*easier*", "*better*" and "*far more pleasant*" experience were posited, including increased parking availability - or free parking - at the destination, and saving

money as petrol was cheaper. Time savings - as there was less traffic on the roads making the journeys quicker - was also a significant factor for many, one individual explained how this meant they could *“spend more time at home”* whilst another liked how the quieter roads demanded less strenuous concentration and many described the journey as being *“less stressful”*. Whilst most individuals *“appreciated”* these changes and viewed them as a *“bonus”*, one individual felt that their commute was finally as it should be and that their normal commute was unreasonably long: *“my commute took far longer than it should have done due to traffic issues, this is not the case at the moment”*. Overall, the majority of participants remarked on an improvement in their commuting experience, both at an emotional and practical level, during the pandemic compared to their normal commute, with one individual declaring that they *“wish it could stay like this”*.

The second broad category, focusing on changes, is further made up of three groups. The first is a significant number who stated that *“COVID hasn’t affected me”*. They did not perceive there to be any changes to their commute as a result of the pandemic, either practically or in their subjective experience of it. The second group represents great swings in the commuting experience, one individual who recalled being *“all ways stuck in traffic, as there were loads of cars in rush hour”* goes on to say *“but now i love it there are less cars on the road and I don’t get stressed driving as its so peaceful”*. The emotive strength of the language used reflects the intensity of the experience, from *always* being stuck in traffic - which was reiterated with *loads of cars* - to then describing the commute as being *so peaceful*, not just better or more peaceful.

And finally, the third group focused on some significant practical change. One individual was able to switch their mode of transport from driving to work to cycling, due to the pandemic making her partner’s work situation more flexible, and expressed that they were *“enjoying the benefits of that”*. In contrast, another individual found themselves *“working a lot longer hours and am rushing on my way back from work to get home a quicker”*. Whilst these two examples present beneficial and detrimental effects of practical pandemic related changes on the commuting experience, others have found a *“nice balance”* in being able to work from home for part of the time, saving money on petrol whilst maintaining a healthy level of work and home divide. One individual who worked from home for eight weeks during lockdown and returned to the office shortly before completing the survey, mentioned how the commute helps them to separate their work and personal life domains and to get into the right mindset for work/ home, confessing *“I think I took this for granted pre covid.”* The individual goes on to further compare their experiences of working from home and commuting: *“Whilst working from home, I would turn off my laptop and use the commute time to go for a walk in order to*

switch off and this feels like a better use of time than commuting. That being said, the podcast makes me feel like I am using the time to do something for myself which I wouldn't have considered this time in such a way before, when I took it for granted". Having undergone two changes - from commuting to working from home and then back again - the individual is able to draw on all three different experiences for their comparisons and declare going for a walk as being *a better use of time than commuting* whilst also expressing greater appreciation for their commute. Not all of the practical changes described pertained to the pandemic, with one individual explaining how changing jobs significantly reduced, or *"massively improved"*, their commute time.

Overall, the pandemic has presented a moment for individuals to reflect on change. Most individuals expressed gratitude for a marked improvement in their commuting experience. Change took different forms across the cohort, some individuals claimed that the pandemic had not affected them, whilst others underwent drastic differences between pre-COVID and during-COVID periods. And whilst most practical changes to the commute and working behaviours were related to the pandemic, this was not always the case; life continued to undergo the more conventional changes within the evolving pandemic framework.

Waste of Time

The *Waste of Time* theme comprises of two groups. The first, also titled *Waste of Time*, is made up of four nuanced sets of responses that all expressed sentiment pertaining to the commute holding no value. The first were those who expressed a desire to eliminate commuting: *"If i could eliminate my commute all together, i would be very happy."* The second set explicitly talk about the commute as being *"wasted time"* or, more strongly, *"a waste of human time and life"*. The third set felt that their commute was too short to be beneficial, *"I live roughly 5 minutes away from work so it's not really time to get in the mindset for work or de-stress from a day of work"*, too short to comment on, *"I am only a 5 minute drive to work"* as the entirety of the response, or too short to even be classed as a commute, *"I only live 5 minutes from work so I don't really class the journey as a commute"*. The final set view their commute as just a necessity, *"I feel the commute is a chore"*.

The second group see their commute not only as wasted time but extend this to rue what else they could have been doing in this time, *"Whilst working from home, I would turn off my laptop and use the commute time to go for a walk in order to switch off and this feels like a better use of time than commuting."* The opportunity cost of commuting was even quantified by one individual who had calculated the amount of time they spend commuting per week: *"The 15 hours a week could be used at home doing more valueable work."* As well as those who expressed a desire to be engaging in an alternative activity, there

were also those who were displeased with their inability to maximise the use of their time when commuting, *“I don’t really see the point of commuting as it is wasted time because I have to drive there. If commuting in another way, I could see more benefit to it being able to read for example on the journey.”* For this individual, it was the redundant capacity of their time, rather than the commute itself, which they lament.

Overall, some individuals view their commute as simply a waste of time. Others extend this idea to consider the opportunity cost or redundant capacity of their commute time, ruminating on what other activities that could (also) engage in.

6.5.2 Working From Home

The thematic analysis followed the process described earlier for the responses from those who continued to commute during the pandemic. This time, however, it utilised the 78 responses from those who worked from home during COVID-19, foregoing their usual commute. 19 codes were assigned across the dataset, which then formed 9 themes at Stage 3, and were further refined to produce the final 4 themes that were deemed to accurately represent the responses describing the experience of working from home, without a commute, during the COVID-19 pandemic.

The formation of the themes, from codes at Phase 2 through to the final themes at Phase 4, are presented in Table 6.5. A thematic map visually presenting the final four themes is provided in Figure 6.3. The remainder of this section defines each of the themes, outlining what each of the themes encompasses and how they are distinct from each other.

Commute Time As Resource

The *Commute Time As Resource* theme encompasses the many ways in which commute time is viewed as a resource. Firstly, this is in the context of the role that it plays. The two roles mentioned in the responses were the commute helping to get into the right mindset for home or work, and the commute facilitating the separation of the personal life and work domains. With regards to the former, individuals reported how the commute to work provided them with the time to prepare for the day ahead and the commute home from work allowed them to unwind. One individual stated *“I know I used to value the opportunity to have the journey to and from work to get into the right mindset, to prepare myself on the way in and to reset to home life in the way home”* whilst another wrote that their commute provided them with the time to *“unwind and contemplate my thoughts and feelings before getting into work or coming home.”*

On the contrary, other individuals felt that their commute was too stressful

Table 6.5: Development of themes for working from home, without a commute, during the COVID-19 pandemic

Phase 2 Codes	Phase 3 Themes	Phase 4 Final Themes
Mindset	Role of Commute	Commute Time As Resource
Separate		
Commute as Time	Commute as Time	
Alone Time		
Other Activities		
Wasted Time	Wasted Time	
Opportunity Cost		
Preconceptions About WFH	Past and Future	Time: Past, Present and Future
Projections Into The Future		
Past Experience		
Comparative Experience AM Vs PM Commute	Comparative Experience	
Commute Time Now		
Replace Commute	Repurposing Commute Time	
Miss Commuting	Desire to Commute	Sentiment Towards Commuting
Household Composition		
Emotion/Affect	Emotional Experience	
Obstacles/Issues Environment		
	Practical Pros & Cons	Practical Aspects

NOTE: Analysis of the 78 responses from individuals who worked from home during COVID-19 led to the development of 19 codes, presented in the left column. The 19 codes formed 9 themes, presented in the middle column. Further refinement produced the final 4 themes, presented in the right column.

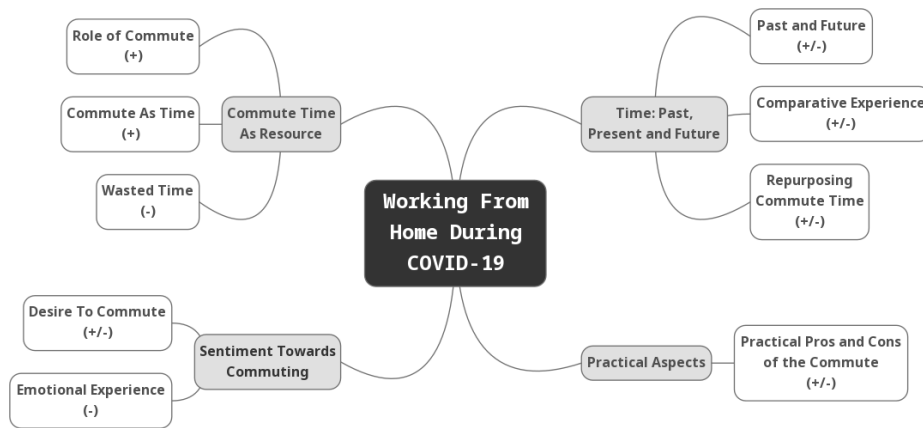


Figure 6.3: Thematic Map of the derived themes for working from home during COVID-19.

NOTE: The sentiment expressed within each theme is indicated to be positive [+], negative [-], or mixed [+/-], where appropriate.

to provide this role - *“I don’t miss my commute to or from work as it often involved traffic jams and stress so I couldn’t have a clear mind to prepare myself properly for where I was going. My attitude now is that I like working from home as I get a relaxing start to the day”* - or too short - *“it’s not really enough time to get into/out of the work mindset”* - or that this role had become redundant as the nature of their work had changed since working from home - *“commuting helped de-stress and prepare for home but without the more stressful elements in the job the commute is required less.”*

The majority of participants reflected on their previous commute and did find it to have provided time to get into the right mindset, with some struggling to manage without it: *“I used to use my commute to work to plan my day and prepare myself in my head. I would use the commute home to digest and decompress everything that happened that day. I find it harder to do that now I am working from home. I find I am worrying about work well into the evening.”* Some commented on how they valued the commute playing this role despite generally disliking their commute: *“I dislike commuting however have used it to get into the right frame of mind.”*

The second role, using the commute to aid in keeping the different life domains separate, was expressed by many, with *“the commute would help separate work/home life”* being a typical response. Some attributed this to the physical distance, *“the 3 yards from the desk where I work at to the sofa isn’t enough to distance the phonecall from work to home.”* One individual suggested that the legal restrictions that prohibit the use of phones whilst driving act to safeguard the sanctity of the commute as a zone free from the demands of work: *“having that commute time distances that ability to communicate. For*

example it is still recommended not to answer phones while driving. Therefore for the hour commute I won't answer my phone people know I am now not at work."

Many expressed their struggles regarding the blurring of the divide between their work and personal life domains: *"whilst I don't enjoy sitting in traffic, I do find that there is great value in transitioning from work to home and home to work. When I work at home exclusively it is much harder to form boundaries, Between work and nonwork activities, and I spend a great deal more time working than I should."* However, one individual felt that they had adapted to a new way of working and no longer had a need for separation: *"initially I missed the separation between home and work life. The commute was an essential part of that separation. Over time, this need for separation has reduced to a point where I no longer miss the old ways of working."*

As mentioned earlier, individuals were asked to rate their commute specifically on its use in providing these two roles prior to being asked the open-ended question. This may have prompted some to mention these roles when answering the question who otherwise would not.

The second way in which the commute time is regarded as a resource is in the time that it provides. This is further broken down into three: the commute as protected and scheduled time for the individual, as time to be alone and as time to engage in other activities. The first of these is more concerned with how individuals regard their commuting time as opposed to what they fill this time doing; the commute is referred to as *"time in the car to..."*, or that it *"gave me time to..."*, or that it *"was a time to..."* With regards to alone time, this was valued both for providing time to enjoy solitary activities - *"a bit of alone time to listen to music or a podcast and enjoy some peace"* - and for just purely being time alone, *"just to be out of the house, without my child in tow!"* Finally, individuals listed a broad range of activities that they carried out on their commute, the most common of which was listening to some auditory entertainment, from podcasts and audio books to music and the radio, with one individual claiming it *"was the only time I ever listen to music, which I do enjoy a lot."* One individual rued the convenience of carrying out other tasks en route: *"it was also handy as I passed a supermarket on the way home which prevented a seperate journey if i needed shopping"*

The final way in which commute time is explored as a resource is in the squandering of this time; *"it is just a waste of time and I am really not looking forward to restarting my commute"*. For some this extends beyond simply being a waste of time to being a negative use of time that is detrimental to them: *"I don't place any value on my commute because I see it more of as a pain"*. It is seen to have *"no value"* and viewed as *"just a method of getting to work."* The wasted time of the commute is also in terms of the opportunity

cost it poses, with one individual feeling that the commute prevented her from maximising the use of her time and working when she is most productive: *“but in the mornings it felt like wasted time when I could have been working more, as I’m more productive first thing.”*

Overall, commute time is seen as a resource in three ways: for the role that it plays in individuals’ lives, providing some function or aid, for its intrinsic value as time, allowing space to be alone or to engage in solitary endeavours, and for the perceived wasteful use of this resource.

Time: Past, Present and Future

The theme *Time: Past, Present and Future* explores the various ways in which the commute is viewed temporally: reflecting back, assessing now and projecting forwards. This theme comprises of three groups. The first encompasses the responses concerned with the future and the past. With regards to the future, this is both in terms of preconceptions that the individual had about working from home before lockdown began as well as projections into the future once the individual was already working from home. Some individuals thought that *“it would be fantastic to not have to commute”* but have since realised that they miss their commute: *“I am really missing the hour driving each way as I now realise that I use it to think about useful things.”* Conversely, others had anticipated missing their commute only to find that they did not, with one individual stating that they *“found it easier than expected to switch off from work without the commute.”* Participants expressed a desire to work from home in the future, even if just for part of their working week: *“I hope I can work at home at least 3 days a week after pandemic is over.”* One individual detailed how the newfound ability to work from home has enhanced his opportunities in other aspects of his life: *“I would love to be able to work from home now as it gives me the option to relocate to a nicer area.”* However, a word of caution was expressed by some who feared that working from home would lead to their work life encroaching on their personal life: *“there is a point where working from home wont just be between 9-5 it will be whenever there is an issue and youll be expected to answer.”* Some individuals would recall their past experiences of commuting, usually expressing their frustrations regarding traffic and stress, resulting in having to *“leave home very early in the morning to avoid the worst of the traffic”* and being in a *“rush to get home to get ready to go out for activities in the evenings.”*

The second group described their comparative experiences. The majority of which were comparisons between their previous commute prior to the pandemic and their current working from home experiences. Some only realised how frustrating their commute was once they stopped doing it, *“my attitude towards commuting hasn’t changed since the outbreak, but it has made me realise how*

frustrated I got from my commute” and many found their stressful mornings to have transformed into a more calm affair since working from home, “my commute to work used to be stressful. Now it’s a time to get ready for work whilst feeling more rested and without the worry of being late.” Conversely, others struggled with managing their energy levels without their commute, “I think the commute home in particular helped with detaching from work and entering relaxation mode at home and now I don’t have that i notice a clear difference in my energy levels and attitude” Comparisons were made with regards to the divide between work and personal life - “when I work at home exclusively it is much harder to form boundaries, Between work and nonwork activities, and I spend a great deal more time working than I should” - many mentioned the time and cost savings - “it’s much easier and cheaper” - and the logistical functionality of the commute was also missed, “the only real disadvantage is that I could stop on the way home to shop if needed.” Some made more general statements expressing their preference, largely in favour of working from home with comments such as “I did enjoy traveling to work but i enjoy finishing in the house more.”

The idea that the pandemic has proven the viability of working from home and that this work format should be an option in the future was expressed by some: *“I didn’t particularly enjoy commuting before the pandemic and the lockdown has shown us we can work effectively from home. The current situation has swung the balance too far, and we would benefit from some face-to-face interaction, but I can see no reason to go back to the old daily commute.”* However, most participants felt that losing their commute had caused them to value it more in its absence, with statements such as *“i value my commute home more now that i am full time at home”* and *“I think not being able to leave the house other than for essential reasons had made me appreciate the little things, such as something as small as the drive to work.”* One individual gained appreciation for other aspects of his life when he stopped commuting, *“i get to spend more time with my family its made me realise how much pressure my partner is under looking after the family and house its also made me realise how many hours it takes me to get to and from work missing out on family time.”*

Comparisons were also made with regards to an individual’s various previous commutes, with one individual stating that the relative duration of his current commute compared to his previous commuting experience has an influence on his attitudes towards commuting: *“given the length of my commute it would not influence my decision to go back to commuting or not. I have had longer commutes in the past, and were that still the case my answer may be very different.”* Stark differences were also observed between the experiences of commuting during the morning and the afternoon, with one individual stating

both that *“I dont miss the rush hour in the morning the rush to get into work, find a parking space and be ready to work as soon as I arrive. Working from home makes that so much less stressful”* and *“I do miss the closing down of the office and driving home at the end of the day.”*

The third, and final, group for the theme was about repurposing the time that individuals usually spent commuting. For many, this time was spent with their family, *“having no commute means I can spend more time with my family”*, or on activities that they enjoy, *“have saved so much time in my commute that I am able to do more things I enjoy.”* Some appreciated the *“extra time at home to think/relax in”* and not having to *“get up and leave so early in the morning.”* Not everyone, however, was able to repurpose this time productively: *“presently and in theory I should be able to have the extra saved time to do something else but it doe not seem to work like that! The commute time is not seen as such and it is easier to procrastinate at home.”*

Participants described the new routines they had implemented in order to replace their commute. For some, this meant taking time out to clear their head, *“I guess I miss the feeling of getting out to clear my head before and after work, though I’m trying to replace that by taking time out at home”*, although this proved to be a more successful endeavour for some than others, *“I find it harder to do that now I am working from home. I find I am worrying about work well into the evening.”* Many implemented some form of physical activity: *“I agree that the commute helps to prepare/switch off from work. But I have designed my own way to do this now I am working from home. As soon as I finish, I get changed and either go for a walk or run, or do an exercise class from home to switch off.”*

Overall, participants explored many temporal aspects of the commuting experience. From their preconceptions and projections into the future, recollections of past commuting experiences and present day utilisation of the commute time, to their comparative experiences. Commuting is an activity that most have a history of, current relationship with and foresee undertaking far into their future.

Sentiment Towards Commuting

The *Sentiment Towards Commuting* theme covers the responses that expressed attitudes and emotions regarding the commute. There were two groups of responses, the first of which was concerned with the desire to commute. Many individuals did not miss their commute, and some expressed joy at not having to commute: *“the fact that I’m no longer having to commute is a blessing”* and *“I love not having to commute to work”*. Indifference towards the commute was also expressed, *“I didn’t mind my commute but I’m not missing it that much”*. When expressing that they did not miss their commute, or were

indifferent to it, individual's did not elaborate. However, those who missed their commute explained that they did so for a range of different reasons. Individuals missed the time it provided, *"miss the time when I was able to process the day"*, the role it played in their day, *"I guess I miss the feeling of getting out to clear my head before and after work"*, the opportunity to go for a drive, *"I miss the drive that I once had"*, the social opportunity it provided, *"well, commuting can be a hassle, unless you are commuting with someone else then it's more enjoyable. Therefore, I miss those short periods of time when I sometimes spoke and laughed with my colleagues"*, and missed it as a secondary effect of actually missing work, *"I miss going to work therefore the commute."*

The composition of the individual's household influenced their desire to commute. Many with families were grateful for the additional time they got to spend with them, *"the fact that I'm no longer having to commute is a blessing because I'm able to spend more time with family"*, and one individual even gained a greater appreciation for their partner, *"i get to spend more time with my family its made me realise how much pressure my partner is under looking after the family and house its also made me realise how many hours it takes me to get to and from work missing out on family time so i now spend less time n the office and more around family."* However, not everyone living with families was happy to forego their commute, one individual missed the opportunity *"just to be out of the house, without my child in tow!"* Working from home without a commute was found to be less suited to those living alone: *"i feel trapped here all day as i live mostly alone."*

The second group covered all of the responses regarding emotions and affect. The vast majority of these sentiments were expressed by those who do not consider their commute favourably. Some of these chose to talk about their commute negatively, using phrases such as *"I would be very stressed"* and *"this was really frustrating"*, whilst others opted to talk about the experience of working from home positively, with language such as *"love not having to commute"* and *"I'm happy working from home."*

Overall, participants expressed their sentiment towards commuting in terms of their desire to commute in the future and their emotional experience of, and relationship with, commuting.

Practical Aspects

The *Practical Aspects* theme covers all of the logistical, physical and practical elements of commuting mentioned in the responses. The first group of these covers the various obstacles or issues associated with commuting. A common complaint was regarding traffic. Traffic was bemoaned for making people late for work, *"often get stuck in traffic for ages and sometimes this could make me late"*, for delaying them getting home, *"it was worse at 5pm"*

as traffic really backed up and it'd take at least 20 minutes extra to get home. This was really frustrating", and for affecting their mood, "I am now able to start work straight away without having to sit in traffic, I find that traffic alters my mood and can make me irritable before work has even begun." Traffic was specifically associated with stress for many individuals, "the traffic was a nightmare and I would be very stressed before and after work." Finding parking was a common inconvenience, "I would often struggle to find somewhere to park." The financial cost of commuting was also deemed significant, with some individuals only realising how expensive it was when they stopped, "also I have realised that I was spending a lot of money on fuel".

The practical aspects of commuting also extended to those responses mentioning the environment. In some cases this was with regards to the positive impact on the environment of having fewer cars on the roads, with suggestions that it was "super beneficial to the environment" and that individuals were "happier my carbon footprint is being reduced." In other cases, this was with regards to the enjoyment of the physical environment in which the commute takes place, either as a pleasant landscape, "I miss spending time in the car, thinking about driving and seeing the sights on my commute", or simply as an opportunity to experience a different space, "I used to enjoy the change of scenery."

Overall, practical aspects of commuting were largely seen as obstacles making the journey more stressful or burdensome. The change of environment, however, and the beauty of those surroundings, were seen to enhance the experience.

6.5.3 Discussion

Four themes emerged from the responses obtained from participants who continued to commute to work during the pandemic. They viewed their commute as playing a number of *roles* in their day: providing time, acting as an agent of change, as work and as a tool to be utilised. The *impact* of commuting was considered in terms of how it affects the environment and the emotional impact it has on the commuter. *Change* was explored with regards to the commuting experience, as a result of both the pandemic and life in general. The commute was also viewed as a *waste of time*, an inefficient use of time on an activity that has little value. Overall, the commuting experience during-COVID was viewed more positively than before-COVID. Some individuals have always valued their commute, some appreciate it now that it is a more pleasant experience, and others continue to view their commute as an undesirable activity.

Responses from those who lost their commute during the pandemic, and

instead worked from home, also revealed four themes. They regarded their commute as a *resource*, in terms of the role that it played in their day, the valuable time that it provided and, for others, ruing the wasteful use of this time. A range of *temporal* aspects of the commuting experience were explored, looking both back to the past and into the future, with regards to comparative experiences and in repurposing the time previously dedicated to the commute. *Sentiment* towards commuting, both the desire to commute in the future and the emotional experience of commuting, was expressed. *Practical* elements of commuting, and their negative or positive impact on the experience, were also explored. Overall, whilst some individuals described their previous commute favourably, others found it to be an equally undesirable experience.

6.6 Overall Discussion

For both initial and revised analysis, increases in the number/ proportion of working hours spent working from home were found to be positively correlated to the desire to work from home in the future, and individuals feeling as though the divide between their work and personal lives was less clear was found to be positively correlated to whether they missed their previous commute. The revised analysis also found increases in the proportion of hours spent working from home to be positively correlated to whether the individual missed their previous commute.

The majority of the study hypotheses were rejected. Those with a greater increase in their working from home hours were found to express a greater desire to work from home in the future, not less as predicted. Thematic analysis found that many of those who lost their commute during the pandemic had a favourable experience of working from home which may explain this finding. Bayesian *t*-tests uncovered that the lack of association between changed commuting behaviours and altered attitudes may be due to the lack of significant differences between pre-COVID and during-COVID attitudinal ratings.

Thematic analysis highlighted the nuanced and complex nature of attitudes towards commuting, with individuals often simultaneously expressing positive evaluations of their previous commute and a lack of desire to return to it. This may explain why increases in the proportion of working hours spent working from home was positively correlated to both a desire to work from home in the future and an individual missing their previous commute, seemingly contradictory sentiments.

Multiple Comparisons

The multiple comparisons problem, explained in Section 5.4, also applies to the regression analysis conducted in the present study. Each of the eight dependent variables was tested for all three of the independent variables: change WFH hours, change objective divide and change subjective divide. The Bonferroni Correction for the present study is calculated by dividing the threshold of 0.05 by 8 to obtain an adjusted p value of 0.006.

Reassessing the model outputs against the adjusted significance threshold alters the study findings. For the initial analysis, subjective divide is no longer associated with an increase in the individual missing their previous commute. Increases in the number of hours spent working from home, however, is still found to be positively correlated to the individual's desire to work from home in the future.

For the refined analysis, the finding that increases in the proportion of working hours spent working from home was positively correlated to the individual's desire to work from home in the future remained statistically significant with the lower adjusted p value. However, both the findings regarding whether individuals miss their previous commute are no longer deemed statistically significant (the findings that (1) increases in the proportion of hours spent working from home positively correlate to whether the individual misses their previous commute, and (2) decreases in subjective divide positively correlated to whether the individual misses their previous commute). Thus, using the adjusted p value, neither change subjective divide nor change objective divide were found to correlate to any of the commuting attitudes assessed in the study.

6.6.1 Limitations and Further Work

The most significant limitation of the study was the sample size. The scale of the study was limited by the number of participants that had completed the earlier Role of Commuting survey. Whilst the achieved sample met the minimum requirement according to power analysis for the planned regression models, it was a small sample. A quantitative study conducted with 138 participants allows insights to be derived that may inspire further investigation; alone, however, it does not have the methodological rigour necessary to influence policy.

The COVID-19 survey was distributed to participants seven weeks after concluding data collection for the Role of Commuting survey. This time period may have impacted the findings. Ideally, additional follow-up surveys would be issued to participants periodically to track changing attitudes. Some elements of the working from home experience may only come into effect a few months

into the changed behaviour, continuing to collect data would allow the effect of these aspects on attitudes towards commuting to be captured.

The study design introduced the multiple comparisons problem; accounting for this rendered a couple of the associations to be statistically insignificant.

The survey design was such that participants were asked the open-ended question, used for the thematic analysis, after being asked specific close-ended evaluative questions which may have influenced their response. Any further efforts to explore commuting attitudes qualitatively should ensure that the data collection process does not risk introducing order-effect bias.

6.7 Conclusion

The coronavirus pandemic affected working behaviours across the globe; this study sought to explore the impact of these changes on attitudes towards commuting within the UK. This was done both quantitatively and qualitatively.

Participants' attitudes regarding their commute were not found to differ significantly between pre-COVID and during-COVID; a significant proportion of our sample continued to commute to some extent during the pandemic. Thus, changed working behaviours were found to correlate only to those attitudinal variables that were exclusively collected in the during-COVID survey and were not based on quantifying a change in attitude. Increases in working hours spent working from home were found to be positively correlated to an individual's desire to work from home in the future.

Thematic analysis revealed the complicated nature of an individual's relationship with their commute, which is often neither wholly negative or positive. COVID-19 affected the commuting experience for most of the participants, regardless of whether they continued to commute or worked from home. Four themes emerged from the responses of those who continued to commute: role of commuting; impact of commuting; reflecting on change; and waste of time. Four themes also emerged from the responses of those who worked from home: commute time as resource; time: past, present and future; sentiment towards commuting; and practical aspects.

This study demonstrated the enduring nature of the commute within the working landscape, despite a pandemic. It highlighted how individuals often hold seemingly contradictory beliefs regarding their commute. The findings of this study begin to uncover some of the complexity of the relationship that individuals have with their commute, and how a significant disruptor affects this. The thematic analysis demonstrated the richness of insight available when adopting qualitative methods, and how utilising this technique supported and deepened our understanding of the results of traditional regression analysis.

Chapter 7

Discussion

The research conducted as part of this thesis aimed to shed light on commuting behaviours. Evaluations of subjective well-being associated with the commuting experience, and the intrinsic value of the activity of commuting, were the focus. Two of the studies - Commuting Comparison to Other Daily Activities [Chapter 3] and Subjective Commute Time and Commute Well-Being [Chapter 4] explored subjective well-being, and the remaining two - The Role of the Commute [Chapter 5] and Commuting and COVID-19 [Chapter 6] - focused on the value of commuting.

This chapter summarises the findings from each of these studies. Reflections on how these findings relate to existing literature were provided within the previous chapters. This chapter presents a discussion on how the studies collectively provide us with new insights on the commuting experience which may inform future efforts to improve this routine activity in the lives of many. Limitations of the studies are considered and recommendations are made for further work.

7.1 Research Summary and Discussion

The thesis addressed four Research Questions. This section begins by providing a brief summary of the findings for each.

RQ1: How does commuting compare with, and impact on, the enjoyment of other daily activities?

Chapter 3 presented a study - Commuting Comparison to Other Daily Activities - which addressed Research Question 1. The study utilised the UKTUS dataset; data from 1944 participants were assessed.

Commuting using passive modes of transport - car, train, bus, van and tram/ underground - was found to be the least enjoyable activity undertaken by individuals, out of a total of 11 activities. At the same level of categorisation, active commuting - walking and cycling - ranked fourth from the lowest. Whilst

both of these rankings are low, significantly more enjoyment was found to be derived from active commuting than commuting using passive modes of transport. This was the first study to use data that was representative of the the UK to explore how commuting compares to other daily activities with regards to experienced well-being.

Commuting was found to have little impact on an individual's enjoyment of the other daily activities in which they partake. For active commuting, enjoyment was found to be just as high on commuting workdays as on non-commuting workdays across all daily activities. This was the first study to compare experienced well-being of daily activities between commuting workdays and non-commuting workdays.

RQ2: What is the relationship between commute duration and commute well-being?

Chapter 4 presented a study - Subjective Commute Time and Commute Well-Being - which addressed Research Question 2. The study utilised primary data, obtained from 194 car commuters in the UK using an online survey.

The study extends the discussion around the impact of subjective measures of commute time on commute well-being beyond *ideal* commute times. *Acceptable* commute times were also explored. More specifically, the study focused on the relative nature of these subjective measures, compared to actual commute time. The ratio of acceptable to actual commute time was found to be positively correlated with commute well-being for both the commutes to work and from work, and to mitigate the effect of commute time on commute well-being. The ratio of ideal to actual commute time was not found to be significantly correlated with commute well-being for either journey.

This was the first study to assess how the ratio of acceptable/ ideal to actual commute time correlates with commute well-being. The study introduced a novel commute time variable, Actual-Acceptable Ratio (AAR), and recommends its inclusion in future studies of commute well-being.

RQ3: Will the commute still play a role in peoples' lives as technological advancements make working remotely an increasingly viable option?

Chapter 5 presented a study - The Role of the Commute - which addressed Research Question 3. The study utilised primary data, obtained from 194 car commuters in the UK using an online survey.

The findings of this study suggest that despite technological advancements leading to an increased blurring of the objective divide between work and home, neither this nor the perceived divide are correlated to an individual's judgment on the role that the commute plays in their life or their assessment of the value

or desirability of their commute.

The findings of this study were novel contributions. They provide some insight into how evolving work behaviours may affect the prevalence of commuting.

RQ4: How do significant changes in commuting behaviours affect attitudes towards commuting?

Chapter 6 presented a study - Commuting and COVID-19 - which addressed Research Question 4. The study utilised primary data, obtained from 138 car commuters in the UK using an online survey.

Increases in an individual's working hours spent working from home were found to be positively correlated to their desire to work from home in the future.

All of the survey participants experienced pandemic-related changes to their commute, regardless of whether they continued to commute or worked from home. Thematic analysis revealed the complicated nature of an individual's relationship with their commute, which is often neither wholly negative or positive. Amongst those working from home, individuals often simultaneously expressed positive evaluations of their previous commute and a lack of desire to return to it.

Four themes emerged from the responses of those who continued to commute: role of commuting; impact of commuting; reflecting on change; and waste of time. Four themes also emerged from the responses of those who worked from home: commute time as resource; time: past, present and future; sentiment towards commuting; and practical aspects.

The findings of this study begin to uncover some of the nuances and complexities of the relationship that individuals have with their commute, and how a significant disruptor may affect this. Qualitative methods are not often used in studies on commuting; this study demonstrated the depth of insight available by adopting such an approach.

Whilst there is some overlap between the various studies - which allows for interesting links to be drawn between them, as are discussed later in this chapter - they each had a unique and distinct focus. All four of the studies utilised regression analyses, and the similarities and differences between them may be demonstrated by the variables included in the analyses. This is presented in Table 7.1.

The corpus of research presented in this thesis begins by evaluating commuting on a macro level - taking the activity of commuting as a whole and looking at how it relates to other daily activities. Commuting is a complex entity, however, with numerous factors affecting how individual's experience

Table 7.1: Variables tested in each of the studies presented in the thesis

Study	Dependent Variables	Independent Variables	Control Variables
Commuting Comparison to Other Daily Activities [Chapter 3]	Commute Enjoyment	Activities	Usual Working Location
			Total Time Spent Commuting in the Day
			Duration of Episode
			Time On Activity During Day Up to Current Point
			Socio-Demographic Factors
Subjective Commute Time and Commute Well-Being [Chapter 4]	Commute Well-Being (STS)	Commute Time	Socio-Demographic Factors
		Actual-Ideal Ratio (AIR)	
		Actual-Acceptable Ratio (AAR)	
		Job Satisfaction	
			Commuting Attitudes
The Role of the Commute [Chapter 5]	Separate Domains	Objective Divide	Commute Time
	Mindset	Subjective Divide	Commute Time Difference (AID)
	Value To		Job Satisfaction
	Value From		Socio-Demographic Factors
	Teleport To		
			Teleport From
Commuting and COVID-19 [Chapter 6]	Change Separate Domains	Change WFH Hours	Commute Time
	Change Mindset	Change Objective Divide	Commute Time Difference (AID)
	Change Value To	Change Subjective Divide	Change Job Satisfaction
	Change Value From		Socio-Demographic Factors
	Change Teleport To		
	Change Teleport From		
	Choose WFH		
			Miss Commuting

NOTE: Table summarises the key variables tested in each of the four studies presented in the thesis, clarifying the distinctions as well as any overlaps.

well-being during their commute. Thus, one of these factors was then selected - one which previous research has established to be highly significantly correlated to commute well-being, but with some uncertainty about the precise nature of the relationship - and assessed with regards to how it relates to commute well-being from a new perspective, accounting for the subjective and relative nature of commute time. Individuals' preferences and past experiences affect their commuting experience, but so does the external landscape in which their commute takes place. Whilst a lot of literature had forecast how the working environment is evolving with technological advancements leading to greater levels of remote workings, few (or none) had focused on how this relates to commuting. How the commute fits into an individual's day, the role it plays in their life, and their attitudes towards it was the focus of the third study. The body of work presented in this thesis ends by extending this to understand how these attitudes may change as a result of a major disruptor to the usual commute.

One of the overarching themes of the research is the importance of accounting for the subjective nature of various measures. Both with regards to commute times and the divide between individuals' work and personal lives, there were found to be clear distinctions and significant differences between the objective and subjective measures. Within the context of commuting, the subjective nature of these two areas had been un(der)explored within the literature.

In the Subjective Commute Time and Commute Well-Being study, a new measure is introduced, Actual-Acceptable Ratio (AAR). This measure is not used in the subsequent studies; the Actual-Ideal Difference (AID) is instead included as a control variable. This was decided due to the untested nature of AAR and the fact that it had only previously been explored within the context of commute well-being which was not the focus of the subsequent studies. AID is an established concept within the literature.

7.2 Research Impact

The research undertaken within this thesis explores commuting behaviours with respect to subjective well-being and the role of the commute. It places the commute within the context of other daily activities, demonstrates that subjective measures of commuting factors significantly differ to objective ones, explores how attitudes regarding the commute relate to the evolving work landscape and assesses the impact of changes to the commute on these attitudes.

Workplaces

Commuting is a distinct activity, separate from other work-related tasks.

It is, however, associated with working and the workplace, and impacts on employees' mood and performance at work [21]. Thus, insights on how to improve the commuting experience for employees would benefit workplaces.

Previous studies showed that active modes of commuting are correlated to higher subjective well-being than non-active modes. This study was the first in the UK to extend that comparison out into the context of an individual's day, showing that not only might an individual experience greater commute well-being if walking than commuting by bus, for example, but how this sits in comparison to doing household chores or exercising. It demonstrates how the worst daily activity for many may be adapted to elevate its well-being effects, and how this change may make it less likely to be amongst the least enjoyable parts of the day. Many workplaces offer incentive schemes for their employees to switch to active commuting; our finding provides further evidence to support such schemes.

Overall, there was little difference in the enjoyment of other daily activities between workdays on which commuting took place and those on which it did not. However, for those commuting using both passive and active modes of transport, sleep was found to be enjoyed significantly more on non-commuting workdays. As the science on, and public awareness of, the importance of sleep for physical and mental health is growing [111], information on how different aspects of the day relate to the quality and experience of sleep is of increasing interest and use. This finding suggests that policies enabling employees to work from home may benefit employers by reducing absenteeism due to ill health.

Two thirds of employees who worked remotely during the pandemic believe a hybrid model of remote and in-workplace work would be ideal for them and their colleagues in the future, according to a survey of 2000 employees in the UK [141]. The findings presented in this thesis both support this approach and offer insights that may inform the design of its implementation.

Research Methods

The relationship between numerous commuting factors, such as mode and duration, and commute well-being has been extensively explored. Most studies of commute well-being include some of these factors as control variables as their impact on this measure is well established. Commute time is one such variable. Recently, the influence of *ideal* commute time has begun to be explored. Our research extends the discussion around the impact of subjective measures of commute time on commute well-being beyond merely ideal commute time. Acceptable commute time was also explored. We found both acceptable commute time and the novel measure introduced in our study, Actual-Acceptable Ratio (AAR), to be significantly correlated to commute well-being.

The limitations of the sample used in the study are acknowledged; however, the study initiates discussion around the testing and inclusion of AAR in studies of commute well-being. If the associations are found to hold true for larger and more representative samples, it may alter our understanding of the relationship between commute time and well-being, and subsequently, how we account for it in research moving forward.

Accounting for subjective measures has also been addressed in other areas of the work presented in this thesis. The objective divide and subjective divide between individuals' work domains and personal life domains were found to not be correlated, and to exhibit distinct differences with regards to their correlation with commuting attitudes. Applying a subjective lens to a broader range of study variables, both well-established and newly formed, may provide new insights and recalibrate our understanding of complex relationships.

Qualitative methods are rarely adopted in studies on commuting. Thematic analysis enhanced our interpretation of the results of more traditional quantitative analysis. Utilising qualitative techniques would enrich our understanding of existing relationships and uncover areas that have not yet been (comprehensively) explored. Studies that focus solely on qualitative analyses would be a useful addition to research on commuting. Additionally, most quantitative studies may also benefit from an element of qualitative exploration to deepen the insights obtained.

7.3 Study Limitations

Some of the limitations of the studies presented in this thesis apply to all, or most, of them. These are detailed first, and are then followed by study specific limitations.

Sample Limitations. Three out of four of the studies presented in this thesis utilised small, convenience samples: Subjective Commute Time and Commute Well-Being [Chapter 4]; The Role of the Commute [Chapter 5]; and Commuting and COVID-19 [Chapter 6]. The lack of representativeness of the samples means that findings can not be generalised to the wider population. Both this and the size of the samples, necessitate further studies to validate the conclusions and recommendations made in this work.

Transport Mode. Three out of four of the studies presented in this thesis utilised data obtained only from individuals who commute by car: Subjective Commute Time and Commute Well-Being [Chapter 4]; The Role of the Commute [Chapter 5]; and Commuting and COVID-19 [Chapter 6]. The mode of transport used has a significant impact on evaluations of the commute and

commute well-being, as discussed in Section 2.2.1. Thus, the findings presented in the three studies listed above can not be generalised to commuting across all modes of transport. The remaining study - Commuting Comparison to Other Daily Activities [Chapter 3] - grouped modes into categories. Whilst assessing transport modes collectively in relevant groups is a valid and justified approach, the findings of the study would have been more specific and detailed had each mode been assessed individually.

Methodological Limitations Some of the limitations with the methods adopted in this thesis include: (1) Associations between variables presented in this thesis are correlations. The methods adopted in the studies do not allow conclusions regarding causality, or the direction of associations, to be drawn. (2) The regression models used in each of the studies accounted for demographic characteristics. However, there may be systematic differences that were not accounted for. (3) The study design for The Role of the Commute [Chapter 5] and Commuting and COVID-19 [Chapter 6] studies introduced the multiple comparisons problem; this needed to be accounted for when interpreting the model outputs.

Additional limitations that are specific to the studies include:

Commuting Comparison to Other Daily Activities [Chapter 3]: The study utilised secondary data, UKTUS, and therefore (1) was unable to distinguish between the commute to work and the commute from work (previous studies have shown these two commuting events to exhibit different experienced well-being effects [147]); and (2) only included one measure of experienced well-being, accounting for additional measures of experienced well-being - including negative affect - would allow for a more comprehensive assessment of commute well-being.

Commuting and COVID-19 [Chapter 6]: (1) The timing of the follow-up survey may have affected the responses obtained. Some aspects of the working from home experience may have evolved over time, or only come into effect months after the pandemic began, and these would have been unaccounted for. Collecting data periodically would have allowed changing attitudes to be tracked over time. (2) The survey asked participants open-ended questions after close-ended evaluative ones. This may have introduced order-effect bias.

7.4 Recommendations for Future Research

Building on the limitations outlined in Section 7.3, a range of possible directions for future research are presented in this section.

Actual-Acceptable Ratio (AAR). A new measure, AAR, was introduced. The relationship between AAR and commute well-being needs to be tested using a larger and more representative sample. The validity of including the measure in commute well-being studies should be assessed. Extending this further, the inclusion of AAR in studies looking at commuting more broadly - not focusing on subjective well-being - and even travel trips in general, should be considered. Additionally, understanding what factors influence subjective judgements of acceptable commute times in the UK could facilitate the design of commuting experiences that elicit greater commute well-being.

Methodological Refinements. Three out of four of the studies presented in this thesis utilised data obtained only from individuals who commute by car, had small sample sizes and utilised convenience samples: Subjective Commute Time and Commute Well-Being [Chapter 4]; The Role of the Commute [Chapter 5]; and Commuting and COVID-19 [Chapter 6]. Repeating the analysis from these studies with larger and more representative samples, and extending them to account for a wider range of transport modes, would provide greater confidence in the findings, allow them to be generalised to the wider population, and offer nuance on how transport mode affects the outcomes.

Qualitative Studies. Qualitative methods are often overlooked in research on commuting. The thematic analysis presented in this thesis demonstrated the richness of insight available when adopting such methods alongside more traditional quantitative approaches. Future studies could focus solely on qualitative methods to deepen our understanding of, for example, the role that the commute plays in an individual's day or what people believe would improve their commuting experience. Collecting qualitative data alongside quantitative data allows additional context to be obtained for the analyses, and may help to explain unexpected findings.

Intervention Studies. The vast majority of intervention studies in commuting research focus on switching commute mode to active modes or public transport. Intervention studies that look to improve the commuting experience within existing time and mode constraints, by changing activities that the individual engages in or the time at which they travel, would provide practical insights to help individuals make more informed choices regarding this routine part of their day.

Subjective Variables. Most variables used in quantitative analysis in research on commuting tend to be objective measures. Many of these may also be viewed subjectively. Accounting for an individual's perception of reality adds

an additional layer of depth to our understanding of complex relationships. The research presented in this thesis demonstrated the use of subjective variables with regards to commute time and the divide between individuals' different life domains. This could apply to a range of other factors, such as evaluations of the usefulness or worthwhileness of activities undertaken whilst commuting.

Future of Transport. The transport and mobility sector is on the verge of undergoing significant change. Innovations such as autonomous vehicles are emerging on the roads. The way individuals plan, book and pay for multi-modal trips is being reimagined with the move towards Mobility as a Service (MaaS). Ultimately, the future of transportation in cities looks to move away from private ownership of vehicles and towards a collaborative system integrating both public and private services; for example, booking a trip that includes an autonomously driven taxi, a bus ride and the underground using a single mobile app with just one overall payment [54]. These changes may drastically affect how individuals experience and utilise travel time, and recalibrate current assessments of the desirability of commute time. Studies that look to uncover how autonomous cars and MaaS may affect the commuting experience, the desirability of the commute and its effect on subjective well-being are necessary to prepare for the future of transport, and the future of commuting.

Chapter 8

Conclusions

For it so falls out
That what we have we prize not to the worth
Whiles we enjoy it, but being lack'd and lost,
Why, then we rack the value, then we find
The virtue that possession would not show us
Whiles it was ours.

Much Ado About Nothing, William Shakespeare

The commute. A routine part of the day for millions across the world. A daily stressor, or a therapeutic escape from the pressures of life. A constant of the everyday that is still yet to be fully understood. Or perhaps just a constant of yesterday, as the COVID-19 pandemic has shown us a different way of living.

The research presented in this thesis has shed some light on commuting behaviours, on how the commute relates to subjective well-being and on attitudes towards the commute. The lens has been broad, focusing on areas largely unexplored and emerging trends or phenomena. How commuting compares to, and impacts on the enjoyment of, other daily activities. Extending the discussion on accounting for subjective measures of commute time. Beginning to shed light on how changing working practices may affect attitudes towards commuting, its desirability and prevalence in daily life. Utilising the unexpected social experiment of the pandemic to understand how a major disruptor to the usual commute affects attitudes towards commuting.

The findings of this research highlight the complex nature of the commute and the relationship that individuals have with it. It is often evaluated as neither a wholly positive nor negative experience, and individuals often hold simultaneously contradictory views. The commute plays a role for many beyond affective evaluations of it. The true value of the commute is hard to quantify. But doing so is important as we find ourselves on the cusp of change. The significant role it may play in facilitating other domains of life should not be overlooked, only for the commute to be rued once it is lost.

Appendix A

Datasets

A number of data sources have been used for the studies presented in this thesis. For each dataset, details on how the data was obtained, what it contains and participant sample characteristics are presented in this Appendix. Some of the datasets have been utilised for multiple studies, and are therefore applicable to more than one of the chapters in this thesis.

A.1 UK Time Use Survey Data

The UK Time Use Survey (UKTUS) was carried out to provide data on how people aged eight years and over in the UK spend their time. It was conducted by NatCen and the Northern Ireland Statistics and Research Agency (NISRA) on behalf of the University of Oxford’s Centre for Time Use Research (CTUR).

The structure and contents of the UKTUS dataset were ideal for analysing commute-related subjective well-being. The data was utilised for one study presented in this thesis: *Commuting Comparison to Other Daily Activities* [Chapter 3].

A.1.1 Data Collection

The UKTUS data [61] was collected between April 2014 and December 2015 from a representative sample of individuals and private households across the UK. The survey design followed the Harmonised European Time Use Survey (HETUS) guidelines [103]. The sample was drawn in two stages, firstly by random selection of postcode sectors and then a random selection of postal addresses within each of these.

The data consists of three main components: household interviews, individual questionnaires and diaries. After conducting the household interview and the individual questionnaire for every member of the household, each individual was provided with a diary. There were four versions of the diary, two of which were tailored for adults (participants ages 14 and over): the

Table A.1: Number of recorded episodes for Level 3 commuting activities in UKTUS 2014–15

Level 3 Activity	Number of episodes
Travel to/from work	315
Travel to work from home and back only	9,192
Travel to work from a place other than home	649
Total:	10,156

standard adult diary, and the full adult diary which also contained a column for recording enjoyment of each activity. Directions on completing the diaries were explained to the participants and example diary entries were provided, presented in Figure A.1.

Participants were advised to fill out the diary as they progressed through the day, as opposed to filling it out at the end of the 24-hour period. Individuals were asked to complete two diary days, one weekday and one weekend day; dates of the allocated days were randomly selected for each household. Phone call and text message reminders were utilised to ensure participants remembered to fill out their diaries.

Diaries were collected from 9,388 participants who completed over 16,550 diary days, rating 587,632 activity episodes on an enjoyment scale. Participants' diaries contained records for every ten minutes over a 24-hour period. They were asked to note down their primary and secondary activities, who they were with, where they were, whether they were using a smartphone/tablet/computer, and their enjoyment rating - on a scale from 1 (not at all) to 7 (very much) - for each activity.

When processing the data from the diaries, NatCen's Data Unit allocated the activities to 276 different activity codes. Activities were ordered using three levels; 11 Level 1 activities split up into 43 Level 2 activities and then further into 276 Level 3 activities. Each activity undertaken by a participant during the day, regardless of its duration, is referred to as an episode.

A.1.2 Commuting Data

Commuting falls under the Level 1 activity *Travel*, the Level 2 activity *Travel by Purpose*, and is covered by three separate Level 3 activities: (1) *Travel to/from work*; (2) *Travel to work from home and back only*; and (3) *Travel to work from a place other than home*. The number of episodes of each of these three activity codes is presented in Table A.1. Commuting episodes were taken to comprise of the three Level 3 activities.

UKTUS includes participants who usually work (1) from home, or in the same grounds/buildings as home, (2) at a single workplace away from home,

Example

- Record your main activity for each 10-minute period
- Only one main activity on each line!
- Distinguish between first and second job, if any.
- Distinguish between travel and the activity that is the reason for travelling.
- Don't forget the mode of transport or location and whether you were using a smartphone, tablet or computer.
- Please remember to record who you were with.

- For each 10-minute period, please write in how much you enjoyed this time on a scale of 1 to 7, with 1 meaning you didn't enjoy it at all and 7 meaning that you enjoyed it very much.
- For example, if you didn't enjoy an activity at all then you would write 1 in the box.

This includes children aged 8 and over

Day 1 Morning Time: 7am – 10am		Day 1 Time: 7am – 10am		Were you alone or with somebody you know? <small>Mark all relevant boxes</small>							How much did you enjoy this time? <small>1 = not at all 7 = very much</small>	
Time: 7am-10am Morning (am)	What were you doing? <small>Please write down one main activity.</small>	If you did something else at the same time, what else did you do?	Did you use a smartphone, tablet, or computer?	Where were you? <small>Location, or mode of transport</small>	Alone	Spouse/ partner	Mother	Father	Child aged 0-7	Other person	Others you know	
7am-7:10	Woke up the children		<input type="checkbox"/>	At home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5
7:10-7:20	Had breakfast	checked emails	<input checked="" type="checkbox"/>	→ on foot	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6
7:20-7:30	"	Talked with my family	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5
7:30-7:40	Cleared the table	Listened to the radio	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4
7:40-7:50	Helped the children dressing	Talked with my children	<input type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1
8am-8:10	"		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8:10-8:20	Went to the day care centre		<input type="checkbox"/>	on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Use an arrow or quote marks to record that an activity lasted longer than 10 minutes.

Figure A.1: Instructional example diary entry provided to participants as a guide

(3) in a variety of different places of work, such as on clients' premises or in their homes, and (4) on the move.

A.1.3 Sample Characteristics

The entire dataset was filtered to include only those episodes (1) for which an enjoyment rating had been noted, (2) that took place on a weekday, (3) that took place on a day classified as a workday, and (4) that were undertaken by participants who described themselves as self-employed or in paid employment (full or part-time). Filtering the data to weekdays meant that only the weekday diary entry of each individual was retained, and individuals who only completed a weekend day diary entry were omitted from the study. The resultant dataset after filtering comprised of 1944 participants, significantly fewer than the original UKTUS sample. Sample characteristics, for both the full UKTUS sample and the filtered dataset, are presented in Table A.2.

A.1.4 Survey Questions

The household survey, individual questionnaire and time-use diaries contained a broad range of questions. The questions utilised for the study presented in this thesis are detailed in this section.

Two versions of databases created using the diaries were available, both presenting the same data in different formats; in the *long* format, each row was a person-day-episode whilst in the *wide* format each row was a person-day. In other words, in the *long* format, each row represented one episode whilst in the *wide* format all of the episodes undertaken within the day were presented in the same row. For the study conducted within this analysis, the *long* version of the diary data, the *uktus15_diary_ep_long* datafile, was utilised. Whilst the two datasets present the same data, the variables used differ; variable names relating to the diary data utilised within this section correspond to the *long* version of the data.

Activity Episodes

NatCen's Data Unit coded the activities contained within the participants' diary entries using a three tier system: 11 Level 1 activity codes, 43 Level 2 activity codes and 276 Level 3 activity codes. The primary activity undertaken was provided in the long diary database as variable *whatdoing*. Every instance of an activity being undertaken was referred to as an episode.

Enjoyment Ratings

The level of enjoyment associated with each episode was provided in the long diary dataset as variable *Enjoy*. Individuals were instructed to rate enjoyment

Table A.2: UKTUS Sample Characteristics

	UKTUS	Filtered UKTUS for Present Study
Number of Participants	9,388	1,944
Age		
Age Range	8–99	17–83
Average Age	44	43
Education Level		
Degree or Higher	2,082	633
Higher Education	1,309	350
A-Level or Equivalent	1,525	381
Secondary	2,266	465
Employment Status		
Self Employed	701	327
Paid Employment	3,879	1,617
Unemployed	324	–
Retired	2,032	–
Full-Time Student	619	–
Marital Status		
Single, Never Married	1,948	392
Married/Cohabiting	5,071	1,359
Divorced/Widowed	1,321	190
Number of Children		
No Children	5,767	1,190
1 Child	1,440	340
More than 1 Child	2,181	414
Self-Reported Health		
Very Good	3,414	776
Good	3,818	864
Fair	1,591	272
Bad	439	27
Very Bad	117	2
Long Term Health Problems or Disabilities		
No	6,203	1,431
Yes	3,154	506

of their time spent on each episode on a scale from 1 (not at all) to 7 (very much).

Transport Mode

The diary entries had a column dedicated to entry of either the location at which the activity took place or, if travelling, the mode of transport used. This information was included as variable, *WhereWhen*, in the long diary dataset. NatCen coded the data into 20 categories related to transport mode (and 14 location codes): travelling on foot/ bicycle/ moped, motorcycle or motorboat/ passenger car as the driver/ passenger car as a passenger/ passenger car - driver status unspecified/ lorry or tractor/ van/ taxi/ bus/ tram or underground/ train/ aeroplane/ boat or ship/ coach; Other specified private/ public travelling mode; Unspecified public transport mode; Unspecified transport mode; Unspecified private transport mode.

Usual Working Location

The participant's usual working location was obtained as part of the individual survey. They were asked "*In [your/Name's] main job, [do/does] [you/he/she] work mainly...*" with the following options: 1. At home, or in the same grounds and buildings as home (e.g. in adjoining property or surrounding land), 2. At a single workplace away from home (e.g. office, factory or shop), 3. In a variety of different places of work (e.g. working on clients' premises or in their homes), and 4. Working on the move (e.g. delivering products or people to different places).

Duration of the Episode

The diary data contained a variable, *epitime*, providing the duration of each episode.

Age

The age of each member of the household was obtained as part of the household survey. The *DVAge* variable was obtained by initially asking "*What is your date of birth?*". If the respondent did not know the answer or refused to respond, they were then asked "*What was your age last birthday?*" If a response was still not provided, the interviewer provided an estimate based on appearance.

Sex

The sex of each member of the household was noted as part of the household survey, variable *DMSex*. The interviewer input a response of either male or female.

Educational Attainment

The CTUR derived variable of *dhiqual* was utilised; CTUR derived variables were included in the dataset containing the information obtained from the

individual questionnaire. *dhiqual* provided the highest qualification obtained by the individuals. The options were: 1. Degree or higher, 2. Higher education, 3. A level or equivalent, 4. Secondary, 5. Other, -9. No answer/refused, -8. Don't know, and -1. Item not applicable.

Country of Birth

The country of birth information, variable *PIBornC*, was obtained during the individual interview. Participants were asked “*In which country [was/were] [you/Name] born?*” with the following options: 1. England, 2. Scotland, 3. Wales, 4. Northern Ireland, 5. Republic of Ireland, 6. France, 7. Germany, 8. Italy, 9. Spain, 10. Poland, 11. Cyprus, 12. Turkey, 13. Australia, 14. New Zealand, 15. Canada, 16. U.S.A, 17. China/Hong Kong, 18. India, 19. Pakistan, 20. Bangladesh, 21. Sri Lanka, 22. Kenya, 23. Ghana, 24. Nigeria, 25. Uganda, 26. South Africa, 27. Jamaica, 28. Other country, -8. Don't know, and -1. Item not applicable.

Relationship Status

The CTUR derived variable of *dmarsta* was utilised; CTUR derived variables were included in the dataset containing the information obtained from the individual questionnaire. *dmarsta* provided the marital/cohabitating status of the individuals. The options were: 1. Single, never married, 2. Married/cohabitating, 3. Divorced/ widowed, -9. No answer/ refused, -8. Don't know, and -1. Item not applicable.

Self-Reported Disability

Information regarding long term health problems and disabilities was obtained as part of the individual survey, variable *LongIll*. Participants were asked “[*Do/Does*] [*you/Name*] *have any health problems or disabilities that [you/he/she] [expect/expects] will last for more than one year?*” and provided with the following options: 1. Yes, and 2. No.

Self-Reported Health

Information regarding the general health of the individual was obtained as part of the individual survey, variable *GenHlth*. Participants were asked “*How is [your/his/her] general health? Would you say it was. . .*” and provided with the following options: 1. Very good, 2. Good, 3. Fair, 4. Bad, and 5. Very bad.

Interview Mode

The format of the interview was noted as part of the individual survey, variable *Indtype*. The interviewer input a response from the following: 1. By the interviewer in a face to face personal interview, 2. By the interviewer in a telephone interview, 3. By the interviewer in a proxy interview, and 4. Not

available/ not eligible.

Economic Activity Status

The economic activity status, variable *WorkSta* was obtained during the household questionnaire. Participants were asked “Which best describes your current employment status?” with the following options: 1. Self employed, 2. In paid employment (full or part-time), 3. Unemployed, 4. Retired, 5. On maternity leave, 6. Looking after family or home, 7. Full-time student , 8. Long-term sick or disabled, 9. On a government training scheme, 10. Unpaid worker in family business, and 97. Doing something else.

UK Region

The UK region in which the individual resides was available as a CTUR derived variable, *dgorpaf*, within the individual survey. The options were: 1. North East, 2. North West (including Merseyside), 3. Yorkshire Humberside, 4. East Midlands, 5. West Midlands, 6. East of England, 7. London, 8. South East, 10. South West, 11. Wales, 12. Scotland, and 13. Northern Ireland.

A.2 Role of Commuting Survey

The main aim of this survey was to gauge commuters’ attitudes and perceptions regarding their journeys to and from work, to understand the role it plays in their day and the value that they place on it.

The survey results were intended to be used for both quantitative and qualitative study. Findings from the quantitative studies are presented in this thesis, the qualitative study is yet to be completed.

After the survey data had been obtained, and following the outbreak of the COVID-19 pandemic that changed the work environment for many across the UK, a subsequent survey was created that utilised some of the responses from this survey in order to assess changed behaviours and attitudes. Details of the second survey are provided in Section A.3. Thus, responses to this survey were utilised for three of the studies presented in this thesis: (1) Subjective Commute Time and Commute Well-Being [Chapter 4], (2) The Role of the Commute [Chapter 5], and (3) Commuting and COVID-19 [Chapter 6].

A.2.1 Data Collection

Data was collected using an online survey conducted over six weeks, between 8 February and 21 March 2020. All data was collected directly from participants. The website Qualtrics was used to create the survey and an online participant recruitment platform, Prolific, was used to recruit participants. A small reward of £1.20, calculated at a rate of £6/hr, was paid to all participants who

completed the survey. Potential participants were presented the survey on Prolific, from which they were directed to Qualtrics to take the survey, and then directed back to Prolific to complete the process and receive their payment.

The online survey was open to all participants who met the following criteria: (1) in employment/ self-employed, (2) over the age of 18, (3) commuters (at least once a week), (4) English speaking, and (5) living in the UK. Prolific screened participants to ensure that they met the criteria and only offered the survey to those who did.

Sample Size

The quantitative analysis required a sample of individuals who commuted using the same, single, form of transport. Commuting by car was selected; the Prolific screening search function indicated that it was the most used transport mode amongst their participant pool - 522 potential participants who had been active on the site in the 90 days prior to checking - and therefore, gave us the greatest chance of obtaining sufficient survey responses for analysis.

Power analysis was used to determine the minimum number of survey responses required in order to make the planned quantitative analysis viable. The `pwr` package [19] in R was used for the calculation.

The `pwr.f2.test` function provides the test for a general linear model:

$$pwr.f2.test(u =, v =, f2 =, sig.level =, power =)$$

where sample size = $u + v + 1$

The significance level was set at **0.05**.

Power, the probability of finding a true effect when one does exist, was set at **0.9**.

Effect size, f^2 , was set at **0.15**. This was based on the suggested guideline value for a medium effect size published by Cohen in 1988 [25].

Numerator degrees of freedom, u , is taken as the number of continuous variables + the number of dummy variables - 1. To determine this figure, the planned regression model with the greatest number of variables was used, and calculated as follows:

Subjective/Objective Divide = 1

Duration = 1

Commute Time Dissonance = 1

Job Satisfaction = 1

Income = $12 - 1 = 11$

$$\begin{aligned} \text{Sex} &= 4-1 = 3 \\ \text{Age} &= 1 \\ &= 19 - 1 = \mathbf{18} \end{aligned}$$

Denominator degrees of freedom, v , was calculated using the `pwr.f2.test` function, and found to be **164**.

Therefore the minimum required sample size was:

$$u + v + 1 = 18 + 164 + 1 = 183$$

Based on power analysis and the size of the potential participant pool, a convenience sample of 400 individuals who commute by car was the target.

The qualitative analysis required participants who commute using a more varied range of transport modes. Thus, the survey was also distributed to 50 individuals who walk to/ from work and 50 who commute by train.

A.2.2 Sample Characteristics

All of the quantitative studies to use this survey data used only the data collected from those who commute by car. The qualitative analysis also utilised the data collected from those who commute by train and foot; data from each of the three groups was analysed separately in that study. As the studies presented in this thesis utilised only the data obtained from those who commute by car, sample characteristics for just that group of individuals is presented in this section.

Three studies utilised this data: (1) Subjective Commute Time and Commute Well-Being, (2) The Role of the Commute, and (3) Commuting and COVID-19. The sample characteristics presented here are applicable to the studies on subjective commute time and the role of the commute. The COVID-19 study utilised a subset of this sample; the sample characteristics for that study are presented in Section A.3.2.

A total of 194 completed survey responses were obtained from participants who commute by car. Sample characteristics are presented in Table A.3.

A.2.3 Survey Questions

The survey contained 30 questions and took approximately 12 minutes to complete. Participants had to answer every question in order to progress through the survey. The survey was split into six sections. The first section explored the value of commuting. The second section focused on attitudes towards commuting. The third section covered employment, both with regards to the individual's attitudes towards their employment and also details on

Table A.3: Sample characteristics for the 194 participants who commute by car

	Number	Percent
Sex		
Female	150	77%
Age		
Age Range	21-66	-
Average Age	38	-
Education Level		
Ph.D	2	1%
Master's Degree	28	14%
Undergraduate Degree	83	43%
College (A-Levels/BTEC/IB etc)	60	31%
Secondary School	21	11%
Marital Status		
Single, Never Married	47	24%
Married	78	40%
Living with Partner	55	28%
Divorced/Separated	13	7%
Widowed	1	1%
Number of Children in Household		
None	123	63%
One	35	18%
Two	31	16%
Three	5	3%
Daily Activity Limitations Due to Health Problems or Disabilities		
No	174	90%
Yes, Limited A Little	18	9%
Yes, Limited A Lot	2	1%

the nature of the employment. The fourth section collected details on the nature of the commute. The fifth section comprised of the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS). The final section covered socio-demographic information. The questions asked within each of these sections are presented below.

1. Value of Commuting

This section began with the following paragraph explaining what was meant by the concept of the “The Value of the Commute”.

*The following questions are about the **value** you place on your commute. Think about the time you spend commuting. Aside from getting you to/from work, how beneficial is this time to you? How disadvantageous? What role does your commute play in your day?*

This paragraph preceded the following questions.

Q2.1

To what extent do you agree/disagree with the following statements:

I value my commute TO work?

Presented alongside a Likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), with 4 (Neither Agree Nor Disagree) as the midpoint.

Q2.2

I value my commute FROM work?

Presented alongside a Likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), with 4 (Neither Agree Nor Disagree) as the midpoint.

Participants were then asked the following two open-ended questions.

Q2.3

Please explain why you do, or do not, value your commute

Three separate text boxes were provided beneath the question for open-ended responses, labelled ‘To Work’, ‘From Work’ and ‘Both Commutes’.

Q2.4

What would make your commute more valuable to you?

Three separate text boxes were provided beneath the question for open-ended responses, labelled ‘To Work’, ‘From Work’ and ‘Both Commutes’.

2. Attitudes Towards Commuting

Two Likert scales were presented to the individuals in matrix table form, ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), with 4 (Neither

Agree Nor Disagree) as the midpoint. The instructions above the matrix read: *Using the scales below, please indicate the extent to which you agree/disagree with the following statements.* The two statements were as follows:

Q2.5

My commute helps me to separate my personal life and work life, and

Q2.6

My commute gives me time to get into the right mindset for home/work

Participants were asked two questions regarding teleporting, preceded by the following statement:

Imagine you could hypothetically teleport to/from work (in other words, click your fingers and magically appear at your workplace).

Q2.7

On how many of your next 10 commutes would you choose to teleport TO work rather than commute?

Q2.8

On how many of your next 10 commutes would you choose to teleport FROM work rather than commute?

A drop-down list of options ranging from 0 to 10 was presented below each question.

Commute Well-Being was measured using the STS developed by Singleton [137]. Separate scales were used for the commute to work and the commute from work, as previous studies have found the travel experience to differ considerably between the two [147].

Q2.9

For each journey - to work and from work - survey participants were presented with nine sets of evaluations alongside unnumbered 7-point scales, with minimum/negative emotions or evaluations on one end and maximum/positive emotions or evaluations on the other. For the journey to work, they were instructed: *For each of the following pairs, please select the choice that best describes how you felt overall during your commute TO work over the last four weeks.* The wording was changed from *TO* to *FROM* for the journey home from work. The nine items were as follows:

I was very tense — I was very relaxed

I was very bored — I was very enthusiastic

I was very sad — I was very happy

<i>I was very tired</i>	—	<i>I was very energised</i>
<i>I was very distressed</i>	—	<i>I was very content</i>
<i>My trips went poorly</i>	—	<i>My trips went smoothly</i>
<i>My trips were displeasing</i>	—	<i>My trips were enjoyable</i>
<i>I was worried that I wouldn't arrive on time</i>	—	<i>I was confident that I would arrive on time</i>
<i>My trips were the worst that I can imagine</i>	—	<i>My trips were the best that I can imagine</i>

The internal consistency of the nine items was checked using Cronbach's alpha. Values of Cronbach's alpha range from 0 to 1. The higher the score, the more reliable the generated scale, with values above 0.7 considered to be acceptable [149]. As the internal consistency of the nine items was good, with Cronbach's alpha values of 0.88 and 0.91 for the commutes to and from work respectively, the scores across the nine items were averaged to create two new variables representing commute well-being.

3. Employment Details

Q2.10

How many days a week, on average, do you commute to/from work?

A drop-down list of options ranging from 0 to 7 was presented below the question.

Income data was used as a socio-demographic control variable in the regression models. As it is employment related, the information was collected from participants in this section of the survey. The decision to treat income as a categorical variable was based on the notion that individuals are more comfortable divulging their income details in this form rather than providing an exact figure. The categories used were based on the abridged income band recommendations provided by the Office for National Statistics in their guidance document for collecting income data as a classificatory variable [53].

Q2.11

Please indicate the category in which your total annual income falls, before deductions for Income Tax, National Insurance etc.

A drop-down list of options was presented below the question: Up to £2,599; £2,600 up to £5,199; £5,200 up to £10,399; £10,400 up to £15,599; £15,600 up to £20,799; £20,800 up to £25,999; £26,000 up to £31,199; £31,200 up to

£36,399; £36,400 up to £41,599; £41,600 up to £46,799; £46,800 up to £51,999; £52,000 or more.

Participants were presented with a matrix containing three statements regarding their attitudes towards their work and a 7-point Likert scale for each, ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), with 4 (Neither Agree Nor Disagree) as the midpoint. They were instructed: *Using the scales below, please indicate the extent to which you agree/disagree with the following statements.* The three statements were as follows:

Q2.12

I look forward to spending time at my workplace

Q2.13

I find my work to be meaningful

Q2.14

I find my work to be worthwhile

Information on job satisfaction was obtained by asking:

Q2.15

Please rate your job satisfaction using the scale below

Presented alongside a Likert scale ranging from 1 (Completely Dissatisfied) to 7 (Completely Satisfied).

The final two questions in this section gathered data on the divide between individuals' personal lives and work. The first of the questions captured perceived notions of this divide, the subjective divide. The second question sought to quantify the divide using an objective measure.

The questions were preceded by the following instructional statement:

For the following questions...

Think of a typical day on which you commute to/from work. Think about how you spend your time outside of working hours AND outside of the office. For example, in the morning before work and in the evening after work. This does not include staying late at your workplace or going in early.

Whilst thinking about this time, please answer the following questions:

Q2.16

Please indicate the level to which you feel your work and personal life merge based on the amount of effort/time you spend working during this time?

Presented with a Likert scale ranging from 1 (Clear Divide Between Work and Personal Life) to 7 (No Divide Between Work and Personal Life).

Q2.17

How many days a week, on average, do you carry out any work-related activities during this time?

A drop-down list of options ranging from 0 to 7 was presented below the question.

4. Commute Details

Q2.18

*Please estimate, in minutes, the duration of your **typical** one-way commute?*

Presented with a single-line text box for data entry.

Q2.19

*Please estimate, in minutes, what you consider to be an **acceptable** duration for your one-way commute?*

Presented with a single-line text box for data entry.

Q2.20

*Disregarding the feasibility of whether this is actually achievable (based on practical elements such as distance), what would be the duration of your **ideal** one-way commute?*

Presented with a single-line text box for data entry.

Q2.21

Do you commute during peak hours?

Presented with multiple choice consisting of two options: Yes, and No.

Q2.22

Do you commute alone?

Presented with multiple choice consisting of two options: Yes, and No. Please specify your relationship with your travelling companion (e.g. a friend, my daughter). A text box was provided for data entry.

Q2.23

Which of the following activities do you regularly carry out whilst commuting? (Please select all that apply)

Presented with multiple choice consisting of 14 options: Reading; Listening to the Radio; Work-Related Tasks; Playing Games; Listening to a Podcast; Watching the World Go By; Browsing the Internet; Meditation/Mindfulness; Social Phone Calls; Listening to Music; Social Media; Writing (Journaling, Novel etc.); Other (Please Specify), presented alongside a text box for data entry; None.

5. Well-Being Questions

The 7-item Short Warwick-Edinburgh Well-Being Scale (SWEMWBS) was presented in this section. The SWEMWBS scales have been designed to be self-completed. The following statements were presented in matrix form with 5 response categories: None of the Time; Rarely; Some of the Time; Often; All of the Time. An instructional statement was presented above the matrix:

Q2.24

Below are some statements about feelings and thoughts.

Please select the box that best describes your experience of each over the last 2 weeks

I've been feeling optimistic about the future

I've been feeling useful

I've been feeling relaxed

I've been dealing with problems well

I've been thinking clearly

I've been feeling close to other people

I've been able to make up my own mind about people

Instructions on scoring the 7-item SWEMWBS scale were obtained from the Warwick Medical School website, the central source of information on collecting, scoring, analysing and interpreting data using the scale. Ratings for the seven scales were summed and then transformed using the conversion table provided on the website. The raw scores ranged between 7 to 35, and the transformed metric scores also ranged from 7.00 to 35.00.

6. Socio-Demographics

Q2.25

What is your sex?

Presented with multiple choice consisting of four options: Male; Female; Other; Prefer Not To Say.

Q2.26

What is your age?

Presented with a single-line text box for data entry.

Q2.27

What is your relationship status?

Presented with multiple choice consisting of five options: Single (Never Been Married); Married; Living With Partner; Divorce or Separated; Widowed.

Q2.28

How many children aged from 0 to 17 do you have living at home with you?

Presented with drop-down list of 14 numbered options from 0 to 13+

Q2.29

What is the highest level of education that you have completed?

Presented with multiple choice consisting of six options: Primary School, Secondary School; College (A-Levels/BTEC/IB etc); Undergraduate Degree; Master's Degree; Ph.D.

Q2.30

Are your day-to-day activities limited because of a health problem or disability which has lasted, or is expected to last, at least 12 months?

Presented with multiple choice consisting of three options: Yes, Limited A Lot; Yes, Limited A Little; No.

A.3 COVID-19 Survey

The purpose of this survey was to capture changes in attitudes towards commuting. The study that this survey served transpired as a result of the outbreak of the COVID-19 pandemic; the work-related behavioural changes imposed across the UK presented the opportunity to undertake an intervention study by presenting our previous survey participants with a follow-up survey. The survey data was utilised for one study: Commuting and COVID-19 [Chapter 6].

A.3.1 Data Collection

The Role of Commuting survey was conducted over a six week period, between 8 February and 21 March 2020. Survey participants were recruited through the Prolific platform which imposed screening to include only individuals currently residing in the United Kingdom, over the age of 18 (the age at which adult employment rights and rules are implemented in the UK), fluent in the English language, in full-time employment, and who commute to work by car. 194 complete survey responses were obtained. The Prolific IDs of these participants were used to create an allowlist for this subsequent survey.

As with the previous survey, the COVID-19 survey was also created using the website Qualtrics and distributed via the Prolific platform. A small payment of £1.15, calculated at a rate of £9.85/hr, was made to participants who completed the survey. Data was collected during the pandemic, between 10 June and 8 July.

Sample Size

Power analysis was used to determine the minimum number of survey responses required in order to make the planned analysis viable. The `pwr` package [19] in R was used for the calculation.

The `pwr.f2.test` function provides the test for a general linear model:

$$\text{pwr.f2.test}(u =, v =, f2 =, sig.level =, power =)$$

where sample size = $u + v + 1$

The significance level was set at **0.05**.

Power, the probability of finding a true effect when one does exist, was set at **0.9**.

Effect size, f^2 , was set at **0.15**. This was based on the suggested guideline value for a medium effect size published by Cohen in 1988 [25].

Numerator degrees of freedom, u , is taken as the number of continuous variables + the number of dummy variables - 1. To determine this figure, the planned regression model with the greatest number of variables was used, and calculated as follows:

$$\begin{aligned} \text{Change Working From Home Hours} &= 1 \\ \text{Duration} &= 1 \\ \text{Commute Time Dissonance} &= 1 \\ \text{Job Satisfaction} &= 1 \\ \text{Sex} &= 4 - 1 = 3 \\ \text{Age} &= 1 \\ \text{Change SWEMWBS} &= 1 \\ &= 9 - 1 = \mathbf{8} \end{aligned}$$

Denominator degrees of freedom, v , was calculated using the `pwr.f2.test` function, and found to be **126**.

Therefore the minimum required sample size was:

$$u + v + 1 = 8 + 127 + 1 = 136$$

Based on power analysis a sample of at least 136 participants was the target.

Table A.5: Sample characteristics for COVID-19 survey participants

	Number	Percent
Sex		
Female	107	78%
Age		
Age Range	21-66	-
Average Age	39	-
Education Level		
Ph.D	2	1%
Master's Degree	22	16%
Undergraduate Degree	61	44%
College (A-Levels/BTEC/IB etc)	37	27%
Secondary School	16	12%
Marital Status		
Single, Never Married	37	27%
Married	59	43%
Living with Partner	33	24%
Divorced/Separated	8	6%
Widowed	1	1%
Number of Children in Household		
None	89	65%
One	23	17%
Two	23	17%
Three	3	2%
Daily Activity Limitations Due to Health Problems or Disabilities		
No	125	91%
Yes, Limited A Little	12	9%
Yes, Limited A Lot	1	1%

A.3.2 Sample Characteristics

A total of 138 participants completed both surveys. Sample characteristics are presented in Table A.5.

A.3.3 Survey Questions

The survey contained 17 questions and took approximately 7 minutes to complete. Participants had to answer every question in order to progress through the survey. The survey was split into four sections. The first section explored working from home behaviours and attitudes towards working from home. The second section focused on attitudes towards commuting. The third section collected details on the divide between the individual's work domain and per-

sonal life domain. The final section comprised of the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS). Socio-demographic information was collected as part of the first survey carried out by the participants, detailed in Section A.2. The questions asked within each of these sections of the survey are presented below.

Before beginning the survey, consent was obtained to match the survey responses with those previously collected from the participants: *Do you consent to your answers to this survey being matched to your responses to a previous survey on commuting which was conducted by the same researchers?* Presented with multiple choice consisting of two options: Yes, and No.

1. Working From Home

Q3.1

How many hours (on average) did you work in a typical week before the COVID-19 pandemic?

Presented with a slider ranging from 0 to 50 hours.

Q3.2

In a typical week before the COVID-19 pandemic, how many of these hours did you spend (on average) working from home?

Presented with a slider ranging from 0 to 50 hours.

Q3.3

How many hours (on average) do you currently work in a typical week, since the COVID-19 pandemic?

Presented with a slider ranging from 0 to 50 hours.

Q3.4

In a typical week since the COVID-19 pandemic started, how many of these hours do you spend (on average) working from home?

Presented with a slider ranging from 0 to 50 hours.

Q3.5

When the COVID-19 pandemic is over, if you are given the choice, in a typical working week, how many of your working hours would you ideally like to spend working from home?

Presented with a slider ranging from 0 to 50 hours.

Q3.6

Please rate your job satisfaction, based on your experience since any pandemic-related changes have been made to your working environment, using the scale below.

Presented alongside a Likert scale ranging from 1 (Completely Dissatisfied) to 7 (Completely Satisfied).

2. Commuting

Two Likert scales were presented to the individuals in matrix table form, ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), with 4 (Neither Agree Nor Disagree) as the midpoint. The instructions above the matrix read: *Thinking about your commuting in general, please indicate the extent to which you agree/disagree with the following statements.* The two statements were as follows:

Q3.7

My commute helps me to separate my personal life and work life, and

Q3.8

My commute gives me time to get into the right mindset for home/work

To introduce the concept of the value of the commute, participants were presented with the following paragraph.

*The following questions are about the **value** you place on your commute.
Aside from getting you to and from work, how beneficial is/was this time to you? How disadvantageous? What role does/did your commute play in your day?*

This paragraph preceded the following questions:

Q3.9

To what extent do you agree/disagree with the following statements:

I value my previous commute TO work?

Presented alongside a Likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), with 4 (Neither Agree Nor Disagree) as the midpoint.

Q3.10

I value my previous commute FROM work?

Presented alongside a Likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), with 4 (Neither Agree Nor Disagree) as the midpoint.

Q3.11

Thinking back about your commute before the COVID-19 pandemic began, do you miss your typical commute to/from work?

Presented with multiple choice consisting of two options: Yes, and No.

Participants were then asked the following open-ended question:

Q3.12

Please write a few sentences explaining your answer. Have your attitudes towards commuting changed since the outbreak of the COVID-19 pandemic?

Think specifically about the value you place on commuting.

Presented alongside an essay style text box.

Participants were asked two questions regarding teleporting, preceded by the following statement:

Imagine you could hypothetically teleport to/from work (in other words, click your fingers and magically appear at your workplace).

Q3.13

Imagine the COVID-19 pandemic is over, and you have to return to your normal working environment, on how many of your next 10 commutes would you choose to teleport TO work rather than commute?

Q3.14

Imagine the COVID-19 pandemic is over, and you have to return to your normal working environment, on how many of your next 10 commutes would you choose to teleport FROM work rather than commute?

A drop-down list of options ranging from 0 to 10 was presented below each question.

3. Employment

This section asked two questions regarding the divide between individuals' personal lives and work. The first of the questions captured perceived notions of this divide, the subjective divide. The second question sought to quantify the divide using an objective measure.

The questions were preceded by the following instructional statement:

For the following questions...

Think of your typical working day since the outbreak of COVID-19. Think about how you spend your time outside of working hours.

Whilst thinking about this time, please answer the following questions:

Q3.15

Please indicate the level to which you feel your work and personal life merge based on the amount of effort/time you spend working during this time?

Presented with a Likert scale ranging from 1 (Clear Divide Between Work and Personal Life) to 7 (No Divide Between Work and Personal Life).

Q3.16

How many days a week, on average, do you carry out any work-related activities during this time?

A drop-down list of options ranging from 0 to 7 was presented below the question.

4. Well-Being Questions

The 7-item Short Warwick-Edinburgh Well-Being Scale (SWEMWBS) was presented in this section. The SWEMWBS scales have been designed to be self-completed. The following statements were presented in matrix form with 5 response categories: None of the Time; Rarely; Some of the Time; Often; All of the Time. An instructional statement was presented above the matrix:

Q3.17

Below are some statements about feelings and thoughts.

Please select the box that best describes your experience of each over the last 2 weeks

I've been feeling optimistic about the future

I've been feeling useful

I've been feeling relaxed

I've been dealing with problems well

I've been thinking clearly

I've been feeling close to other people

I've been able to make up my own mind about people

Instructions on scoring the 7-item SWEMWBS scale were obtained from the Warwick Medical School website, the central source of information on collecting, scoring, analysing and interpreting data using the scale. Ratings for the seven scales were summed and then transformed using the conversion table provided on the website. The raw scores ranged between 7 to 35, and the transformed metric scores also ranged from 7.00 to 35.00.

Appendix B

Additional Tables: Subjective Commute Time

Supplementary material for the Subjective Commute Time and Commute Well-Being study [Chapter 4] is presented in this Appendix.

Results for the multiple regression models that included the socio-demographic variables - for the analysis conducted using ratio, and log transformed, duration variables - presented in Tables 4.2 and 4.3, are presented in Table B.1.

Results for the multiple regression models that included the socio-demographic variables - for the analysis conducted using difference duration variables - presented in Tables 4.4 and 4.5, are presented in Table B.2.

Results for the multiple regression models that included the socio-demographic variables - for the analysis conducted using difference, and log transformed, duration variables - presented in Tables 4.6 and 4.7, are presented in Table B.3.

Table B.1: Multiple regression models for commute well-being for the commute to work and the commute from work, using commute time ratio variables and log transformed variables, including all socio-demographic variables.

	To Work			From Work				
	Coef	Std. Err.	t	P>t	Coef	Std. Err.	t	P>t
Log Commute Duration	-0.276	0.139	-1.986	.049	-0.252	0.152	-1.659	.099
AIR	0.078	0.300	0.260	.795	-0.497	0.329	-1.512	.132
AAR	1.339	0.479	2.794	.006	1.465	0.525	2.791	.006
Commute Attitudes	0.183	0.042	4.371	<.001	0.234	0.046	5.097	<.001
Job Satisfaction	0.177	0.049	3.635	<.001	0.035	0.053	0.654	.514
Sex (ref: Female)								
Male	0.196	0.162	1.207	.229	-0.070	0.178	-0.397	.692
Age	0.004	0.006	0.658	.512	0.006	0.007	0.826	.410
Education (ref: College)								
Ph.D	0.130	0.668	0.195	.846	0.381	0.732	0.520	.604
Master's Degree	-0.299	0.211	-1.418	.158	-0.181	0.231	-0.785	.434
Undergraduate Degree	-0.179	0.158	-1.130	.260	-0.135	0.173	-0.778	.438
Secondary School	-0.327	0.234	-1.397	.164	-0.234	0.256	-0.912	.363
Disability (ref: No)								
Limited A Little	-0.321	0.229	-1.400	.163	-0.525	0.251	-2.094	.038
Limited A Lot	-0.792	0.653	-1.213	.227	-2.077	0.715	-2.906	.004
Adjusted R-Squared		.28				.22		

Table B.2: Multiple regression models for commute well-being for the commute to work and the commute from work, using commute time difference variables, including all socio-demographic variables.

	To Work			From Work			
	Coef	Std. Err.	t P>t	Coef	Std. Err.	t P>t	
Commute Duration	-0.011	0.008	-1.343	.181	0.009	-1.289	.199
AIR	0.006	0.009	0.609	.543	0.010	0.662	.509
AAR	-0.009	0.006	-1.497	.136	0.006	-1.492	.137
Commute Attitudes	0.190	0.043	4.412	<.001	0.046	4.632	<.001
Job Satisfaction	0.184	0.051	3.595	<.001	0.055	0.748	.456
Sex (ref: Female)							
Male	0.155	0.171	0.906	.366	0.184	-0.328	.744
Age	0.002	0.007	0.322	.748	0.007	0.413	.680
Education (ref: College)							
Ph.D	0.035	0.692	0.051	.959	0.746	0.709	.479
Master's Degree	-0.323	0.221	-1.464	.145	0.238	-0.793	.429
Undergraduate Degree	-0.176	0.165	-1.062	.290	0.178	-0.534	.594
Secondary School	-0.279	0.245	-1.137	.257	0.265	-0.680	.497
Disability (ref: No)							
Limited A Little	-0.373	0.240	-1.558	.121	0.259	-2.107	.037
Limited A Lot	-0.761	0.686	-1.108	.269	0.741	-2.827	.005
Adjusted R-Squared	.21				.16		

Table B.3: Multiple regression models for commute well-being for the commute to work and the commute from work, using commute time difference variables and log transformed variables, including all socio-demographic variables.

	To Work			From Work				
	Coef	Std. Err.	t	P>t	Coef	Std. Err.	t	P>t
Log Commute Duration	-0.323	0.143	-2.252	.026	-0.336	0.157	-2.138	.034
AIR	0.009	0.102	0.088	.930	0.150	0.111	1.351	.178
AAR	-0.393	0.162	-2.428	.016	-0.407	0.177	-2.296	.023
Commute Attitudes	0.184	0.042	4.344	<.001	0.229	0.046	4.921	<.001
Job Satisfaction	0.177	0.049	3.602	<.001	0.036	0.054	0.677	.499
Sex (ref: Female)								
Male	0.196	0.164	1.200	.232	-0.064	0.179	-0.357	.721
Age	0.004	0.007	0.604	.547	0.005	0.007	0.738	.462
Education (ref: College)								
Ph.D	0.087	0.674	0.130	.897	0.402	0.739	0.544	.587
Master's Degree	-0.284	0.212	-1.339	.182	-0.161	0.233	-0.691	.490
Undergraduate Degree	-0.173	0.159	-1.091	.277	-0.115	0.174	-0.662	.509
Secondary School	-0.315	0.236	-1.337	.183	-0.216	0.258	-0.836	.404
Disability (ref: No)								
Limited A Little	-0.335	0.231	-1.450	.149	-0.530	0.253	-2.098	.037
Limited A Lot	-0.778	0.657	-1.184	.238	-2.070	0.720	-2.876	.005
Adjusted R-Squared				.27				.20

Appendix C

Additional Tables: The Role of the Commute

Supplementary material for The Role of Commuting study [Chapter 5] is presented in this Appendix.

Full model results for the multiple regression models presented in Table 5.2 are presented in Tables C.1 and C.2.

Table C.1: Multiple linear regression models for subjective divide, including commute/work and socio-demographic control variables

	Separate Domains				Mindset				Teleport To			
	Estimate	Std. Err.	t	p	Estimate	Std. Err.	t	p	Estimate	Std. Err.	t	p
Subjective Divide	-0.071	0.082	-0.869	.386	-0.087	0.080	-1.084	.280	0.151	0.162	0.933	.352
Commute Time	0.046	0.015	3.126	.002	0.044	0.014	3.096	.002	-0.110	0.029	-3.801	<.001
Commute Time Difference	-0.052	0.015	-3.406	.001	-0.054	0.015	-3.580	<.001	0.133	0.031	4.328	<.001
Job Satisfaction	0.223	0.097	2.299	.023	0.246	0.095	2.583	.011	-0.021	0.193	-0.108	.914
Sex (ref: Female)												
Male	0.088	0.329	0.268	.789	-0.200	0.324	-0.618	.537	0.728	0.655	1.111	.268
Age	-0.007	0.013	-0.546	.586	-0.002	0.013	-0.147	.883	-5.16 x10 ⁻⁴	0.026	-0.020	.984
Income (ref: Up to £2,599)												
£2,600 up to £5,199	-1.807	2.581	-0.700	.485	1.622	2.537	0.639	.524	-0.107	5.135	-2.092	.0379
£5,200 up to £10,399	-0.466	2.008	-0.232	.817	-0.483	1.974	-0.245	.807	-3.841	3.995	-0.962	.338
£10,400 up to £15,599	-2.149	1.896	-1.133	.259	-1.675	1.864	-0.899	.370	-7.040	3.773	-1.866	.064
£15,600 up to £20,799	-1.759	1.824	-0.964	.336	-1.206	1.794	-0.672	.502	-3.561	3.630	-0.981	.328
£20,800 up to £25,999	-2.309	1.809	-1.276	.204	-1.931	1.778	-1.086	.279	-3.342	3.598	-0.929	.354
£26,000 up to £31,199	-1.920	1.823	-1.053	.294	-1.122	1.792	-0.626	.532	-3.785	3.626	-1.044	.298
£31,200 up to £36,399	-1.932	1.824	-1.059	.291	-1.580	1.794	-0.881	.380	-3.547	3.629	-0.977	.330
£36,400 up to £41,599	-1.798	1.867	-0.963	.337	-1.483	1.835	-0.808	.420	-3.706	3.714	-0.998	.320
£41,600 up to £46,799	-2.557	1.861	-1.374	.171	-1.745	1.830	-0.954	.341	-3.738	3.702	-1.010	.314
£46,800 up to £51,999	-2.041	1.870	-1.091	.277	-1.049	1.839	-0.570	.569	-4.585	3.721	-1.232	.220
£52,000 or more	-1.563	1.854	-0.843	.400	-1.007	1.823	-0.552	.581	-3.427	3.689	-0.929	.354
Adjusted R-Squared	.071				.106				.102			

Table C.1: Multiple linear regression models for subjective divide, including commute/work and socio-demographic control variables

	Teleport From				Value To				Value From			
	Estimate	Std. Err.	t	p	Estimate	Std. Err.	t	p	Estimate	Std. Err.	t	p
Subjective Divide	0.072	0.130	0.553	.581	-0.017	0.075	-0.232	.817	-0.112	0.077	-1.441	.151
Commute Time	-0.083	0.023	-3.563	<.001	0.025	0.014	1.864	.064	0.036	0.014	2.587	.010
Commute Time Difference	0.117	0.025	4.746	<.001	-0.044	0.014	-3.100	.002	-0.055	0.015	-3.744	<.001
Job Satisfaction	-0.267	0.155	-1.716	.088	0.112	0.090	1.247	.214	-0.111	0.092	-1.196	.233
Sex (ref: Female)												
Male	0.851	0.528	1.610	.109	-0.104	0.306	-0.341	.733	-0.395	0.314	-1.258	.210
Age	-0.004	0.021	-0.190	.850	0.007	0.012	0.562	.575	0.018	0.012	1.436	.153
Income (ref: Up to £2,599)												
£2,600 up to £5,199	-8.294	4.141	-2.003	.047	4.703	2.398	1.961	.051	-0.310	2.463	-0.126	.900
£5,200 up to £10,399	-2.759	3.222	-0.856	.393	5.311	1.866	2.846	.005	0.733	1.916	0.383	.702
£10,400 up to £15,599	-5.053	3.043	-1.661	.099	3.882	1.762	2.203	.029	-0.661	1.810	-0.366	.715
£15,600 up to £20,799	-2.631	2.927	-0.899	.370	3.255	1.695	1.920	.056	-1.536	1.741	-0.882	.379
£20,800 up to £25,999	-3.171	2.902	-1.093	.276	2.745	1.681	1.633	.104	-1.978	1.726	-1.146	.253
£26,000 up to £31,199	-4.220	2.924	-1.443	.151	3.627	1.694	2.141	.034	-1.202	1.739	-0.691	.490
£31,200 up to £36,399	-1.878	2.927	-0.641	.522	2.933	1.695	1.730	.085	-2.020	1.741	-1.161	.247
£36,400 up to £41,599	-2.632	2.995	-0.879	.381	3.047	1.735	1.756	.081	-1.825	1.781	-1.025	.307
£41,600 up to £46,799	-3.175	2.986	-1.063	.289	2.261	1.729	1.307	.193	-2.281	1.776	-1.285	.201
£46,800 up to £51,999	-5.224	3.001	-1.741	.083	4.179	1.738	2.404	.017	-0.420	1.785	-0.235	.814
£52,000 or more	-4.014	2.975	-1.349	.179	2.761	1.723	1.602	.111	-1.694	1.770	-0.957	.340
Adjusted R-Squared					.138				.151			

Table C.2: Multiple linear regression models for objective divide, including commute/work and socio-demographic control variables

	Separate Domains				Mindset				Teleport To			
	Estimate	Std. Err.	t	p	Estimate	Std. Err.	t	p	Estimate	Std. Err.	t	p
Objective Divide	-0.125	0.059	-2.113	.036	-0.124	0.058	-2.127	.035	0.058	0.119	0.482	.631
Commute Time	0.045	0.014	3.088	.002	0.043	0.014	3.050	.003	-0.110	0.029	-3.762	<.001
Commute Time Difference	-0.052	0.015	-3.433	.001	-0.054	0.015	-3.606	<.001	0.133	0.031	4.322	<.001
Job Satisfaction	0.229	0.095	2.396	.018	0.254	0.094	2.703	.008	-0.038	0.192	-0.196	.845
Sex (ref: Female)												
Male	0.038	0.327	0.117	.907	-0.246	0.322	-0.765	.446	0.726	0.658	1.103	.271
Age	-0.006	0.013	-0.450	.653	-0.001	0.013	-0.051	.959	-7.15 x10 ⁻⁴	0.026	-0.028	.978
Income (ref: Up to £2,599)												
£2,600 up to £5,199	-1.472	2.558	-0.576	.566	1.961	2.517	0.779	.437	-0.110	5.151	-2.126	.035
£5,200 up to £10,399	-0.068	1.990	-0.034	.973	-0.150	1.959	-0.076	.939	-3.597	4.008	-0.898	.371
£10,400 up to £15,599	-2.101	1.869	-1.124	.263	-1.668	1.839	-0.907	.366	-6.771	3.764	-1.799	.074
£15,600 up to £20,799	-1.681	1.803	-0.932	.352	-1.158	1.774	-0.652	.515	-3.395	3.631	-0.935	.351
£20,800 up to £25,999	-2.162	1.789	-1.209	.228	-1.816	1.760	-1.032	.304	-3.194	3.602	-0.887	.376
£26,000 up to £31,199	-1.686	1.805	-0.934	.352	-0.923	1.776	-0.520	.604	-3.657	3.635	-1.006	.316
£31,200 up to £36,399	-1.825	1.802	-1.013	.313	-1.508	1.773	-0.851	.396	-3.350	3.628	-0.923	.357
£36,400 up to £41,599	-1.656	1.846	-0.897	.371	-1.372	1.817	-0.755	.451	-3.562	3.718	-0.958	.339
£41,600 up to £46,799	-2.355	1.839	-1.280	.202	-1.588	1.810	-0.877	.382	-3.528	3.704	-0.953	.342
£46,800 up to £51,999	-1.718	1.856	-0.926	.356	-0.768	1.826	-0.421	.675	-4.458	3.737	-1.193	.235
£52,000 or more	-1.371	1.835	-0.747	.456	-0.851	1.805	-0.472	.638	-3.267	3.694	-0.884	.378
Adjusted R-Squared	.090				.123				.098			

Table C.2: Multiple linear regression models for objective divide, including commute/work and socio-demographic control variables

	Teleport From				Value To				Value From			
	Estimate	Std. Err.	t	p	Estimate	Std. Err.	t	p	Estimate	Std. Err.	t	p
Objective Divide	0.010	0.096	0.103	.918	-0.020	0.056	-0.356	.722	-0.079	0.057	-1.376	.170
Commute Time	-0.083	0.023	-3.545	.001	0.025	0.014	1.851	.066	0.035	0.014	2.520	.013
Commute Time Difference	0.117	0.025	4.744	<.001	-0.044	0.014	-3.100	.002	-0.055	0.015	-3.741	<.001
Job Satisfaction	-0.275	0.155	-1.778	.077	0.114	0.090	1.272	.205	-0.099	0.092	-1.074	.284
Sex (ref: Female)												
Male	0.841	0.530	1.585	.115	-0.111	0.307	-0.362	.718	-0.413	0.315	-1.309	.192
Age	-0.004	0.021	-0.184	.854	0.007	0.012	0.576	.565	0.018	0.012	1.481	.140
Income (ref: Up to £2,599)												
£2,600 up to £5,199	-8.352	4.151	-2.012	.046	4.759	2.401	1.982	.049	-0.067	2.468	-0.027	.978
£5,200 up to £10,399	-2.551	3.229	-0.790	.431	5.352	1.868	2.864	.005	0.740	1.920	0.386	.700
£10,400 up to £15,599	-4.893	3.033	-1.613	.108	3.874	1.755	2.208	.029	-0.797	1.803	-0.442	.659
£15,600 up to £20,799	-2.524	2.925	-0.863	.389	3.257	1.693	1.924	.056	-1.602	1.739	-0.921	.358
£20,800 up to £25,999	-3.062	2.902	-1.055	.293	2.757	1.679	1.642	.102	-2.008	1.726	-1.164	.246
£26,000 up to £31,199	-4.106	2.929	-1.402	.163	3.651	1.695	2.154	.033	-1.189	1.742	-0.683	.496
£31,200 up to £36,399	-1.748	2.924	-0.598	.551	2.937	1.692	1.737	.084	-2.093	1.738	-1.204	.230
£36,400 up to £41,599	-2.526	2.996	-0.843	.400	3.058	1.733	1.764	.079	-1.855	1.781	-1.042	.299
£41,600 up to £46,799	-3.021	2.984	-1.012	.312	2.277	1.727	1.319	.189	-2.327	1.774	-1.311	.191
£46,800 up to £51,999	-5.095	3.011	-1.692	.092	4.215	1.742	2.419	.017	-0.374	1.791	-0.209	.835
£52,000 or more	-3.890	2.977	-1.307	.193	2.778	1.722	1.613	.109	-1.714	1.770	-0.969	.334
Adjusted R-Squared					.138				.150			

Appendix D

Additional Tables: Commuting and COVID-19

Supplementary material for Commuting and COVID-19 study [Chapter 6] is presented in this Appendix.

Full model results for the multiple regression models and multiple logistic regression model presented in Table 5.2 are presented in Tables D.1, D.2 and D.3.

Full model results for the multiple regression models and multiple logistic regression model - obtained using the revised methodology - presented in Table 5.2 are presented in Tables D.4, D.5 and D.6.

Table D.1: Multiple regression models and multiple logistic regression model for Change in WFH Hours

	Change Value To			Change Value From			Change Teleport To			Change Teleport From		
	Coef.	Std. Err.	t	Coef.	Std. Err.	t	Coef.	Std. Err.	t	Coef.	Std. Err.	t
Change WFH Hours	-0.008	0.011	-0.722	0.008	0.011	0.693	-0.039	0.024	-1.646	-0.022	0.022	-0.975
Commute Time	0.015	0.203	0.726	-0.004	0.020	-0.200	0.100	0.042	2.390	0.078	0.040	1.969
Commute Time Difference	-0.006	0.021	-0.315	0.010	0.020	0.505	-0.105	0.043	-2.460	-0.099	0.040	-2.453
Change Job Satisfaction	-0.199	0.115	-1.732	-0.203	0.113	-1.797	0.151	0.237	0.636	0.160	0.224	0.714
Male	-0.000	0.462	0.000	0.139	0.454	0.306	-2.446	0.953	-2.567	-0.640	0.902	-0.709
Age	-0.006	0.018	-0.332	-0.018	0.018	-1.020	0.009	0.038	0.247	-0.003	0.036	-0.086
Change SWEMWBS	0.080	0.059	1.359	0.062	0.058	1.077	-0.088	0.121	-0.728	0.067	0.114	0.586
Adjusted R-Squared	-.008			-.016			.089			.027		

	Change Separate Domains			Change Mindset			Choose WFH			Miss Commute		
	Coef.	Std. Err.	t	Coef.	Std. Err.	t	Coef.	Std. Err.	t	Coef.	Std. Err.	t
Change WFH Hours	0.000	0.010	0.037	-0.005	0.010	-0.536	0.269	0.063	4.263	0.026	0.013	1.921
Commute Time	-0.015	0.017	-0.870	-0.002	0.018	-0.138	0.052	0.111	0.467	0.039	0.023	1.672
Commute Time Difference	0.022	0.017	1.246	0.012	0.018	0.634	-0.035	0.113	-0.306	-0.052	0.024	-2.176
Change Job Satisfaction	-0.144	0.097	-1.484	-0.116	0.102	-1.135	1.740	0.630	2.761	-0.357	0.144	-2.477
Male	-0.268	0.390	-0.687	0.343	0.411	0.834	1.445	2.533	0.570	-0.266	0.512	-0.521
Age	0.017	0.015	1.078	0.006	0.016	0.361	0.002	0.100	0.016	0.024	0.020	1.197
Change SWEMWBS	0.102	0.049	2.054	0.065	0.052	1.256	-0.467	0.321	-1.454	-0.112	0.068	-1.660
Adjusted R-Squared	.010			-.011			.150			.139		

Table D.2: Multiple linear regression models and multiple logistic regression model for Change in Subjective Divide

	Change Value To			Change Value From			Change Teleport To			Change Teleport From						
	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p				
Change Subjective Divide	0.044	0.086	0.511	.610	-0.059	0.084	-0.702	.484	-0.071	0.178	-0.397	.692	-0.157	0.167	-0.942	.348
Commute Time	0.015	0.020	0.747	.457	-0.004	0.020	-0.211	.834	0.105	0.042	2.484	.014	0.082	0.040	2.070	.040
Commute Time Difference	-0.006	0.021	-0.283	.778	0.009	0.020	0.453	.651	-0.108	0.043	-2.509	.013	-0.104	0.040	-2.559	.012
Change Job Satisfaction	-0.207	0.114	-1.810	.073	-0.198	0.112	-1.762	.080	0.089	0.238	0.372	.710	0.114	0.223	0.511	.610
Male	-0.069	0.454	-0.153	.879	0.206	0.445	0.463	.644	-2.742	0.944	-2.904	.004	-0.794	0.885	-0.896	.372
Age	-0.008	0.018	-0.429	.669	-0.016	0.018	-0.905	.367	0.006	0.038	0.165	.869	-0.002	0.036	-0.069	.945
Change SWEMWBS	0.083	0.059	1.394	.166	0.058	0.058	0.993	.322	-0.100	0.123	-0.813	.418	0.049	0.116	0.428	.669
Adjusted R-Squared																
	-.010				-.016				.071				.026			

	Change Separate Domains			Change Mindset			Choose WFH			Miss Commute						
	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p
Change Subjective Divide	0.036	0.072	0.495	.622	0.025	0.076	0.332	.740	0.035	0.501	0.071	.944	0.235	0.101	2.334	.020
Commute Time	-0.015	0.017	-0.895	.372	-0.002	0.018	-0.120	.905	0.023	0.118	0.196	.845	0.032	0.023	1.416	.157
Commute Time Difference	0.023	0.017	1.290	.199	0.012	0.018	0.648	.518	-0.021	0.121	-0.169	.866	-0.045	0.024	-1.874	.061
Change Job Satisfaction	-0.140	0.096	-1.455	.148	-0.122	0.102	-1.196	.234	2.126	0.668	1.331	.185	-0.294	0.139	-2.120	.034
Male	-0.269	0.382	-0.703	.483	0.297	0.404	0.737	.463	3.532	2.653	1.331	.185	-0.121	0.509	-0.237	.813
Age	0.016	0.015	1.035	.303	0.005	0.016	0.292	.771	0.031	0.107	0.291	.772	0.023	0.021	1.113	.266
Change SWEMWBS	0.105	0.050	2.105	.037	0.067	0.053	1.273	.205	-0.425	0.346	-1.229	.221	-0.081	0.068	-1.189	.235
Adjusted R-Squared	.012				-.013				.031				.151			

Table D.3: Multiple linear regression models and multiple logistic regression model for Change in Objective Divide

	Change Value To				Change Value From				Change Teleport To				Change Teleport From			
	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p
Change Objective Divide	0.038	0.071	0.525	.600	-0.036	0.140	-0.257	.798	-0.099	0.148	-0.665	.507	-0.036	0.140	-0.257	.798
Commute Time	0.016	0.020	0.790	.431	0.080	0.040	2.013	.046	0.103	0.042	2.445	.016	0.080	0.040	2.013	.046
Commute Time Difference	-0.007	0.021	-0.338	.736	-0.100	0.040	-2.470	.015	-0.106	0.043	-2.480	.014	-0.100	0.040	-2.470	.015
Change Job Satisfaction	-0.217	0.115	-1.897	.060	0.135	0.224	0.603	.548	0.112	0.238	0.471	.638	0.135	0.224	0.603	.548
Male	-0.061	0.454	-0.135	.893	-0.814	0.888	-0.916	.361	-2.759	0.943	-2.925	.004	-0.814	0.888	-0.916	.361
Age	-0.008	0.018	-0.446	.656	-0.004	0.036	-0.122	.903	0.008	0.038	0.211	.834	-0.004	0.036	-0.122	.903
Change SWEMWBS	0.083	0.059	1.394	.166	0.060	0.116	0.520	.604	-0.104	0.123	-0.847	.399	0.060	0.116	0.520	.604
Adjusted R-Squared	-.010				0.020				.073				.020			

	Change Separate Domains				Change Mindset				Choose WFH				Miss Commute			
	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p
Change Objective Divide	-0.029	0.060	-0.488	.626	-0.000	0.064	-0.003	.997	-0.104	0.417	-0.250	.803	0.043	0.080	0.533	.594
Commute Time	-0.015	0.017	-0.893	.374	-0.002	0.018	-0.106	.916	0.022	0.118	0.189	.850	0.034	0.022	1.544	.123
Commute Time Difference	0.022	0.017	1.252	.213	0.011	0.018	0.619	.537	-0.021	0.121	-0.175	.861	-0.048	0.023	-2.064	.039
Change Job Satisfaction	-0.138	0.096	-1.434	.154	-0.124	0.102	-1.215	.226	2.140	0.670	3.197	.002	-0.309	0.138	-2.239	.025
Male	-0.267	0.382	-0.700	.485	0.300	0.404	0.743	.459	3.527	2.652	1.330	.186	-0.088	0.498	-0.176	.860
Age	0.018	0.015	1.137	.258	0.005	0.016	0.322	.748	0.035	0.107	0.327	.744	0.024	0.020	1.183	.237
Change SWEMWBS	0.099	0.050	1.978	.050	0.065	0.053	1.229	.221	-0.440	0.346	-1.272	.206	-0.093	0.066	-1.405	.160
Adjusted R-Squared	.011				-.014				.032				.117			

Table D.4: Multiple linear regression models and multiple logistic regression model for Change in WFH Hours using revised methodology

	Change Value To			Change Value From			Change Teleport To			Change Teleport From						
	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p				
Change WFH Hours	-0.005	0.004	-1.177	.241	0.001	0.004	0.337	.737	-0.011	0.009	-1.187	.238	-0.005	0.009	-0.613	.541
Commute Time	0.211	0.310	0.680	.498	-0.012	0.306	-0.038	.970	0.777	0.654	1.188	.237	0.512	0.620	0.827	.410
Commute Time Difference	1.175	0.787	1.492	.138	0.879	0.777	1.131	.260	2.866	1.660	1.726	.087	2.461	1.572	1.565	.120
Change Job Satisfaction	-0.180	0.113	-1.587	.115	-0.174	0.112	-1.555	.122	0.078	0.239	0.328	.743	0.087	0.226	0.383	.703
Male	0.177	0.455	0.389	.698	0.347	0.449	0.772	.441	-2.665	0.960	-2.777	.006	-0.962	0.909	-1.058	.292
Age	-0.005	0.018	-0.267	.790	-0.017	0.018	-0.931	.354	0.006	0.038	0.158	.875	-0.007	0.036	-0.196	.845
Change SWEMWBS	0.067	0.059	1.133	.259	0.049	0.058	0.836	.405	-0.096	0.124	-0.777	.439	0.063	0.118	0.539	.591
Adjusted R-Squared																
	.006				-0.013				.060				-0.005			

	Change Separate Domains			Change Mindset			Choose WFH			Miss Commute						
	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p
Change WFH Hours	-0.004	0.004	-0.957	.340	-0.005	0.004	-1.403	.163	0.250	0.062	4.004	<.001	0.014	0.006	2.409	.016
Commute Time	-0.114	0.263	-0.432	.666	0.158	0.277	0.569	.570	0.232	4.416	0.052	.958	0.114	0.414	0.275	.784
Commute Time Difference	-0.858	0.667	-1.287	.200	0.210	0.704	0.298	.766	-9.136	11.207	-0.815	.416	5.044	1.490	3.385	.001
Change Job Satisfaction	-0.120	0.096	-1.246	.215	-0.089	0.101	-0.878	.382	4.228	1.613	2.621	.010	-0.453	0.162	-2.804	.005
Male	-0.154	0.385	-0.401	.689	0.504	0.407	1.239	.218	2.377	6.479	0.367	.714	-0.189	0.543	-0.347	.729
Age	0.019	0.015	1.222	.224	0.007	0.016	0.436	.664	0.018	0.260	0.068	.946	0.028	0.022	1.270	.204
Change SWEMWBS	0.108	0.050	2.161	.033	0.059	0.053	1.126	.262	-1.226	0.838	1.462	.146	-0.148	0.073	-2.028	.043
Adjusted R-Squared	.015				-0.008				.138				.238			

Table D.5: Multiple linear regression models and multiple logistic regression model for Change in Subjective Divide using revised methodology

	Change Value To			Change Value From			Change Teleport To			Change Teleport From						
	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p				
Change Subjective Divide	0.026	0.086	0.299	.765	-0.081	0.084	-0.972	.333	-0.058	0.180	-0.321	.749	-0.131	0.170	-0.770	.443
Commute Time	0.207	0.312	0.664	.508	-0.030	0.306	-0.097	.923	0.740	0.659	1.124	.263	0.468	0.620	0.754	.452
Commute Time Difference	1.144	0.796	1.437	.153	0.964	0.779	1.237	.218	2.915	1.679	1.737	.085	2.590	1.580	1.639	.104
Change Job Satisfaction	-0.197	0.113	-1.740	.084	-0.177	0.111	-1.599	.112	0.031	0.238	0.131	.896	0.053	0.224	0.235	.814
Male	0.080	0.450	-0.179	.859	0.382	0.441	0.865	.388	-2.860	0.950	-3.012	.003	-1.047	0.894	-1.171	.244
Age	-0.007	0.018	-0.387	.699	-0.015	0.018	-0.812	.418	0.004	0.039	0.093	.926	-0.006	0.036	-0.171	.865
Change SWEMWBS	0.067	0.060	1.127	.262	0.041	0.058	0.708	.480	-0.106	0.126	-0.840	.402	0.049	0.119	0.415	.679
Adjusted R-Squared																
	-.004				-.006				.050				-.003			

	Change Separate Domains			Change Mindset			Choose WFH			Miss Commute						
	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p
Change Subjective Divide	0.032	0.072	0.440	.661	0.014	0.077	0.178	.859	0.345	1.285	0.269	.789	0.231	0.106	2.176	.030
Commute Time	-0.112	0.264	-0.426	.671	0.150	0.280	0.538	.592	0.817	4.690	0.174	.862	0.140	0.403	0.347	.729
Commute Time Difference	-0.894	0.672	-1.329	.186	0.191	0.713	0.267	.790	-9.265	11.947	-0.776	.439	4.749	1.424	3.335	.001
Change Job Satisfaction	-0.130	0.095	-1.357	.177	-0.108	0.101	-1.068	.287	5.204	1.696	3.067	.003	-0.375	0.154	-2.435	.015
Male	-0.223	0.380	-0.585	.560	0.402	0.403	0.996	.321	6.910	6.759	1.022	.309	-0.061	0.540	-0.113	.910
Age	0.017	0.016	1.099	.274	0.005	0.016	0.304	.762	0.093	0.275	0.339	.735	0.028	0.022	1.272	.203
Change SWEMWBS	0.110	0.050	2.171	.032	0.059	0.053	1.096	.275	-1.106	0.896	-1.234	.220	-0.114	0.072	-1.577	.115
Adjusted R-Squared	.009				-.023				.032				.229			

Table D.6: Multiple linear regression models and multiple logistic regression model for Change in Objective Divide using revised methodology

	Change Value To			Change Value From			Change Teleport To			Change Teleport From						
	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p				
Change Objective Divide	0.027	0.071	0.387	.700	-0.029	0.070	-0.415	.679	-0.116	0.150	-0.778	.438	-0.041	0.141	-0.291	.772
Commute Time	0.199	0.312	0.639	.524	-0.007	0.306	-0.023	.982	0.763	0.656	1.162	.247	0.504	0.620	0.813	.418
Commute Time Difference	1.159	0.792	1.464	.146	0.892	0.777	1.147	.253	2.902	1.666	1.742	.084	2.473	1.575	1.570	.119
Change Job Satisfaction	-0.204	0.113	-1.801	.074	-0.163	0.111	-1.469	.144	0.057	0.239	0.241	.810	0.074	0.225	0.326	.745
Male	0.087	0.450	0.193	.847	0.370	0.442	0.836	.405	-2.882	0.948	-3.040	.003	-1.066	0.896	-1.190	.236
Age	-0.007	0.018	-0.402	.688	-0.015	0.018	-0.853	.395	0.006	0.039	0.153	.879	-0.008	0.037	-0.210	.834
Change SWEMWBS	0.068	0.060	1.139	.257	0.046	0.059	0.782	.436	-0.113	0.126	-0.903	.368	0.057	0.119	0.479	.633
Adjusted R-Squared																
	-.004				-.012				.054				-.007			

	Change Separate Domains			Change Mindset			Choose WFH			Miss Commute						
	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p	Coef.	Std. Err.	t	p
Change Objective Divide	-0.029	0.060	-0.476	.635	-0.006	0.064	-0.091	.927	-0.246	1.067	-0.231	.818	0.056	0.086	0.648	.517
Commute Time	-0.119	0.263	-0.451	.653	0.147	0.279	0.528	.599	0.743	4.679	0.159	.874	0.119	0.397	0.301	.764
Commute Time Difference	-0.850	0.669	-1.271	.206	0.207	0.709	0.292	.771	-8.815	11.883	-0.742	.460	4.806	1.373	3.499	<.001
Change Job Satisfaction	-0.128	0.096	-1.336	.184	-0.109	0.102	-1.069	.287	5.210	1.701	3.063	.003	-0.395	0.153	-2.584	.010
Male	-0.223	0.380	-0.587	.558	0.403	0.404	0.998	.320	6.909	6.760	1.022	.309	-0.024	0.536	-0.045	.964
Age	0.019	0.016	1.194	.235	0.005	0.016	0.331	.741	0.108	0.276	0.391	.696	0.029	0.022	1.341	.180
Change SWEMWBS	0.103	0.050	2.048	.043	0.057	0.053	1.059	.291	-1.166	0.896	-1.301	.195	-0.123	0.071	-1.748	.080
Adjusted R-Squared	.010				-.023				.032				.202			

Bibliography

- [1] Maya Abou-Zeid and Moshe Ben-Akiva. The effect of social comparisons on commute well-being. *Transportation Research Part A: Policy and Practice*, 45(4):345 – 361, 2011. ISSN 0965-8564. doi: <https://doi.org/10.1016/j.tra.2011.01.011>. Special Issue: Transportation and Social Interactions.
- [2] Maya Abou-Zeid and Satoshi Fujii. Travel satisfaction effects of changes in public transport usage. *Transportation*, 43(2):301–314, 2016. doi: [10.1007/s11116-015-9576-3](https://doi.org/10.1007/s11116-015-9576-3).
- [3] Maya Abou-Zeid, Regina Witter, Michel Bierlaire, Vincent Kaufmann, and Moshe Ben-Akiva. Happiness and travel mode switching: Findings from a swiss public transportation experiment. *Transport Policy*, 19(1): 93 – 104, 2012. doi: <https://doi.org/10.1016/j.tranpol.2011.09.009>.
- [4] Zakiyya Adam, Lukasz Walasek, and Caroline Meyer. Workforce commuting and subjective well-being. *Travel Behaviour and Society*, 13: 183–196, 2018. doi: <https://doi.org/10.1016/j.tbs.2018.08.006>.
- [5] Tammy D. Allen, Timothy D. Golden, and Kristen M. Shockley. How effective is telecommuting? assessing the status of our scientific findings. *Psychological Science in the Public Interest*, 16(2):40–68, 2015. doi: [10.1177/1529100615593273](https://doi.org/10.1177/1529100615593273). PMID: 26403188.
- [6] D.M. Almeida. Resilience and vulnerability to daily stressors assessed via diary methods. *Current Directions in Psychological Science*, 14 (2):64–68, 2005. doi: [10.1111/j.0963-7214.2005.00336.x](https://doi.org/10.1111/j.0963-7214.2005.00336.x). URL <https://doi.org/10.1111/j.0963-7214.2005.00336.x>.
- [7] D.M. Almeida, J.R. Piazza, R.S. Stawski, and L.C. Klein. Chapter 12 - the speedometer of life: Stress, health and aging. In K. Warner Schaie and Sherry L. Willis, editors, *Handbook of the Psychology of Aging (Seventh Edition)*, Handbooks of Aging, pages 191 – 206. Academic Press, San Diego, seventh edition edition, 2011. ISBN 978-0-12-380882-0. doi: <https://doi.org/10.1016/B978-0-12-380882-0.00012-7>. URL <http://www.sciencedirect.com/science/article/pii/B9780123808820000127>.

- [8] Amanda J. Anderson, Seth A. Kaplan, and Ronald P. Vega. The impact of telework on emotional experience: When, and for whom, does telework improve daily affective well-being? *European Journal of Work and Organizational Psychology*, 24(6):882–897, 2015. doi: 10.1080/1359432X.2014.966086.
- [9] Richard A. Armstrong. When to use the bonferroni correction. *Ophthalmic and Physiological Optics*, 34(5):502–508, 2014. doi: <https://doi.org/10.1111/opo.12131>. URL <https://onlinelibrary.wiley.com/doi/abs/10.1111/opo.12131>.
- [10] Blake E. Ashforth, Glen E. Kreiner, and Mel Fugate. All in a day’s work: Boundaries and micro role transitions. *The Academy of Management Review*, 25(3):472–491, 2000.
- [11] Sigrun Beige and Kay W. Axhausen. The dynamics of commuting over the life course: Swiss experiences. *Transportation Research Part A: Policy and Practice*, 104:179 – 194, 2017. ISSN 0965-8564. doi: <https://doi.org/10.1016/j.tra.2017.01.015>.
- [12] Cecilia Jakobsson Bergstad, Amelie Gamble, Tommy Gärling, Olle Hagman, Merritt Polk, Dick Ettema, Margareta Friman, and Lars E. Olsson. Subjective well-being related to satisfaction with daily travel. *Transportation*, 38:1 – 15, 2011. doi: <https://doi.org/10.1007/s11116-010-9283-z>.
- [13] Anna Lena Biel and Elisabeth V. C. Friedrich. Why you should report bayes factors in your transcranial brain stimulation studies. *Frontiers in Psychology*, 9:1125, 2018. ISSN 1664-1078. doi: 10.3389/fpsyg.2018.01125. URL <https://www.frontiersin.org/article/10.3389/fpsyg.2018.01125>.
- [14] Virginia Braun and Victoria Clarke. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2):77–101, 2006. doi: 10.1191/1478088706qp063oa.
- [15] Alex Bryson and George MacKerron. Are You Happy While You Work? *The Economic Journal*, 127(599):106–125, 01 2017. ISSN 0013-0133. doi: 10.1111/eoj.12269.
- [16] McEwen B.S. Stress, adaptation, and disease. allostasis and allostatic load. *Annals of the New York Academy of Sciences*, 840:33–44, 1998. doi: 10.1111/j.1749-6632.1998.tb09546.x.
- [17] Angelo Canty and B. D. Ripley. *boot: Bootstrap R (S-Plus) Functions*, 2017. R package version 1.3-20.

- [18] Connected Places Catapult. *How do people value Travel Time*. Connected Places Catapult, London, n.d.
- [19] Stephane Champely. *pwr: Basic Functions for Power Analysis*, 2018. URL <https://CRAN.R-project.org/package=pwr>. R package version 1.2-2.
- [20] Kiron Chatterjee, B Clark, A Martin, and A Davis. *The commuting and wellbeing study: Understanding the impact of commuting on people's lives*. University of the West of England, Bristol, 2017.
- [21] Kiron Chatterjee, Samuel Chng, Ben Clark, Adrian Davis, Jonas De Vos, Dick Ettema, Susan Handy, Adam Martin, and Louise Reardon. Commuting and wellbeing: a critical overview of the literature with implications for policy and future research. *Transport Reviews*, 40(1): 5–34, 2020. doi: 10.1080/01441647.2019.1649317.
- [22] Janet Choi, Joseph F. Coughlin, and Lisa D'Ambrosio. Travel time and subjective well-being. *Transportation Research Record*, 2357(1):100–108, 2013. doi: 10.3141/2357-12.
- [23] Ben Clark, Kiron Chatterjee, Adam Martin, and Adrian Davis. How commuting affects subjective wellbeing. *Transportation*, 47(6):2777–2805, 2020. ISSN 1572-9435. doi: 10.1007/s11116-019-09983-9.
- [24] Leigh Anne Clark, Steven J. Karau, and Michael D. Michalisin. Telecommuting attitudes and the ‘big five’ personality dimensions. *Journal of Management Policy and Practice*, 13(3):31 – 46, 2012.
- [25] Jacob Cohen. *Statistical Power Analysis for the Behavioral Sciences*. Lawrence Erlbaum Associates, New Jersey, 2 edition, 1988.
- [26] National Research Council. *Subjective Well-Being: Measuring Happiness, Suffering, and Other Dimensions of Experience*. The National Academies Press, Washington, DC, 2013. ISBN 978-0-309-29446-1. doi: 10.17226/18548.
- [27] Tim Cresswell, Sara Dorow, and Sharon Roseman. Putting mobility theory to work: Conceptualizing employment-related geographical mobility. *Environment and Planning A: Economy and Space*, 48(9):1787–1803, 2016. doi: 10.1177/0308518X16649184.
- [28] Robert A Cummins, Richard Eckersley, Julie Pallant, Jackie Van Vugt, and RoseAnne Misajon. Developing a national index of subjective well-being: The Australian Unity Wellbeing Index. *Social Indicators Research*, 64(2):159–190, 2003.

- [29] C.P. Dancey and J. Reidy. *Statistics Without Maths for Psychology*. British Psychological Society book. Pearson/Prentice Hall, 2007. ISBN 9780132051606.
- [30] Joost de Kruijf, Dick Ettema, Carlijn B.M. Kamphuis, and Martin Dijst. Evaluation of an incentive program to stimulate the shift from car commuting to e-cycling in the netherlands. *Journal of Transport Health*, 10:74 – 83, 2018. ISSN 2214-1405. doi: <https://doi.org/10.1016/j.jth.2018.06.003>.
- [31] Jonas De Vos. Satisfaction-induced travel behaviour. *Transportation Research Part F: Traffic Psychology and Behaviour*, 63:12 – 21, 2019. ISSN 1369-8478. doi: <https://doi.org/10.1016/j.trf.2019.03.001>.
- [32] Jonas De Vos and Frank Witlox. Do people live in urban neighbourhoods because they do not like to travel? analysing an alternative residential self-selection hypothesis. *Travel Behaviour and Society*, 4:29 – 39, 2016. ISSN 2214-367X. doi: <https://doi.org/10.1016/j.tbs.2015.12.002>.
- [33] Jonas De Vos, Tim Schwanen, Veronique Van Acker, and Frank Witlox. How satisfying is the scale for travel satisfaction? *Transportation Research Part F: Traffic Psychology and Behaviour*, 29:121 – 130, 2015. ISSN 1369-8478. doi: [10.1016/j.trf.2015.01.007](https://doi.org/10.1016/j.trf.2015.01.007).
- [34] Joni Delanoetje, Marijke Verbruggen, and Lynn Germeys. Boundary role transitions: A day-to-day approach to explain the effects of home-based telework on work-to-home conflict and home-to-work conflict. *Human Relations*, 72(12):1843–1868, 2019. doi: [10.1177/0018726718823071](https://doi.org/10.1177/0018726718823071).
- [35] Lydia DeSantis and Doris Noel Ugarriza. The concept of theme as used in qualitative nursing research. *Western Journal of Nursing Research*, 22(3):351–372, 2000. doi: [10.1177/019394590002200308](https://doi.org/10.1177/019394590002200308). PMID: 10804897.
- [36] Andy Dickerson, Arne Risa Hole, and Luke A. Munford. The relationship between well-being and commuting revisited: Does the choice of methodology matter? *Regional Science and Urban Economics*, 49:321 – 329, 2014. ISSN 0166-0462. doi: <https://doi.org/10.1016/j.regsciurbeco.2014.09.004>.
- [37] ED Diener, Robert A Emmons, Randy J Larsen, and Sharon Griffin. The satisfaction with life scale. *Journal of personality assessment*, 49(1): 71–75, 1985.
- [38] Ed Diener, Derrick Wirtz, William Tov, Chu Kim-Prieto, Dong-won Choi, Shigehiro Oishi, and Robert Biswas-Diener. New well-being measures: Short scales to assess flourishing and positive and negative feelings. *Social indicators research*, 97(2):143–156, 2010.

- [39] Ed Diener, Samantha J Heintzelman, Kostadin Kushlev, Louis Tay, Derrick Wirtz, Lesley D Lutes, and Shigehiro Oishi. Findings all psychologists should know from the new science on subjective well-being. *Canadian Psychology/psychologie canadienne*, 58(2):87–104, 2017.
- [40] Edward Diener. *The science of well-being: The collected works of Ed Diener*, volume 37. Springer, 2009.
- [41] Dilum Dissanayake. Watching the clock on the way to work? analysing trends in commuting activities, modes and gender differences in commute times, using hazard-based duration modelling methods. *Journal of Transport Geography*, 65:188 – 199, 2017. ISSN 0966-6923. doi: <https://doi.org/10.1016/j.jtrangeo.2017.10.013>.
- [42] Paul Dolan, Richard Layard, and Robert Metcalfe. *Measuring Subjective Well-being for Public Policy*. Office for National Statistics, London, 2011.
- [43] Dick Ettema, Tommy Gärling, Lars Eriksson, Margareta Friman, Lars E. Olsson, and Satoshi Fujii. Satisfaction with travel and subjective well-being: Development and test of a measurement tool. *Transportation Research Part F: Traffic Psychology and Behaviour*, 14(3):167 – 175, 2011. ISSN 1369-8478. doi: <https://doi.org/10.1016/j.trf.2010.11.002>.
- [44] Dick Ettema, Margareta Friman, Tommy Gärling, Lars E. Olsson, and Satoshi Fujii. How in-vehicle activities affect work commuters’ satisfaction with public transport. *Journal of Transport Geography*, 24:215 – 222, 2012. ISSN 0966-6923. doi: <https://doi.org/10.1016/j.jtrangeo.2012.02.007>. Special Section on Theoretical Perspectives on Climate Change Mitigation in Transport.
- [45] Eurofound and the International Labour Office. *Working anytime, anywhere: The effects on the world of work*. Publications Office of the European Union, Luxembourg, and the International Labour Office, Geneva, 2017.
- [46] Gary W. Evans, Richard E. Wener, and Donald Phillips. The morning rush hour: Predictability and commuter stress. *Environment and Behavior*, 34(4):521–530, 2002. doi: 10.1177/00116502034004007.
- [47] Linda Ng Fat, Shaun Scholes, Sadie Boniface, Jennifer Mindell, and Sarah Stewart-Brown. Evaluating and establishing national norms for mental wellbeing using the short warwick–edinburgh mental well-being scale (swemwbs): findings from the health survey for england. *Quality of Life Research*, 26(5):1129–1144, 2017.

- [48] Zhiqiang Feng and Paul Boyle. Do long journeys to work have adverse effects on mental health? *Environment and Behavior*, 46(5):609–625, 2014. doi: 10.1177/0013916512472053.
- [49] Leon Festinger. A theory of social comparison processes. *Human Relations*, 7(2):117–140, 1954. doi: 10.1177/001872675400700202.
- [50] Kathryn L. Fonner and Michael E. Roloff. Why teleworkers are more satisfied with their jobs than are office-based workers: When less contact is beneficial. *Journal of Applied Communication Research*, 38(4):336–361, 2010. doi: 10.1080/00909882.2010.513998.
- [51] Office for National Statistics. *2011 Census Analysis - Distance Travelled to Work*. Office for National Statistics, London, 2014.
- [52] Office for National Statistics. *Commuting and Personal Well-being, 2014*. Office for National Statistics, London, 2014.
- [53] Office for National Statistics. *Harmonised Concepts and Questions for Social Data Sources. Secondary Principles. Income*. Office for National Statistics, London, 2015.
- [54] Department for Transport. *Future of Mobility: Urban Strategy*. Department for Transport, 2019.
- [55] M.W. Fordyce. A review of research on the happiness measures: A sixty second index of happiness and mental health. *Social Indicators Research*, 20(4):355 – 381, 1988. doi: 10.1007/BF00302333.
- [56] Margareta Friman, Satoshi Fujii, Dick Ettema, Tommy Gärling, and Lars E. Olsson. Psychometric analysis of the satisfaction with travel scale. *Transportation Research Part A: Policy and Practice*, 48:132 – 145, 2013. ISSN 0965-8564. doi: <https://doi.org/10.1016/j.tra.2012.10.012>. Psychology of Sustainable Travel Behavior.
- [57] Margareta Friman, Lars E. Olsson, Michael Ståhl, Dick Ettema, and Tommy Gärling. Travel and residual emotional well-being. *Transportation Research Part F: Traffic Psychology and Behaviour*, 49:159 – 176, 2017. ISSN 1369-8478. doi: <https://doi.org/10.1016/j.trf.2017.06.015>.
- [58] Ravi S. Gajendran and David A. Harrison. The good, the bad, and the unknown about telecommuting: Metaanalysis of psychological mediators and individual consequences. *Journal of Applied Psychology*, 92(6):1524–1541, 2007. doi: 10.1037/0021-9010.92.6.1524.

- [59] Birgitta Gatersleben and David Uzzell. Affective appraisals of the daily commute: Comparing perceptions of drivers, cyclists, walkers, and users of public transport. *Environment and Behavior*, 39(3):416–431, 2007. doi: 10.1177/0013916506294032.
- [60] Philippe Gerber, Tai-Yu Ma, Olivier Klein, Julien Schiebel, and Samuel Carpentier-Postel. Cross-border residential mobility, quality of life and modal shift: A luxembourg case study. *Transportation Research Part A: Policy and Practice*, 104:238 – 254, 2017. ISSN 0965-8564. doi: <https://doi.org/10.1016/j.tra.2017.06.015>.
- [61] J. Gershuny and O. Sullivan. *United Kingdom Time Use Survey, 2014-2015. [data collection]*. UK Data Service, Centre for Time Use Research, IOE, University College London, 2017.
- [62] J. Ignacio Gimenez-Nadal and José Alberto Molina. Daily feelings of us workers and commuting time. *Journal of Transport Health*, 12:21 – 33, 2019. ISSN 2214-1405. doi: <https://doi.org/10.1016/j.jth.2018.11.001>.
- [63] Carol Graham and Milena Nikolova. Bentham or aristotle in the development process? an empirical investigation of capabilities and subjective well-being. *World Development*, 68:163 – 179, 2015. ISSN 0305-750X. doi: <https://doi.org/10.1016/j.worlddev.2014.11.018>.
- [64] A. E. Green. A question of compromise? case study evidence on the location and mobility strategies of dual career households. *Regional Studies*, 31(7):641–657, 1997. doi: 10.1080/00343409750130731.
- [65] Douglas T. Hall and Judith Richter. Balancing work life and home life: What can organizations do to help? *Academy of Management Perspectives*, 2(3):213–223, 1988. doi: 10.5465/ame.1988.4277258.
- [66] Susan Handy and Calvin Thigpen. Commute quality and its implications for commute satisfaction: Exploring the role of mode, location, and other factors. *Travel Behaviour and Society*, 16:241 – 248, 2019. ISSN 2214-367X. doi: <https://doi.org/10.1016/j.tbs.2018.03.001>.
- [67] Yaser Hatamzadeh. Do people desire to walk more in commuting to work? examining a conceptual model based on the role of perceived walking distance and positive attitudes. *Transportation Research Record*, 2673(7):351–361, 2019. doi: 10.1177/0361198119849397.
- [68] Mingwei He, Shengchuan Zhao, and Min He. Tolerance threshold of commuting time: Evidence from kunming, china. *Journal of Transport Geography*, 57:1 – 7, 2016. ISSN 0966-6923. doi: <https://doi.org/10.1016/j.jtrangeo.2016.09.007>.

- [69] Margo Hilbrecht, Bryan Smale, and Steven E. Mock. Highway to health? commute time and well-being among canadian adults. *World Leisure Journal*, 56(2):151–163, 2014. doi: 10.1080/16078055.2014.903723.
- [70] E.Jeffrey Hill, Maria Ferris, and Vjollca Mårtinson. Does it matter where you work? a comparison of how three work venues (traditional office, virtual office, and home office) influence aspects of work and personal/family life. *Journal of Vocational Behavior*, 63(2):220 – 241, 2003. ISSN 0001-8791. doi: [https://doi.org/10.1016/S0001-8791\(03\)00042-3](https://doi.org/10.1016/S0001-8791(03)00042-3). Special Issue on Technology and Careers.
- [71] John D. Hill and Linda Ng Boyle. Driver stress as influenced by driving maneuvers and roadway conditions. *Transportation Research Part F: Traffic Psychology and Behaviour*, 10(3):177 – 186, 2007. ISSN 1369-8478. doi: <https://doi.org/10.1016/j.trf.2006.09.002>.
- [72] Prasanna Humagain and Patrick A. Singleton. Investigating travel time satisfaction and actual versus ideal commute times: A path analysis approach. *Journal of Transport Health*, 16:100829, 2020. ISSN 2214-1405. doi: <https://doi.org/10.1016/j.jth.2020.100829>.
- [73] J.M. Jachimowicz, J.J. Lee, B.R. Staats, J.I. Menges, F. Gino, and Harvard Business School. *Between Home and Work: Commuting as an Opportunity for Role Transitions*. Working paper (Harvard Business School). Harvard Business School, 2018. URL <https://books.google.co.uk/books?id=qLw7uwEACAAJ>.
- [74] Mohieddin Jafari and Naser Ansari-Pour. Why, when and how to adjust your p values? *Cell Journal*, 20(4):604–607, 2019. doi: 10.22074/cellj.2019.5992.
- [75] Juliet Jain and Glenn Lyons. The gift of travel time. *Journal of Transport Geography*, 16(2):81 – 89, 2008. ISSN 0966-6923. doi: <https://doi.org/10.1016/j.jtrangeo.2007.05.001>.
- [76] Myung-Jin Jun, Ki-Hyun Kwon, and Ji-Eun Jeong. An evaluation of the value of time for commuting in seoul: A life satisfaction approach. *International Journal of Sustainable Transportation*, 13(10):703–709, 2019. doi: 10.1080/15568318.2018.1510561.
- [77] Daniel Kahneman and Alan B. Krueger. Developments in the measurement of subjective well-being. *Journal of Economic Perspectives*, 20(1): 3–24, March 2006. doi: 10.1257/089533006776526030.
- [78] Daniel Kahneman, Alan B. Krueger, David A. Schkade, Norbert Schwarz, and Arthur A. Stone. A survey method for characterizing daily life

- experience: The day reconstruction method. *Science*, 306(5702):1776–1780, 2004. ISSN 0036-8075. doi: 10.1126/science.1103572.
- [79] Arie Kapteyn, Jinkook Lee, Caroline Tassot, Hana Vonkova, and Gema Zamarro. Dimensions of subjective well-being. *Social Indicators Research*, 123(3):625–660, 2015. doi: 10.1007/s11205-014-0753-0.
- [80] Clémence Kieny, Gabriela Flores, and Jürgen Maurer. Assessing and decomposing gender differences in evaluative and emotional well-being among older adults in the developing world. *Review of Economics of the Household*, 2020. doi: 10.1007/s11150-020-09521-y.
- [81] E. Kossek, Brenda A. Lautsch, and S. Eaton. Flexibility enactment theory: Implications of flexibility type, control, and boundary management for work- family effectiveness. 2005.
- [82] Alexandra Kuznetsova, Per B. Brockhoff, and Rune H. B. Christensen. lmerTest package: Tests in linear mixed effects models. *Journal of Statistical Software*, 82(13):1–26, 2017. doi: 10.18637/jss.v082.i13.
- [83] Seth LaJeunesse and Daniel A. Rodríguez. Mindfulness, time affluence, and journey-based affect: Exploring relationships. *Transportation Research Part F: Traffic Psychology and Behaviour*, 15(2):196 – 205, 2012. ISSN 1369-8478. doi: <https://doi.org/10.1016/j.trf.2011.12.010>.
- [84] Sascha Lancée, Ruut Veenhoven, and Martijn Burger. Mood during commute in the netherlands: What way of travel feels best for what kind of people? *Transportation Research Part A: Policy and Practice*, 104: 195 – 208, 2017. ISSN 0965-8564. doi: 10.1016/j.tra.2017.04.025.
- [85] R.S. Lazarus. *Stress and Emotion: A New Synthesis*. Springer Publishing Company, 2006. ISBN 9780826103802. URL <https://books.google.co.uk/books?id=mATTP46QIp4C>.
- [86] Huyen T.K. Le, Ralph Buehler, Yingling Fan, and Steve Hankey. Expanding the positive utility of travel through weeklong tracking: Within-person and multi-environment variability of ideal travel time. *Journal of Transport Geography*, 84:102679, 2020. ISSN 0966-6923. doi: <https://doi.org/10.1016/j.jtrangeo.2020.102679>.
- [87] John Locke. An essay concerning human understanding, 1690. 1948.
- [88] Olga Lorenz. Does commuting matter to subjective well-being? *Journal of Transport Geography*, 66:180 – 199, 2018. ISSN 0966-6923. doi: <https://doi.org/10.1016/j.jtrangeo.2017.11.019>.

- [89] John Ludbrook. Multiple comparison procedures updated. *Clinical and Experimental Pharmacology and Physiology*, 25(12):1032–1037, 1998. doi: <https://doi.org/10.1111/j.1440-1681.1998.tb02179.x>. URL <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1440-1681.1998.tb02179.x>.
- [90] Glenn Lyons, Juliet Jain, and David Holley. The use of travel time by rail passengers in great britain. *Transportation Research Part A: Policy and Practice*, 41(1):107–120, 2007. doi: <https://doi.org/10.1016/j.tra.2006.05.012>.
- [91] Mary Madden and Sydney Jones. *Networked Workers*. PEW Research Center’s Internet American Life Project, Washington, D.C., 2008. URL https://www.pewinternet.org/wp-content/uploads/sites/9/media/Files/Reports/2008/PIP_Networked_Workers_FINAL.pdf.
- [92] Moira Maguire and Brid Delahunt. Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. *AISHE-J: The All Ireland Journal of Teaching and Learning in Higher Education*, 9(3): 3351–3364, 2017.
- [93] Eleanor Mann and Charles Abraham. The role of affect in uk commuters’ travel mode choices: An interpretative phenomenological analysis. *British Journal of Psychology*, 97(2):155–176, 2006. doi: <https://doi.org/10.1348/000712605X61723>.
- [94] Zidan Mao, Dick Ettema, and Martin Dijst. Commuting trip satisfaction in beijing: Exploring the influence of multimodal behavior and modal flexibility. *Transportation Research Part A: Policy and Practice*, 94:592 – 603, 2016. ISSN 0965-8564. doi: <https://doi.org/10.1016/j.tra.2016.10.017>.
- [95] Adam Martin, Yevgeniy Goryakin, and Marc Suhrcke. Does active commuting improve psychological wellbeing? longitudinal evidence from eighteen waves of the british household panel survey. *Preventive Medicine*, 69:296 – 303, 2014. ISSN 0091-7435. doi: [10.1016/j.ypmed.2014.08.023](https://doi.org/10.1016/j.ypmed.2014.08.023).
- [96] J.C. Messenger. *Telework in the 21st Century: An Evolutionary Perspective*. The ILO Future of Work series. Edward Elgar Publishing, 2019. ISBN 9781789903751. URL <https://books.google.co.uk/books?id=tALADwAAQBAJ>.
- [97] Dimitris Milakis and Bert van Wee. “for me it is always like half an hour”: Exploring the acceptable travel time concept in the us and european

- contexts. *Transport Policy*, 64:113 – 122, 2018. ISSN 0967-070X. doi: <https://doi.org/10.1016/j.tranpol.2018.02.001>.
- [98] Dimitris Milakis, Robert Cervero, Bert van Wee, and Kees Maat. Do people consider an acceptable travel time? evidence from berkeley, ca. *Journal of Transport Geography*, 44:76 – 86, 2015. ISSN 0966-6923. doi: <https://doi.org/10.1016/j.jtrangeo.2015.03.008>.
- [99] Patricia L. Mokhtarian and Ilan Salomon. How derived is the demand for travel? some conceptual and measurement considerations. *Transportation Research Part A: Policy and Practice*, 35(8):695 – 719, 2001. ISSN 0965-8564. doi: [https://doi.org/10.1016/S0965-8564\(00\)00013-6](https://doi.org/10.1016/S0965-8564(00)00013-6).
- [100] Richard D. Morey and Jeffrey N. Rouder. *BayesFactor: Computation of Bayes Factors for Common Designs*, 2018. URL <https://CRAN.R-project.org/package=BayesFactor>. R package version 0.9.12-4.2.
- [101] Eric A. Morris and Erick Guerra. Are we there yet? trip duration and mood during travel. *Transportation Research Part F: Traffic Psychology and Behaviour*, 33:38 – 47, 2015. ISSN 1369-8478. doi: <https://doi.org/10.1016/j.trf.2015.06.003>.
- [102] Eric A. Morris and Ying Zhou. Are long commutes short on benefits? commute duration and various manifestations of well-being. *Travel Behaviour and Society*, 11:101 – 110, 2018. ISSN 2214-367X. doi: <https://doi.org/10.1016/j.tbs.2018.02.001>.
- [103] S. Morris, A. Humphrey, P. Cabrera Alvarez, and O. D’Lima. *The UK Time Diary Study 2014–2015. Technical Report*. NatCen Social Research, London, 2016.
- [104] Killian Mullan and Judy Wajcman. Have mobile devices changed working patterns in the 21st century? a time-diary analysis of work extension in the uk. *Work, Employment and Society*, 33(1):3–20, 2019. doi: [10.1177/0950017017730529](https://doi.org/10.1177/0950017017730529).
- [105] Peng Nie and Alfonso Sousa-Poza. Commute time and subjective well-being in urban china. *China Economic Review*, 48:188 – 204, 2018. ISSN 1043-951X. doi: <https://doi.org/10.1016/j.chieco.2016.03.002>.
- [106] S.H. Norgate, A.M. Cooper-Ryan, S. Lavin, C. Stonier, and C.L. Cooper. The impact of public transport on the health of work commuters: a systematic review. *Health Psychology Review*, 14(2):325–344, 2020. doi: [10.1080/17437199.2019.1618723](https://doi.org/10.1080/17437199.2019.1618723).

- [107] Lorelli S. Nowell, Jill M. Norris, Deborah E. White, and Nancy J. Moules. Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, 16(1):1609406917733847, 2017. doi: 10.1177/1609406917733847.
- [108] Jennifer Oates, Julia Jones, and Nicholas Drey. Subjective well-being of mental health nurses in the united kingdom: Results of an online survey. *International Journal of Mental Health Nursing*, 26(4):391–401, 2017. doi: <https://doi.org/10.1111/inm.12263>.
- [109] Chartered Institute of Personnel and Development. *Employee Outlook Spring 2017*. Chartered Institute of Personnel and Development, London, 2017.
- [110] Cabinet Office. *Staying at home and away from others (social distancing)*. Cabinet Office, 2020.
- [111] Maurice Ohayon, Emerson M. Wickwire, Max Hirshkowitz, Steven M. Albert, Alon Avidan, Frank J. Daly, Yves Dauvilliers, Raffaele Ferri, Constance Fung, David Gozal, Nancy Hazen, Andrew Krystal, Kenneth Lichstein, Monica Mallampalli, Giuseppe Plazzi, Robert Rawding, Frank A. Scheer, Virend Somers, and Michael V. Vitiello. National sleep foundation’s sleep quality recommendations: first report. *Sleep Health*, 3(1):6–19, 2017. ISSN 2352-7218. doi: <https://doi.org/10.1016/j.sleh.2016.11.006>.
- [112] Margrethe H. Olson and Sophia B. Primps. Working at home with computers: Work and nonwork issues. *Journal of Social Issues*, 40(3): 97–112, 1984. doi: 10.1111/j.1540-4560.1984.tb00194.x.
- [113] Julie B. Olson-Buchanan and Wendy R. Boswell. Blurring boundaries: Correlates of integration and segmentation between work and nonwork. *Journal of Vocational Behavior*, 68(3):432 – 445, 2006. ISSN 0001-8791. doi: <https://doi.org/10.1016/j.jvb.2005.10.006>.
- [114] E. Olsson, L. T. Gärling, D. Ettema, M. Friman, and S Fujii. Happiness and satisfaction with work commute. *Social Indicators Research*, 111(1): 255 – 263, 2013. doi: 10.1007/s11205-012-0003-2.
- [115] David T. Ory, Patricia L. Mokhtarian, Lothlorien S. Redmond, Ilan Salomon, Gustavo O. Collantes, and Sangho Choo. When is commuting desirable to the individual? *Growth and Change*, 35(3):334–359, 2004. doi: 10.1111/j.1468-2257.2004.00252.x.
- [116] Nadine C Page and Viktor O Nilsson. Active commuting: Workplace health promotion for improved employee well-being and organizational

- behavior. *Frontiers in Psychology*, 7(1):1 – 12, 2017. doi: 10.3389/fpsyg.2016.01994.
- [117] Pablo E. Paredes, Yijun Zhou, Nur Al-Huda Hamdan, Stephanie Balters, Elizabeth Murnane, Wendy Ju, and James A. Landay. Just breathe: In-car interventions for guided slow breathing. *Association for Computing Machinery*, 2(1):1 – 23, 2018. doi: 10.1145/3191760.
- [118] Pablo Enrique Paredes, Nur Al-Huda Hamdan, Dav Clark, Carrie Cai, Wendy Ju, and James A Landay. Evaluating in-car movements in the design of mindful commute interventions: Exploratory study. *J Med Internet Res*, 19(12):e372, 2017. doi: 10.2196/jmir.6983.
- [119] J.R Piazza, S.T Charles, M.J Sliwinski, J Mogle, and D.M Almeida. Affective reactivity to daily stressors and long-term risk of reporting a chronic physical health condition. *Annals of behavioral medicine : a publication of the Society of Behavioral Medicine*, 45(1):110 –120, 2013. doi: 10.1007/s12160-012-9423-0.
- [120] Jonathan Posner, James A Russell, and Bradley S Peterson. The circumplex model of affect: an integrative approach to affective neuroscience, cognitive development, and psychopathology. *Development and psychopathology*, 17(3):715 – 734, 2005. doi: 10.1017/S0954579405050340.
- [121] Eleanor Putnam-Farr and Carey K. Morewedge. Comparing one and many: Insights from judgment and decision-making for social comparison. In Jerry Suls, Rebecca L. Collins, and Ladd Wheeler, editors, *Social Comparison, Judgment, and Behavior*, pages 386–429. Oxford University Press, Oxford, 2020.
- [122] Antonio Páez and Kate Whalen. Enjoyment of commute: A comparison of different transportation modes. *Transportation Research Part A: Policy and Practice*, 44(7):537 – 549, 2010. ISSN 0965-8564. doi: <https://doi.org/10.1016/j.tra.2010.04.003>.
- [123] R Core Team. *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria, 2018. URL <https://www.R-project.org/>.
- [124] Lothlorien S. Redmond and Patricia L. Mokhtarian. The positive utility of the commute: modeling ideal commute time and relative desired commute amount. *Transportation*, 28(2):179–205, 2001. ISSN 1572-9435. doi: 10.1023/A:1010366321778.
- [125] Jennifer Roberts, Robert Hodgson, and Paul Dolan. “it’s driving her mad”: Gender differences in the effects of commuting on psychological

- health. *Journal of Health Economics*, 30(5):1064 – 1076, 2011. ISSN 0167-6296. doi: <https://doi.org/10.1016/j.jhealeco.2011.07.006>.
- [126] Katherine D. Rogers, Claire Dodds, Malcolm Campbell, and Alys Young. The validation of the short warwick-edinburgh mental well-being scale (swemwbs) with deaf british sign language users in the uk. *Health and Quality of Life Outcomes*, 16(1).
- [127] Chiara Ruini and Carol D. Ryff. *Using Eudaimonic Well-being to Improve Lives*, chapter 11, pages 153–166. John Wiley Sons, Ltd, 2016. ISBN 9781118468197. doi: <https://doi.org/10.1002/9781118468197.ch11>. URL <https://onlinelibrary.wiley.com/doi/abs/10.1002/9781118468197.ch11>.
- [128] James A Russell. A circumplex model of affect. *Journal of personality and social psychology*, 39(6):1161, 1980.
- [129] Carol D. Ryff and Burton H. Singer. Know thyself and become what you are: A eudaimonic approach to psychological well-being. *Journal of Happiness Studies*, 9(1):13–39, 2008. doi: 10.1007/s10902-006-9019-0.
- [130] Erika Sandow. Commuting behaviour in sparsely populated areas: evidence from northern sweden. *Journal of Transport Geography*, 16(1):14 – 27, 2008. ISSN 0966-6923. doi: <https://doi.org/10.1016/j.jtrangeo.2007.04.004>.
- [131] Monica H. Schaeffer, Stacey W. Street, Jerome E. Singer, and Andrew Baum. Effects of control on the stress reactions of commuters1. *Journal of Applied Social Psychology*, 18(11):944–957, 1988. doi: <https://doi.org/10.1111/j.1559-1816.1988.tb01185.x>.
- [132] Ulrich Schimmack. *The Structure of Subjective Well-Being*, pages 97–123. Guilford Press;, New York, 2008.
- [133] F. Atiyya Shaw, Aliaksandr Malokin, Patricia L. Mokhtarian, and Giovanni Circella. It’s not all fun and games: An investigation of the reported benefits and disadvantages of conducting activities while commuting. *Travel Behaviour and Society*, 17:8 – 25, 2019. ISSN 2214-367X. doi: <https://doi.org/10.1016/j.tbs.2019.05.008>.
- [134] D. C. Shin and D. M. Johnson. Avowed happiness as an overall assessment of the quality of life. *Social Indicators Research*, 5(1):475–492, 1978. doi: 10.1007/BF00352944.
- [135] Kristen M. Shockley and Tammy D. Allen. When flexibility helps: Another look at the availability of flexible work arrangements and

- work–family conflict. *Journal of Vocational Behavior*, 71(3):479 – 493, 2007. ISSN 0001-8791. doi: <https://doi.org/10.1016/j.jvb.2007.08.006>.
- [136] Uri Simonsohn. New yorkers commute more everywhere: Contrast effects in the field. *The Review of Economics and Statistics*, 88(1):1–9, 2006. ISSN 00346535, 15309142. URL <http://www.jstor.org/stable/40042954>.
- [137] Patrick A. Singleton. Walking (and cycling) to well-being: Modal and other determinants of subjective well-being during the commute. *Travel Behaviour and Society*, 16:249 – 261, 2019. ISSN 2214-367X. doi: <https://doi.org/10.1016/j.tbs.2018.02.005>.
- [138] Patrick Allen Singleton. *Exploring the Positive Utility of Travel and Mode Choice*. PhD thesis, Portland, 2017.
- [139] Oliver Smith. Commute well-being differences by mode: Evidence from portland, oregon, usa. *Journal of Transport Health*, 4:246 – 254, 2017. ISSN 2214-1405. doi: <https://doi.org/10.1016/j.jth.2016.08.005>.
- [140] Understanding Society. British household panel survey, 2020. URL <https://www.understandingsociety.ac.uk/about/british-household-panel-survey>.
- [141] Nick South, Ben Shuttleworth, Christin Owings, Juliana Lisi, and Maryam Saleh. What’s next for how we work in the uk?, 2020. URL <https://www.bcg.com/en-gb/publications/2020/future-of-working-models-united-kingdom>.
- [142] Evelyne St-Louis, Kevin Manaugh, Dea van Lierop, and Ahmed El-Geneidy. The happy commuter: A comparison of commuter satisfaction across modes. *Transportation Research Part F: Traffic Psychology and Behaviour*, 26:160 – 170, 2014. ISSN 1369-8478. doi: <https://doi.org/10.1016/j.trf.2014.07.004>.
- [143] Andrew Steptoe, Angus Deaton, and Arthur A Stone. Subjective wellbeing, health, and ageing. *The Lancet*, 385(9968):640 – 648, 2015. ISSN 0140-6736. doi: [https://doi.org/10.1016/S0140-6736\(13\)61489-0](https://doi.org/10.1016/S0140-6736(13)61489-0). URL <http://www.sciencedirect.com/science/article/pii/S0140673613614890>.
- [144] Neil Stewart, Nick Chater, and Gordon D.A. Brown. Decision by sampling. *Cognitive Psychology*, 53(1):1 – 26, 2006. ISSN 0010-0285. doi: <https://doi.org/10.1016/j.cogpsych.2005.10.003>.

- Vish Viswanath, Dorota Weziak-Białowolska, and Laura D. Kubzansky. Current recommendations on the selection of measures for well-being. *Preventive Medicine*, 133:106004, 2020. ISSN 0091-7435. doi: <https://doi.org/10.1016/j.ypmed.2020.106004>.
- [154] Daniel Västfjäll, Margareta Friman, Tommy Gärling, and Mendel Kleiner. The measurement of core affect: A swedish self-report measure derived from the affect circumplex. *Scandinavian Journal of Psychology*, 43(1): 19–31, 2002. doi: 10.1111/1467-9450.00265.
- [155] S.L Vine, J. Polak, and A. Humphrey. *Commuting Trends in England 1988-2015*. Department for Transport, London, 2017. URL https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/877039/commuting-in-england-1988-2015.pdf.
- [156] David Watson, Lee Anna Clark, and Auke Tellegen. Development and validation of brief measures of positive and negative affect: the panas scales. *Journal of personality and social psychology*, 54(6):1063–1070, 1988.
- [157] Richard E. Wener and Gary W. Evans. Comparing stress of car and train commuters. *Transportation Research Part F: Traffic Psychology and Behaviour*, 14(2):111 – 116, 2011. ISSN 1369-8478. doi: <https://doi.org/10.1016/j.trf.2010.11.008>.
- [158] Mathew P. White and Paul Dolan. Accounting for the richness of daily activities. *Psychological Science*, 20(8):1000–1008, 2009. doi: 10.1111/j.1467-9280.2009.02392.x. PMID: 19549079.
- [159] Elizabeth D. Wilhoit. ‘my drive is my sacred time’: commuting as routine liminality. *Culture and Organization*, 23(4):263–276, 2017. doi: 10.1080/14759551.2017.1341518.
- [160] Chee Sing Yap and Helen Tng. Factors associated with attitudes towards telecommuting. *Information Management*, 19(4):227 – 235, 1990. doi: [https://doi.org/10.1016/0378-7206\(90\)90032-D](https://doi.org/10.1016/0378-7206(90)90032-D).
- [161] Runing Ye and Helena Titheridge. Satisfaction with the commute: The role of travel mode choice, built environment and attitudes. *Transportation Research Part D: Transport and Environment*, 52:535 – 547, 2017. ISSN 1361-9209. doi: <https://doi.org/10.1016/j.trd.2016.06.011>. Land use and transportation in China.
- [162] Runing Ye, Jonas De Vos, and Liang Ma. Analysing the association of dissonance between actual and ideal commute time and commute

- satisfaction. *Transportation Research Part A: Policy and Practice*, 132:47–60, 2020. ISSN 0965-8564. doi: <https://doi.org/10.1016/j.tra.2019.10.011>.
- [163] A.J. Zautra. *Emotions, Stress, and Health*. Oxford University Press, 2006. ISBN 9780195307986. URL <https://books.google.co.uk/books?id=qPXB4s3AHa4C>.
- [164] Mingyu Zhao, Nick Tyler, and Cheng Lan. What determines commute time choices? a structural equation modelling approach. *Transportation Planning and Technology*, 35(4):393–408, 2012. doi: 10.1080/03081060.2012.680809.
- [165] Jing Zhu and Yingling Fan. Commute happiness in xi’an, china: Effects of commute mode, duration, and frequency. *Travel Behaviour and Society*, 11:43 – 51, 2018. ISSN 2214-367X. doi: 10.1016/j.tbs.2018.01.001.
- [166] Zhenjun Zhu, Zhigang Li, Hongsheng Chen, Ye Liu, and Jun Zeng. Subjective well-being in china: how much does commuting matter? *Transportation*, 46(4):1505–1524, 2019. ISSN 1572-9435. doi: 10.1007/s11116-017-9848-1.