

Socioeconomic diversity and physical activity:
Using the Model of Human Occupation
to explore physical activity behaviour

Thesis submitted in accordance with the requirements of the
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Declaration

Material in this thesis has not been presented either wholly or in part for any other degree or qualification. Content within this document is a result of my own work, apart from where stated.

This thesis describes independent research funded by the National Institute for Health Research Collaboration for Leadership in Applied Health Research and Care, North West Coast (NIHR CLAHRC NWC). The views expressed are those of the author and not necessarily those of the National Institute for Health Research nor the Department of Health and Social Care.

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Glossary of terms

This thesis is written from an occupational therapy perspective. The terms below, used throughout this thesis, may be unfamiliar to those outside the profession. Lay definitions are provided for clarity and ease of reference.

Activities of daily living: Daily tasks such as self-care activities, dressing, housework, shopping and meal preparation.

Conceptual practice model: A visual framework for explaining a concept, or set of interconnected concepts, providing theoretical knowledge to guide practice.

Frame of reference: A set of criteria upon which information is evaluated.

Habituation: The process by which occupation is organised into patterns or routine.

Holistic: Consideration of the *whole* person, taking into account all interconnected cognitive, psychological, sociological, biological, spiritual and environmental elements.

Interpretive lens: Conceptual or theoretical framework through which one sees the world; a set of concepts and/or theories influencing thought, behaviour and action.

Occupation: Daily activities which individuals undertake themselves and/or with others, which occupy time and bring meaning and purpose to life. These include activities individuals need to do, want to do and are expected to do.

Performance capacity: Interconnected cognitive and physical abilities which underlie occupational engagement.

Person-centred: Focused on the needs, individuality and preferences of the person.

Reflexivity: Reflection upon the manner in which one's situatedness in society, history and culture may shape values, judgements and actions on an individual and societal level.

Responsibility for self: Responsibility for elements of one's own life which are within personal control.

Self-actualisation: The realisation of one's full personal potential.

Self-efficacy: Sense of confidence and effectiveness to engage and accomplish a task.

Volition: Intrinsic motivation toward occupation.

Abstract

Aims

The aim of this research was to explore the influence of where people live on their physical activity behaviour. Written from an occupational therapy perspective, the Model of Human Occupation (MoHO) was applied as a lens through which to approach the study. Previous research into environmental influence on physical activity has focused largely on built environment features through quantitative enquiry. This study used mixed methods to explore the motivations and barriers to being physically active in relation to where people live. Wirral, Merseyside was selected as the study location, given the borough's sociodemographic and geographic diversity between east and west. East Wirral is broadly characterised by greater deprivation, greater residential density and primarily urban features. West Wirral is more rural, with greater affluence and lower housing density. The study aimed to explore whether residence of east versus west Wirral influenced physical activity behaviour.

Methods

40 residents were recruited from across Wirral, representing each deprivation quintile. Participants formed east/west sub-samples of 19 and 21, respectively. Participants completed self-report questionnaires on demographics, general health, personal wellbeing, physical activity and perception of neighbourhood environment. They subsequently wore a Fitbit Charge HR physical activity monitor for seven days during waking hours. Those consenting also completed one semi-structured interview exploring physical activity behaviour in Wirral, including perceived facilitators and barriers to being active. Quantitative and qualitative data were analysed independently and interpreted as mixed methods results, from which discussion and conclusions were drawn, using MoHO as the theoretical underpinning.

Results

Physical activity was found to be influenced more by intrinsic motivation and daily routine than physical environment features. Participants describing patterns of habitual routine involving physical activity reported and demonstrated greater levels of daily activity than those describing a more ad-hoc lifestyle. Physically active participants reported greater personal wellbeing than those reporting and demonstrating less daily activity. No difference was found between inclination toward physical activity between residents of east and west Wirral. An inverse association was identified between deprivation and physical activity, personal wellbeing and perception of neighbourhood environment. Conversely, although perceived neighbourhood activity-friendliness was reported lower in east Wirral than west Wirral, eastern residents engaged in more daily physical activity than their western neighbours.

Conclusion

Physical activity is influenced more by personal inclination and the presence of physically active, habit-formed routine than by built environment features. Roles, responsibilities and the degree of meaningfulness and importance are greater influences on physical activity than external environment features. Interventions to encourage physical activity must focus on a person-centred approach alongside insightful urban and rural planning.

Introduction: Providing foundations for this research

*“Equality is not in regarding different things similarly;
equality is in regarding different things differently”*

Tom Robbins

1.1 Start at the beginning

The Physical Activity in Wirral (PAW) study was funded by a PhD studentship from National Institute for Health Research Collaboration for Leadership in Applied Health Research and Care, North West Coast (NIHR CLAHRC NWC). NIHR CLAHRC NWC’s mandate is to support research into reducing health inequalities in north west England. Funding was granted to support mixed methods enquiry into associations between where people live and their engagement with physical activity as part of a healthy lifestyle. The purpose of this study was to explore whether inequalities arising from socioeconomic inequity influence physical activity behaviour.

1.2 Defining health inequalities

Equality is the quality of being equal; (1) access to the same rights, status and opportunities as the next person. Equality within and between populations should not be mistaken for all members being and behaving the same, but instead individuals having access to the same opportunities and support, to live life in the manner of their choosing. Human nature involves pursuing free choice to determine one’s own destiny, rather than resigning oneself to live under the control of influences beyond personal control. (2) Health inequality is the uneven distribution of health between and within populations, often underpinned by unwarranted, avoidable and unequal distribution of resources and basic health provision, causing health inequity. (3)

The determinants of health are an amalgamation of circumstances into which we are born, grow, live, work and age. They impact on an individual and societal level and are determined by social and economic influence, often beyond an individual’s control. (4) Disadvantages can arise which may limit opportunities to thrive and develop in health, wealth and wellbeing. Health inequalities are associated with

degrees of social advantage; distinct differences in health outcomes evident from one population to another, caused by inequality in social, economic, political and environmental influence. (5,6) Health inequalities between and among populations are often associated with where people live, given the innate influence of environmental factors on everyday routine, opportunities and personal experiences.

1.3 Scope of this research

The complexities associated with identifying determinants of health as distinct influences of health inequalities preclude full exploration in a single study. As such, it was necessary to isolate one element of individual and population health upon which to focus. Physical activity was identified as a measurable entity, through which it may be possible to identify facilitators and barriers to pursuing a physically active lifestyle, in the context of where people live. This study was designed to gather exploratory data regarding the experiences of individuals' daily routine in relation to where they live, and the role of physical activity within it. The intention was for findings to lay foundations for future research into evidence-based interventions to encourage physical activity in relation to where people live; to engage with local environment features and promote physical activity. It was hoped that findings may encourage key stakeholders to take into account the unique needs and preferences of local communities and appreciate the necessity of a person-centred, locality-specific focus.

1.4 Author's professional standpoint

This study was designed and approached from an occupational therapy standpoint. Occupational therapy adopts a person-centred approach to health and wellbeing, by supporting individuals to overcome barriers to necessary and meaningful occupations and enabling them to reach their full potential. (7) Throughout this thesis, the word 'occupation' will be used in the context of daily activities which individuals, families and communities are required, expected and want to do, which bring meaning and purpose to life. (8) Occupational therapists approach situations from a holistic (whole) perspective, taking into account the broad spectrum of environmental influence – personal, social and physical – on daily routine. In line with

this tripartite environmental influence, the research was approached with the acknowledgement that human nature involves an awareness of self (personal influence), an affinity toward others (social influence) and engagement in meaningful occupations (activities within the physical environment sphere).

1.5 Physical activity and health

1.5.1 Physical activity parameters

Physical activity is defined as any bodily movement requiring energy expenditure, produced by skeletal muscle. (9) Physically active occupations involve energy expenditure above that used by the body at rest (resting metabolic rate) and performing only basic functions such as breathing and circulation. (10) Resting metabolic rate fluctuates from one individual to the next, influenced by age, gender, weight and physical fitness. (11) Physical activity is measured in metabolic equivalents (METs), calculated as approximately one calorie per kilogram of body weight per hour, when sitting quietly. (12) The terms ‘physical activity’ and ‘exercise’ are distinct, with exercise being a subcategory of physical activity involving planning, structure and repetition toward the goal of maintaining physical fitness. (9) Physical inactivity is failure to achieve the level and volume of physical activity suggested by public health guidelines. (13) Physical inactivity should not be mistaken for sedentary behaviour, which is characterised by activities with energy expenditure of ≤ 1.5 METs during waking hours. (14) Table 1.5 presents examples of activities and their associated METs for healthy adults.

Table 1.5 Activity examples and associated METs for healthy adults. (12)

Light activities <3 METs	Moderate activities 3-6 METs	Vigorous activities >6 METs
Slow walking	Brisk walking	Jogging
Working at a computer	Mowing the lawn	Fast cycling
Playing an instrument	Light cycling	Carrying heavy loads
Washing dishes	Vacuuming	Hiking

Healthy adults aged 19-64 are encouraged to engage in 150 minutes of moderate to vigorous aerobic activities divided throughout the week, plus strength exercises for major muscle groups twice weekly. (15) Whilst these examples may indicate structured exercise, daily tasks such as household chores, employment-related physical activity and active transportation all count toward recommended physical activity guidelines.

1.5.2 Health and wellbeing

10,000 daily steps is a figure often cited as a benchmark for maintaining good health and originates from a Japanese pedometer marketing campaign in the 1960s for an activity monitoring unit named Manpo-Kei; *man* meaning 10,000, *po* meaning steps and *kei* meaning metre. (16) The cited figure of 10,000 steps lacks validity as a daily target as individuals can achieve 10,000 steps without accumulating recommended energy expenditure and/or achieve recommended energy expenditure prior to reaching 10,000 steps. (17) The 10,000 steps marketing phenomenon, however, has endured and remains a positive influence, inspiring individuals to accumulate regular daily steps by means of a manageable, memorable target.

Engaging in a physically active lifestyle can reduce risk of preventable disease, increase the likelihood of remaining independent in later life, support educational attainment, boost employment productivity and promote positive mental health. (18) A recent government call to action for healthcare professionals urges practitioners to encourage physical activity as part of daily routine, to minimise avoidable ill health and promote personal wellbeing and resilience. (19) Proactive early intervention is much needed to promote healthy lifestyles and reduce the economic burden of chronic ill health and an ageing society. (20) Associations between health, wellbeing and occupation can be traced to Aristotle, who concluded that personal wellbeing is associated with effective use of body, mind and place in society (resources), together with action (occupation) and the absence of misfortune, whilst also highlighting that capacity to control these entities is variable from one individual to the next. (21)

1.6 Encouraging physical activity

1.6.1 Internal versus external influences

Whilst the benefits of engaging with physical activity are widely reported, not everyone will wish to, nor be able to, engage in active occupation to the degree deemed appropriate for good health. UK initiatives have been implemented to encourage and support participation for at-risk groups, such as exercise referral schemes. These schemes were developed for inactive individuals with underlying health conditions, or displaying disease risk factors, for whom practical support for engagement with physical activity, and associated socialisation, may be beneficial. (22)

These time-bound interventions are designed to initiate long term behaviour change, yet effective habit-forming change is underpinned by perceived self-efficacy, social support and perception of environmental barriers, suggesting that interventions must target psychological as well as physical factors. (23,24) It is important for schemes such as this to effect stepped discharge to other services, to ensure adequate ongoing support. Initiatives such as social prescribing schemes take advantage of proactive, non-medical intervention by providing signposting to local facilities aimed to engender community spirit, promote health and target social needs for individuals and communities. (25)

1.6.2 Impact of technology on physical activity

With the advent of increased workplace automation and mobile personal technologies enabling entertainment, social networking and daily tasks to be accessed and completed online, it has been mooted that technological advancement may be exacerbating the trend in physical inactivity. (26) Whilst it may be prudent to consider the long term effect of evolving technologies, certain advancements have enabled the introduction of activity-promoting devices, such as personal trackers and physical activity monitors. These devices continue to grow in popularity, such as the popular Fitbit brand, providing physical activity monitors for the consumer market and demonstrating significant ongoing growth since launch in 2007. (27) Associated mobile apps providing tracking technology for physical activity have demonstrated

similar popularity, for example Strava, which was reported in 2018 to accumulate approximately one million new users every 40 days. (28)

Whilst not everyone will be interested in physical activity monitoring technologies such as these, organisations appear to be acknowledging the versatility in mobile technologies for promoting physical activity and networking opportunities. For example Pathwatch, a Ramblers campaign encouraging members of the public to report issues with public footpaths in England and Wales via designated web page and mobile app. Path users are invited to upload photographs and share discoveries via social networks, actively encouraging social engagement whilst generating data regarding required path maintenance. Ramblers predict that as a result of public engagement in this campaign, these rights of way will be well maintained by 2020. (29) This initiative must surely be considered positive use of personal technology in support of both physical activity and maintenance of public resources.

1.7 Health, physical activity and deprivation

Population health in different areas of the UK is unequal. For four decades, residents of northern England have demonstrated poorer health than those in southern counties. (30) This regional trend has persisted, underpinned by socioeconomic inequity, with severity of causes consistently greater in the north, e.g. greater poverty, exposure to health damaging environments and lack of access to protective factors. (31) Inverse associations have been reported between socioeconomic status and engagement with physical activity, yet given the multifactorial nature of physical activity and factors influencing daily routine, it remains a complex topic. (32) This research sought to explore the nature of environmental influence on physical activity and how this is affected by socioeconomic diversity. As the UK population ages, consequences of geographic health imbalances have become more apparent and although society may overall be healthier and able to work for longer, geographic inequalities are undermining benefits derived from remaining healthy for longer. (33)

Population mobility and factors influencing why people live in certain locations, or relocate to others, must be taken into account on an individual level. Attempting to infer relationships on an individual level from population-based findings leads to

inherent inaccuracies and is an example of ecological fallacy. (34) Different results will be generated from statistical analysis conducted at unit level than at area level, yet ecological fallacy in population research has been described as unavoidable. (35) The effect of ecological fallacy must be accounted for when describing generalisability of findings.

In recent years, government focus has turned toward reducing income poverty, improving social mobility and promoting social justice, to ensure that everyone has the same opportunities. (36) The impact of socioeconomic and environmental influence on health outcomes has been recognised as a core focal point, alongside promotion of psychosocial resilience and adoption of healthy behaviours. (37) Whilst adequate provision for health is a necessity for individuals and communities to thrive, evidence indicates that politicians and the public believe that government intervention is secondary to individuals taking responsibility for their own health and wellbeing. (38) These findings must be interpreted with caution as the authors did not share details of respondents' demographics, socioeconomic status, nor regional location. Whilst responsibility for self is a factor in adopting and maintaining a healthy lifestyle, policy makers must first ensure that individuals have access to equal opportunities to be physically active, to enable these health-promoting behaviours to take place. The notions of self-efficacy and self-responsibility feature highly in occupational therapy literature and are explored via qualitative enquiry in the PAW study.

1.8 Scope and focus of existing literature

1.8.1 Preliminary literature search

A scoping review was conducted prior to study protocol development. To ensure that the search and selection process was developed in a methodologically sound manner, the process was implemented in line with the recognised protocol for a systematic review. (39) The rigorous search strategy development and approach to results selection ensured that pertinent literature was identified, from which insight could be drawn regarding current knowledge in this subject field. A scoping review of existing literature can provide a framework by which to examine a broad subject

field, clarify current research focus, identify types of evidence available and identify gaps in knowledge. (40) The review was conducted to explore the breadth and focus of existing literature surrounding environmental influence on physical activity.

1.8.2 Literature search research question

How do environment features influence physical activity behaviours?

1.8.3 Search aims and objectives

The review of relevant literature was conducted to ensure that protocol development was based on an accurate understanding of current information. The primary aim was to ascertain the type, scope and content of historic and contemporary enquiry into the influence of the environment on physical activity. This was achieved by designing and implementing a topic-driven, structured search strategy to identify appropriate texts.

1.8.4 Search strategy development

An initial synonym search was conducted, to identify words associated with the core topics of 'physical activity' and 'environment'. This ensured that the search strategy would encompass more abstract/obscure terms and minimised the risk of pertinent manuscripts being overlooked. These terms were subsequently combined, using variations of keywords relating to seven discrete focus areas embedded within each search string. A copy of the full search strategy and search terms is presented in appendix 1. Search syntax was adapted in line with individual database requirements, to ensure accurate use of Boolean logic and database-specific Medical Subject Headings (MeSH) terms. Each search required the following topics to be present within each returned manuscript; physical activity, sedentary behaviour, environment, adults, inequalities, activity monitoring and use of geographic information systems. No limits were applied to the initial search, however, 'English language' limit was latterly applied, given researcher language limitations. 35 individual databases were searched. A list of these databases is presented in appendix 2.

1.8.5 Search results selection process

Following automatic database de-duplication, citations were imported into Mendeley reference management software, to facilitate methodical screening using pre-identified inclusion criteria. Table 1.8a presents screening inclusion criteria. Items were screened at three levels; title, abstract and full text. To demonstrate validity of the screening process, a sub-sample of 50 citations were independently screened at title and abstract level by two separate academics experienced in the subject field. Where opinion deviated regarding the selection of individual citations, consensus was achieved through discussion and screening inclusion criteria remained unaltered. Figure 1.8 on page 11 presents results of the screening process via flow diagram, using the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) format. (41)

Table 1.8a Inclusion criteria for literature screening process

Inclusion criteria
Physical activity behaviour (active or sedentary)
Human subjects
Adults (≥ 18 years of age)
No reported clinical diagnosis
Objective physical activity measurement
Objective environmental measurement

The rationale for excluding participants <18 years of age was to avoid the influential bias of mandatory physical activity delivered as part of the national curriculum. Similarly, the rationale for excluding literature on specific diagnostic groups was to avoid the influence of health-related physical activity limitations. Whilst a degree of functional limitation was not a prohibitive factor for participation in the PAW study, mobility was assessed using the Functional Mobility Scale as part of the study's inclusion criteria (detailed on page 31). The scale was implemented to minimise excessive activity bias introduced by functional limitations. It was deemed prudent to exclude literature describing clinical co-morbidities, to minimise the influence of confounding factors on physical activity behaviour.

Following the screening process, 24 studies remained. Every study focused on physical activity and environment features. Both entities were measured using objective measures. Articles originated from a total of 8 countries; Belgium, Canada, Japan, Mexico, New Zealand, Sweden, UK and USA. The majority of literature originated from Belgium and USA. Only four studies were standalone research projects reporting on primary data via the main published article. Two studies used primary data but were not the main reporting article. Four studies were the main reporting article for large-scale studies which have subsequently generated multiple publications. The remaining 15 articles were secondary analyses using data from parent studies, often a number of years after original data were collected.

Each of the 24 resultant articles used solely quantitative enquiry and focused on elements of the built environment such as street connectivity, housing density and land use mix. These authors used the word 'environment' in the context of these physical features. There was no mention of personal nor social environment features, nor evidence of qualitative or mixed methods enquiry in the articles generated by the search. Calls for more holistic research generating rich descriptive findings into the effect of environmental influence on physical activity have been made previously, exploring complexities of activity behaviour in the context of sociodemographic and lifestyle factors. (42,43) Evidence of this nature was not identified through implementation of the literature selection strategy outlined above.

1.8.6 Revised search results selection process

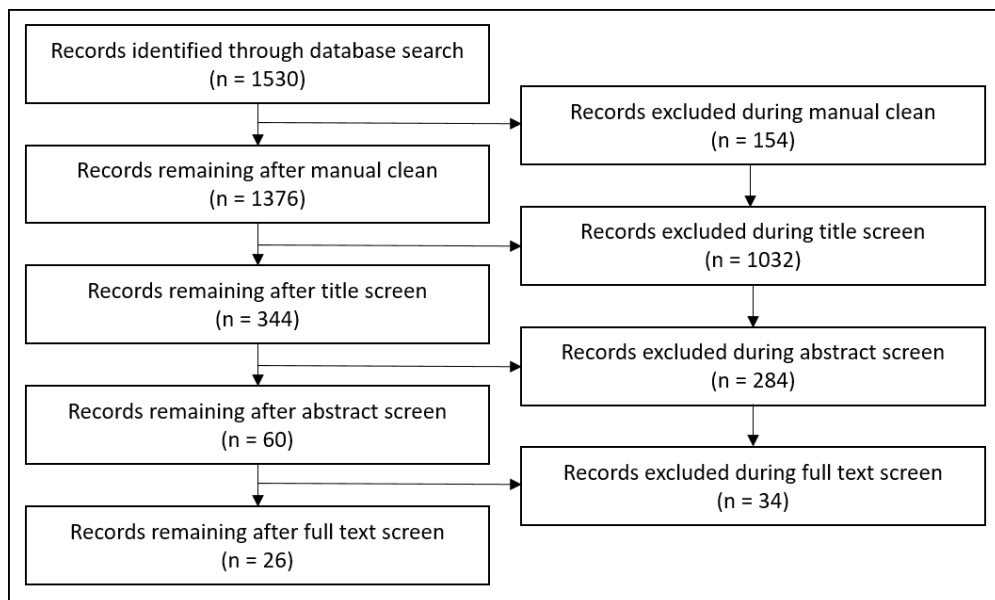
Following methodical review of the original search strategy development, this was confirmed to be accurate and robust. On reflection, and further to review of the literature selection process, however, it was apparent that use of the word 'objective' in the screening inclusion criteria prohibited inclusion of qualitative or mixed methods literature. The literature selection process was therefore repeated, using the original 1530 citations identified by the original search strategy. Inclusion criteria was adapted to ensure that no records were excluded on methodological grounds. Table 1.8b overleaf presents revised screening inclusion criteria.

Table 1.8b Revised inclusion criteria for literature screening process

Inclusion criteria
Physical activity behaviour (active or sedentary)
Human subjects
Adults (≥18 years of age)
No reported clinical diagnosis
Environmental influence

Figure 1.8 below presents results of the revised literature screening process via flow diagram, using the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) format. (41) Manual cleaning prior to selection removed non-English language manuscripts, duplicates and citations prior to the year 2000, to ensure contemporary results. Systematic reviews were excluded from both literature selection processes, in preference for primary evidence. Learnings from two pertinent qualitative systematic review articles are, however, referenced for context in section 1.8.7.

Figure 1.8 Literature screening PRISMA flow diagram



Having revisited the selection process, two articles describing qualitative enquiry were identified. The remainder, some of which comprised the initial 24 articles from the original selection process, used quantitative enquiry and focused on features of the physical environment. By repeating the selection process using adapted inclusion criteria, it was apparent that there was a lack of knowledge regarding descriptive

context for physical activity behaviour, from a qualitative and mixed methods perspective. This assertion is supported by authors of a systematic review exploring the relationship between physical environment features and physical activity, who call for multidisciplinary mixed methods enquiry in this field. (44)

The following pages provide an overview of evidence sourced from the original 24 search articles, alongside the two qualitative articles identified during the revised selection process, supported by wider reading. Postgraduate researchers are encouraged not to simply reframe content sourced by the literature search, but instead demonstrate selective, insight-driven application of existing evidence for the purposes of their own research. (45) The purpose of the search was to generate understanding of the scope and focus of existing literature into environmental influence on physical activity. Results supported development of this study and indicated clearly the current gap in knowledge. Appendix 3 presents the 26 articles with an overview of study characteristics.

1.8.7 Reflections upon existing literature

In the 24 studies generated by the original literature search, quantitative physical activity questionnaires were a frequently-reported data capture tool. Two instances of computer-aided interviews were described, which used structured questions in a quantitative question-answer format. Quantitative questionnaires were also used to explore perception of neighbourhood environment features. Geographic information systems were used for measurement and visual mapping of physical environment features. Given the results of the literature search and wide additional reading, it would appear that USA currently leads the field in relation to research into environmental influence on physical activity. This has been reported by other researchers in the subject field, who cite Belgium as current leaders of European research of this nature. (46) Authors of the two qualitative systematic reviews included in this discussion also cite USA as the country from which the majority of qualitative research into environmental influence on physical activity behaviour originates. (44,47)

Evidence from Belgian literature reporting on data from two inter-related population studies of >2,000 participants regarding structure of the built environment (residential density, street connectivity and accessibility of local amenities), reported positive correlations between these independent variables and volume of physical activity. (48–51) Secondary analyses of data from studies of >2,000 participants in New Zealand, Sweden and USA reported the same correlated findings on the same physical environment variables. (46,52–55) There have been calls for further research into the influence of urban planning and the benefit of activity-friendly built environments features to promote and support active transportation and leisure-time physical activity. (52,53,55–57) These calls emphasise the need for evidence-based urban and rural planning to support societal groups to be physically active as part of daily routine. In order for policy makers to understand how best to provide opportunities to be physically active, it is imperative for the end user (members of the public) to be involved in the planning phase. Findings from Salvo *et al.* support this call, referencing the importance of synergy between all key stakeholders during the planning and implementation process. (47)

Location of physical activity has been cited as an important contextual consideration for understanding activity behaviour with traditional geographic buffer zones used in previous neighbourhood-based research – often one kilometre around participants' homes – suggested to be too narrow to accurately record activity farther from home and employment locations. (58–62) A buffer is a pre-defined zone around a mapped geographic site, within which physical entities (in this instance research participants) are present/move, permitting distance or time analysis. (63) Due to the diversity of daily routine, physical activity research involving relatively small buffer zones around participants' homes may risk missing activity data occurring outside the defined area, thus omitting valuable data pertaining to activity farther from home.

Physical activity location, choices and behaviour have been reported to relate to perception of neighbourhood features; primarily perceived safety from neighbourhood crime and environmental aesthetics. (64–67) Associations have also been reported between physical activity and neighbourhood socioeconomic status, with findings broadly indicating an inverse relationship between the two variables.

(48,54,56,68) Each of these studies used accelerometer and questionnaire to objectively measure physical activity in major cities; 508 women aged 52-62 in Pittsburgh, USA; 250 participants aged 20-65 plus 438 aged 65+ in Ghent, Belgium and 1925 participants aged 20-66 in Stockholm, Sweden. (48,54,56,68)

The primarily urban setting of these studies must be considered when interpreting results, yet the use of open source deprivation data and geographic information systems was a robust method of sampling to ensure a range of socioeconomic postcode areas. The application of validated physical activity monitoring equipment and validated questionnaires further supports the robustness of findings, yet it is difficult to accurately conclude whether the range of socioeconomic backgrounds of participants in these studies can be generalised to the UK population. Similarly, the heterogeneous population between cities across the UK, Europe and USA makes it challenging to directly generalise findings across these diverse population groups.

Findings from the two systematic reviews of qualitative data support the findings of the quantitative literature, with participants identifying perceived personal safety, environmental aesthetics/functionality and accessibility to amenities as core influences of physical activity behaviour in relation to home location. (44,47) The PAW study aimed to explore how perception of neighbourhood features may influence physical activity, in relation to the way in which participants feel about their neighbourhood and their associated inclination/ability to engage in physical activity.

Given the complexities and interconnected nature of factors influencing physical activity within and between populations, calls have been made for future research to focus on contextual factors underpinning activity patterns, including individual characteristics and neighbourhood-specific environment features. (46,65,69,70) The role of personal perception, though not widely explored in the context of where people live and influence on physical activity, has been cited as an important factor, with calls for further research into the influence of perceived neighbourhood safety and perception of environmental aesthetics. (66,67,71) Perceived self-efficacy and functional limitations are also important personal environment influences likely to affect activity behaviour. Research to date has found that instances of low self-efficacy and reported functional limitations have hindered achievement of 10,000

daily steps, exacerbated by perceived lack of environmental supports for physical activity. (72)

The PAW study sought to generate insight into the way in which personal perception of individual roles, routines, abilities and support may influence physical activity in relation to where people live. The study took a holistic approach to understanding individuals' daily routine, exploring the way in which physical activity was incorporated into everyday life. This included exploring activity type, influencing factors, timing, frequency, location, social support and degree of enjoyment.

The two qualitative papers generated from repeating the literature screening process provided a different perspective on the subject, by their ability to provide descriptive context to physical activity behaviour. Grant *et al.* (73) explored via focus groups, semi-structured interview and field notes associations between physical activity, socioeconomic status (SES) and urban form, concluding that perception of physical environment features and their impact on physical activity differs between socioeconomic groups. Perception differed in line with what was meaningful for each, with monies available to neighbourhood associations for local improvements spent differently according to perceived priority; pedestrian safety measures in lower SES areas and aesthetic improvements in more affluent areas. (73)

Findings shed contextual light on what was important to, and realistically possible for, residents of each area, which, when reviewed against land use data provided greater understanding of reasons underpinning physical activity in relation to urban form. Descriptive quotes provided rich insight into participants' daily routine and although numeric activity data was not gathered to objectively measure the volume of physical activity, narrative data enabled vivid appreciation of the realities of living within each neighbourhood. Findings provided in-depth insight of what it meant to be a resident in each area, in their own voice, which enabled greater understanding of the complexities of exploring environmental influences on physical activity.

The study focused solely on features of the built environment and supported the findings of quantitative literature previously described. The value of Grant *et al.*'s (73) findings is the personal reflection provided by qualitative enquiry, building upon

the body of knowledge surrounding the influence of physical environment features on physical activity. Participants were aged 65+ years and all lived in Canada's capital city of Ottawa. Caution should be taken when interpreting these findings across different population groups, given the influence of city versus rural living, and the preferences and priorities of individuals as they age, regarding what is important to them.

The second qualitative study arising from the repeat literature search explored via semi-structured interview the long term impact of a previous primary care intervention encouraging increased walking among community-based UK residents. (74) Normansell *et al.* (74) interviewed a sub-sample of 43 participants from the initial randomised control trial, involving a pedometer, guidance handbook, daily diary and, for some, three contacts with a nurse experienced in behavioural change techniques. Participants aged 45-74 years resided in south west London and were described as representing diversity across socioeconomic and ethnic groups, however, neighbourhood characteristics were not described, so it is difficult to assess the degree to which the setting and sample is representative of the average UK resident.

The qualitative study identified participants from both trial intervention groups, representing increased versus non-increased activity with and without nurse support; no nurse support and did not increase activity; no nurse support and did increase activity; nurse support and did not increase physical activity; nurse support and did increase activity. Every interview participant reported perceived benefits of increased activity across various domains including physical wellbeing, weight loss and social interaction, citing self-efficacy, self-monitoring and social support as facilitators for increased activity. (74) Findings from this study provided insight into the importance of exploring the influence of personal and social factors in understanding physical activity behaviour. This supports the notion that to fully appreciate the extent and interconnectivity of environmental influence on physical activity, it is imperative to take a wide view of the situation, exploring all facets of the person, the people and the place.

The two systematic review articles omitted from the literature review above focus on features of the built environment and support findings from quantitative studies, identifying associations between perception of physical environment features and physical activity. (44,47) Whilst it is valuable to note that qualitative researchers have identified similar physical environment influences underpinning activity behaviour, results do not shed light on how individual differences, lifestyle factors and daily routine may influence engagement with physical activity. Salvo *et al.* identify an association between physical activity and social engagement, describing opportunities for shared activity as a facilitator for physical activity. (47) The PAW study sought to build upon contextual insight such as this, to understand from a holistic perspective the spectrum of environmental influence on physical activity in relation to where people live.

1.9 Gap in knowledge

Results from the structured literature search regarding environmental influence on physical activity focused primarily on physical environment features. No definition of 'environment' was used as part of the search, yet there was an abundance of citations describing urban form, and lack of citations describing the wider elements of the personal and social environment. Given the multidisciplinary nature of the topic, the broad search encompassed databases of various disciplines, including geography, ecology, medicine, nursing, allied health, social care, education, history, philosophy, psychology and sport science. This broad scope provided the opportunity for the more abstract concepts of personal and social environment influence to feature in search results, however, this was not the case. The literature resulting from an interdisciplinary search focused primarily on quantitative enquiry into tangible, physical environment features of the built environment.

The PAW study sought to build upon the current body of knowledge surrounding the influence of physical environment features on physical activity. This was achieved by focusing on the wider span of influence affecting physical activity and daily routine; personal, social *and* physical environment features. The inclusion of qualitative enquiry provided rich, contextual description for activity behaviour as part of daily routine. The PAW study focused not only on physical environment influence, but also

the influence of environment features intrinsic to the person themselves, and the effect of those around them; the impact of the personal and social environment.

By approaching the research from an occupational therapy perspective, using a conceptual practice model through which to explore the topic, it was possible to explore the manner in which this three-fold environmental influence affects physical activity behaviour in relation to where people live. Exploring the three-way influence of personal, social and physical environment features using primarily quantitative methods may preclude generation of rich, descriptive data and the opportunity to provide valuable context. The PAW study used a mixed methods approach, to harness the strength of both paradigms and provide broad insight into the volume, patterns and factors underpinning physical activity behaviour in relation to where people live.

It is proposed by the author that to fully understand the complexities of factors influencing physical activity on an individual level, it is necessary to speak with people directly and ask about their own experiences. Qualitative and mixed methods enquiry in this subject field do not appear to have been widely adopted to date. This provided an opportunity to explore this complex topic from a more holistic perspective.

Mixed methods enquiry offered the opportunity to address the current gap in knowledge regarding the impact of personal and social environmental influence on physical activity and how these relate to existing knowledge regarding the influence of physical environment features. Results provide descriptive insight for individuals, communities and policy makers to better understand this complex topic and identify opportunities for focus future on efforts to support physical activity in the context of where people live. By engaging with individuals directly and actively exploring what is meaningful and possible for them, the PAW study sought to generate contextual understanding regarding what motivates, or prevents people from being physically active in their daily lives.

1.10 Scope and focus of this research

1.10.1 Study rationale

The PAW study was designed to build upon the knowledge surrounding the influence of physical environment features on physical activity behaviour. The focus of this research was to explore the influence of personal, social *and* physical environment features on physical activity in relation to where people live. A mixed methods study design was selected as the most appropriate approach to explore the topic, harnessing the benefit of both quantitative and qualitative data and interpreting results together.

Quantitative and qualitative datasets were amalgamated to provide contextual insight into physical activity behaviour and daily routine in relation to where people live. The study location was the metropolitan borough of Wirral, north west England; a sub-region of Merseyside, UK. Wirral provided a microcosm of socioeconomic and geographic diversity, broadly reflective of the UK population across various lifestyle and deprivation domains. The inherent diversity of the borough facilitated an exploratory study into associations between socioeconomic and geographic diversity from a personal, social and physical environment perspective, and how these factors influence physical activity behaviour. The following section outlines the principal research aims and objectives. Rationale and full detail is provided in chapter two.

1.10.2 Research aims

The PAW study aimed to achieve the following three research aims:

1. Gather objectively-measured physical activity data for Wirral residents over a seven day period
2. Explore the influence of personal, social and physical environment features on physical activity behaviour
3. Generate understanding of the physical activity experiences of Wirral residents in the context of where they live

1.10.3 Research objectives

The research aims were achieved through six discrete objectives:

1. Identify Wirral participants from postcode areas with a range of Indices of Multiple Deprivation (75) scores
2. Collect objectively-measured daily step data over a seven day period
3. Gather questionnaire data relating to demographics, general health, mental health, physical activity and perception of neighbourhood environment
4. Conduct semi-structured interviews to explore the topics of health and wellbeing, physical activity and experiences of neighbourhood environment
5. Triangulate quantitative and qualitative data to generate contextualised understanding of physical activity behaviour
6. Examine data from east and west Wirral to establish whether associations are evident between socioeconomic and geographic diversity and physical activity behaviour

1.10.4 Central research question

Study aims and objectives were formulated into the primary research question:

What are the effects of personal, social and physical environment features on physical activity behaviour in relation to socioeconomic and geographic diversity?

1.11 Summary: Chapter one

This chapter has introduced the core research topics underpinning this study, including background, overview of existing literature, gap in knowledge and study rationale. The following chapter details the study's methodology and methods, including author's epistemology, theoretical framework, study design, data collection tools and data analysis.

Methodology: Conducting the study

“Action is the foundational key to all success.”

Pablo Picasso

This chapter describes the processes involved in designing and conducting the PAW study. A copy of the study protocol is presented in appendix 7.

2.1 Theoretical framework

2.1.1 Interpretive lens

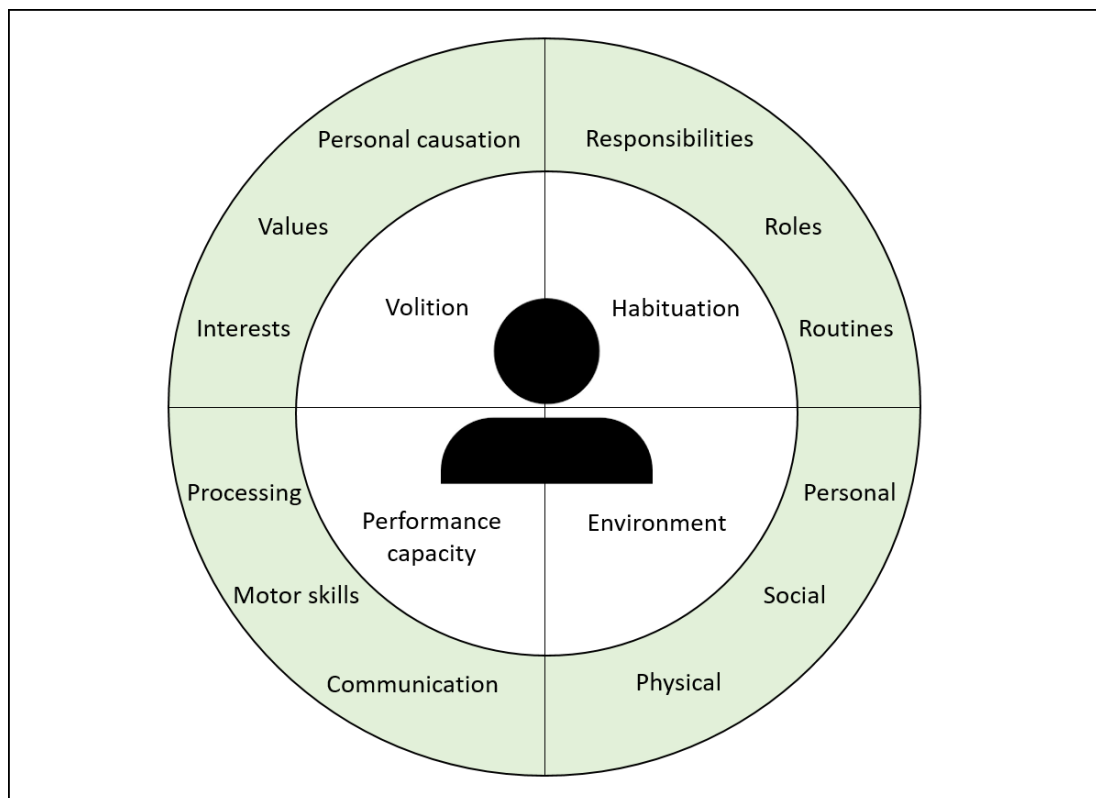
The Model of Human Occupation (MoHO) is an occupational therapy conceptual practice model conceived by Gary Kielhofner in 1980, which continues to evolve today through input from occupational therapists throughout the world. (76) The model provides a theoretical framework to guide practitioners in their work and was identified as an appropriate framework by which to develop the proposal for the PAW study. MoHO provided not only a philosophical structure around which study design was developed, but was also used as the theoretical lens through which to explore analysed data and present results. Researchers are encouraged to make use of theoretical frameworks, to guide decision-making regarding the weighting and importance of discrete phenomena, identify core issues and reflect upon how they may be best addressed. (77) MoHO provided the philosophical foundation for this study, to which each component was anchored.

MoHO was the first occupation-focused practice model used by occupational therapists and has developed the broadest evidence base, with researchers and practitioners working together globally to continually develop the model and associated assessment battery. (78) MoHO seeks to understand the nuances of occupational motivation and performance, by exploring individual patterns and function in view of temporal, sociocultural and physical environmental influence. (79) Kielhofner suggested that human occupation is influenced by three interconnecting personal entities – volition, habituation and performance capacity – each influenced by environmental factors combining to effect inclination, repetitive likelihood and

personal ability to engage. (76) Each of the three intrinsic elements interact with one another to influence what, when and how individuals consider, plan and take action in daily life. MoHO, with its broad, holistic perspective has been identified previously as an appropriate conceptual framework to support understanding of the complexities of engagement with physical activity. (80)

Figure 2.1 provides a visual representation of the central MoHO principles, adapted from the original model. The person themselves remains central, comprising the three intrinsic components of volition, habituation and performance capacity, accompanied by the fourth, inextricably linked component of environmental influence. The green outer circle represents sub-categories within each theme; unique aspects of the person themselves and elements of their life, united to provide a visualisation of how an individual may experience, and act upon, the world around them. The central components of volition, habituation, performance capacity and environment are explored in chapters four, five, six and seven.

Figure 2.1 The Model Of Human Occupation (adapted) (81)



2.1.2 Frame of reference

Having introduced the theoretical framework underpinning the PAW study, it is prudent to make explicit the author's philosophical perspective, as this has been recommended to aid understanding of research approach and study design. (82) This research was approached using the person-centred frame of reference, a term first introduced by Carl Rogers in 1939. (83) The person-centred approach emphasises the importance of self-actualisation, empathy and active listening, each of which comprise the core principles of a client-centred approach in occupational therapy. (84) Occupational therapy is founded on client-centred practice, involving the concepts of collaboration and partnership, autonomy and choice, enablement, diversity, accessibility and contextual congruence. (85) Employing an empathetic approach and actively engaging with and listening to individual experiences, enables practitioners to better understand unique perspectives and personal views. (86)

The author's epistemology, as an occupational therapist, inherently involves consideration of the client at the centre of every contact and intervention, therefore, development of the PAW study was influenced by this perspective. Occupational therapy seeks to promote health, enable occupations and support participation in society by focusing on an individual's needs, wants and abilities in relation to their environment. (87) The person-centred frame of reference channelled the desire to conduct a holistic exploration of factors affecting physical activity, including the intrinsic influence of participants' motivations and capabilities (actual and perceived), social environment and physical surroundings.

By taking a broad view of factors influencing physical activity as part of daily routine in relation to where people live, findings complement the growing body of evidence relating to physical environment features, by providing illustrative context for these data. The person-centred frame of reference accorded with the principal focus of the Model of Human Occupation, with the individual themselves remaining the central entity.

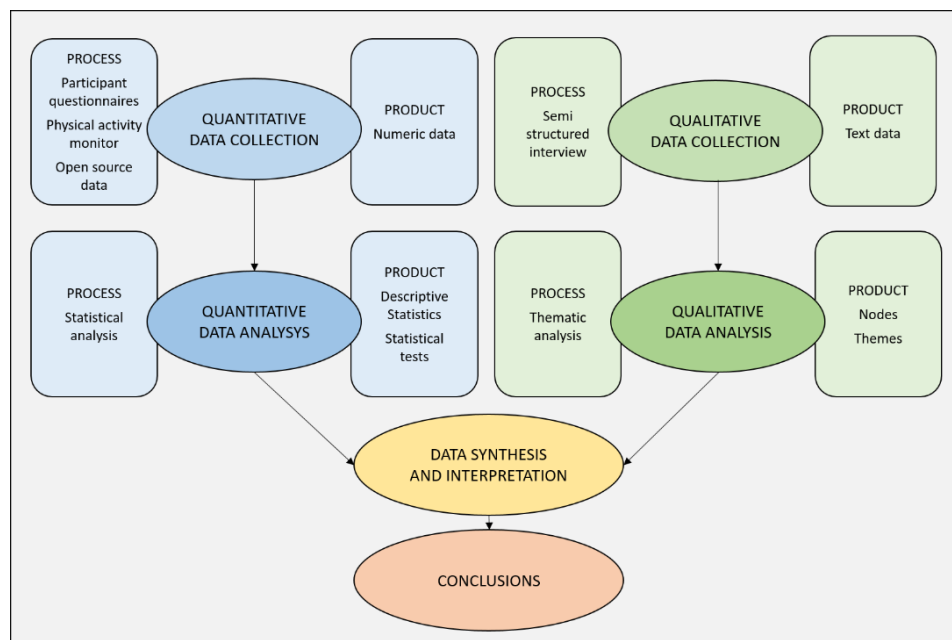
2.2 Study design

2.2.1 Convergent parallel mixed methods

A mixed methods study design was identified as most the appropriate approach to address the PAW study’s research question, aims and objectives. Mixed methods was selected given the complexities of exploring environmental influence on physical activity and the ability to harness the collective strength of both quantitative and qualitative data. Mixed methods research has the capacity to facilitate broader understanding of a research topic than one approach alone, with each method building upon the findings of the other, facilitating data triangulation and contextualisation of amalgamated results. (88)

Quantitative and qualitative data were collected during the same time period and analysed independently. Data triangulation and synthesis took place during the interpretation phase. Convergent parallel study design was identified as most appropriate for this study as neither quantitative nor qualitative data were perceived as having greater importance than the other, given the combined research aims. Both datasets were afforded equal priority weighting and managed in tandem with one another. Figure 2.2 presents a visualisation of the convergent parallel study design and components.

Figure 2.2 Convergent parallel mixed methods schema (adapted) (89)



2.2.2 Purpose statement; adapted from Creswell's template (90)

The PAW study addressed the influence of environmental factors on individual engagement with physical activity, in the context of where people live. Multiple datasets were collected on the same topic using concurrent mixed methods. Quantitative participant questionnaires were used to collect demographic data, examine perception of personal health and wellbeing, record physical activity and gather self-report data on perception of neighbourhood environment. Wrist-worn physical activity monitors were used to objectively measure daily step count. Quantitative datasets were used to examine associations between health and wellbeing, physical activity, environmental influence and socioeconomic deprivation. Open source deprivation data based on participant postcodes were used to facilitate analysis. Qualitative semi-structured interviews were conducted concurrently, during the same recruitment period, to explore participants' experiences of physical activity within their neighbourhood, including facilitators and barriers to engagement. Mixed methods data synthesis combined the strength of both paradigms to optimise understanding of environmental factors influencing physical activity behaviour.

2.3 Study sample

2.3.1 Research population

The participant sample for this study was drawn from a population reflecting the Sponsor's geographic focus of north west England. The metropolitan borough of Wirral was selected as an appropriate population for this research given its diversity of physical geography, socioeconomic status and health outcomes. Wirral is divided approximately in half by the M53 motorway, with east and west postcode regions differing significantly in socioeconomic characteristics and deprivation. East Wirral is home to greater housing density, urbanisation and industry. West Wirral is characterised by rural landscape, greenspace and naturally-occurring physical environment features. Health outcomes differ markedly between east and west regions. 2018 saw a difference in life expectancy of 10.1 years and 12.5 years for males and females respectively, in east and west Wirral. (91)

Since 2010, Wirral has not been classified among the 20% most deprived local authorities in England, yet 30% of Wirral residents live in sub-regions categorised as the 20% most deprived in England. (92) Wirral itself is still considered a deprived borough against England as a whole. This situation reflects the deprivation present in many regions of northern England in relation to more affluent southern counties. (31) Wirral was identified as an appropriate location for this study, given the inequalities in physical geography, socioeconomic status and health outcomes between east and west regions. The borough itself is a microcosm of diversity across these three domains, enabling sharp focus on deprivation inequity within a small geographic boundary. The PAW study explored experiential differences and the reality of living in east and west Wirral, in the context of being physically active within the borough, from the perspective of residents of east and west.

2.3.2 Sampling strategy

The Indices of Multiple Deprivation (IMD) measures relative deprivation in English regions against seven deprivation domains. The most recent Wirral IMD was published in 2015 and provides statistical data at the Lower Super Output Area (LSOA) level. There are 32,844 LSOAs in England and 206 in Wirral. LSOAs were created to facilitate statistical observations for UK regions of a consistent size. (92) LSOAs are scored against each deprivation domain to generate an overall IMD score, against which resources can be targeted toward areas of greatest need. LSOAs are an aggregation of Output Areas (OAs) which share similar social characteristics. Typically four to six OAs combine to form one LSOA, with an average population of 1,500. (93) Table 2.3a overleaf presents details of each deprivation domain and associated percentage weighting of the full IMD score.

The study sample was drawn from the population of Wirral, with a recruitment target of 40 individuals; 20 from east Wirral, 20 from west Wirral. A map of Wirral electoral ward boundaries overlaid with IMD scores was used to monitor recruitment and ensure even distribution of postcode areas and electoral wards (figure 2.3a on page 28). Anonymised participant details were recorded on the map, in the order of recruitment. This ensured an even representation of gender, age, postcode and

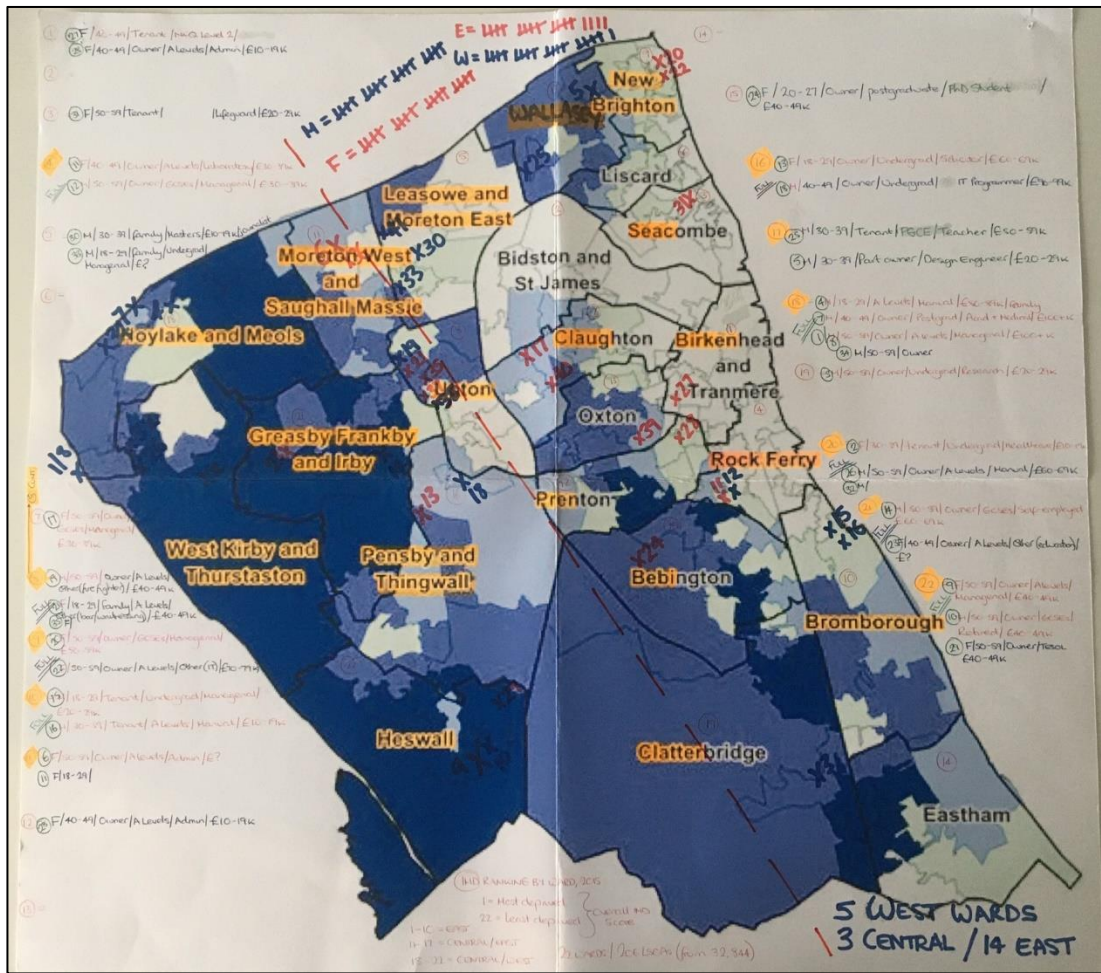
deprivation quintile. Section 2.3.4 on page 30 provides full detail of the recruitment process.

Participant recruitment was achieved through purposive, non-random stratified sampling based on IMD score to ensure that a broad range of postcode areas were represented. The volume of recruited participants from each electoral ward was recorded on a rolling basis, with a target of approximately two individuals per ward. Snowball sampling was employed with participants who had completed the study, who were asked to identify one prospective recruit from specified wards. This enabled close control over recruitment across Wirral to ensure broad representation of borough-wide IMD deprivation scores. The recruitment strategy is detailed on page 30.

Table 2.3a IMD deprivation domains and percentage weightings (75)

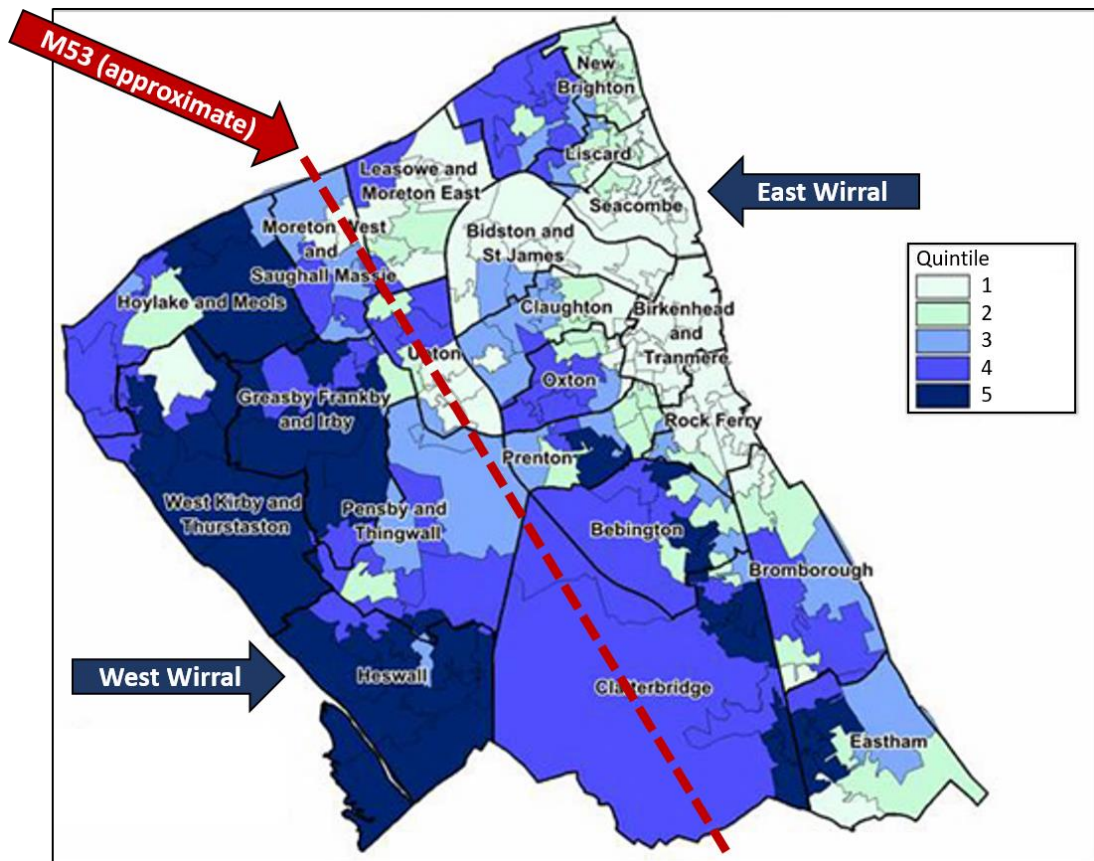
Deprivation domain	Domain description and % weighting
Income deprivation	Weighting 22.5% Proportion of population experiencing deprivation relating to low income
Employment deprivation	Weighting 22.5% Proportion of working age population in an area excluded from the labour market
Education, skills and training deprivation	Weighting 13.5% Lack of attainment and skills in the local population
Health deprivation and disability	Weighting 13.5% Risk of premature death and quality of life impairment through poor health
Crime	Weighting 9.3% Risk of personal and material victimisation at local level
Barriers to housing and services	Weighting 9.3% Physical and financial accessibility of housing and social services
Living environment deprivation	Weighting 9.3% Quality of indoor and outdoor living environment

Figure 2.3a Wirral map recording anonymised participant recruitment



There are 22 electoral wards in Wirral. Figure 2.3b overleaf presents a map of the borough, with ward boundaries overlaid by colour-coded IMD quintile data. The colour scheme mirrors that of the hard copy recruitment map in figure 2.3a above. Areas with the highest deprivation (quintile 1) are represented in pale blue. Areas with least deprivation (quintile 5) are represented in dark blue. The red hatched line indicates the line of the M53 motorway. The motorway does not physically reach the north western tip of the peninsula, but for the purposes of the PAW study, the line was hypothetically extended to fully dissect the borough.

Figure 2.3b Wirral ward boundaries and IMD quintiles (92)



2.3.3 Recruitment target

The study's recruitment target was identified based on the number of qualitative datasets manageable for one student researcher. Given the concurrent parallel mixed methods study design, it was the intention to gather both quantitative and qualitative data from each participant, to enable interpretative results triangulation. Whilst it has been argued that the aim of qualitative enquiry is not to generalise beyond the sample, researchers are encouraged to assess the appropriateness of units under study (in this case participants) using a power analysis. (94) A formal power analysis was not performed prior to identifying the PAW study's recruitment target, which could be perceived as a limitation. However, it was hoped that a purposive sampling strategy would offset sample size limitations inherent when aiming to gather full quantitative and qualitative datasets from every participant, as described overleaf. 40 participants represents a small quantitative sample, yet in the

absence of an intervention requiring efficacy testing, small sample research can address wider questions to advance a subject field more generally. (95)

Mixed methods sample size poses a challenge for robust analysis of both datasets, yet should be informed by research objectives, questions and study design. (96) Given the equal weighting of this study's quantitative and qualitative elements and the desire to interview every participant 40 full datasets was deemed manageable and adequate for statistical analysis of a descriptive nature. It was acknowledged that the mixed methods approach involved sacrificing quantitative data volume in return for gathering concurrent qualitative data to contextualise numeric findings. To safeguard against non-attainment of qualitative saturation during data analysis, study protocol stated that the recruitment target could be increased to a maximum of 50 participants, if required. This was not necessary as qualitative data saturation was achieved prior reaching the original recruitment target. The term 'data saturation' is used in the context of no new codes being identified during iterative data analysis. The qualitative data analysis process is described on page 41.

2.3.4 Recruitment strategy

Participant recruitment was commenced by placing press advertisements in Wirral's two free printed newspapers; Wirral News and Wirral Globe. An example of the advertisement is presented in appendix 4. Four participants contacted the study team in response to press advertising, three of which subsequently participated in the study. The third interested party did not reply to emails sent in response to the initial expression of interest. Word of mouth was also used to promote study awareness. Press advertisements were adapted to poster format for use in council libraries, council leisure facilities and one private leisure chain. The poster adaptation is presented in appendix 5. 30 participants were recruited via poster advertising and word of mouth.

Snowball sampling indicated an east-west Wirral divide, with participants reporting challenges in identifying prospective recruits from the opposite side of the borough. Participants reported these challenges to the student researcher via telephone and email following their own study completion. Further poster adaptation targeting

specific Wirral wards was undertaken to target individuals from under-represented wards. An example of the second poster adaptation targeting east Wirral wards is presented in appendix 6. Previous participants were contacted again to consider prospective participants from these areas. Prior to receiving expressions of interest via the second poster adaptation, snowball sampling successfully identified the remaining seven participants. Target recruitment was achieved in eight months.

2.3.5 Eligibility criteria

Interested parties were advised of the study's eligibility criteria and provided a participant information sheet if they wished to consider study involvement. An example of the participant information sheet is presented in appendix 8. Eligibility criteria comprised four key requirements, listed below. Criterion two refers to the Functional Mobility Scale (97), detailed in table 2.3b overleaf. Following provision of the participant information sheet, interested parties were followed up within one week to confirm eligibility and intention to participate.

Age range was limited to adults of working age. This was intended to minimise bias in physical activity behaviour from external influences or confounding factors, e.g. mandatory physical activity curriculum in school-age children or age-related co-morbidities/functional limitations. Whilst age as an independent factor may not preclude/influence activity engagement, it was deemed prudent to apply age-related boundaries for the PAW study, to limit the potential for unforeseen bias across this domain. Much of the literature described in chapter one adopted age-related inclusion criteria, so this decision was aligned with literature in the subject field.

PAW study eligibility criteria:

- Age 18-65 years
- Self-reported score of 2-6 on Functional Mobility Scale (97)
- Able to provide written consent for study participation
- Able to commit to completing all study tasks

Table 2.3b Functional Mobility Scale (97)

Rating	Functional mobility description
1	Uses wheelchair May stand for transfers, may do some stepping supported by another person or using a walking frame
2	Uses a walker or frame Without help from another person
3	Uses crutches Without help from another person
4	Uses sticks (one or two) Without help from another person
5	Independent on all level surfaces Does not use walking aids or need help from another person. Requires a rail for stairs (if uses furniture, select rating 4)
6	Independent on all surfaces Does not need any walking aids or need help from another person when walking over all surfaces and in a crowded environment

2.3.6 Informed consent

Following provision of a participant information sheet, interested parties wishing to participate were provided with a consent form which they were required to sign and return prior to study involvement. An example of the participant consent form is presented in appendix 9. Enrolled participants were allocated a chronological unique study identification number (study ID), which was stored confidentially in accordance with UK data protection protocol. (98) Participants were known thereafter by study ID only and all data ascribed to their confidential identifier. Electronic recruitment records were stored alongside full study documentation on a password-protected, secure network server at the University of Liverpool. Hard copy documentation was stored in a locked filing cabinet within a locked office on access-controlled University premises.

2.3.7 Participant journey

Following provision of informed consent, pre-enrolment administration was completed by telephone, email, by post and face to face, as was convenient for each recruit. Participants were asked to complete questionnaires in their own time, prior

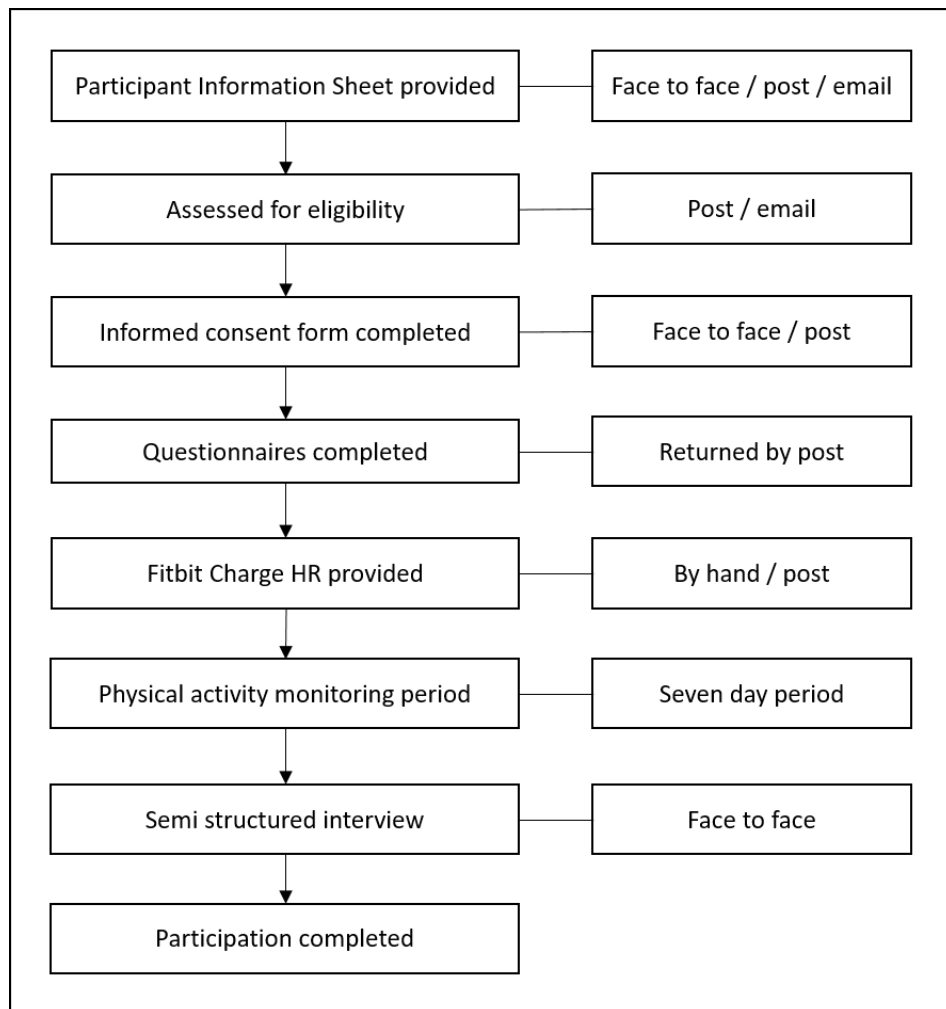
to provision of physical activity monitoring equipment. Participants provided height, weight and dominant hand details to facilitate configuration of their physical activity monitor. One typical week was identified with each participant to avoid unusual routine, annual leave and periods away from Wirral, to maximise normal physical activity data capture. Electronic synchronisation of the physical activity monitor with web-based software was not required during the data capture period due to seven day data storage capacity. Charging via USB cable was undertaken by participants every second day.

Participants completed one face to face study visit during the enrolment period. Visits took place at community-based public facilities in east and west Wirral. Two community venues were sought; one community centre in south west Wirral, the other a private nursing home in north east Wirral. Both venues provided meeting rooms with table and chairs in a relaxed, professional environment. The rationale for selecting public venues was in observance of lone working practices to maximise participant and researcher safety. The location of both venues meant that participants would not need to travel to the other end of the borough for their study visit. Participants were invited to reclaim travel expenses to and from the appointment venue. No financial or material incentive was provided for study involvement. Details of the full participant journey during study involvement are presented in figure 2.3c overleaf.

2.3.8 Ethical considerations

Permission for this study was granted by University of Liverpool Health and Life Sciences Committee on Research Ethics (Human participants, tissues and databases). A copy of the original approval letter is presented in appendix 10. Three subsequent minor amendments were submitted and approved via online software. These involved an adaptation to the recruitment strategy to facilitate the use of advertising posters, inclusion of a demographic questionnaire item to capture participants' work postcode to contextualise GPS track data and cessation of GPS tracker usage as detailed on page 39. Amendments did not alter the core structure of the approved study.

Figure 2.3c PAW study participant journey



2.4 Quantitative data collection

2.4.1 Demographic questionnaire

This bespoke questionnaire was developed for the PAW study based on questions from the 2011 census. (99) Questions were paraphrased using census content. All questions apart from those relating to age and annual household income were influenced by census questions. It was proposed that data relating to participant age and household income would provide the opportunity for additional statistical analysis. The questionnaire was used to collect basic demographic data for statistical analysis of a descriptive nature. A copy of this questionnaire is presented in appendix 11. This questionnaire was not piloted prior to use. This decision was taken based on the validity of question structure used within national census documentation, with

methods developed in consultation with census users, demographers, statisticians and academics to ensure robustness and fitness for purpose. (100)

2.4.2 EQ-5D-3L Health Questionnaire (101)

This questionnaire was selected for use in the PAW study based on its ability to provide descriptive scores regarding participants' perception of their own personal health. The official acronym stands for EuroQol 5-dimension 3-level questionnaire. The tool addresses five discrete health domains; mobility; self-care; usual activities; pain or discomfort; anxiety or depression. EQ-5D-3L also involves a visual analogue scale recording respondents' self-rated health on the day of questionnaire completion. The tool has been proven valid, reliable and responsive in population research, clinical trials and in real-world settings and has been translated into multiple languages. (102)

The internationally recognised, validated tool was used in this research as a generic health measure to generate a personal health profile for each participant and facilitate health evaluation at individual and sample level. (103) The PAW study utilised the 3-level answer format, which was favoured over the alternative 5-level answer format. The student researcher was mindful of the potential participant burden associated with completing five questionnaires. The 3-level answer format was deemed adequate to facilitate generation of descriptive statistics on an individual and group level and straightforward for participants to complete. EQ-5D-3L was used to provide a broad overview of perceived health on the day of questionnaire completion. A copy of this questionnaire is presented in appendix 12.

2.4.3 WHO (Five) Well-Being Index (104)

This questionnaire was developed as a short self-report measure of perceived mental wellbeing, with proven validity in screening for depression and as an outcome measure in clinical trials to facilitate wellbeing comparison between groups. (105) The tool was selected for this study as it provides the opportunity to measure subjective wellbeing by addressing five cognitive and affective life domains over the previous seven day period. (106) The tool was selected to complement EQ-5D-3L with its focus on different domains of perceived wellbeing. Results from both

questionnaires from each participant provided a comprehensive self-report regarding perceived physical and mental health. A copy of this questionnaire is presented in appendix 13.

2.4.4 International Physical Activity Questionnaire (IPAQ) (Long) (107)

IPAQ (Long) is an internationally recognised, validated questionnaire measuring self-reported physical activity across a range of lifestyle domains. (108) Questions are grouped into four domains of physical activity; employment, leisure, transport and household tasks. Responses from each domain are collated during questionnaire scoring and self-reported activity is categorised into low, moderate or high level activity across each domain. IPAQ (Long) was selected for this study to record perceived physical activity over a seven day period prior to questionnaire completion. The long form was selected in preference to the short form as the long form provides more detailed information and is suggested to be more appropriate for use in research and for evaluation purposes. (109) IPAQ (Long) has proven reliability and validity internationally and is cited as an appropriate measure for recording self-reported physical data in diverse settings. (110) A copy of this questionnaire is presented in appendix 14.

Four of the studies described in the literature review used IPAQ (Long) with success in adult subjects aged 20-69. (46,49,52,64) Robertson *et al.* also selected this tool for their investigation of the effectiveness of a walking intervention in adults aged 18-65 in Glasgow, Scotland. (111) Findings from Ryan *et al.* found discrepancies between objectively measured physical activity and IPAQ activity classification, however, these findings cannot be accurately generalised to the PAW study as subjects were aged 60-89 years. (112) Authors of a physical activity study in Northern Ireland of older adults aged 60+ suggested that discrepancies between IPAQ data and accelerometer data were due to inaccurate recall, recommending the provision of additional examples of activity classification to support older participants in their comprehension of time spent in each of the activity domains. (108) Given the reported validity for measuring physical activity via self-report of IPAQ (Long) in working age adults, it was deemed an appropriate choice for the PAW study.

2.4.5 *Physical Activity Neighbourhood Environment Scale (PANES) (113)*

This internationally recognised measure was developed to assess perception of the supportiveness of neighbourhood environment features for physical activity; referred to in the form's documentation as activity-friendliness. (114) The questionnaire was, until recently, called *International Physical Activity Prevalence Study Self-Administered Environmental Module*. A copy of PANES under its original name, as per the current downloadable tool, is presented in appendix 15. PANES questions are categorised into 11 discrete domains; residential density, land use mix, transit access, pedestrian infrastructure, bicycling infrastructure, recreation facilities, street connectivity, crime safety, traffic safety, pedestrian safety and aesthetics. Researchers are invited to use the collective domain (overall) score, or look at individual constructs, as is appropriate for their research. PANES has been proven to provide meaningful data on perceived neighbourhood activity-friendliness via short-form format appropriate for research and public health surveillance. (115)

2.4.6 *Fitbit Charge HR wrist-worn physical activity monitor*

Fitbit Charge HR was selected as the most appropriate wrist-worn physical activity monitor for this study. This unit was selected based on price, design simplicity, user-friendliness and brand awareness. The PAW study aimed to understand the intricacies of intrinsic and external influences on physical activity behaviour, rather than simply measure physical activity. The Fitbit brand was identified as a name familiar to the public, which may encourage study participation and was selected in preference to research grade units, which have been described as more cumbersome and carrying a higher price point than those designed for the consumer market. (116,117) Project budget was a consideration in selection of study equipment, to ensure that expenditure remained within appropriate limits. Fitbit brand familiarity was perceived beneficial as a recruitment incentive and the unit provided adequate data capture capabilities for cross-referencing objective physical activity data against self-reported physical activity.

Fitbit units have performed well against research grade units and Fitbit Charge HR demonstrated comparative measurement accuracy against research grade reference

devices. (117–119) Rosenberger *et al.* compared nine research grade and consumer devices, reported that Fitbit compared favourably, yet as none of the devices were precisely, consistently accurate over a 24-hour period, researchers were recommended to select devices based on their primary outcomes of interest. (118) In a comparison of eight purely consumer grade units, Fitbit technology was rated second, providing promising results against research grade devices. (119) Farina and Lowry measured the validity of Fitbit Charge HR against research grade technology in monitoring physical activity in healthy adults over a 7-day period, reporting near perfect agreement between the two devices. (117)

For this study, accumulated step count was the primary variable required for descriptive statistical analysis. Fitbit Charge HR provided participants the additional opportunity to engage with an interactive screen displaying real-time physical activity data. This was deemed beneficial with regard to understanding the effect of interactive self-monitoring technology on physical activity. The PAW study sought to explore the influence of both internal and external factors on activity behaviour, therefore the opportunity to explore the effect of visual feedback was important in the context of understanding the influence of self-monitoring and self-actualisation. Seven identical Fitbit Charge HR units were purchased for this research; each the same model and year. Individual units were not tested for inter-unit reliability prior to use, which was an oversight and acknowledged as a study limitation. A number of participants in the PAW study continued to wear their personal wrist-worn activity monitors during the study period. They each reported congruence between the Fitbit Charge HR and their personal activity monitors in terms of recording daily step count.

Physical activity data was collected for a 7-day period, in line with the 7-day IPAQ monitoring period. It was hoped that one full week of objectively measured activity data, collected during a week in which participants were asked to go about their usual routine, would provide insight into typical weekly physical activity patterns. Fitbit data was downloaded by the student researcher at the study end, using free online Fitbit software in Microsoft Excel format. Units were subsequently cleaned and set up for the next participant.

2.4.7 i-gotU GT-120 Travel Logger

A second activity monitoring unit was used by 15 participants recruited prior to interim data analysis, which recorded geographic location data. The i-gotU GT-120 Travel Logger was selected for use in the PAW study to provide geographic positioning system (GPS) data to facilitate analysis of physical activity location. Selection of a standalone GPS unit over a physical activity unit with combined GPS capability was based on the superior battery life of the standalone unit of up to 24 hours, dependent on setting. GPS data was initially considered beneficial to contextualise physical activity in relation to where people live and has proved advantageous in geographic evaluation of physical activity in conjunction with other measurement tools. (120)

The GPS unit was disregarded following interim data analysis due to limited contextual benefit from daily track data and lack of participant concordance with re-charging and carrying the device. Track data comprised primarily daily commute, with little evidence of additional travel within the borough. It was hoped that track data may provide insight into the movement of participants around the borough, but continuous location data appeared to be lacking, therefore rendering the GPS logger somewhat obsolete. Missing data due to poor participant concordance reinforced the decision to disregard geographic tracking and focus on the remaining data capture methods. The student research was mindful that unnecessary burden on participants may deter concordance with other study elements. No further participants were therefore asked to carry the GPS unit.

2.4.8 Open source deprivation data

Data from the PAW study were analysed against open source socioeconomic data to establish generalisability of results. Data from the 2015 English Indices of Deprivation (IMD) (75) and 2015 Wirral IMD (92) were reviewed in conjunction with results from this study to evaluate similarities, disparities and transferability of findings. 2015 IMD documents were the most recent version of the indices available at the time of study design and development. Deprivation data within this thesis have been drawn from these documents.

2.5 Qualitative data collection

2.5.1 Semi-structured interview

Each participant was invited to take part in one semi-structured interview following the activity monitoring period; 33 individuals from the sample of 40 obliged. 33 participants represented 83% of participants and this was deemed provisionally adequate for qualitative analysis based on Pareto's 80/20 rule, whereby a subsection of at least 80% of a sample can prove acceptable for examination to represent the sample as a whole. (121,122) In the event that saturation was not reached during qualitative data analysis, further interviews would have been sought, either with previous participants with whom an interview had not yet been conducted or by recruiting additional participants up to the approved recruitment limit of 50 full datasets.

An interview guide was written as an *aide mémoire* to guide discussion around four core topics, listed below. A copy of the interview guide is presented in appendix 16.

Four core interview discussion topics:

- Concept of physical activity and personal physical activity patterns
- Physical activity within Wirral
- Perceived facilitators and barriers to physical activity
- Experience of engaging with Fitbit technology

Introductory and valedictory scripts were included to clarify the purpose and structure of the interview and to conclude discussion. Participants were encouraged to elaborate on each answer to elicit rich description and encourage free-flowing conversation. Interviews were audio recorded via Olympus DM-650 voice recorder for subsequent transcription. Audio recording during interview is recommended for precise data capture and to remove the distraction of note-taking which can inhibit generation of rapport between interviewer and participant, risking loss of much rich description and detail due to inherent inefficiency and subjectivity. (123) Interviews were conducted in accordance with best practice protocol with consideration given

to rapport-building, probing questions and conversational flow within topic boundaries, concluded by structured interview close-out. (124)

2.6 Quantitative data analysis

Raw numeric data from each quantitative measure were inputted into Microsoft Excel in their original state to generate one comprehensive data spreadsheet. The raw data file was formatted, cleaned and imported to IBM SPSS Statistics 22.0 (SPSS) for statistical analysis. Descriptive statistics were generated to illustrate the PAW sample, supported by basic inferential statistics comparing east and west Wirral data. SPSS syntax was written and/or adapted from available existing syntax, to facilitate statistical analysis, enable straightforward completion of repeat analyses and generate an analysis audit trail. Syntax for analyses documented in this thesis is presented in appendix 17. Whilst a formal data analysis plan was not drafted prior to statistical analysis, a full list of data variables and variable type was documented and reviewed against the core research question. This enabled clarity to be achieved regarding pertinent focus points and identification of appropriate statistical tests.

Data was normally distributed across the full dataset and within east Wirral/west Wirral subsets. Independent samples t-tests were conducted to compare the means of east/west subsets, to ascertain the degree of difference between groups. Pearson's correlation coefficients were generated to measure the strength of the relationship between continuous variables. Frequencies and cross-tabulations were run to produce summary data for individual categorical variables and to describe the relationship between two categorical variables, respectively. Analyses were conducted on full sample and east/west sub-group data; the results of which are presented in chapter three.

2.7 Qualitative data analysis

Interview audio files were transcribed verbatim into Microsoft Word format and subsequently imported to QSR NVivo 10 for analysis. Consideration was given to the prospective analytic methods appropriate for this study. Grounded theory was discounted due to its focus upon theory-generation and explanation of social phenomena through conceptual abstraction. (125) This study sought not to generate

theory, but instead observe and understand the experiences of Wirral residents and permit themes to be identified from the data itself, rather than apply preconception to the analytic process. Discourse analysis was disregarded based on its concern with language patterns and how themes construct different accounts of reality. (126) Abstract themes of this nature could have proved challenging for meaningful synthesis with quantitative data. Interpretative Phenomenological Analysis exploring the lived experience of participants was discounted due to its focus on experiential sense of understanding and interpretation of personal realities. (126) This approach was considered too abstract to comprehensively address this study's research aims.

Braun and Clarke's Thematic Analysis (TA) (127) was selected as the most appropriate method for the PAW study. The process involves identifying, analysing and interpreting patterns and themes within qualitative data. (128) TA provided a structured framework by which to analyse and explore interview transcripts on an individual and collective level, to identify explicit themes from participant dialogue. TA is appropriate for use across theoretical and epistemological boundaries and provides analytical freedom to explore complex data using a flexible, systematic tool. (127) Detailed guidance was available for conducting thematic analysis in practice, which was imperative for ensuring appropriate use of the method to support credibility and confidence in findings. (129) TA was completed in accordance with Braun and Clarke's guidelines using their six stage recursive process. (130,131) Table 2.7 on page 44 presents details of the six phases. The final structure of qualitative data coding is presented in appendix 18.

Use of codebooks in certain approaches to TA have been reported as beneficial in demonstrating rigour, through the use of a quantitative-style tool with qualitative data. (129) Codebooks involve analysing data using both an inductive and deductive approach, involving development of a priori coding frameworks based on an initial search of relevant literature. (129) Braun and Clarke's TA involves a less rigid coding framework, yet utilises a similar concept of a thematic map, by which to interpret data. (127) In this research, it was intended for codes and themes to arise from the data itself, rather than via an imposed coding framework. The decision was taken to

avoid use of a codebook and instead approach data analysis from an entirely inductive perspective, in line with Braun and Clarke's specific approach to TA.

Similarly, whilst the Model of Human Occupation (MoHO) (76) was applied as the interpretive lens through which to interpret analysed data and present results, the model was not used as a framework by which to approach qualitative data analysis. The original PAW study protocol (appendix 7) was written during the first three months of the PhD studentship, concurrent with literature search strategy development. At that stage, whilst the author was mindful of their own epistemology as an occupational therapist, MoHO had not been formally identified as the theoretical framework by which to progress this research. As such, the model is not mentioned in the study protocol. Qualitative data were analysed using an inductive approach, as per the study protocol, with no preconceived coding framework. MoHO supported the author to subsequently interpret analysed data, using the model's constructs of volition, habituation, performance capacity and environment.

Due to the complexities and interconnected nature of exploring factors influencing physical activity behaviour in line with personal, social and physical environment features, the author chose to manually organise pre-coded data presented in appendix 18, to facilitate full sight of identified codes. By manually organising coded data, it was possible to more accurately visualise the overlapping nature of data concepts and take decisions regarding how best to present results. Whilst certain conceptual content presented in chapters four, five and six are acknowledged as overlapping, data are presented in the context in which participants used the concept during interview, rather than as self-contained concepts in their own right. The overlapping nature of concepts was expected, given the complexities of human behaviour. Appendix 19 presents an example of the manual coding process, which was achieved following multiple structuring revisions.

Table 2.7 The six phases of Thematic Analysis (127)

Phase	Task
1	Familiarisation with data Intimate acquaintance with data via interview facilitation, audio files, transcription and re-reading transcribed files
2	Coding Generation of individual labels for explicit and semantic text features against research questions. Ongoing data grouping of similar labels. Every item of text coded. Codes titled, retitled, grouped and regrouped until saturation is achieved
3	Identification of themes Identification of coherent, meaningful data patterns around research questions. Provisional themes constructed by searching for similarity across text, codes and groups. Collation of coded data relating to each theme
4	Review themes Provisional themes checked for coherence against codes and full dataset. Evaluation of theme strength to share accurate story of the dataset. Definition of individual themes, inter-theme relationships, appropriateness of theme framework and adjustment of coded groups within provisional themes. Iterative, ongoing process until finalised themes identified
5	Define and name themes Evaluation of story behind individual themes and positioning of themes within full story of dataset. Identification of essence of individual themes and themes named accordingly
6	Write up Review of qualitative themes against quantitative results. Synthesis of findings from each dataset using analytic narrative and descriptive statistics to construct a contextualised, compelling story. Analysis and critical appraisal of mixed methods findings in relation to research question and existing literature

The student research conducted each of the 33 participant interviews. Following re-familiarisation with the fully transcribed dataset, each individual transcript was open coded without preconception. Qualitative researchers utilising an interpretive approach are encouraged to acknowledge that individual realities are shaped by unique experiences and social concepts and should therefore approach interpretation without preconception of the phenomena under study. (132) The

process was iterative, with previous transcripts re-coded in line with new codes identified from transcripts coded at a later date. This involved revisiting previously coded transcripts when new codes were identified whilst coding subsequent transcripts, to ensure that every transcript was analysed against the unified coding structure.

The coding process was overseen by a mixed methods specialist, familiar with NVivo and the thematic analysis process. Individual codes and identified themes were reviewed and discussed at regular intervals and the coding framework was adjusted, as required, in response to feedback generated by discussion. Finalised themes were checked for coherence, to ensure that they were an accurate reflection of the full dataset. One limitation of the data analysis process was the involvement of a third party to transcribe audio interview files, which precluded a valuable opportunity for familiarisation with the data. However, as the student researcher conducted each interview and the full analytical process, it was hoped that this would offset any limitations introduced by not transcribing the audio files.

2.8 Summary: Chapter two

This chapter has illustrated the theoretical framework and methods used to conduct this research. The following four chapters present results of the PAW study. Chapter three provides an introduction to the sample, presenting quantitative data to illustrate core characteristics and generalisability between the population of Wirral and the UK. Chapters four, five and six present qualitative results, in line with themes identified during qualitative analysis. Results are structured using the interpretive concepts of the Model of Human Occupation and the influence of the personal, social and physical environment on physical activity behaviour.

Introducing the sample: Demographics, characteristics and generalisability

“You never get a second chance to make a first impression.”

Will Rogers

3.1 Sample demographics

Sample demographics were reviewed against Wirral and UK deprivation data to establish the degree to which findings from the PAW study could be considered generalisable to the population of Wirral and the UK. Table 3.1a presents demographic data for the full sample collected via demographic questionnaire. These data are compared with Wirral and UK population data on page 50. Although the demographic questionnaire provided multiple response options for each question, only populated responses are shown in the tables within this chapter. Standard deviation is abbreviated to ‘SD’.

Table 3.1a Demographics of the PAW sample (continued on pages 47 and 48)

	East Wirral	West Wirral	E/W difference	Full sample
Sample statistics				
Participants	19	21	2	40
Age range (years)	25-59	20-63	n/a	20-63
Mean age (years)	41	47	6	45
Mean age <i>SD</i>	11.45	13.72	2.27	12.93
Gender				
Male	9	11	2	20
Female	10	10	0	20
Age bracket				
18-29 years	6	4	2	10
30-39 years	3	2	1	5
40-49 years	4	3	1	7
50-59 years	6	11	5	17
60-65 years	0	1	1	1
Ethnicity				
White British	18	21	3	39
Prefer not to say	1	0	1	1
Religion				
No religion	5	3	2	8
Christian	13	18	5	31
Prefer not to say	1	0	1	1

Chapter 3: Introducing the sample

	East Wirral	West Wirral	E/W difference	Full sample
Accommodation type				
Terraced house	2	3	1	5
Semi-detached house	10	14	4	24
Detached house	4	2	2	6
Bungalow	3	1	2	4
Flat	0	1	1	1
Accommodation status				
Owner	11	16	5	27
Tenant	5	3	2	8
Family member	3	2	1	5
Car ownership				
Yes	16	20	4	36
No	3	1	2	4
Main transport				
On foot	2	1	1	3
Bicycle	1	0	1	1
Car	15	19	4	34
Bus	1	1	0	2
Highest academic qualification				
No secondary qualifications	1	0	1	1
GCEs	5	6	1	11
A Levels	4	11	7	15
Undergraduate degree	5	3	2	8
Postgraduate qualification	4	1	3	5
Employment status				
Unemployed	0	1	1	1
Temporary/fixed term (part time)	0	2	2	2
Temporary/fixed term (full time)	0	3	3	3
Permanent (part time)	3	2	1	5
Permanent (full time)	13	9	4	22
Other	3	3	0	6
Retired	0	1	1	1
Employment type				
Manual	1	3	2	4
Administrative	3	4	1	7
Managerial	6	3	3	9
Other	9	10	1	19
Retired	0	1	1	1

	East Wirral	West Wirral	E/W difference	Full sample
Annual household salary				
£0 - £9,999	1	0	1	1
£10,000 - £19,999	3	2	1	5
£20,000 - £29,999	4	0	4	4
£30,000 - £39,999	4	1	3	5
£40,000 - £49,999	2	5	3	7
£50,000 - £59,999	2	0	2	2
£60,000 - £69,999	0	4	4	4
£70,000 - £79,999	2	0	2	2
£80,000 - £89,999	0	2	2	2
£90,000 - £99,999	0	1	1	1
£100,000+	0	2	2	2
Prefer not to say	1	4	3	5

Limited category choice on the 'employment type' question led to 19 out of 40 participants selecting the category 'other', supported by free text. Table 3.1b below presents additional free text employment type data for east and west Wirral. Participants who selected the standard category options presented in table 3.1a (page 46) did not submit additional employment type details. One participant from west Wirral added 'retired' in the free text box for the 'employment' question. No other participants reported their status as retired.

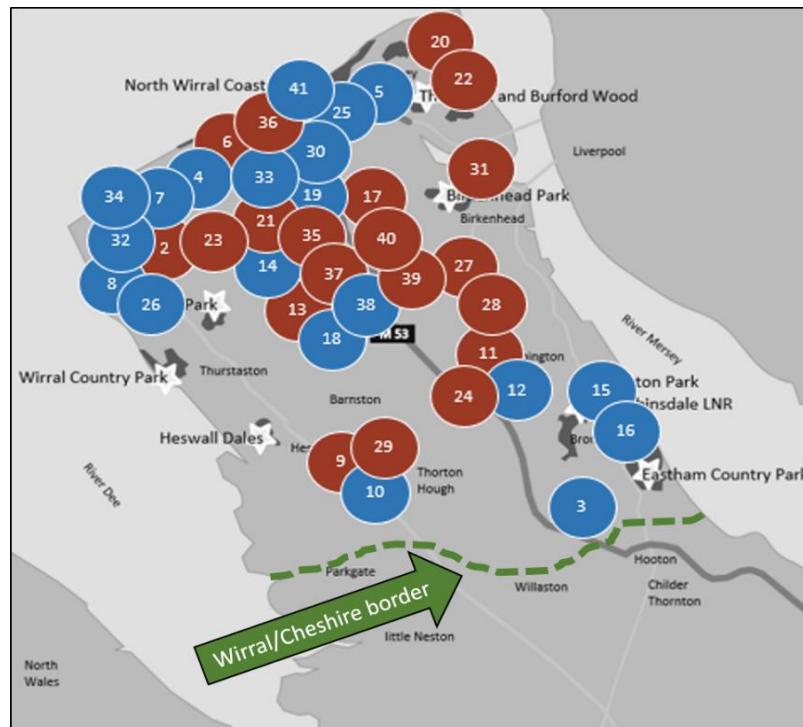
Table 3.1b Demographic questionnaire free text data (employment type)

East Wirral	West Wirral
Research Scientist	Community care supervisor
Design engineer	Academic medical
Laboratory work	Solicitor
IT consultant	IT Programmer
Full time student (funded PhD)	Fire Fighter
Teacher (special educational needs (SEN))	Waitress/bar work
Care work	Nursery assistant
Journalist	Teaching assistant (SEN)
Lifeguard	Heating engineer
Driving (taxi)	Training company director
	Full time student (undergraduate)
	Housewife

3.2 Participant home locations

Figure 3.2 illustrates the home location of each participant, indicated by their unique identifier (Study ID (PAWID)). N.B. PAW01 was pilot data only. Male participants are represented by blue circles, females by red circles. The sample's residential dispersion mirrors that of residential density within the borough, e.g. south and west Wirral is primarily green space and therefore lower in housing density.

Figure 3.2 Participant home location by study ID



3.3 Sample generalisability

Descriptive and inferential statistics are presented in this chapter. It may be helpful, however, to firstly demonstrate whether or not the study sample was representative of the population of Wirral and the UK. This should provide the contextual foundation upon which full quantitative results may be presented.

Table 3.3 overleaf presents comparative data from the PAW study sample against the population of Wirral and the UK. Wirral and UK data were not available for every variable presented in the study sample demographics table, but cross-referenced data is provided on all comparable variables. Wirral and UK data were drawn from

open source local insight documentation. (133) Study data have been transposed to percentage format, as per open source data format. Percentages have been rounded to the nearest whole number. Although Wirral does not represent the ethnic, nor religious diversity of the UK, the borough is comparable across other variables. The study sample reported higher academic qualifications than the Wirral average and higher instance of car ownership. Ethnic and religious diversity was slightly lower in the study sample than the wider Wirral population. The sample reported lower unemployment than the Wirral average, but matched that of the UK population. Overall, the study sample was largely representative of the Wirral population.

Table 3.3 Comparison of sample and population demographics

	Sample	Wirral	UK
Ethnicity			
White British	98%	95%	80%
Religion			
Christianity	78%	70%	59%
Accommodation type			
Terraced house	13%	25%	25%
Semi-detached house	60%	41%	31%
Detached house (incl. bungalow)	25%	17%	22%
Flat	3%	18%	22%
Accommodation status			
Owner	68%	68%	64%
Car ownership			
Yes	90%	72%	74%
No	10%	28%	26%
Highest academic qualification			
No secondary qualifications	3%	23%	23%
GCSEs	28%	31%	29%
A Levels	38%	13%	12%
Undergraduate degree and above	33%	25%	27%
Employment status			
Unemployed	3%	4%	3%
Employed	98%	96%	98%
Employment type			
Manual	10%	21%	23%
Administrative	18%	13%	12%
Managerial	30%	9%	11%
Professional / Other	48%	30%	30%

3.4 Participant concordance and data snapshot

Participants were concordant with study requirements. All 40 participants provided seven days of objectively measured physical activity data. Fitbit software produced downloadable data for the seven day period as a total daily count; hour-by-hour breakdown was not provided. Two instances of participants recording less than 50 daily steps on day seven of the monitoring period were included for analysis. Three instances of missing IPAQ questionnaire data were due to individual participants failing to answer one single question, or sub-question. Missing IPAQ responses resulted in missing physical activity categorical scores for these participants. Open source deprivation data were not available for one participant postcode, resulting in one instance of missing deprivation data.

Table 3.4 overleaf introduces each participant individually, together with basic demographic data and an overview of self-reported and objectively measured physical activity. IPAQ category scores were generated as per scoring guidance and participants were categorised as either low, moderate or high level physical activity based on questionnaire responses. Fitbit steps categories were generated based on objectively measured accumulated daily step count and categorised as low, moderate or high using the same category boundaries as IPAQ scoring principles. Activity categorisation (low, moderate or high) is explained further on page 53.

These two scores were cross-referenced to provide a bespoke, study-specific score of perceived versus actual physical activity. This third score was categorised into three domains; accurate (good match between perceived versus actual physical activity, underestimation (actual physical activity was underestimated by participants via self-report) and overestimation (perceived physical activity was overestimated against objectively measured activity). Throughout this chapter data from east Wirral residents will be presented in blue. Data from west Wirral residents will be presented in red.

Table 3.4 Participant characteristics and physical activity categorisation

Wirral region	ID	Gender	Age	IPAQ category	Fitbit category	Perception accuracy	Average daily steps	IMD quintile
East	3	Male	53	High	High	Accurate	24,269	5
East	5	Male	28	Moderate	Low	Overestimate	6,382	3
East	11	Female	46	High	High	Accurate	12,675	2
East	12	Male	56	High	High	Accurate	15,945	2
East	15	Male	28	High	Low	Overestimate	7,060	1
East	16	Male	32	Moderate	Moderate	Accurate	9,863	1
East	17	Female	53	High	Moderate	Overestimate	8,044	3
East	20	Female	53	High	Low	Overestimate	6,897	2
East	22	Female	59	Moderate	High	Underestimate	18,997	2
East	24	Female	28	High	High	Accurate	16,605	2
East	25	Male	39	High	High	Accurate	13,672	4
East	27	Female	43	High	High	Accurate	11,191	1
East	28	Female	45	Moderate	Moderate	Accurate	7,516	2
East	30	Male	38	High	Moderate	Overestimate	8,111	2
East	31	Female	51	High	Low	Overestimate	6,145	1
East	33	Male	28	High	High	Accurate	14,206	4
East	39	Female	29	High	Moderate	Overestimate	9,188	3
East	40	Female	25	High	High	Accurate	10,113	3
East	41	Male	49	Moderate	High	Underestimate	15,524	4
West	2	Female	41	Moderate	Low	Overestimate	7,187	2
West	4	Male	23	High	High	Accurate	13,539	5
West	6	Female	55	High	Moderate	Overestimate	8,604	4
West	7	Male	44	Missing	High	Missing	15,914	3
West	8	Male	60	Moderate	High	Underestimate	10,845	4
West	9	Female	58	Low	Low	Accurate	6,382	3
West	10	Male	61	Moderate	High	Underestimate	13,359	3
West	13	Female	31	Missing	Moderate	Missing	8,587	3
West	14	Male	56	Moderate	High	Underestimate	21,542	5
West	18	Male	46	Low	Low	Accurate	6,396	3
West	19	Male	54	High	High	Accurate	13,548	4
West	21	Female	20	Moderate	Moderate	Accurate	9,880	4
West	23	Female	51	High	Low	Overestimate	7,294	5
West	26	Male	63	High	Moderate	Overestimate	9,519	2
West	29	Female	58	High	High	Accurate	11,012	5
West	32	Male	37	High	High	Accurate	14,350	Missing
West	34	Male	56	High	High	Accurate	14,330	3
West	35	Female	52	High	High	Accurate	12,959	4
West	36	Female	20	Missing	High	Missing	10,142	3
West	37	Female	53	High	High	Accurate	11,997	4
West	38	Male	58	High	Low	Overestimate	7,244	4

3.5 East and west Wirral sub-group comparison

To ascertain whether differences between data from east and west Wirral sub-groups were statistically significant, three initial independent-samples t-tests were conducted. The three t-tests were conducted on age, average daily step count and deprivation score to provide an understanding of similarity between east and west sub-groups. These results provided a baseline understanding of the differences between east and west Wirral sub-groups, from which further analyses could take place. The following pages present quantitative results for east and west Wirral across a range of domains. These data are triangulated with qualitative results in chapter seven, interpreted using the Model of Human Occupation as a framework for discussion.

There was no significant difference in participant age between sub-groups of east Wirral ($M = 41.21, SD = 11.45$) and west Wirral ($M = 47.48, SD = 13.72; t(38) = -1.56, p = 0.13$, two tailed). There was no significant difference in average daily step count between participant sub-groups of east Wirral ($M = 11705.41, SD = 4938.53$) and west Wirral ($M = 11172.78, SD = 3748.24; t(38) = 0.39, p = 0.70$, two tailed). There was, however, significant difference in postcode deprivation scores between participant sub-groups in east Wirral ($M = 28.02, SD = 18.61$) and west Wirral ($M = 14.12, SD = 7.98; t(37) = 3.06, p = .004$, two tailed).

3.6 Perceived versus actual physical activity

3.6.1 Self-reported level of physical activity

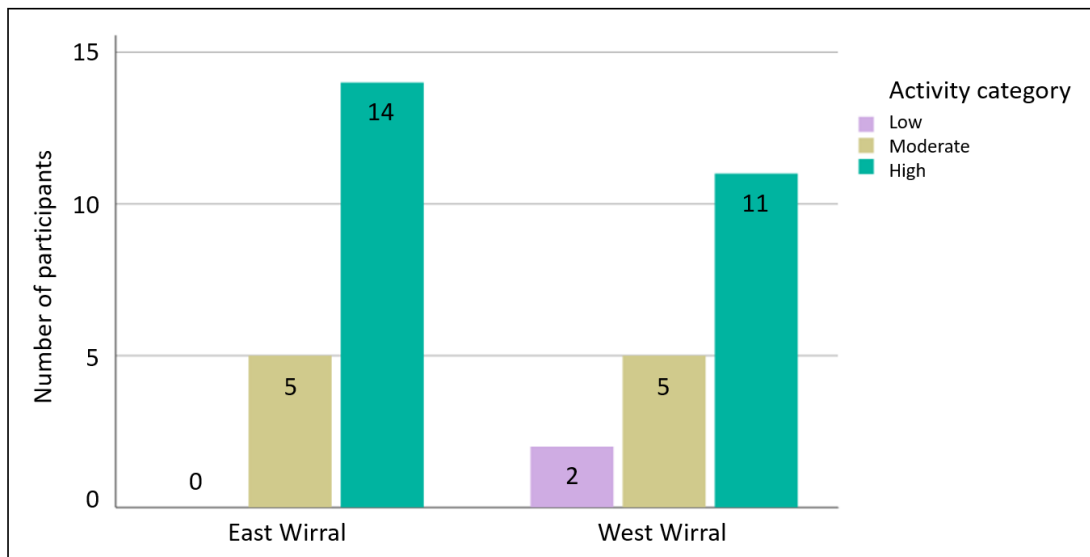
Participants were asked to quantify self-reported physical activity via IPAQ questionnaire. Using IPAQ's scoring procedure, reported physical activity was converted into accumulated steps categories, classifying participants as achieving low, moderate or high volumes of daily physical activity. Table 3.6 overleaf indicates the volume of steps associated with each IPAQ category. These classification boundaries were applied in the PAW study as they are recognised in the field of physical activity literature. (17,134,135) The same classification boundaries were used to categorise objectively measured accumulated daily steps, as recorded by Fitbit Charge HR.

Table 3.6 Daily step count and associated physical activity classification

Daily steps	Level of physical activity
<7,500	Low
7,500 - 9,999	Moderate
≥10,000	High

IPAQ category scores were missing for three west Wirral participants, therefore category scores were calculated for 19 east Wirral and 18 west Wirral residents. Figure 3.6a presents IPAQ physical activity categorisation for east and west Wirral. No residents from east Wirral perceived their level of physical activity to be low. Two residents from west Wirral identified themselves in this category. Five residents from east and west Wirral, respectively, identified themselves as moderately physically active. The majority of residents from east and west perceived themselves to be highly active; 14 from east Wirral, 11 from west Wirral.

Figure 3.6a Self-reported physical activity and IPAQ categorisation



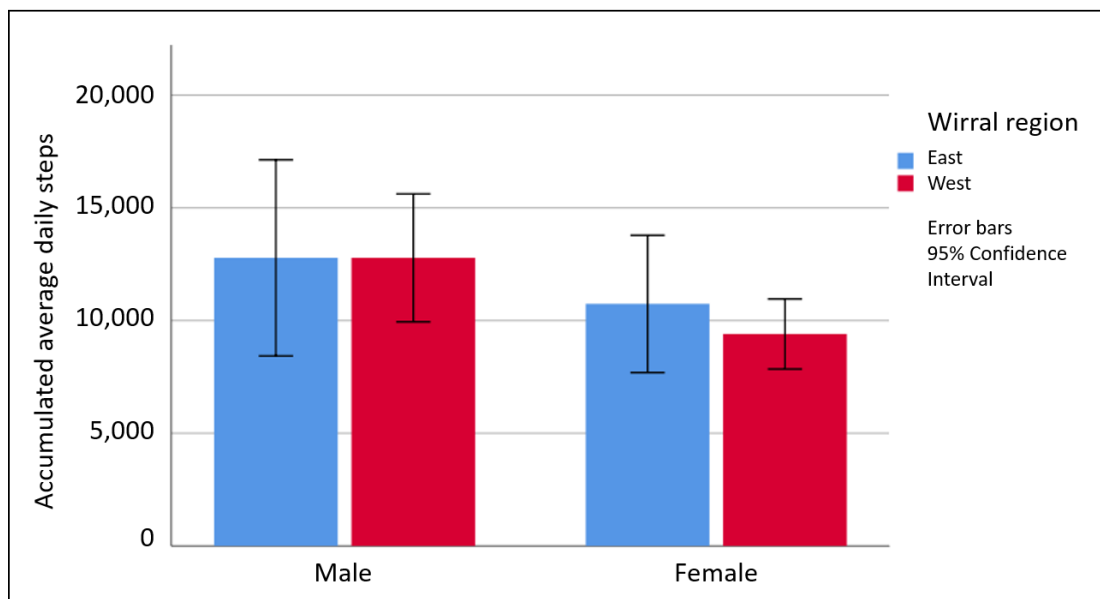
3.6.2 Objectively measured daily steps

To compare perceived physical activity against actual physical activity, participants recorded daily steps during waking hours using Fitbit Charge HR. During interview, participants described instances where they had removed their non-waterproof Fitbit for swimming. Perceived inaccuracies were also mentioned with regard to how

the Fitbit measured cycling activity. These inaccuracies were taken into consideration when interpreting activity data, however it was not possible to accurately ascertain the full extent to which cycling-related inaccuracies and missing swimming data may have affected overall Fitbit data. Full accumulated daily step data for each participant was included for analysis. Figure 3.6b below presents accumulated average daily step count for males ($n = 20$) and females ($n = 20$) in east and west Wirral ($n = 19$; $n = 21$, respectively).

Accumulated mean daily steps for the full sample was 11,483, $SD = 4345.85$. Residents of east Wirral accumulated a marginally greater volume of average daily steps than residents of west Wirral ($M = 11,705$, $SD = 4,938.53$ and $M = 11,173$, $SD = 3748.24$ respectively). As reported on page 53, an independent-samples t-test indicated no significant difference in accumulated daily step count between residents of east Wirral ($M = 11845.26$, $SD = 5042.84$) and west Wirral ($M = 11172.76$, $SD = 3748.24$; $t(37) = 4.78$, $p = 0.64$, two tailed). Males accumulated a greater volume of average daily steps than females in east and west Wirral. Male participants accumulated on average 12,781 daily steps. Female participants accumulated on average 10,071 daily steps. These data are presented in figure 3.6b.

Figure 3.6b Objectively measured accumulated daily steps by gender



From a quantitative perspective, the PAW study was underpowered. The rationale for this study's recruitment target was presented in section 2.3.2 on page 29. Not every participant providing quantitative data consented to provide qualitative data. A full dataset of quantitative and qualitative data was available for 33 participants. Consideration was given to the best approach to data analysis and presentation of results. Given the intention to triangulate quantitative and qualitative data, one option was to exclude data from participants for whom qualitative data were not available. This would have facilitated cross-reference of quantitative and qualitative data for each remaining participant. It seemed unwise and unethical to disregard data from seven participants who had kindly volunteered their time toward this research. This method was disregarded in favour of taking a wider approach to data analysis, maximising the strength of both datasets in their own right.

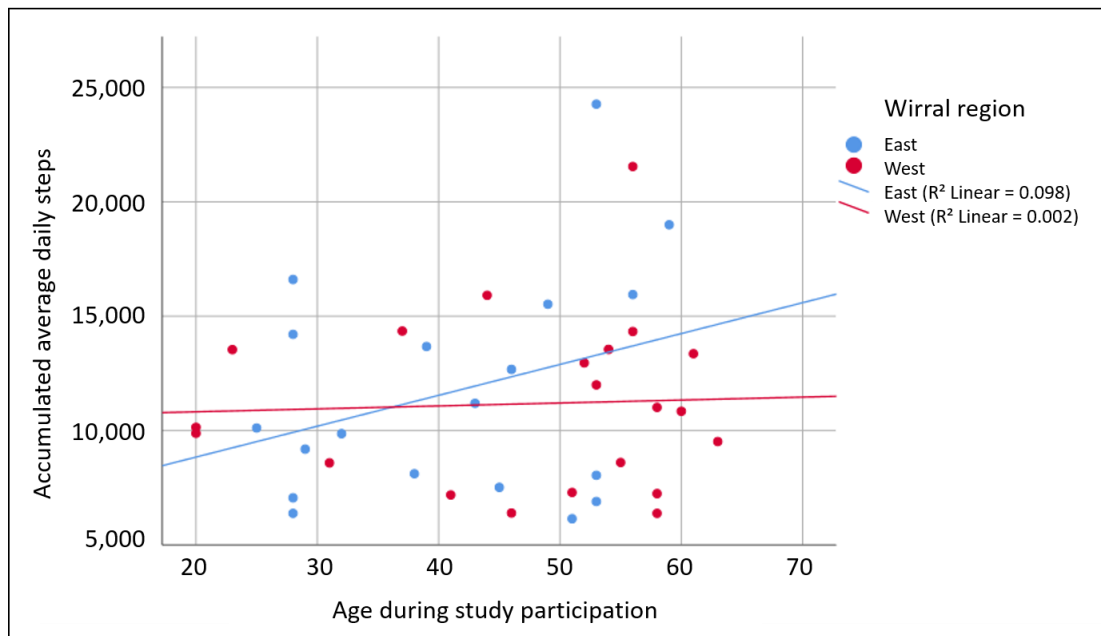
To generate the most informative returns from quantitative data, this chapter presents data from the full sample and from east and west Wirral sub-groups across different domains. Whilst independent samples t-tests were used to measure whether between group differences were statistically significant between east and west Wirral, Pearson's correlation coefficients were used to look at Wirral as a whole. These correlations, presented visually in scatterplot format, provide for the reader an overarching picture of the full sample. Due to the deprivation continuum across the borough, generating a broad picture of Wirral residents through numeric data was deemed the most meaningful approach.

Not every test was conducted on the full sample *and* on east and west Wirral sub-groups. E.g. generating a p-value for east and west Wirral sub-groups was not deemed meaningful, as little confidence could be afforded to these data due to small sub-group numbers. P-values have therefore been generated for full sample data only ($N = 40$ datasets). It is hoped that the following pages will provide a holistic picture of the PAW study sample, through numbers represented visually. Chapters four, five and six present qualitative data, which provide a more personal glimpse into the reality of living in east and west Wirral, in the words of participants themselves. Quantitative data in this chapter will tell the collective story of Wirral residents. Qualitative data will tell the individual stories. Chapter seven provides

interpretation and amalgamation of mixed methods results, through the interpretive lens of the Model of Human Occupation. (76)

To understand the relationship between participant age and objectively measured accumulated daily steps across Wirral, a Pearson's correlation coefficient was generated. A positive but not statistically significant correlation was observed between age and accumulated daily steps in the full sample ($r = 0.15, n = 40, p = 0.34$). Data indicated that participant age was positively correlated with accumulated daily steps. Volume of daily steps appeared to increase with participant age across Wirral. This relationship was more pronounced in residents of east Wirral, with a stronger positive correlation observed between age and accumulated daily steps in east Wirral than west Wirral. Figure 3.6c presents these data via scatterplot.

Figure 3.6c Relationship between participant age and accumulated daily steps

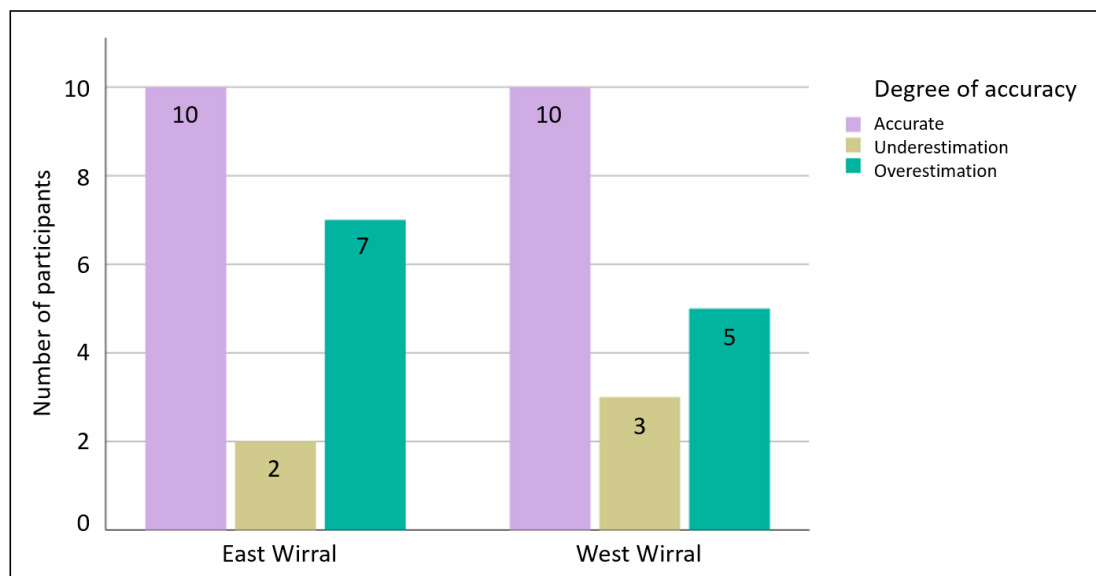


3.6.3 Accuracy between self-reported and actual physical activity

To explore the extent to which participants accurately or inaccurately reported their own levels of physical activity, IPAQ category score was compared with accumulated average daily step count for residents of east and west Wirral. 10 residents in east Wirral and west Wirral, respectively, accurately reported their level of physical

activity via IPAQ questionnaire. Categorised daily step count measured by Fitbit tallied with activity self-report from these 20 participants. Two residents from east Wirral and three residents from east Wirral underestimated their physical activity via IPAQ questionnaire. These individuals accumulated a greater volume of Fitbit-measured daily steps than their self-report suggested. Seven residents from east Wirral and five residents from west Wirral overestimated their physical activity via IPAQ questionnaire. These individuals accumulated fewer Fitbit-measured daily steps than their self-report suggested. These statistics are presented in figure 3.6d.

Figure 3.6d Accuracy of self-report versus objective activity measurement



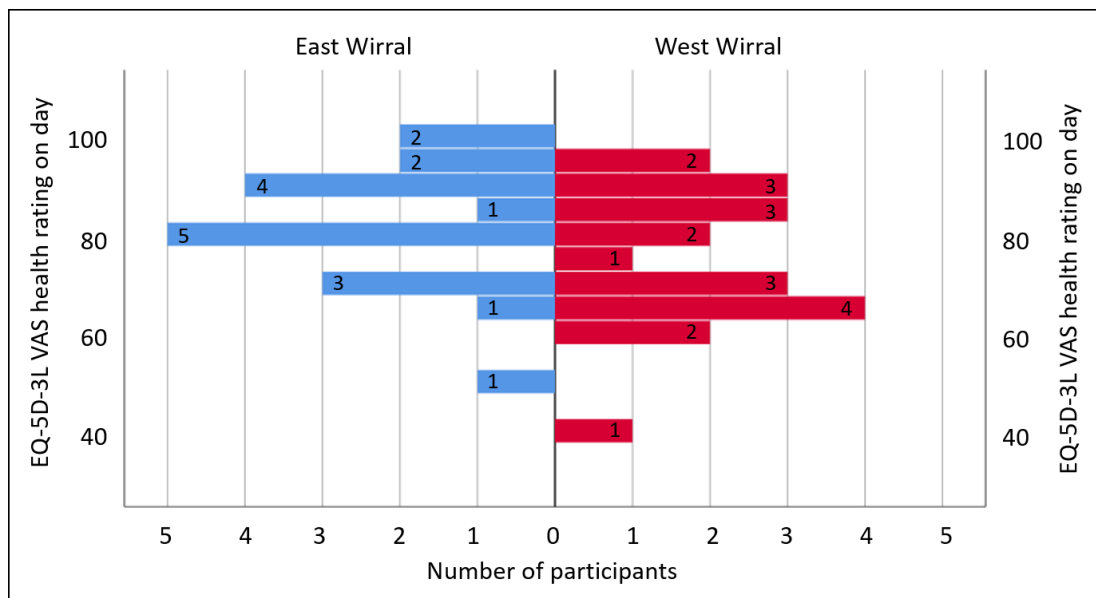
There was variance throughout the sample in the extent to which residents accurately or inaccurately reported their physical activity via IPAQ versus actual physical activity measurement via Fitbit Charge HR. To explore the difference in accuracy of self-report versus objectively measured physical activity between residents of east and west Wirral, a Fisher's exact Test was conducted. This test was selected in place of chi-square as two cells had an expected count of <5, therefore violating the chi-square assumption. No statistical significance was found between residence of east or west Wirral and accuracy of self-report in relation to objectively measured physical activity ($p = 0.60$).

3.7 Self-reported health and wellbeing

3.7.1 Self-reported general health

Participants were asked to quantify how well they felt on the day of questionnaire completion, via EQ-5D-3L questionnaire visual analogue scale (VAS). Participants provided a general health rating of between zero and 100. A rating of zero indicated the worst health imaginable. A rating of 100 indicated the best health imaginable. All except two participants – one from east Wirral and one from west Wirral – rated their health on the day of questionnaire completion as ≥ 60 . The lowest rating was provided by a resident of west Wirral. Results indicated greater self-reported wellbeing amongst residents of east Wirral. An independent-samples t-test was conducted to compare EQ-5D-3L VAS health ratings between residents of east and west Wirral. There was no significant difference in ratings between east Wirral ($M = 82.11, SD = 12.96$) and west Wirral ($M = 75.71, SD = 14.12; t(38) = 1.49, p = 0.15$, two tailed). Figure 3.7a presents these data via population pyramid.

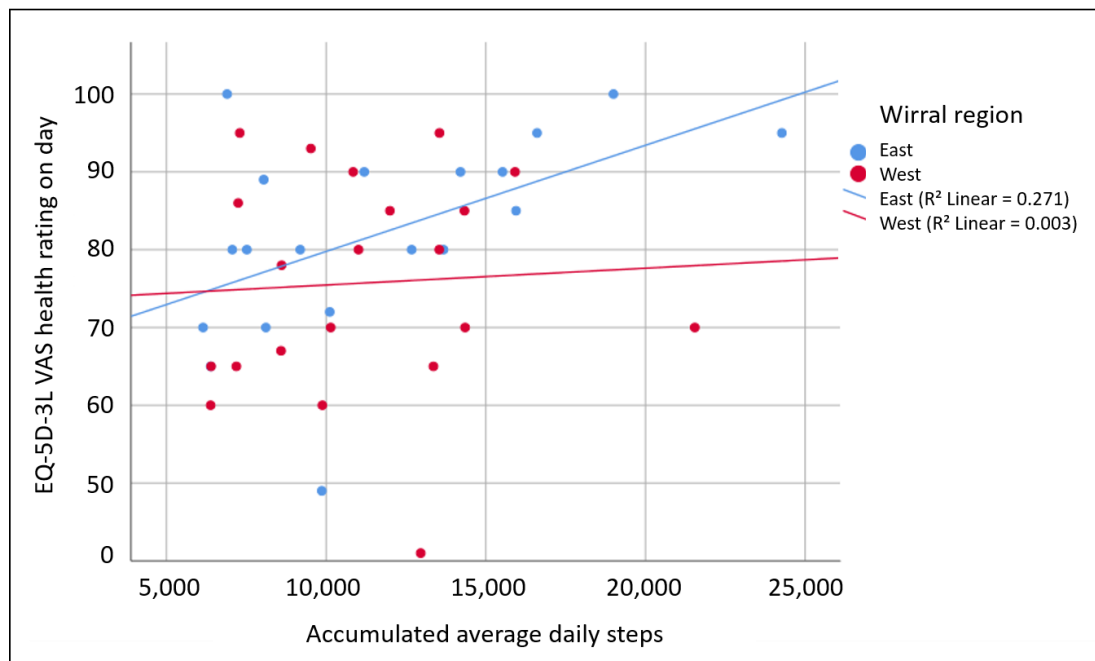
Figure 3.7a Self-reported general health for east and west Wirral



To understand the relationship between self-reported general health and objectively measured daily steps during the study enrolment period, a Pearson’s correlation coefficient was generated. A positive but not statistically significant correlation was

observed between self-reported health and accumulated daily steps ($r = 0.30$, $n = 40$, $p = .06$). Data indicated that self-reported general health was positively correlated with accumulated daily step count. The greater the volume of steps, the greater the self-reported wellbeing. A stronger positive correlation was observed between self-reported health and accumulated steps in east Wirral than west Wirral. Figure 3.7b presents these data via scatterplot.

Figure 3.7b Relationship between self-reported health and accumulated daily steps



3.7.2 Perception of health-related challenges

Participants were asked to rate their general health across five lifestyle domains via EQ-5D-3L questionnaire. The questionnaire explored whether or not respondents identified challenges across each domain; self-care, mobility, usual activities, pain and anxiety or depression. Responses to each question were rated using one of three categorical levels. Level one indicated no problems. Level two indicated some problems. Level three suggested serious problems. EQ-5D-3L domain scores were analysed independently of one another, as permitted by questionnaire guidelines, to identify distinct areas of difficulty with daily routine and generate contextual health

profiles. The first four lifestyle domains are explored in this section. Lifestyle domain five is explored in section 3.7.3 below.

No participants reported difficulties with self-care tasks. One participant from east Wirral reported some problems with mobility. Two participants, both from east Wirral reported some problems with usual daily activities. The pain domain generated a more diverse response, with five participants from east Wirral and four participants from west Wirral reporting some problems with pain or discomfort. No participants reported serious problems across any domain. Each of the five east Wirral participants describing some problems with pain accumulated below sample average daily steps. Sample mean daily step count was 11,483, $SD = 4345.85$. One of these five individuals also reported some problems with mobility and usual daily activities. Two of the four west Wirral participants describing some problems with pain accumulated above sample average daily steps.

3.7.3 Self-reported mental health

EQ-5D-3L domain five explored anxiety and depression. Three participants from east Wirral reported some problems with anxiety or depression. Six participants from west Wirral reported some difficulties across this domain. Three of the nine participants across the full sample experiencing some problems with anxiety or depression also reported some problems with pain. One participant from east Wirral experiencing some problems with anxiety or depression also reported some problems with usual daily activities. Seven of the nine participants from the full sample reporting some problems with anxiety or depression accumulated below sample average daily steps ($M = 11,483$, $SD = 4345.85$).

Table 3.7 overleaf displays EQ-5D-3L response data for all participants identifying some problems across one or more of the lifestyle domains. Participants reporting no problems across any domain are not represented in the table ($n = 12$ in east Wirral; $n = 13$ in west Wirral). Participant data have been highlighted according to objectively measured accumulated physical activity categorisation; low activity (<7,500 steps; red), moderate activity (7,500-9,999 steps; orange) and high activity ($\geq 10,000$ steps; green).

Residents in east Wirral accumulating fewest daily steps reported problems with pain. Those accumulating fewest daily steps in west Wirral reported problems with anxiety or depression. Overall, residents of west Wirral reporting problems across EQ-5D-3L domains accumulated marginally higher daily steps than those in east Wirral.

Table 3.7 Self-reported health challenges by lifestyle domain

East Wirral	Mobility	Usual activities	Pain	Anxiety or depression	Average daily steps
PAW31			X		6,145
PAW28			X		7,516
PAW17			X		8,044
PAW30			X	X	8,111
PAW16		X		X	9,863
PAW27	X	X	X		11,191
PAW11				X	12,675
West Wirral	Mobility	Usual activities	Pain	Anxiety or depression	Average daily steps
PAW09				X	6,382
PAW02				X	7,187
PAW06			X	X	8,604
PAW21				X	9,880
PAW29			X	X	11,012
PAW37			X		11,997
PAW10			X		13,359
PAW32				X	14,350

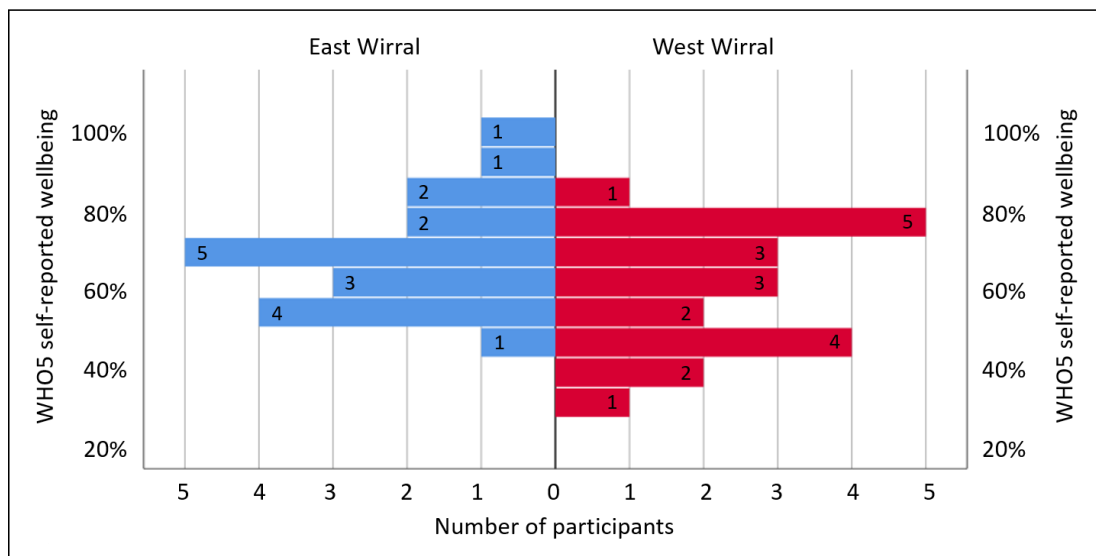
3.7.4 Self-reported wellbeing

Participants were asked to rate their perceived wellbeing during the past two weeks via WHO (Five) (WHO5) questionnaire. WHO5 explored participants' sense of general wellbeing and produced two separate scores, as per the WHO5 scoring protocol. The questionnaire is divided into five questions, each exploring a separate cognitive or affective life domain. Broadly speaking, the domains address the concepts of cheerfulness, calmness, activity, feeling refreshed and feeling interested in life during the past fortnight. Collated responses to the five questions were calculated to provide an overall percentage score. This percentage score represented the first

WHO5 wellbeing score. Zero indicated the poorest reported wellbeing and 100% indicated optimal wellbeing. The second score was generated by dividing raw domain scores into two categories; scores of <13 indicated poor wellbeing and scores of ≥13 indicated positive wellbeing.

Residents of east Wirral reported greater overall wellbeing. Only one participant from east Wirral from the sub-sample of 19 reported poor wellbeing according to WHO5 wellbeing classification (second WHO5 score). Seven residents of west Wirral reported poor wellbeing according to WHO classification, from the sub-sample of 21. An independent-samples t-test was conducted on WHO5 percentage scores to compare WHO5 self-reported wellbeing between residents of east and west Wirral. There was no significant difference in self-reported wellbeing between east Wirral ($M = 68.63, SD = 15.22$) and west Wirral ($M = 61.71, SD = 16.23; t(38) = 1.39, p = 0.17$, two tailed). Figure 3.7c presents these data via population pyramid.

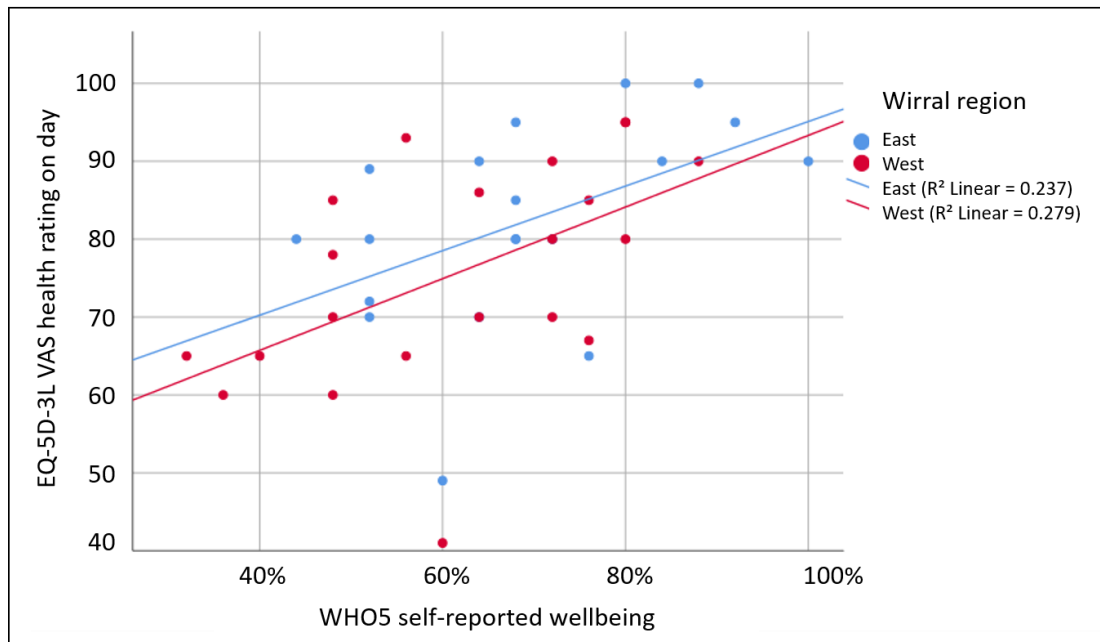
Figure 3.7c Self-reported wellbeing for east and west Wirral



EQ-5D-3L VAS and WHO5 both explored how participants were feeling on the day of questionnaire completion. Both tools explored a similar concept via a different angle of enquiry. To understand concordance between the two measures and the relationship between self-reported health via EQ-5D-3L VAS and self-reported wellbeing via WHO5, a Pearson’s correlation coefficient was generated. A positive

and statistically significant correlation was observed between EQ-5D-3L VAS score and WHO5 percentage score ($r = 0.54, n = 40, p = <.001$). Data indicated that self-reported health via EQ-5D-3L was positively correlated with self-reported wellbeing via WHO5. Figure 3.7d presents these data via scatterplot.

Figure 3.7d Relationship between EQ-5D-3L VAS and WHO5 health scores



3.8 Perceived neighbourhood activity-friendliness

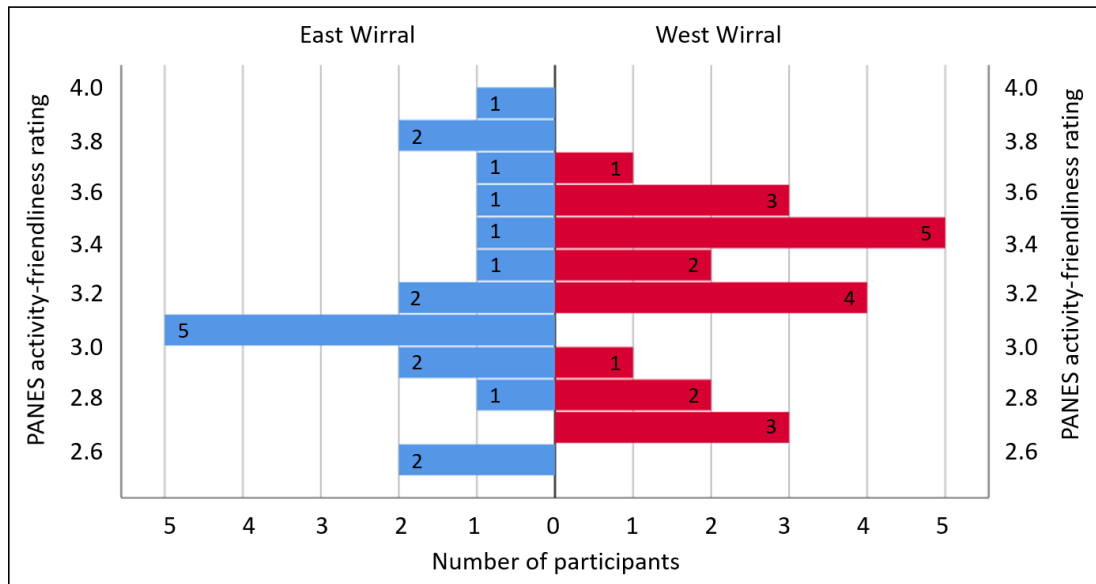
3.8.1 Perception of neighbourhood for supporting physical activity

Participants were asked to quantify the degree to which their neighbourhood environment was supportive of physical activity. They provided this information via PANES questionnaire. PANES explored perception of neighbourhood activity-friendliness across a range of physical environment domains. Scores were calculated using raw data to generate a neighbourhood activity-friendliness rating of between one and four. A score of one indicated a non-supportive environment for physical activity. A score of four indicated a high degree of neighbourhood activity-friendliness.

There was greater variation in scores within the east Wirral sub-group than the sub-group from west Wirral. Both the lowest and highest scores across the full sample

were generated by residents of east Wirral. Ratings from residents of west Wirral were more closely grouped. An independent-samples t-test was conducted to compare neighbourhood activity-friendliness ratings between residents of east and west Wirral. There was no significant difference in ratings between east Wirral ($M = 3.18, SD = 0.39$) and west Wirral ($M = 3.18, SD = 0.32; t(38) = -.06, p = 0.96$, two tailed). Figure 3.8a presents these data via population pyramid.

Figure 3.8a Perceived east and west Wirral neighbourhood activity-friendliness

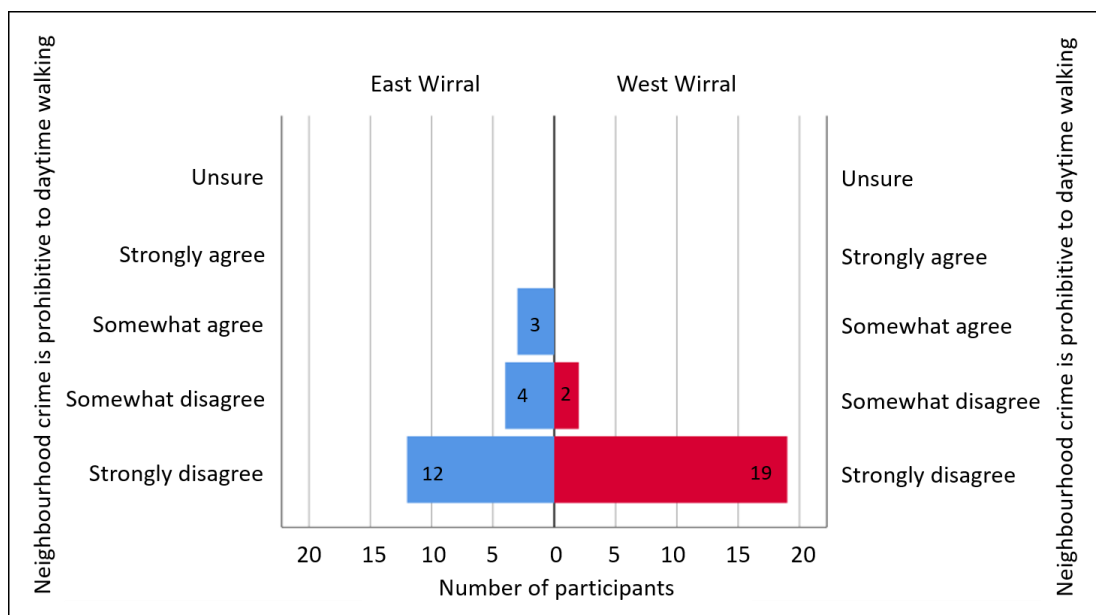


3.8.2 Perceived safety from neighbourhood crime

PANES permits the use of individual questionnaire items/constructs for sub-topic analysis. Two of the 17 questionnaire items comprised the ‘crime safety’ construct. Participants were asked to rate the degree to which perceived crime was prohibitive to going for a walk during the day in their neighbourhood. No participants reported crime to be fully prohibitive in their neighbourhood, however, three residents from east Wirral ‘agreed somewhat’ that crime negatively impacted daytime walking in their neighbourhood. Each of these three participants lived in postcode areas ranked as Wirral’s most deprived quintile one. A focus was afforded to daytime walking due to the PAW study collecting physical activity data during waking hours. Although the concept of day versus night may be subjective and may be related to daylight hours, it was deemed appropriate to focus on daytime walking in this instance.

PAW16, a male participant from Bromborough, east Wirral accumulated on average 9,863 daily steps. PAW27, a female participant from Birkenhead and Tranmere, east Wirral accumulated on average 11,191 daily steps. PAW31, a female participant from Seacombe, east Wirral accumulated on average 6,145 daily steps. Each of these participants accumulated below sample average daily steps ($M = 11,483$, $SD = 4345.85$) Birkenhead is ranked the most deprived of Wirral's 22 electoral wards. Seacombe is ranked third and Bromborough ranked 10th. Figure 3.8b presents full sample data for perception of crime prohibiting daytime walking in participants' neighbourhoods.

Figure 3.8b Perceived impact of neighbourhood crime on daytime walking

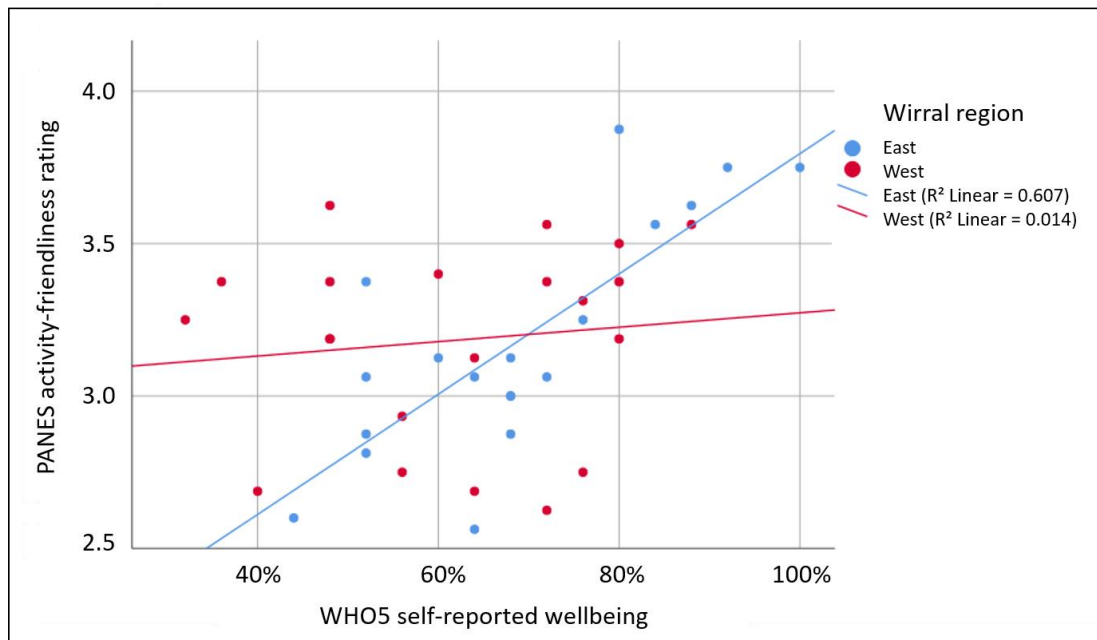


3.8.3 Influence of neighbourhood activity-friendliness

PANES scores were examined against WHO5 self-reported wellbeing scores and objectively measured daily step count. These data shed light on the impact of neighbourhood perception on overall wellbeing and engagement with physical activity. To understand the relationship between perception of neighbourhood environment via PANES and self-reported wellbeing via WHO5, a Pearson's correlation coefficient was generated. A positive and statistically significant correlation was observed between neighbourhood perception and self-reported

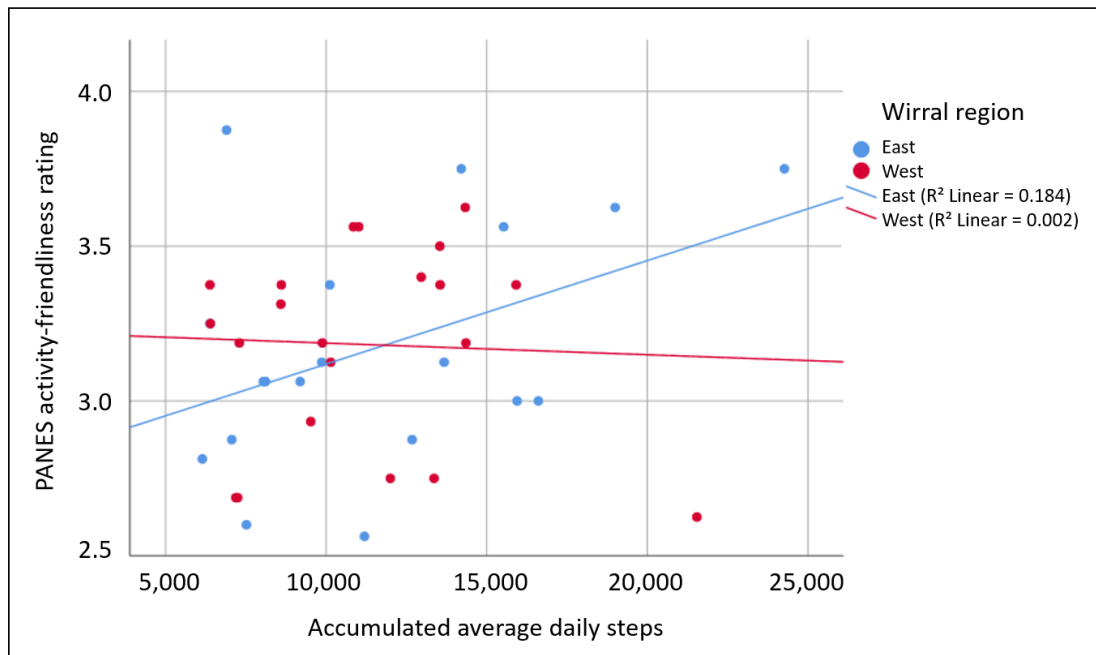
wellbeing. ($r = 0.44$, $n = 40$, $p = .01$). Data indicated that as perception of neighbourhood environment increases, self-reported wellbeing similarly increases. This positive relationship was more pronounced in east Wirral. Figure 3.8c presents these data via scatterplot.

Figure 3.8c Relationship between neighbourhood activity-friendliness and wellbeing



To understand the relationship between perception of neighbourhood environment via PANES and accumulated daily steps, a second Pearson’s correlation coefficient was generated. A positive but not statistically significant correlation was observed between neighbourhood perception and accumulated daily steps. ($r = 0.23$, $n = 40$, $p = 0.15$). In east Wirral, data indicated a positive correlation. Increases in perception of neighbourhood activity-friendliness were correlated with accumulated daily steps. As perception of the neighbourhood environment for activity-friendliness increased, so did accumulated daily steps. In west Wirral a slight negative correlation was observed and the pattern observed in east Wirral data was not replicated. Increases in perception of neighbourhood activity-friendliness in west Wirral were inversely correlated with accumulated daily steps. Figure 3.8d overleaf presents these data via scatterplot.

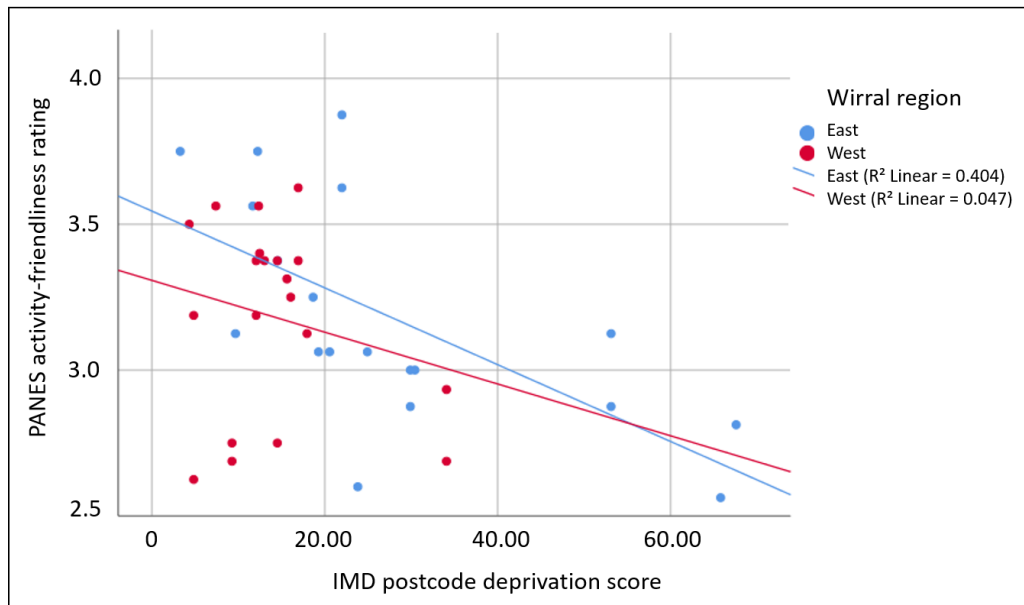
Figure 3.8d Relationship between neighbourhood activity-friendliness and daily steps



3.8.4 Influence of neighbourhood deprivation

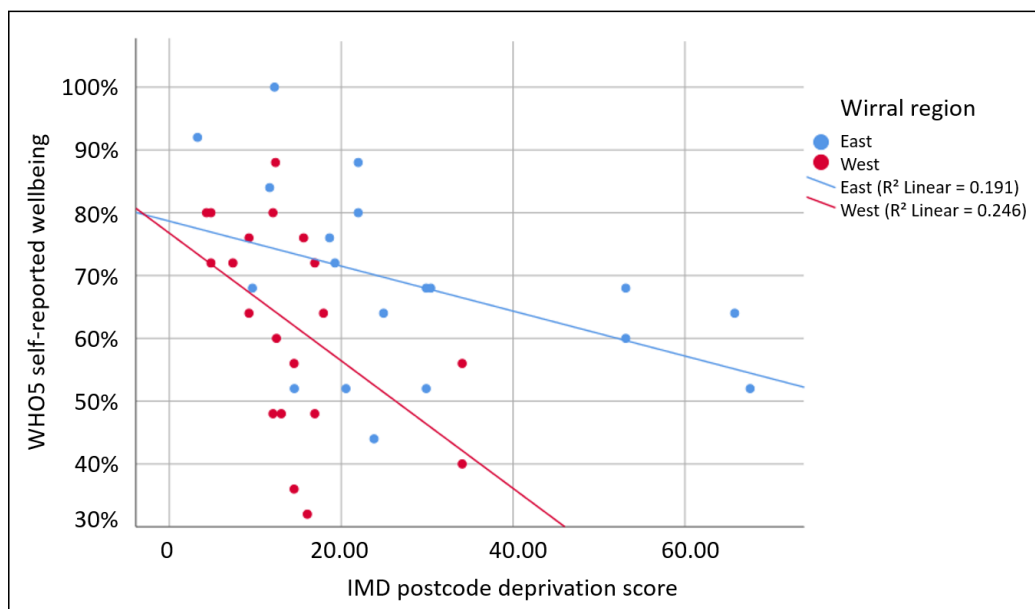
Open source data from Wirral Indices of Multiple Deprivation (IMD) (92) were examined against PAW study data to explore the impact of where people live in terms of postcode deprivation on neighbourhood perception, self-reported wellbeing and accumulated daily steps. To understand the relationship between postcode deprivation via IMD score and perception of neighbourhood activity-friendliness via PANES, a Pearson's correlation coefficient was generated. A negative and statistically significant correlation was observed between regional deprivation and self-reported neighbourhood activity-friendliness ($r = -0.47$, $n = 39$, $p = .01$). Data indicated that as neighbourhood deprivation increased, perception of neighbourhood for activity-friendliness decreased. This pattern was slightly more pronounced in east Wirral. Figure 3.8e overleaf presents these data via scatterplot.

Figure 3.8e Relationship between deprivation and perception of activity-friendliness



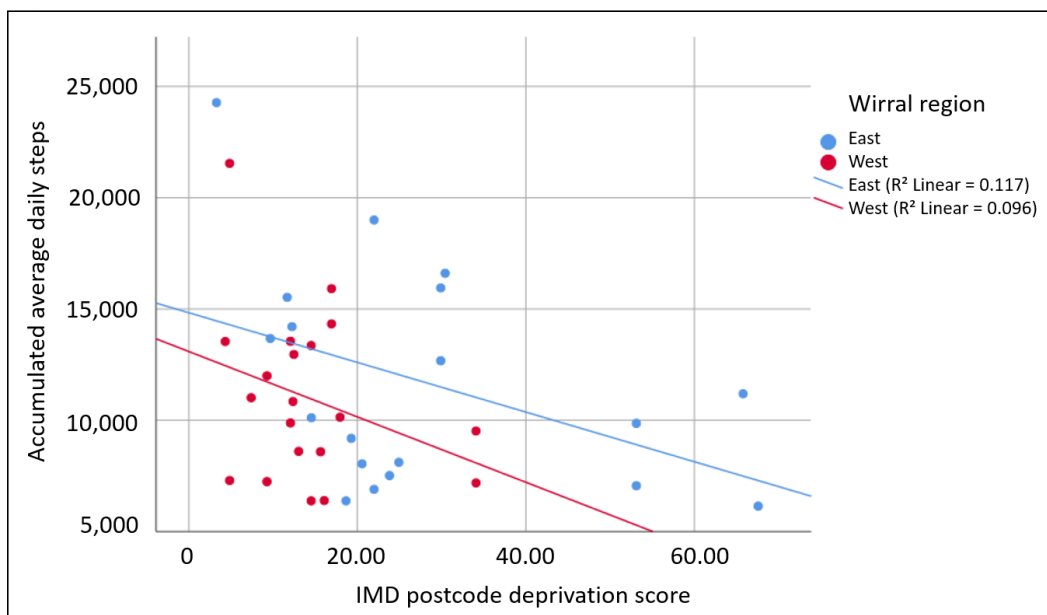
To understand the relationship between postcode deprivation via IMD score and self-reported wellbeing via WHO5, a second Pearson’s correlation coefficient was generated. A negative but not statistically significant correlation was observed between regional deprivation and self-reported wellbeing ($r = -0.28, n = 39, p = .09$). Data indicated that as neighbourhood deprivation increased, self-reported wellbeing decreased. This pattern was more pronounced in east Wirral. Figure 3.8f presents these data via scatterplot.

Figure 3.8f Relationship between deprivation and self-reported wellbeing



To understand the relationship between postcode deprivation via IMD score and objectively measured accumulated daily step count, a third and final Pearson's correlation coefficient was generated. A negative but not statistically significant correlation was observed between regional deprivation and objectively measured average daily steps ($r = -0.30, n = 39, p = .06$). Data indicated that as neighbourhood deprivation increased, objectively measured accumulated daily steps decreased. The same pattern was observed in east and west Wirral sub-groups. Figure 3.8g presents these data via scatterplot.

Figure 3.8g Relationship between deprivation and accumulated daily steps



3.9 Summary: Chapter three

This chapter has introduced the PAW sample via quantitative data. Descriptive and inferential statistics have provided an overview of the characteristics of the full sample and east and west Wirral sub-groups. The following three chapters present qualitative data, structured using a personal, social and physical environment focus. Each chapter begins with a brief introduction of the core chapter focus. Individual stories are told, in participants' own voices, of the unique experience of engaging with physical activity in Wirral, in relation to personal, social and physical environmental influence.

Personal environment and physical activity: Individuality and perception

“The privilege of a lifetime is being who you are.”

Joseph Campbell

4.1 Unique realities

The first theme identified during qualitative data analysis was the influence of individuality and perception on physical activity. The Model of Human Occupation (MoHO) (78,81,136) locates the person at the centre of any given situation, from which all other considerations emanate. It is from this central point of personal uniqueness that presentation of qualitative results will begin. Chapters four, five and six present qualitative results, without interpretation, contextualised by individual participant quotes. Interpretation of presented results will take place in chapter seven. Qualitative results were structured and presented under the three domains of ‘personal’, ‘social’ and ‘physical’ environment. This was to contextualise findings from the PAW study against existing knowledge surrounding the influence of physical environment features on physical activity behaviour, as described in the study rationale on page 19. Results are interpreted in chapter seven against the four MoHO domains of volition, habituation, performance capacity and environment, as described and presented on pages 123 and 124.

To begin this section, the author would like to share their own view of individuality, perception and the way in which these two entities may influence daily routine. The following paragraph comprises purely the author’s own thoughts, which although may be inherently influenced by professional background and personal experiences, are not consciously mapped to formal theoretical perspectives. Instead, it is intended to provide contextual background regarding the angle from which this chapter is approached, by describing the author’s personal perspective. This reflexive process is repeated at the beginning of chapters five and six, to indicate the author’s epistemology and the interpretive perspective from which data are presented.

We each perceive the world differently, experiencing life through the interpretation of sensory data, processed by the brain in tandem with past experiences and generating unique personal realities. We are shaped by a combination of genetic

foundations and life events – the alliance of nature and nurture – which affect our experience and understanding of daily life and underpin our conscious and unconscious thought, decision-making and action. Individuals are influenced by a myriad of intrinsic and external factors affecting how they feel, their choices made, pressures experienced and action taken. Reasons underpinning human behaviour are in part due to individuality and perception of the world around us. Our personal environment is deeply unique and affects every element of daily life. It is from this perspective that this chapter is written, with a belief that everyone’s ‘normal’ is entirely unique to them.

Table 4.1 provides an overview of qualitative coding themes identified during thematic analysis and organised under the overarching theme of ‘the influence of personal environment features on physical activity’. This theme comprises two sub-themes of ‘individuality’ and ‘perception’. The chapter is organised around these two sub-themes and the degree to which individuals’ perception and experience of the world around them (their own reality) influences daily routine and physical activity.

Table 4.1 Personal environment and physical activity thematic coding content

Theme concept	Theme content
Concept 1: Perception of physical activity	Nature of personal physical activity Physical activity and good health Physical activity and healthy ageing
Concept 2: Personal daily routine	Working hours and work routine Habituated daily activity Leisure time physical activity
Concept 3: Intrinsic motivations	Volition toward physical activity Responsibility for self Awareness of own activity patterns

4.2 Concept 1: Perception of physical activity

4.2.1 Nature of personal physical activity

When asked to define the concept of physical activity, participants described a variety of daily activities involving bodily movement and/or raised heart rate. Whilst the majority considered all non-sedentary actions to be part of their daily physical activity, certain participants described physical activity as specific engagement with structured activities over and above routine daily tasks. One participant typified the shared notion that physical activity involves exertion over and above the energy expended during usual activities of daily living.

“Physical activity to me is when I push myself, when I exert myself, when I perspire and I’m working hard. Running to the bus for me isn’t physical activity...I go on the bus when I come to West Kirby and I’ll have a few drinks, but for me running to the bus [is] ‘I’m going socialising’ and I can’t put the two together...One’s structured and one is everyday life” PAW19, male aged 54, west Wirral (13,548 average daily steps)

Dependent upon participants’ perception of what constituted ‘physical activity’ in their daily routine, responses to questions regarding their own level of physical activity varied. To explore the impact of individual perception of physical activity versus objectively-measured activity, interview responses and average accumulated daily steps were cross-examined. PAW19 accumulated on average 13,548 daily steps, recorded by Fitbit Charge HR, which exceeded the full sample average of 11,483 ($SD = 4345.85$).

During interview, participants spoke of their own experiences of being physically active, and described what to them being active meant. Individual perception of physical activity differed from one participant to the next, with examples ranging from light housework to structured gym sessions. For each participant, accuracy between self-report and objectively measured physical activity varied, with a range of under-reporting, over-reporting and accurate reporting via IPAQ questionnaire, referenced against Fitbit data. Participants were asked to select a study enrolment period during which they undertook their usual routine, to minimise the risk of atypical routine influencing objective activity measurement. Also to maximise the

opportunity for participants to accurately reflect upon their routine during the past week, recorded by questionnaire.

PAW20, a female participant aged 53 from east Wirral, recorded one of the lowest accumulations of average daily steps via Fitbit ($n = 6,897$) and was categorised by accumulated step count as low level physical activity. This participant, however, reported a high level of physical activity via IPAQ questionnaire. During interview, she did not mention atypical routine during her week of study involvement, nor periods during which the Fitbit was removed for any reason, or where the device was non-operational during waking hours, for example through flat battery. PAW20 did not mention engagement with activities such as swimming or cycling, which were highlighted by other participants as not accurately recorded by Fitbit. Due to quantitative and qualitative data being collected during the same time period, the student researcher was not aware to follow this discrepancy during interview.

PAW09, a female participant aged 58 from west Wirral, accurately self-reported her physical activity level as low. She accumulated on average 6,382 daily steps. She described during interview a busy daily schedule, balancing caring responsibilities, family life and a managerial role at a local general hospital. PAW09 attributed her low level of physical activity to managing multiple responsibilities. She described her volition to overcome current, existing barriers and was endeavouring to incorporate physical activity into her routine, where possible. The influence of responsibility for others on daily routine and physical activity is explored in chapter five.

4.2.2 Physical activity and good health

Many interview respondents perceived physical activity to be beneficial to health and wellbeing, describing its positive impact on general health, and in particular mental health. Stress relief during physical activity was a concept described by many, cited as having the ability to enhance and maintain health and wellbeing, even during challenging life periods. For example, a number of participants mentioned feeling the benefits of yoga, for strength, conditioning and mindfulness. Whilst acknowledging that yoga is not as physically exertive as other activities, it was cited as a core component for relaxation, with the capacity to enhance general wellbeing.

“I personally like getting up and doing it [physical activity] first thing in the morning because that means that I start the day positively and clear my head and I don’t go and touch my phone until I get to work. And then after work it varies; I try and go the gym some nights. If I’ve had a bad day I may go for a longer walk instead of going to the gym, so for me it’s like if you do any sort of physical activity it’s always a stress reliever.” PAW33, male aged 28, east Wirral (14,206 average daily steps)

“I feel like when I exercise or when I stay healthy, my mind’s just much clearer. Because I have quite a lot of anxiety and I feel like I have more anxiety when I don’t do a lot of exercise or I don’t eat healthily...So when I feel like I have quite frequent anxiety episodes, or feel really anxious, I think ‘right ok, right I need to start exercising’; I need to start...even yoga or just stretching...just eating healthily; kind of cleansing myself like going out for walks...it does really help a lot.” PAW21, female aged 20, west Wirral (9,880 average daily steps)

It was recognised by some participants, however, that often during periods of low mood, it was difficult to muster the mental energy to engage with physical activity, even though participants acknowledged that they would likely feel better for having engaged. Participants reported times during which they were unable to summon the mental strength to pursue physical activities, but other times they persevered and experienced subsequent benefits.

“If I’m down and depressed, you know, I could spend quite a large portion [of the day] in bed, really depressed. And then other days I could be really active, you know, blitzing the house. Other days I force myself out, other days I have to go out so there’s no set pattern...They say physical activity helps but sometimes you’re so low you can’t drag yourself out to get to that physical activity to try and help.” PAW02, female aged 41, west Wirral (7,187 average daily steps)

“Because you think, ‘oh I won’t bother’...I had a rough few months a while ago and I noticed that by still doing the exercise it was genuinely helping my wellbeing. So I would say it was good to be motivated even if I didn’t want to be; it was like ‘I can feel the benefits [so] I’m going to keep it up’.” PAW35, female aged 52, west Wirral (12,959 average daily steps)

PAW02 and PAW21, two female participants age 41 and 20, respectively, both from west Wirral, reported periods of depression and anxiety. They described times during which mood impacted engagement with physical activity, and for which physical activity was found to be beneficial. Both participants described the potential for physical activity to elevate mood and support positive wellbeing. PAW02 accumulated on average 7,187 daily steps. PAW21 accumulated on average 9,880 daily steps. Both accumulated fewer average daily steps than the sample average ($M = 11,483$, $SD = 4345.85$). PAW35 did not report low mood *per se*, but described ongoing engagement with physical activity as beneficial during a challenging period. PAW35 accumulated on average 12,959 daily steps, which was above the sample average. She spoke of her ongoing volition to engage with physical activity, from which she derived health benefits.

PAW02, described above, shared her belief that it is not lack of education regarding the benefit of physical activity which prevents society from achieving physical activity guidelines. Every interview respondent shared this view. With busy lifestyles and numerous draws on available time, a number of participants described engagement with physical activity alongside work colleagues, citing the NHS' Couch to 5K running programme and National Three Peaks Challenge as two initiatives organised by their employers. Physical activity both during work hours and associated with work was suggested by various participants as a route by which physical activity may be incorporated into busy schedules, in the company of colleagues. Physical activity was cited as helpful for work-based challenges, with active breaks reported as beneficial for focus and productivity during the day.

"I think people are educated; I do think people know [the benefits of physical activity], but then life gets in the way. I don't think people are that stupid that they don't know that exercise is good for you and, you know, it's better for your health." PAW02, female aged 41, west Wirral (7,187 average daily steps)

"I usually find [that] if there are work things that I can't work out that have been bugging me throughout the day, quite often if I go for a walk the answer sort of comes; presents itself to you. Or at least if it doesn't then at least you've sort of

cleared your mind a little bit and maybe the next day it won't seem such a big deal and you may even fix it. I sometimes go for a walk at lunchtime; again that's nearly always to try and solve a problem." PAW18, male aged 46, west Wirral (6,396 average daily steps)

4.2.3 Physical activity and healthy ageing

Healthy ageing was a topic mentioned by the majority of interview participants, regarding adoption of healthy habits to prevent avoidable health conditions in later life. This included a conscious decision to engage with increased physical activity to support healthy ageing. Many identified a specific time at which they became aware of poor habits and made a conscious decision to change behaviour and maximise the opportunity for good future health. Every participant who described a change in physical activity behaviour to protect future health was female. Although males reflected upon fluctuating weight over the years and a desire to lose weight in the present day, no male participants made specific reference to health during older age.

"It's definitely sort of middle age you are more aware of; your mindset changes with regard to being more healthy I suppose. And obviously having two children you want to be a good example don't you?" PAW11, female aged 46, east Wirral (12,675 average daily steps)

"My mum had quite severe osteoporosis and I'm determined that I'm not going to go down that route, because I had a bone density test and I've already got osteoporosis in my spine. So I thought, 'right, I'm not wanting to let that get any worse', so yes that's my main motivation really...I want to stay feeling young." PAW37, female aged 53, west Wirral (11,997 average daily steps)

With regard to public health campaigns designed to encourage physical activity as a protective factor for good health, PAW08, a male participant from west Wirral spoke of uncertainty regarding the effectiveness of such initiatives. PAW08 accumulated on average 10,845 daily steps; below the sample average of 11,483 ($SD = 4345.85$). Public initiatives to encourage physical activity are explored further in chapter five.

“Scare tactics don’t really work. It’s not saying you’re going to die early, it’s saying that you could live longer...I think the only way people are going to have more exercise is [that] they’re only ever going to be doing it for themselves. It is entirely selfish. It’s how you appeal to people’s desire for longevity and self-preservation; how you convince them that it will be worth it. PAW08, male aged 60, west Wirral (10,845 average daily steps)

4.3 Concept 2: Personal daily routine

4.3.1 Working hours and work routine

When describing daily routine, participants cited their employment and the nature of their work as significantly influencing physical activity, due to working hours for most participants signifying a substantial percentage of time during the day. It was reported that sedentary jobs negatively influenced the opportunity to engage in physical activity during the day. For many, the lack of physical activity during working hours incentivised small opportunities for movement, but although brief interludes were sought to mitigate sedentary working patterns, participants did not consider these a substitute for more active employment, nor adequate daily activity for good health.

“If a work day involves [being] on the road, I can be on the road from anything between five and six o’clock to get to my destination between nine and 10 o’clock. Meetings all day, travel back and...I can possibly miss every opportunity for exercise completely...there’s been times I’m not getting back until quarter to nine; it’s a very long day...I’m conscious now, especially with the Fitbit, that I’ve taken part in no exercise at all; I will consciously take the stairs and not the lift.” PAW20, female aged 53, east Wirral (6,897 average daily steps)

“I’m a massive person of habit so I tend to do the same stuff all the time. [At] work I have a sitting down job at a computer so what I make sure that I do is take regular breaks, get up and move, whether I walk to the furthest toilet or silly daft stuff and then of a lunch time I don’t have my lunch at my desk and I always make sure that I walk and get out for at least half an hour, whether it be rain or sunshine; I tend to

always try and move...I try and be very active as much as possible.” PAW33, male aged 28, east Wirral (14,206 average daily steps)

Accumulated daily steps for these two participants differed greatly. PAW20 accumulated on average 6,897 daily steps; below the sample average of 11,483 ($SD = 4345.85$). PAW33 accumulated on average 15,995 steps. Whilst they both described similar seated working patterns and sought opportunities for physical activity during the day, the notable difference in accumulated daily steps suggested the presence of additional confounding factors influencing opportunities for, and/or general engagement with physical activity. The subject of personal physical activity and habituated daily routine was raised by PAW33 and was explored further in relation to daily activity patterns.

4.3.2 Habituated daily activity

“I’ll start things moving and I’ve just got a routine really...it sounds as if my life’s really boring here but I do everything in a routine. I’ll get up and I’ve got an automatic body clock that I automatically get up just before seven o’clock. So I’ll wake up, go downstairs, make a cup of tea for everyone, make sure the breakfast dishes are done, empty the dishwasher; by that time the kettle’s boiled and I’ll go back upstairs and give [them] a cup of tea and then it just gets things moving.” PAW19, male aged 54, west Wirral (13,548 average daily steps)

“I’m a person of routine, I really like routine and we get in the car and we go for a walk and we do approximately three quarters of an hour walk round the local park...whatever the weather...this is even in the winter we do this, with torches, gloves, hats, in the rain; we go every single morning.” PAW14, male aged 56, west Wirral (21,542 average daily steps)

PAW14 recorded on average 21,542 daily steps; second highest accumulation in the sample. He described his daily structure and routine as of greater importance than consideration of weather or available time; the habitual walk was repeated daily. Similarly for PAW19, the habitual morning routine involved various, physically active, activities of daily living and supported a productive start to his own day and that of his family.

4.3.3 Leisure time physical activity

Available time during non-working days was reported to positively influence opportunities for physical activity. Participants spoke of more relaxed schedules and often more varied physical activity than during work day routine. Daily steps on work days were examined against daily steps on non-work days for two participants reporting increased physical activity during the weekend (their days off).

“Well I walk the dog during the week so I suppose that’s a brisk walk for about half an hour in the morning...At the weekend [I’m] generally more active because we’d be outdoors more, maybe doing a bit more sailing, maybe doing things about the house or fixing boats or jumping in and out of dinghies when we’re cruising...A typical weekend day I suppose would be getting up at a similar sort of time, again going out walking the dog; maybe a longer walk because time allows because I’m not too keen on sitting around doing nothing.” PAW08, male aged 60, west Wirral (10,845 average daily steps)

PAW08 demonstrated accurate perception of his increased activity on non-work days, accumulating on average 11,645 daily steps on days off versus 10,507 during work days. Whilst not greatly different, there was an increase of 1,138 daily steps on average on a weekend day. Conversely, PAW30, a male participant aged 38 from east Wirral, also reported increased physical activity on non-work days. His objectively measured accumulated average daily steps was 10,076 steps on work days and 7,326 steps on non-work days. PAW30’s average daily step count on work days *and* days off were both lower than the sample average of 11,483 daily steps ($SD = 4345.85$). This was another instance where it was not possible to explore the discrepancy due to concurrent quantitative and qualitative data collection. Data analysis took place at a later date and, therefore, the student researcher was unaware of the discrepancy during interview.

4.4 Concept 3: Intrinsic motivations

4.4.1 Volition toward physical activity

Participants spoke of inner drive supporting physical activity; the personal inclination to be active. The fact that inclination can also wane, and/or be hindered by perceived and tangible barriers was also described. Personal volition was reported to either support or hinder engagement with physical activity, dependent on the individual themselves and the presenting circumstance. The notion of personal volition was described as inherently fluid and subject to change.

“More sort of just what you feel like doing on the day...wake up and open the blinds and if it doesn’t suit me, yeah I’m not doing it.” PAW28, female aged 45, east Wirral (7,516 average daily steps)

“There are obviously times where I have been on the road and I get in and could possibly go on that walk...but I just feel too tired. But I think that’s in your head and not physically because I’ve done nothing all day; I’ve sat in the car all day, I’ve sat in meetings all day, so mentally drained. Which I don’t believe excuses you for being physically drained so I could possibly push myself...and do that last walk.” PAW20, female aged 53, east Wirral (6,897 average daily steps)

PAW28 and PAW20 both accumulated below average daily steps ($M = 11,483$, $SD = 4345.85$). Conversely, PAW03 spoke of his personal inclination toward and enjoyment in being physically active. He accumulated 24,269 daily steps, the highest accumulation in the sample; 2,727 more steps than the participant with the second highest accumulation.

“I do enjoy being active; enjoy walking. I would say certainly an inclination there. I’m working as well so I’ve other things to do but you know if I had more time I’d probably do more walking. Still I see people at work using lifts to go up and that really irritates me; I think you could be using this opportunity to be taking the stairs. It depends...very much on your character type I suppose.” PAW03, male aged 53, east Wirral (24,269 average daily steps)

4.4.2 Responsibility for self

Taking responsibility for oneself and engaging in physical activity was described as highly subjective and unique to the individual concerned. Preferences toward being either physically active, or physically inactive, were attributed to the person themselves, influenced by interconnected intrinsic and external factors. Participants describing a high sense of responsibility for self accumulated greater volumes of daily steps than those not mentioning a sense of personal responsibility.

“I’m a type A personality. So I think I’m quite organised and I think, ‘like ok, I want to change this’ and I’ll put things in place to do it. Whereas my partner, he’s a type B personality and it’s always easier for him to sit on the sofa and do it tomorrow; everything can wait until tomorrow. He wants to lose a bit of weight...he eats healthily because I do all the cooking but getting him out of the door to actually do the exercise is really difficult and I think if you’ve got a personality like that where’s it’s ‘oh you know, it can wait until tomorrow’, that’s really difficult to break those habits.” PAW24, female aged 28, east Wirral (16,605 average daily steps)

PAW24 accumulated 16,605 average daily steps, exceeding the sample mean ($M = 11,483$, $SD = 4345.85$). She described an awareness of the positive impact of her own personality characteristics on volition to engage with physical activity. She expanded on her perception of personality type and volition, describing the influence of character type on propensity to engage with incentives to encourage physical activity.

“I’ve got another friend who’s got exactly the same Garmin...we got exactly the same Garmin at the same time and she abandoned it within a week. She was like ‘it kept telling me to move and I couldn’t cope with it, it was just too much.’ She felt it was too much pressure on her. She’s what I call a type A personality but she’s the other end [of the scale] so, like, if you put too much pressure on her she just crumbles whereas I kind of rise to the challenge.” PAW24, female aged 28, east Wirral (16,605 average daily steps)

4.4.3 Awareness of own activity patterns

With regard to general awareness of their own physical activity levels, participants spoke broadly positively regarding their experience of using Fitbit Charge HR. They reflected on whether or not wearing the device had influenced their physical activity behaviour. A small minority described wearing the Fitbit as having no influence on physical activity during their seven day monitoring period. The majority reported the Fitbit to have had a positive impact on their week, with increased awareness of daily activity and understanding of their own body, including fluctuations in heart rate throughout the day and accumulation of steps during work days and days off.

“[It’s] a self-awareness thing...they’re excellent. I think it’s a benefit because people are becoming aware. I think they’re very positive. I didn’t realise just how sedentary...I can be at times. It’s definitely made me become more active. I haven’t had my personal one [Fitbit] that long but I do think it’s made a difference; well it has, I have started to change my lifestyle. Because nothing’s changed except that really my circumstances are still the same but now I’m actively doing something about it. I’m starting to move more and my physical activity is increasing and it’s definitely because of the Fitbit.” PAW09, female aged 58, west Wirral (6,382 average daily steps)

Participants spoke of increased physical activity during and following their activity monitoring period. Certain individuals owned their own physical activity monitor and others described their intention to purchase one following study involvement, having enjoyed the experience.

“As soon as I put it [the Fitbit] on I thought ‘oh my gosh this is amazing’. I really want one myself now because I feel like, I don’t know how to describe this without sounding weird, but I feel like since I was wearing it I felt a lot healthier in myself. I don’t want to give it back; I loved it.” PAW21, female aged 20, west Wirral (9,880 average daily steps)

Whilst for many participants the Fitbit encouraged physical activity, it was suggested by some that engagement with activity monitors may not appeal to everyone and may lack longevity. Certain participants had experienced physical activity monitors previously and reflected on using both their own unit and the study device.

“Initially it was almost like a drug, so initially I couldn’t stop looking at it and checking what had happened and what had gone on; looking on the information on the Fitbit, looking at the information on the app. And then that kind of lasted, probably that really intense [period] probably lasted maybe a month or 3 weeks...until it was more kind of checking in every day and keeping track, and then [it] really tailed off after probably six months or so.” PAW18, male aged 46, west Wirral (6,396 average daily steps)

“I wasn’t terribly interested in the information it gave me. I think a lot of people would be interested in the information...and it would be useful for them to see how active, inactive or otherwise they are. But I don’t think it’s a long term thing; I think it is the type of thing that would interest people for a bit and I’m not sure how many of these things [Fitbits] end up thrown in the back of a drawer once the initial interest is gone.” PAW08, male aged 60, west Wirral (10,845 average daily steps)

4.5 Summary: Chapter four

This chapter has focused on the influence of personal environment features on physical activity; primarily the influence of individuality and perception. Whilst personal volition to engage with physical activity originates from intrinsic factors, individuals are also influenced by external factors. Chapter five will focus on the impact of social environment features on engagement with physical activity; the manner in which people around us may influence activity behaviour. Firstly, the main results from chapter four have been summarised in table 4.5 overleaf, to highlight core discussion points from this chapter. Summary tables are presented in chapters five and six on pages 98 and 121, respectively. These summaries are intended to provide an overview of the essence of each chapter in relation to core concepts presented. Interpretation and discussion of full study results is presented in chapter seven.

Table 4.5 Influence of personal environment on physical activity

Personal environment and physical activity: Core results
Perception of what constitutes physical activity can influence engagement
Perceived benefits of physical activity for health and ageing can encourage action
Engaging in structured daily routine can support physical activity
Habituated physical activity can encourage regular engagement
Personal volition toward activity can fluctuate with changing circumstances
Responsibility for self can influence engagement with physical activity
Increased awareness of own physical activity can encourage future engagement

Social environment and physical activity: Companionship and cohesion

*“Humans are social beings, and we are happier, and better,
when connected to others.”*

Paul Bloom

5.1 Social creatures

This chapter will focus on the second theme identified during qualitative data analysis; the influence of companionship and social cohesion on physical activity. To begin this section, the author would like to share their own views on how these two entities may influence daily routine. The following two paragraphs comprises purely the author’s own thoughts, in the manner described on page 71. This reflexive process is repeated at the beginning of chapter six, to indicate the author’s epistemology and the perspective from which this chapter is approached.

As inherently social creatures, humans thrive on support from other people. Whether moral, emotional or practical in nature, and either in close proximity or from a distance, we are buoyed by the collective strength of companionship. Whilst it is healthy to feel comfortable in one’s own company, there are times at which a listening ear or reasoned debate can boost confidence, clarify thoughts and keep us on track. Although individuality and unique perception ultimately colours our experience of the world around us, support at the right time can help overcome surmountable obstacles, lessen concerns and enable us to proceed with renewed strength, purpose and a sense of wellbeing.

The majority of people grow up in the company of others, who will likely influence their thoughts, behaviour and understanding, whether consciously or unconsciously. From early years through to older age, we learn from our own experiences and from the experience of others, to form habits and routines; some healthy, some less so. Our unique roles in life also play a part in daily routine, requiring us to understand and fulfil what is needed from us in any given role; be that of son, daughter, sibling, parent, headmaster, peer, line manager and so on. The ability to fulfil our many roles contributes to overall health and wellbeing and the ability to contribute to society

and the social groupings important to us. This chapter focuses on the impact of other people on our volition and ability to engage with physically active occupations as part of a balanced lifestyle.

Table 5.1 provides an overview of qualitative coding themes identified during thematic analysis and organised in this chapter under the overarching theme of ‘the influence of social environment features on physical activity’. This theme comprises two sub-themes of ‘companionship’ and ‘social cohesion’. This chapter is organised around these two sub-themes and the degree to which companionship and social cohesion influences daily routine and physical activity.

Table 5.1 Social environment and physical activity thematic coding content

Theme concept	Theme content
Concept 1: Early social experiences	School days and learned behaviour
Concept 2: Responsibility for others	Caring responsibilities Dog ownership responsibilities
Concept 3: Companionship	Physical activity in company Competition with self and others Physical activity through public events
Concept 4: Connected communities	Community-based physical activity Community-based cohesion

5.2 Concept 1: Early social experiences

5.2.1 School days and learned behaviour

When asked to describe their own physical activity patterns, many participants spoke of coming from an active family and having enjoyed active family activities from a young age. PAW24, however, a female participant aged 28 from east Wirral, was less keen on physical activity during childhood and changed her habits later in life when asked to complete a physical activity questionnaire during a routine health check. It was at this point that she began to reflect upon her physical inactivity. PAW24

described her belief that healthy habits adopted at a young age are more likely to be sustained during later life and should therefore be encouraged and nurtured.

“When I was school I was completely inactive. I always avoided games; I’d do anything I could to get out of games at school. I think there’s a lot comes from childhood; I think kids aren’t encouraged enough...When I was at school the kids that were good at sport were encouraged to do sport...I wasn’t brilliant at sport so no-one encouraged me to do it...I think kids need to be encouraged just to do sport for the sake of doing sport, so if you get into those habits as young as possible then maybe that’s better, you know [to] take forward through life.” PAW24, female aged 28, east Wirral (16,605 average daily steps)

The concept of habituated physical activity through learned behaviour during childhood was described by many interview respondents. Children learning habits from those around them, including dietary and physical activity habits, was spoken of as a core factor influencing development of healthy behaviours early in life. These behaviours may then be consolidated throughout the lifespan as part of daily routine.

“I have come to the conclusion that most of this [physical activity habits] is to do with your parenting and what you’ve grown up with. I think to a greater or lesser extent the amount of physical exercise that you do is determined by your early life experiences. Such that if you grew up with that being an important part of what you did as a kid, if you saw your parents doing that sort of thing then I suspect you’re more likely to continue that for most of your life. I think it’s habitual and learned behaviour...I think people’s perception of normal is part of that thing that they learn very early on. I think there are a lot of people who may have grown up in households where people sit and watch the telly all night who regard people who go out to the gym or go and play football three times a week as not normal, because that’s not what they’re normally used to seeing and doing.” PAW07, male aged 44, west Wirral (15,914 average daily steps)

5.3 Concept 2: Responsibility for others

5.3.1 Caring responsibilities

Many participants spoke of caring responsibilities influencing their daily routine and time available for physical activity. PAW09, a female participant aged 58 from west Wirral described on page 74, described the challenging balance between work commitments, caring responsibilities and home life. She further elaborated on the way in which responsibility for an older relative and also children living at home, influenced her own routine.

“I tend to have one non-working day a week and that’s normally taken up with domestic things. And my mother’s not very well at the moment so it’ll always involve a visit there and doing bits there at the weekend...the last six months has been [focused] around my mum’s care mostly. But in the past, for probably about a month, is when I have been trying to walk daily if I can; it mightn’t be far but I’m trying to build that up. Time is my biggest barrier definitely, we’ve got two adult children but they’re still at home [and] it’s a busy home life. Obviously I’m restricted with caring for Mum at the moment and being busy here [at work], so time is the huge barrier.”
PAW09, female aged 58, west Wirral (6,382 average daily steps)

PAW07, a male participant aged 44 from west Wirral, described his role as a busy joint parent with three school age children and full time employment across two work locations. He reported commuting to work by bicycle on occasion, alongside enjoying running and various active family activities. PAW07 accumulated on average 15,914 daily steps, above the sample mean ($M = 11,483$, $SD = 4345.85$). Having cited his parental role as influencing his ability to engage in as much physical activity as he may like, PAW07 described incorporating physical activity into family routine. This ensured that opportunities to be active were maximised and physical activity was something to be shared and enjoyed together with family members.

“Sometimes I’ll go for a run on the prom and that’s basically on my own. Increasingly I’m taking my daughters to the Parkrun on a Saturday or Sunday morning in Birkenhead; we do it together so that’s social...But we also as a family do physical

things together, so we'll go for a walk, we'll go for bike rides, those sorts of things."

PAW07, male aged 44, west Wirral (15,914 average daily steps)

Sharing physical activity with family members was a concept reported by many participants for whom responsibility for others was a priority. PAW09, quoted on page 89 with regard to caring responsibilities, spoke of trying to combine physical activity with regular family time. This enabled her to engage in physical activity whilst maintaining her ability to fulfil her various caring roles.

"Well I've been walking with my husband, so then that's our time as well to catch up on things and that's actually been one of the major benefits of us walking and being together, and catching up on things with such a busy lifestyle." PAW09, female aged 58, west Wirral (6,382 average daily steps)

5.3.2 Dog ownership responsibilities

Participants also spoke about dog ownership in the context of taking responsibility for exercising them, and therefore dog ownership in itself was an incentive for physical activity. Responsibility for their dogs' mental and physical wellbeing was described as taking priority over personal disinclination toward physical activity on any given day. Owners spoke of habituated dog-walking activity, driven by both responsibility and personal enjoyment.

"Obviously when it's a lovely sunny day it's absolutely gorgeous to be out walking. And then in the middle of winter when its pouring down it's a chore, but when you've got a dog you've got to get out and do it...You could quite happily just hibernate in the winter, couldn't you?" PAW11, female aged 46, Rock Ferry, east Wirral (12,675 average daily steps)

"The dog walking; yes it doesn't matter whether it's raining, blowy, freezing cold, we still do that. And he is a hobby as well, because I still work with him. It's not a case of a dog walk to empty the dog, it is a dog walk because he needs walking and I enjoy working with him. And getting the feedback from him as he's good at that. So I enjoy keeping up his training." PAW34, male aged 56, Hoylake and Meols, west Wirral (14,330 average daily steps)

5.4 Concept 3: Companionship

5.4.1 Physical activity in company

When asked to describe what encouraged participants to be physically active, every interview respondent identified the company of others as important to them. Taking part in physical activity with another person, or group of people was reported to inspire action and increase enjoyment. Many respondents reported that they were more likely to engage in physical activity if they had a companion to participate with. Enjoyment of the social element of physical activity was a recurrent theme.

“I’ll always go to a class if I know my friends are going and if it’s just me I will um and ah about it and I will think twice about it. So yes 100%, the social thing is massive, especially for women I think. Because you know it’s hard to make, like, new friends and stuff these days if it’s not at work or if it’s not a friend of a friend...so the social thing is brilliant.” PAW39, female aged 29, east Wirral. (9,188 average daily steps)

Many participants continued by saying that the positive social element of physical activity in the company of others had, in turn, inspired increased volition to engage in future physical activity, thus effecting a positive activity cycle. Habituated physical activity in the company of others was identified as a facilitator for keeping active. Participating in a group occupation at a set time supported engagement and maintenance of a structured schedule.

“I always like to get involved with people associated with physical activity...I think you unite around physical activity so the social side is massively important. And I think if you’re around your friends who are physically active you generally tend to be [active] as well...I think physical activity is becoming more of a social scene.” PAW33, male aged 28, east Wirral (14,206 average daily steps)

“I think when there’s activity where it’s just myself, like going out for a walk, it’s easy to dismiss it and think ‘I’ll do it another day’. Whereas activities where there’s a particular class at a certain time, you either go or you don’t and you’re not going to be able to do that another day at a different time. Sailing’s a good example; if you

want to go and sail in that class, that's when it is. Nobody's going to rearrange that race for you." PAW18, male aged 46, west Wirral (6,396 daily steps)

Many participants reported that they were less likely to cancel pre-arranged activities when it may impact upon another person's schedule. Prior agreement was reported to ensure that the shared activity took place and the subsequent positive intrinsic feedback preserved the ongoing activity cycle.

"I think if I'd booked in advance a squash game on a Wednesday night, even if I was feeling knackered I'd still go...I would be much more likely to go because I'd set a date. Whereas if it's just up to me to decide at 9 o'clock on a Wednesday night whether I get off my backside and go for a run or not, increasingly I'm much more likely to decide not to." PAW07, male age 44, west Wirral (15,914 average daily steps)

5.4.2 Competition with self and others

The topic of competition was raised by many participants as an incentive to engage with, and in certain cases improve upon, techniques and results of individual physical activity. Skills development and observed progression was cited as an important element of ongoing activity enjoyment. Participants described enjoying a degree of competition with oneself and others, enjoying skills development, activity mastery and the intrinsic incentive for further activity. PAW34, a male participant from west Wirral described his own competitive nature, which supported him during engagement with physical activity. He accumulated on average 14,330 daily steps. This was above the sample average of 11,483.

"I'm quite competitive you see, with myself and with others, well more with myself, because I know I want to do things and I want to do them quite well. That's why I'm frustrated with the [catamaran] sailing; I don't do it very well. Whereas the cycling, all it means is 'just keep pushing; just keep pushing, just keep pushing', you know...I was fourth out of all the hundreds of people who'd ridden that leg!" PAW34, male aged 56, west Wirral (14,330 average daily steps)

"Being in a running club makes me more active. Going on Strava makes me more active. Because you see other people doing stuff and that makes you do stuff, in a

friendly way. I don't try to compare myself to other people but it's good to have people [and] seeing what they're doing. You're seeing what pace they're running, what activities are on and you're like, 'well I want to try and be as good as them', so it's friendly competition I think...definitely that social aspect." PAW24, female aged 28, east Wirral (16,605 average daily steps)

Certain participants mentioned ownership of their own Fitbit, and engaging in competition with others via the online Fitbit Community platform. Social fitness networks such as Strava were mentioned as technologies used to support physical activity and facilitate information-sharing with others.

"I had one [Fitbit] two years ago and we had a competition going with all the lifeguards in here. So I was walking everywhere and I'd be walking round the pool, then on my break I was walking round the building. I was knackered; I didn't win, I came third...I did carry on walking quite a lot after the competition." PAW31, female aged 51, east Wirral (6,145 average daily steps)

5.4.3 Physical activity through public events

Many participants spoke of their enjoyment of large-scale public events and group activities. Parkrun was the group activity most often cited, with many participants having either taken part themselves or describing their awareness of the social phenomenon. Parkrun was described as inclusive and enjoyable, regardless of age or level of fitness. The popularity of organised public events was identified as an incentive for engagement; the opportunity for collective group activity. Success of group activities was attributed to wide-reaching appeal to all ages and abilities.

"It doesn't matter how long it takes them. It's really supportive, it's brilliant; I love it. You get kids who are five or six doing a whole 5K so it's a real mix of abilities and a mix of shapes and sizes. Club runners, non-club runners, people with buggies, people with dogs, people walk, or run; it's just all sorts. Yes Parkrun I think actually has made a difference...And I think because it's at a set time every week it doesn't matter if you miss one. Nobody's judging you; that really encourages people." PAW24, female aged 28, east Wirral (16,605 average daily steps)

“Parkrun isn’t like a money-making organisation or anything like that. It’s just for the benefit of all and The Ramblers are the same; just encouraging people to get out. So that’s really good but yes Parkrun is great... [My daughter’s] at an age now where she can come and do that; we can do that together. And [my son] not quite yet but probably in the next year or so and again that appeals to me a lot; being able to go out and us all have a little trot round the park on a Saturday morning.” PAW18, male aged 46, west Wirral (6,396 average daily steps)

The appeal of Parkrun was widely reported. Its evolution as a voluntarily-led public event were described as key to its success. Certain participants highlighted their belief that some individuals do not welcome imposed pressure from national organisations to be physically active. They suggested that more often individuals are more open to engagement with spontaneous, informal events.

“I’m fascinated by the Parkrun phenomenon. You know, I haven’t read a lot about it but my understanding is that it’s essentially all voluntary and been set up by enthusiastic people. But you could easily see how that sort of thing could be expanded in parks and open spaces, well beyond just running. Almost always these things are more successful when they’re just kind of spontaneously led, as opposed to some government campaign telling you [that] you ought to. I suspect if the Parkrun had been led by some kind of series of public health videos on TV, it would be much less successful than just having spontaneously come from nowhere.” PAW07, male aged 44, west Wirral (15,914 average daily steps)

One participant described her involvement in Swim22, a charity swimming event for Diabetes UK. She expressed support for public events which inspire individuals who may not usually be interested, or confident, to consider participation.

“I think things like the Olympics, when it was in London, that was like a big surge of loads of people getting active. I think it was a social thing, like everyone likes getting involved in something bigger... Things like that get more people that wouldn’t normally, so it’s big charity things... like Tough Mudder. Yes so they look brilliant but they would get people who would never do a marathon or never do a 5K to do a 5K,

because it's a different kind of thing." PAW36, female aged 20, west Wirral (10,142 average daily steps)

A number of participants spoke of national campaigns designed to improve health and wellbeing. There was a mixed response to initiatives from government organisations. Whilst certain participants spoke positively of publicised health interventions and initiatives such as Change4Life, others were less supportive and expressed uncertainty regarding response to perceived pressure, as described by PAW07 on page 94. PAW22, a female participant from east Wirral expressed positivity toward public initiatives to increase physical activity. She accumulated on average 18,997 daily steps; above the sample average of 11,483 ($SD = 4345.85$).

"You know, to see campaigns on the TV to get you up and walking...this is where I heard that tip; it was a news bulletin about parking furthest away [in a shop car park]. It was a gentleman that had diabetes and was overweight and realised obviously he had to something about it, and that was very enlightening. So I think case studies like that and research that highlights it to you...can change your life and you can do something different to enhance it." PAW22, female aged 59, east Wirral (18,997 average daily steps)

5.5 Concept 4: Connected communities

5.5.1 Community-based physical activity

When asked what encouraged physical activity within their community, interview respondents highlighted the importance of public awareness of local events, to generate support and involvement. Awareness of a variety in activities to facilitate broad appeal was cited as key to generating interest and support for local events. Certain Wirral wards were described as being community-friendly and advertising local events well. The topic of neighbourhood characteristics and differences between individual Wirral wards is explored further in chapter six.

"I think variety; perhaps if there were some things on offer. I saw the noticeboard [here; Hoylake] and I thought oh wow, they've got a lot more here than they have in West Kirby. So then I thought...when I get home I'll go on their website and see what clubs they do...If I see any activities that are on in the community I might join in, if

something takes my fancy. I haven't done anything recently but things like, you know, Tai Chi [and] I did enquire about Clubbercise." PAW02, female aged 41, west Wirral (7,187 average daily steps)

A number of respondents described awareness of opportunities for outdoor physical activity in Wirral. They provided positive feedback of combining physical activity with one of Wirral's most prominent features; the beach. Outdoor versus indoor physical activity is explored further in chapter six. The concept of free versus paid-for opportunities for physical activity was highlighted by PAW34, a male participant aged 56 from west Wirral. He described the potential for increased involvement in low-cost, beach-based activity, which he believed could prove popular. Whilst the topic of financial outlay for physical activity was mentioned briefly by some, the direct cost of physical activity itself was not a prominent theme in this sample.

"If there were more things, I think like the classes that you can kind of see going on in parks or in local areas...that might encourage more people to do it. Because you can see a group of people having fun and then want to get involved...I think if it's more kind of a social thing then more people will be up for doing it." PAW40, female aged 25, east Wirral (10,113 average daily steps)

"I know at West Kirby there is somebody who runs [physical training] sessions where they put hoops out and people go along and do the exercises on the beach...Yes, so there's a boot camp there and if that was...more wildly publicised and let's say that was an activity that was provided free of charge, I think more people would go." PAW34, male aged 56, west Wirral (14,330 average daily steps)

One participant described her support for gardening as a positive physical activity for mind and body. The direct engagement with nature was cited as both physically advantageous and relaxing, with sensory and social benefits. Engagement with the natural world is explored further in chapter six. Community gardens were suggested as an initiative through which neighbours may unite and experience the multi-factorial benefits of gardens, gardening and growing local produce.

"It's very relaxing, it's very grounding; it's very 'going back to nature' which helps you to de-stress. Things like that I think would be very good. I think it would be good for

mental health. We haven't got community gardens [in Heswall]; that's what I think would ideally be good...Organisations could have a communal garden or a plot that people can go to and actually see things growing and then taste them." (PAW29, female aged 58, west Wirral (11,012 average daily steps)

5.5.2 Community-based cohesion

Communities rallying round a common goal was described by one participant in the context of gardening. PAW14, a male participant aged 56 from west Wirral, described cuts to local council spending budgets. He described having taken responsibility for the public greenspace surrounding his property as a result. Having cited gardening as one of his main physical activities, he described the outcome of having invested time and effort for the benefit of his family and neighbouring community.

"I actually look after the roundabout now; I cut the grass and prune the tree...There is a path that goes round the back of our house, and people walk their dogs and what not. And I've found that if I cut the grass at the back of the house, if it's short, less dog waste is left, so I cut the grass...Well actually what's happened is, because I've started doing that, other neighbours started joining in a little bit and they've been cutting the area behind theirs. Because like what I said before...I've noticed, because I started taking a bit of pride in what's behind my house, which I don't see unless I actually walk round the back, other neighbours have sort of jumped on the bandwagon a little bit. Yes so I'm quite pleased with that." PAW14, male aged 56, west Wirral (21,542 average daily steps)

Many participants described the snowball effect of social physical activity and the positive cycle involvement often generates. Companionship was reported not only to enhance enjoyment of the experience but also to positively influence volition to engage in social activities in the future.

"Once you feel more involved, more connected, you're more inclined to meet somebody and say, well actually I wouldn't mind going for a stroll or going on a bike ride, or going on a coach trip and walking along a river" PAW29, female aged 58, west Wirral (11,012 average daily steps)

5.6 Summary: Chapter five

This chapter has focused on the influence of social environment features on physical activity; primarily the influence of companionship and social cohesion. Chapter six will focus on the impact of physical environment features on engagement with physical activity; the manner in which our physical surroundings may influence activity behaviour. Firstly, the main results from chapter five have been summarised in Table 5.6, to highlight core discussion points from this chapter. This summary is intended to provide an overview of the essence of chapter five in relation to core concepts presented. Interpretation and discussion of full study results is presented in chapter seven.

Table 5.6 Influence of social environment on physical activity

Social environment and physical activity: Core results
Early social influences during childhood can shape physical activity habits
Social roles and responsibilities can influence engagement with physical activity
Companionship during physical activity can promote regular engagement
Awareness and accessibility of opportunities to be active locally is influential
Community cohesion during active occupations can encourage engagement

Physical environment and physical activity: Activity-friendliness

“We are what we see. We are products of our surroundings.”

Amber Valletta

6.1 Our physical world

This chapter will focus on the third theme identified during qualitative data analysis; the influence of neighbourhood activity-friendliness on physical activity. To begin this section, the author would like to share their own views on how features of the physical environment and neighbourhood activity-friendliness may influence daily routine. The following two paragraphs comprises purely the author’s own thoughts, in the manner described on page 71. This reflexive summary is presented to indicate the author’s epistemology and the perspective from which this chapter is approached.

The physical environment surrounds us. Its influence on daily life cannot be underestimated, nor avoided. From natural phenomena to man-made infrastructure, our physical environment can either enable or hinder physical activity, dependent on the individual themselves and their mental and physical capacity to engage and overcome challenges arising. Whether engaging in indoor or outdoor occupations, physical environment features can change the nature of our experiences. These experiences may then colour our reflections and judgement when considering future engagement.

The potential health benefits of physical activity in natural surroundings is balanced by the practical importance of purpose-built infrastructure, often thoughtfully designed with safety, utility and aesthetics in mind. Seasons and weather can affect activity choices, timings and possibilities, fluctuating throughout the year and influencing daily routine. Maintenance of our shared public resources and local neighbourhood interventions can either help or hinder engagement with physical activity, often receiving mixed responses. Whether we enjoy the area in which we live or aspire to live somewhere different, our physical environment affects us daily.

Table 6.1 provides an overview of qualitative coding themes identified during thematic analysis and organised in this chapter under the overarching theme of ‘the influence of physical environment features on physical activity’. This theme comprises two sub-themes of ‘companionship’ and ‘social cohesion’. This chapter focuses on the degree to which features of the physical environment and activity-friendliness influences daily routine and physical activity.

Table 6.1 Physical environment and physical activity thematic coding content

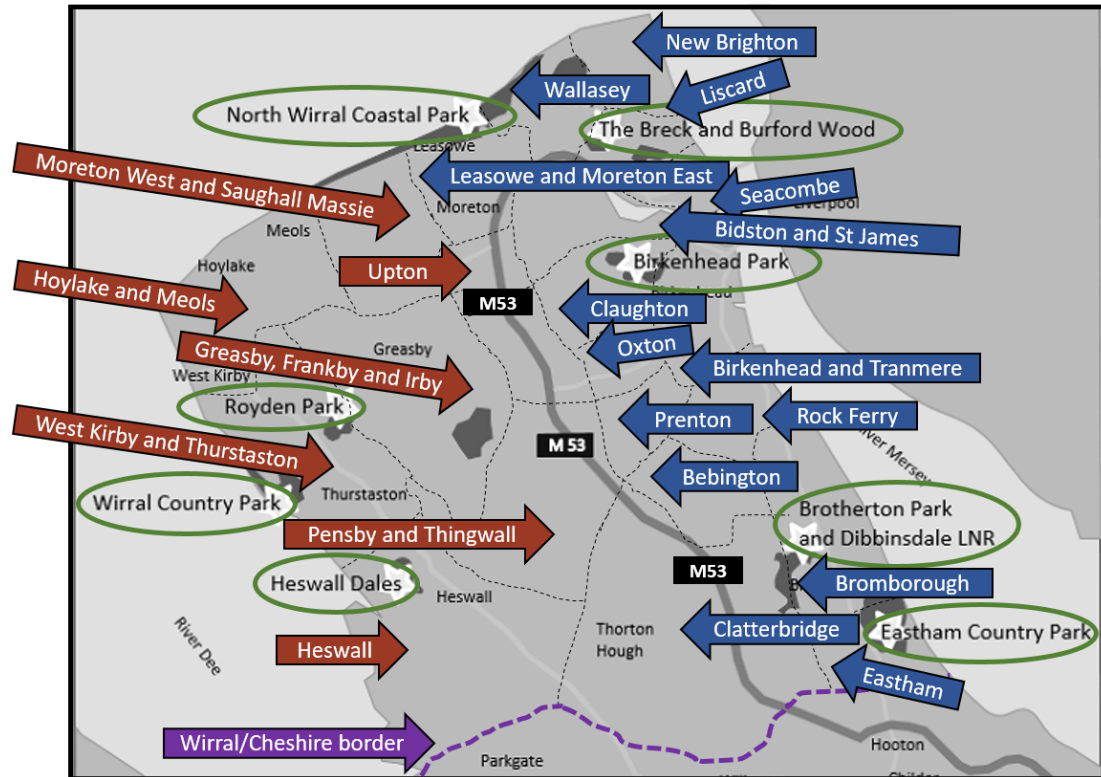
Theme concept	Theme content
Concept 1: Neighbourhood reflections	Neighbourhood past and present
Concept 2: Wirral activity-friendliness	Public physical activity resources Neighbourhood influence on physical activity Neighbourhood safety Opportunities for physical activity
Concept 3: The natural world	Outdoor versus indoor physical activity Influence of seasons and nature
Concept 4: Wirral descriptions	Perception of individual Wirral wards Perception of Wirral as a borough

Firstly, to provide geographic context for this chapter, figure 6.1 overleaf presents a map of Wirral with dashed lines indicating electoral ward boundaries. Wards are indicated by named arrows. Blue indicates wards in east Wirral. Red indicates wards in west Wirral. The M53 motorway divides the borough north west to south east. Four wards span both east and west Wirral, but in the PAW study, postcodes were used to denote residence of east or west, therefore arrows have been coloured according to participant postcode.

Certain town names are visible on the map. Electoral ward boundaries span town boundaries and can include multiple towns. Major greenspace is also indicated on the map, denoted by named green ovals. These areas were spoken about by certain participants during interview and names may be familiar from interview excerpts. More minor areas of greenspace are not indicated on the map, for example smaller

parcs and gardens. The map should provide context for discussion within this chapter and facilitate deeper understanding of the wards described by participants. Home ward details are provided alongside quotes in this chapter.

Figure 6.1 Wirral electoral boundaries and major greenspace



6.2 Concept 1: Neighbourhood reflections

6.2.1 Neighbourhood past and present

Participants were asked to describe the area in which they live. Interview respondents were free to interpret the question in a way meaningful to them. Alongside literal descriptions of rural, urban and suburban features, many reflected back on changes to their neighbourhood over the years and the ways in which they continue to make use of their physical environment.

“I’ve got lots of lovely memories of New Brighton open air baths, but again there’s so much more. The amenities in New Brighton now are absolutely spectacular... We’ve always had the Floral Pavilion but that’s been updated now, so we’ve got a theatre,

pictures, restaurants, wine bars, shops; all within walking distance.” PAW20, female aged 53, New Brighton, east Wirral (6,897 average daily steps)

“We’ve been in the house 34 years and the children have been brought up on that promenade. From their prams to scooters, to bikes, to roller skates and they’ve all used it.” PAW22, female aged 59, New Brighton, east Wirral (18,997 average daily steps)

Opportunities for social engagement within participants’ local neighbourhood was mentioned by many, often in relation to shared resources and amenities. Participants spoke positively regarding neighbourhood opportunities for social and physical environments to unite. Shared facilities were described as offering individuals the opportunity to congregate and feel part of the community.

“I feel like Hoylake is a real little community that talk and socialise together and they say ‘ok right’; they all come together [and say] let’s do this, let’s do that, let’s hold an event. And they put flyers and posters everywhere so they have their own little schemes and programmes. I would love it if Upton just came together and did, like, an activity event or something physical like a little sports day for kids and stuff like that. I think that would be absolutely great because Hoylake do it all the time and [also] West Kirby...so I think that’ll be so good to do it in Upton or Bromborough or, you know, like different parts of the Wirral. Just to do it locally, instead of every one just going to one place.” PAW21, female aged 20, Upton, west Wirral (9,880 average daily steps)

“It’s great, it’s quite like a village feel. Everyone knows, or knows of each other and it’s quite friendly; there’s a lot going on in the community. They do a lot of stuff in the village such as summer fayres. They do, like, this Oxton garden thing, where everyone does their garden up and you can open your garden up and people can come and see your garden and...donate to a charity, which is really nice and it’s really popular. They close all the roads off and it’s like a bit of a party in the street afterwards. Obviously when the Royal wedding was going on they had a bit of a street party for that and all the local businesses opened up and gave discounts and stuff...It’s quite a friendly

neighbourhood with lots going on.” PAW39, female aged 29, Oxton, east Wirral (9,188 average daily steps)

One participant described a lack of opportunity for community integration due to a perceived lack of shared neighbourhood amenities. PAW36, a female participant from west Wirral described Moreton West and Saughall Massie as lacking in local amenities which provide an opportunity for community members to interact. She spoke of the local pub having recently closed and described one remaining shop offering little opportunity to engage with others. As someone who had recently moved to the area, she reflected upon the lack of opportunity for locals to get to know one another.

“Maybe something more to create a social [scene], like there was a pub just round the corner but they’ve just lost that. So I think something like that to get social people in and then you’re more likely to socialise once you know people. Because it’s a bit isolating, like if you don’t know someone round here, you’ll never meet them...I think that’s what’s missing [is] there’s no community place. Like the best is a fish and chip shop and they all know each other because they’re all regulars...if you walk in it’s a bit like, ‘oh, new person’.” PAW36, female aged 20, Moreton West and Saughall Massie, west Wirral

6.3 Concept 2: Wirral activity-friendliness

6.3.1 Public physical activity resources

Interview participants were asked to identify and describe shared neighbourhood physical activity resources. The majority identified outdoor spaces, free of charge and available to all. Leisure centres were mentioned secondary to outdoor physical activity opportunities. Many described shared resources appropriate to all ages, some with physical activity equipment, some simply open spaces in which to be physically active.

“We have a green area where the kids can go and play. They can run round, we have we have a game of cricket, we have a game of football.” PAW30, male aged 38, Leasowe and Moreton East, east Wirral (8,111 average daily steps)

“I live about two seconds away from a big field...[with] organised football pitches and things...They have lots of football leagues; things for children right through. There’s a very active, very modern playground for children; from infants right through.”
PAW29, female aged 58, Heswall, west Wirral (11,012 average daily steps)

Wirral is located on a peninsula, with a coastal path beginning at Seacombe in north east Wirral and following the coast west toward Thurstaston in south west Wirral. As the path negotiates West Kirby, at the north west tip of the peninsula, it begins to follow a disused railway line. At this point the path becomes known as Wirral Way. The coastal path extends past Thurstaston and continues on to Hooton in Cheshire. The point at which Wirral Way veers inland at Thursaston is the recognised end of the coastal path.

Wirral’s numerous public green spaces were mentioned frequently during interview. Wirral’s coastal path was the borough’s single most mentioned location for physical activity. Every participant mentioning the path spoke positively of its flexibility of use, its popularity and of their own regular usage. In the following excerpts, participants refer to the path by both of the names described above. The third recognised name for the coastal path is ‘the promenade’, or ‘the prom’. The promenade is the area between Seacombe and West Kirby, prior to the path connecting with Wirral Way. Figure 6.3 overleaf provides a visualisation of the path’s track around the Wirral peninsula. The fact that the coastal path was Wirral’s single most mentioned opportunity for public physical activity warrants closer review. Five individual quotes are therefore presented, each of which highlight the manner in which the resource is meaningful to the participant themselves and to their family, friends and the wider community.

“Within 100 metres of me I can be on the prom and then walk for seven miles without seeing a car, so that’s good...I think one of the motivators is having that great big prom that runs round the peninsular, because I think a lot of people choose to do even quite low level physical activity, just because it’s there...You do see lots of people just going for a walk on a Sunday and although that’s not enormous cardiovascular activity, I think if it wasn’t there and in areas where that sort of thing isn’t available,

they wouldn't chose to do that. I don't think they'd just walk round the block in Birkenhead for example, without a prom...I think that is an enabler...I choose to go for a run on the prom because it's quite nice to run next to the sea." PAW07, male aged 46, Hoylake and Meols, west Wirral (15,814 average daily steps)

Figure 6.3 Track of Wirral coastal path and Wirral Way



"That beach there [at Thursaston] is a really nice stretch, because that's...right next to the Wirral Way. That's a nice walk as well, yes we do that quite lot actually. I don't have a bike anymore but a few years ago we did have bikes, and when I did have a bike we all used to go on family bike rides...We still go onto the Wirral Way, just walk along it, get an ice cream and stuff like that, which is really nice." PAW21, female aged 20, Upton, west Wirral (9,880 average daily steps)

"I always cycle down to the shore. You know, it's an incentive to cycle there and then if you go west, then you can cycle all the way up to Parkgate, get fish and chips and then cycle back." PAW33, male aged 28, Leasowe and Moreton East, east Wirral (14,206 average daily steps)

“I like to go along the Wirral Way...I’ll either cycle or I’ll walk...I walk on the horse path at the side because it’s more interesting. It’s higher up, you can see the sea, you can see what the sea state is there, if there are any boats; you can watch the golfers.” PAW34, male aged 46, Hoylake and Meols, west Wirral (14,330 average daily steps)

“I run the Wirral Way quite a lot...[with] one of my best friends from college...I live at one end of the Wirral Way and he lives right at the other, so he’s miles away in a different county...He’s in West Cheshire and I’m here, so yeah, so I can go from one end to the other with him.” PAW32, male aged 37, West Kirby and Thursaston, west Wirral (14,350 average daily steps)

6.3.2 Neighbourhood influence on physical activity

Interview participants were asked to consider the manner in which physical environment features influence their physical activity. Many described their local neighbourhood as suburban, with a combination of housing and green spaces. They described easy access to public parks and natural greenspace throughout Wirral. Participants described positive neighbourhood aesthetics with no reports of physical environment features prohibitive to physical activity in their neighbourhood.

“I walk around this area and around Wirral. Yes I would say it’s very rural; leafy suburbia is a bit of a cliché but it is really and there is residential and light industry. It’s semi-rural as well; within five minutes you’re out into the countryside from where I actually live, so I get the best of both worlds really...It is an attractive area to walk...It doesn’t influence me [though]; I would it whatever.” PAW03, male aged 53, Clatterbridge, east Wirral (24,269 average daily steps)

Every interview participant described their own personal volition to engage in physical activity as outweighing any physical environment characteristics of their neighbourhood. All interview participants spoke of intrinsic motivation to take advantage of the physical environment features in Wirral. Every respondent spoke of Wirral’s coastline and greenspace.

“For me, the word ‘influence’...it’s only about my own...motivation and thinking ‘yeah, we live in a great little part of the world; I’ve chosen to live here, let’s use what’s

around and about us.' I think I'm more inclined because of where I live, because you know, it's nice, but the Wirral is nice. I was fortunate to grow up in Port Sunlight so fully appreciate it. There are parks and places there but we've got more than parks; parks are like the default aren't they, for any area. We've actually got natural green open space haven't we, that we can tap into, rather than, sort of manmade." PAW41, male aged 49, Leasowe and Moreton East, east Wirral (15,524 average daily steps)

The concept of individual perception and inherent subjectivity was raised by one participant directly. PAW38, a male participant from west Wirral described his own volition to engage, and the degree to which individuals may be influenced by environment features, as entirely personal. His own view was that he would choose to engage in physical activity regardless of physical neighbourhood attributes. He acknowledged that this view may not be shared by all. PAW38 accumulated on average 7,244 daily steps. This was below the sample average of 11,483 ($SD = 4345.85$).

"I don't think the neighbourhood affects me being physically active or inactive. It's again, it's down to the individual, not the neighbourhood...The neighbourhood doesn't restrict me going to do it if I want to do it...If it was a different area, different person, they might say a different answer but obviously it's my perception on that...Same person in a different area; possibly, it's subjective." PAW38, male aged 58, Upton, west Wirral (7,244 average daily steps)

6.3.3 Neighbourhood safety

Interview participants were asked to describe whether they felt safe in their neighbourhood environment. Respondents were at liberty to interpret the notion of 'neighbourhood environment' as they wished. Some spoke primarily of their local area, whereas others spoke of other areas of Wirral or the borough as a whole. Responses included references to pedestrian and cycling safety, safety from crime and fluctuations in activity behaviour between daylight hours and hours of darkness. Responses varied between participants and included reports of perceived safety, fear, perceived fear imposed by others and of feeling at ease in the neighbourhood.

“I wouldn’t say that I lived in a bad area, but travelling home from work, yeah, you see the youths; you see that and you think, no it’s not a nice area...If I was to go and visit a friend who doesn’t live far away once it’s dark, I think ‘I don’t want to walk home’. I don’t want to walk home alone because I don’t feel safe in that environment. But I wouldn’t say I lived in a really bad area, but yeah there’s something there that makes me think, after dark I don’t want to go out.” PAW28, female aged 45, Prenton, east Wirral (7,516 average daily steps)

“They’ve made areas, certainly around Leasowe and Moreton, very much more accessible. Some that would have been a little bit, sort of, off the beaten track that you’d have looked at them and thought, I don’t fancy walking along there on my own. But now there’s a proper footpath and you know where it goes from A to B, as opposed to sort of just wandering into the wilderness and thinking, ‘will I ever come back?’...I’m not in fear of my neighbourhood, but it’s just being aware...We quite often walk in West Kirby and Caldy and, you know, my general sort of feeling is that, you know, nothing particularly happens down in Caldy village, so I feel absolutely fine there. As opposed to perhaps when we walk to Seacombe; I’m a bit more aware of what...an area [like] Seacombe is.” PAW41, male aged 49, Leasowe and Moreton East, east Wirral (15,524 average daily steps)

One participant described restrictions imposed upon her by family members regarding physical activity in her neighbourhood. PAW22 (quoted below), a female participant from east Wirral, spoke of reduced footfall in her neighbourhood (New Brighton) during hours of darkness. This was an area described by many interview respondents as popular during the day. Many participants spoke of darkness as prohibitive to their own physical activity.

“I have three sons and a husband and I’m banned from walking in the dark...I went out last night in the rain at the last minute but had to be back by, at the latest, five o’clock...They wanted me back in the house because, it’s difficult, because you can’t walk on the roads and I walk on the promenade and then that can be quite isolating, because when it’s dark there’s nobody down there.” PAW22, female aged 59, New Brighton, east Wirral (18,997 average daily steps)

Other participants described feeling entirely at ease within their neighbourhood, regardless of time, daylight hours, or having company whilst out and about. Perception of individual Wirral wards and of the borough as a whole in relation to physical activity are explored in section 6.5 on page 114.

“I think because it’s a nice village and it’s nice and safe and it’s got lots of places to be able to walk to, I’m more than happy to go walking and walk [to] places. Whether it be with somebody or by myself.” PAW39, female aged 29, Oxton, east Wirral (9,188 average daily steps)

“It’s a very safe environment. It’s comfortable; people say good morning, people say hello, people are respectful of each other. It is a safe environment to live I believe. I’ve never felt threatened whilst walking the dog...and even on occasion being at the sailing club which from here is a five mile walk, or ride...[I’ve] cycled home down the Wirral Way [in darkness] and felt completely at ease all the way.” PAW34, male aged 56, Hoylake and Meols, west Wirral (14,330 average daily steps)

6.3.4 Opportunities for physical activity

Every interview participant described the variety of opportunities and public shared spaces in which to be physically active in Wirral. Walking and cycling were cited most frequently as popular activities for participants themselves and from them having observed others. Respondents spoke about manmade infrastructure such as Wirral’s coastal path and public parks in the context of enjoying nature and outdoor open spaces. Similarly, the accessibility of Wirral’s country parks, beaches and nature reserves was cited as supportive for physical activity.

“We live in quite a nice place...the Wirral’s nice in the sense that we’ve got, obviously we’re on a peninsula, we’ve got loads of parks, we’ve got loads of beaches. Storeton Woods is like two minutes away from where I live. So we do live in a nice area for getting out and walking.” PAW11, female aged 46, Rock Ferry, east Wirral (12,675 average daily steps)

“It’s mostly woods, paths and little bit of country lane. Yes then there’s sailing down at West Kirby. Coastal paths, the Wirral Way; there’s a lot of very good walking and

very interesting environments to look at. Thurstaston Common as well. So it's varied, so we're very fortunate I think on the Wirral, having all those different types of area. The parks for the kids, so we use those; yes quite a lot actually...The variation of the environment is good in Wirral." PAW18, male aged 46, Pensby and Thingwall, west Wirral (6,396 average daily steps)

Maintenance of public shared activity spaces was mentioned by many interview respondents, with reflections on change to provision over the years. The topic of council budgets and allocation of funds for public resources was described in the context of maintenance and generation of funds. Participants presented a mixed response to local initiatives; some of which were perceived to support physical activity and some to hinder engagement.

"Regarding the way that the area is kept by the local Council, I've seen a decline, quite majorly really over the last five or six years. I have quite a large area of land behind where I live which is actually Council owned. It's an open expanse of land that when my children were growing up we used to play cricket and football and rounders and what not...and it used to be cut and maintained by the Council...Now it's only cut a fraction of the time that is used to be cut. So the grass is about a foot long before it's cut, so local families now can't use that area as a leisure area really, for family games and stuff like we used to. Because the grass is always too long." PAW14, male aged 56, Greasby, Frankby and Irby, west Wirral (21,542 average daily steps)

The physical activity initiative of park-based public outdoor gym equipment received a mixed response from interview participants. Whilst no respondents reported disagreement with the initiative *per se*, the location of equipment, perceived to be in more deprived areas of Wirral, elicited mixed responses regarding popularity and opportunity for misuse.

"I know they've put a few out into Victoria Park and I don't know whether the Council have paid for that. So they're putting them into more deprived areas. The only thing with that is the one that's quite near me, I wouldn't go to that particular park because I don't. It is a bit rough so I'd feel nervous going and using that gym equipment." PAW11, female aged 46, Rock Ferry, east Wirral (12,675 average daily steps)

“Arrowe Park comes straight back to mind because they’ve got exercise equipment dotted around the park...Each time I’ve gone and walked round there, usually with the kids, we’ve gone and used it as a bit of fun to play with really. I have seen people use it, as in people that are going for a run and using it as a bit of circuit training, but infrequently. More often when I go they’re not being used...I’ve also been round Birkenhead Park and they’re used much more frequently there...Vale Park, that comes down to the waterfront [at New Brighton]...they’ve got them along there as well and I do see them being used there, so I think they’re a great idea. There’s a much greater footfall in Birkenhead Park and unfortunately I’ve also seen them...damaged and vandalised which always makes me feel rather sad...it’s a shame. I think there is a vandalism question, but you know it doesn’t stop you putting up bus stops. It doesn’t stop you putting up exercise equipment in parks. You know a proportion of them will get vandalised; sad reality.” PAW18, male aged 46, Pensby and Thingwall, west Wirral (6,369 average daily steps)

One initiative in particular influencing physical activity was raised by a number of interview participants; the concept of charging for parking in Wirral’s country parks. The introduction of charges was reported as unpopular and detrimental to efforts to encourage physical activity. Participants described seeking alternative locations in which to be physically active. The first excerpt below from PAW02 was from an interview conducted prior to parking charges taking effect. The second excerpt from PAW14 was from an interview conducted following inception of parking charges.

“I mean I’m not, like, destitute but you know the Council is on about introducing this new charge for all the country parks now where you’ve got to pay to park, and I think things like that are a real barrier...that would prevent me. I would literally go elsewhere and go for a beach walk; I would not go and park at Thurstaston and pay for parking to go for a walk there. I think things like that will only hinder people.” PAW02, female aged 41, West Kirby and Thurstaston, west Wirral (7,187 average daily steps)

“Wirral Borough Council has now started to charge for parking; they have put parking meters in all the country parks...It’s 50p for the first hour. We’re always out for just

about an hour and a half, so we are in the next category and then it's four pounds for the whole day. Or you can buy a season ticket, a yearly permit, for 50 quid. We're normally out for over two hours on a Sunday. Because Sunday's a bit more leisurely and you haven't got to get back to get to work... We spend a lot more time in the park and we go right to Thurstaston Hill...so we'll probably be over two hours which will take you into the next time slot; you need to pay for the whole day...It's quite a lot of money, four quid, to go for a walk. And the Council...they've been advertising lately how they want the public to be...active and healthy and what not, and then we're charged for parking in all the local parks...it just doesn't make sense." PAW14, male aged 56, Greasby, Frankby and Irby, west Wirral (21,542 average daily steps)

6.4 Concept 3: The natural world

6.4.1 Outdoor versus indoor physical activity

Participants described their preference toward outdoor rather than indoor physical activity. They describing perceived health benefits and opportunities to connect with the natural environment. Respondents described sensory input as an important component in their physical activity choices; the ability to engage with elements of nature which stimulate the senses during outdoor activities. These sensory benefits were reported to reduce perceived stress and promote general wellbeing. PAW39, a female participant from east Wirral, described her preference for outdoor physical activity. Although PAW39 was categorised as demonstrating a high level of physical activity, she accumulated on average 10,113 daily steps; below the sample average of 11,483 ($SD = 4345.85$). PAW25, a male participant from east Wirral also described his preference for outdoor activity. He accumulated on average 13,672 daily steps; above the sample average and also categorised as high level physical activity.

"For your mind as well, I think exercise is a great thing. Just to get out and just to clear your head and forget a lot of the daily stress...I just think you can just lose yourself more in it [the moment] and forget about everything and just appreciate being outside, rather than stuck in a sweaty gym." PAW39, female aged 29, Claughton, east Wirral (10,113 average daily steps)

“I would much rather run across the sand, because I prefer the sand...I don’t time my run to go out when the tide’s out, but if it is out I’ll run on the sand because I prefer it. So it’s nicer for your, kind of, wellbeing; your thought process.” PAW25, male aged 39, Wallasey, east Wirral (13,672 average daily steps)

“So all of that comes in, I think, to the feeling of wellbeing. It can be like the certain types of flowers as well. Like in Royden [Park]...those, like gorse; spikey bushes but they’ve got a yellow flower with a really great scent... it’s that smell that is absolutely fantastic.” PAW34, male aged 56, Hoylake and Meols, west Wirral (14,330 average daily steps)

6.4.2 Influence of seasons and nature

Seasons and weather were mentioned frequently during interview, as both a facilitator and barrier to physical activity. This was reported to depend on individual perception and changeable inclination to engage. Participants spoke of fluctuations in mood, mindset and personal volition toward physical activity in line with seasonal fluctuations, daylight hours and outdoor temperature. Many described continuation or adaptation of activities regardless of seasonal change or perceived inclement weather. Many respondents reported disinclination toward physical activity during colder, darker months and an increase in activity concurrent with extended daylight hours and warmer weather.

“I do love walking, so in the summer months I am more active...The sun starts shining and you think, ‘oh maybe I should have a walk along the beach’, things like that...I don’t walk as much as I used to; I used to walk into town a lot but I’m worse in the winter [with my mood] for a start, because of weather and the dark.” PAW02, female aged 41, West Kirby and Thursaston, west Wirral (7,187 average daily steps)

“We always try, and especially when the weather is nice like this, try and get out and do something...In the winter and it’s dark and I’m like, ‘oh no I’m not going back out’. So if it’s a nice day, yes in the summer obviously, it does make you a bit more proactive I think, with the lighter nights and it feels a bit earlier than it is...In the winter and the cold mornings the last thing you want to do is get up when it’s pitch black and we get home when it’s pitch black...I think getting through from, I don’t know, from about

April to October is probably the best time for me.” PAW39, female aged 29, Oxtan, east Wirral (9,188 average daily steps)

Seasonal changes were described by many as introducing variety and interest to regular physical activity, with opportunities to engage with others and share seasonal experiences. Participants described outdoor activity experiences as enriching; providing intrinsic rewards in addition to reported health benefits.

“It is a spectacular park and especially when you’re visiting that park throughout the various seasons, it totally changes; it’s beautiful. Such a massive community spirit and it is so well maintained, it’s beautiful every day of the year. It’s beautiful but it’s the close community feel and the café, and in the summer the bandstand, all in such a little park. It isn’t a big park but it’s got everything in it.” PAW20, female aged 53, New Brighton, east Wirral (6,897 average daily steps)

“I find now that going out and walking in particular is a big thing...just clearing your head, relaxing, offloading some stress. I tend to go with my wife so it enables us then to have an hour and a half where we can just bounce things off each other and chat. But in doing that as well you become very aware of sort of your surroundings; take in, you know, the wildlife and architecture and things like that. So it’s quite sort of stimulating in that respect...When we walk now we actually see things and we say ‘how long has that been there?’ Or one of the things we’re looking at at the moment is birds and the wildlife on the coast. We’ve now realised that during the winter it’s sort of oyster catchers, curlews, egrets and cormorants, But now [in summer] it’s herons; a complete change around, which we’ve never had time to sort of focus on...Or we might have done, we’ve just not identified with it.” PAW41, male aged 49, Leasowe and Moreton East, east Wirral (15,524 average daily steps)

6.5 Concept 4: Wirral descriptions

6.5.1 Perception of individual Wirral wards

Certain participants hypothesised about the influence of living in a different part of Wirral on their physical activity. They reflected on whether residence of a different ward may influence their own activity. Wirral wards with an abundance of public

open space were identified by many as potentially more conducive for physical activity than more densely populated urban wards.

“When you go to New Brighton, you always think ‘if I lived here I’d be out walking every day’” PAW28, female aged 45, Prenton, east Wirral (7,516 average daily steps)

“Maybe if I lived nearer to West Kirby, maybe I’d go and walk along the prom every day.” PAW37, female aged 53, Upton, west Wirral (11,997 average daily steps)

The concept of a socioeconomic divide between east and west Wirral was raised by three participants. Each of these resided in west Wirral. They described their belief that west Wirral is more privileged than east Wirral, with a greater abundance of natural physical environments more supportive of physical activity. One participant described the M53 motorway as the dividing line between east and west. PAW14 below refers to ‘north’ of the borough. Given the orientation of the M53 running north west to south east, PAW14 is referring to east Wirral, as described in this study.

“Yeah it’s quite nice, obviously coastal, because it’s by the beach. Semi-rural because we are on the better side of the Wirral.” PAW02, female aged 41, West Kirby and Thurstaston, west Wirral (7,187 average daily steps)

“I mean personally I think the Wirral, the part of the Wirral that I live in, is well set up to support people’s physical activity. You know there are lots of parks, there’s lots of sports facilities and it’s easy to get to open spaces. I don’t think it’s an accident that the reason so many people cycle on the Wirral is that it’s so flat, you know it’s a good environment for riding a bike. Lots of people get onto the water to do various things as well...But that wouldn’t be the case for all of the Wirral would it; I mean, we live in a slightly privileged part of the Wirral.” PAW07, male aged 44, Hoylake and Meols, west Wirral (15,914 average daily steps)

“I don’t want to sound like a snob, but there are rougher parts of the Wirral, and nicer parts of the Wirral. I mean there is, well, to put a line right through the middle, you’d say the M53. North of the M53, that’s the major cut-off point really.” PAW14, male aged 56, Greasby, Frankby and Irby, west Wirral (21,542 average daily steps)

Interview participants shared their perception of their own neighbourhood environment and of Wirral as a whole. In continuation of the discussion surrounding newly-introduced parking charges, PAW14 expressed his opinion that parking charges had led to the decline of one specific area of Wirral in the past. Birkenhead and Tranmere is ranked as Wirral's most deprived ward according to Indices of Multiple Deprivation (IMD) postcode scoring. (92)

"It's what killed Birkenhead you know. Birkenhead is, Birken Vegas I call it. It's a horrible place Birkenhead...it didn't used to be like that. When I was a young man and my wife used to work in the market, you know, as a kid, and there was a really vibrant, clean, nice place. And then the Council had this great idea of 'let's start charging everyone to park in Birkenhead'. And that was the catalyst really; that started the decline of Birkenhead...People go where there is free parking...You go to Birkenhead, it's like a ghost town." PAW14, male aged 56, Greasby, Frankby and Irby, west Wirral (21,542 average daily steps)

Participants describing Birkenhead and surrounding areas spoke of poverty and lack of public provision. They described what they perceived to be communities poorly served and lacking the same opportunities enjoyed by residents of other wards. None of the participants in this study were from Birkenhead and Tranmere, therefore, no data were available regarding the lived experience of Birkenhead residents. Residents of other wards described their perception of Birkenhead and surrounding wards in relation to other parts of Wirral.

"You've got areas such as Poulton, Seacombe, Rock Ferry, Tranmere...and also Birkenhead North End; there's real poverty there." PAW30, male aged 38, Leasowe and Moreton East, east Wirral (8,111 average daily steps).

"I think a lot of our [Wirral] housing estates, whether it's just over a period of time, have become quite poorly served...Noctorum or Ford estate; there's no facilities on there." PAW41, male aged 49, Leasowe and Moreton East, east Wirral (15,524 average daily steps)

“I like going out and running in the evenings and, for example, I wouldn’t really want to go and run round the streets of Birkenhead as much...It is really important that we do incentivise the general public to be active...When I go to work [in council-run leisure centres] in...the less affluent areas of the Wirral, like Birkenhead, Wallasey, places like that, a lot of it is affordability; people don’t have the options and the opportunities...I think it [leisure centre-based physical activity] has to be made affordable to people...it’s getting less and less and less subsidised.” PAW32, male aged 37, West Kirby and Thursaston, west Wirral (14,350 average daily steps)

Seacombe is ranked as Wirral’s third most deprived ward via IMD postcode scoring. (92) PAW31, a female participant from Seacombe, east Wirral, worked as a lifeguard in council-run leisure centres and shared the same employer as PAW32, cited above. She described different experiences of physical activity subsidies and shared her own thoughts that historic price reductions had led to misuse of the privilege. Her experiences were as a staff member responsible for children benefiting from subsidised swim sessions.

“Thank God they stopped that; it was horrendous. [The children were] nightmares; they’re horrible...they don’t respect the place...It was terrible...You know they’re saying ‘what about our kids; what are we going to do with them’ and I’m like ‘you’re their mum; you find something to do with them’...Babysitting service, yeh basically.” PAW31, female aged 51, Seacombe, east Wirral (6,145 average daily steps)

PAW31 accumulated on average 6,145 average daily steps. This was the lowest accumulated average step count in the sample. Sample mean daily steps were 11,483 ($SD = 4345.85$). She did not describe any physical environment characteristics of her neighbourhood as prohibitive to physical activity. Nor did she describe her experiences with other residents of Seacombe as a barrier to physical activity. Seacombe was mentioned by a number of other interview participants who reported favouring other areas of Wirral in which to be physically active. They were not describing lived experiences from the perspective of a resident. In the few instances of interview participants describing negative perceptions of individual Wirral wards,

they described the behaviour of other people, not physical environment features, as a barrier to physical activity.

“The other way which I don’t really go to is Seacombe, so that’s going towards the ferry. Sometimes I’ll walk towards the ferry if it’s a really busy day, but I wouldn’t go that way by myself, whereas I always go to New Brighton. Because when I’ve cycled there in the past, in Seacombe quite often you’ll get some youths gathering and they’ll be drinking cider or something like that. So it’s only happened twice but I don’t need to go that way, I can go the other way. But it’s not the best place to walk to and walk back...I would never leave a bicycle there whereas I would if it was in New Brighton.”
PAW22, female aged 59, New Brighton, east Wirral (18,997 average daily steps)

New Brighton and Upton (described below) are two Wirral wards ranked as mid-range deprivation according to IMD postcode scoring. (92) Many interview participants spoke positively of New Brighton in relation to its promenade and beach, with one resident describing developments to leisure facilities and area improvements over the years. New Brighton was identified by PAW22 (quoted above) as popular during the day, but quiet during hours of darkness (page 105). She reported warnings from her family not to go out alone after dark, describing caution toward personal safety in response to the behaviour of others. New Brighton was described as an area having received recent financial support to improve community facilities. Upton was another Wirral ward described in this manner. Recent financial support to develop physical environment features and local amenities was spoken about positively. PAW21, a female participant aged 21 from Upton, described these recent changes, but also instances of unwelcome behaviour from other residents.

“I’d say it’s quite nice, I quite like where I live anyway...I love the road that I live on because there’s lots of trees, lots of greenery. There’s a lot of blossom trees, it’s so lovely in the summer and all that. But then Upton village is actually really nice. I mean, I feel like since the restaurant that I work in opened, it’s become a lot more nice because my restaurant...you know, you have to dress nicely to go in there. Whereas we’ve never had that before in the village...We’ve got nicer and newer hairdressing shops there and all that, but we do have the two pubs; they’re not the best. I think

that's what kind of brings Upton village down slightly, because they're not the best looking and you have, not rowdy people, but you do have drunken people...Where I live it's so quiet and lovely...and I do think Upton village is getting a lot nicer." PAW21, female aged 21, Upton, west Wirral (9,880 average daily steps)

Heswall is ranked as Wirral's most affluent ward according to IMD postcode scoring. (92) The ward borders west Cheshire and is located on the south east tip of the Wirral peninsula, overlooking the Dee Estuary and Wales. Whilst Heswall provides a more generous allocation of public greenspace than some other west Wirral wards, it was not mentioned frequently during interview, apart from by Heswall residents themselves. They described their own enjoyment of its physical features of the natural environment.

"Walking [and] cycling's very accessible; it's very rural. It's very relaxing, it's very grounding, it's very 'going back to nature' which helps you to de-stress. Wales, rivers, mountains, it's very well maintained. It's all down to location, isn't it really?" PAW29, female aged 58, Heswall, west Wirral (11,012 average daily steps)

6.5.2 Perception of Wirral as a borough

Much of participants' location-based discussion related to coastal regions providing public open spaces overlooking the Dee Estuary and River Mersey. New Brighton and West Kirby and Thursaston were the two wards described most frequently in terms of locations for physical activity. This was often in the context of Wirral's coastal path and the borough's proximity to the sea.

"I live in a nice area...I love living by the sea, so I like that. I love the scenery, I love going round the lake [at West Kirby]. There's Thurstaston; a really lovely stretch of coastline that goes all the way up to Heswall. There's really nice commons, like Royden Park. There's all along the front from Hoylake up until New Brighton; you can get on a bike and that, so that's nice." PAW32, male aged 37, West Kirby and Thursaston, west Wirral (14,350 daily steps)

The primary focus of discussion regarding the influence of physical environment features on physical activity, was Wirral's geographic variety and accessibility to

public greenspace. Participants spoke of natural and man-made infrastructure designed to maximise the borough's diverse natural environment characteristics and opportunities to be physically active outdoors. Regardless of where interview respondents lived, green open space in the form of coastal access and an abundance of public parks was frequently mentioned. Every participant spoke highly of their borough in support of varied opportunities to be physically active.

"We live in new Brighton, just by Vale Park on the promenade. If I do an early morning walk with [my friend] because [she's] an early bird as well, you've got the most beautiful sunrises coming up across the Liverpool skyline...I've got some stunning pictures, because you cannot, you just cannot, let that scene go, you know, when you're walking along and you see it...We were along there a couple of weeks ago and the way the wind was and it was the highest tide of the month; the waves were crashing over and they are spectacular, they really are." PAW20, female aged 53, New Brighton, east Wirral (6,897 average daily steps)

And on returning home to Wirral following time away from the borough...

"My friend from Coventry moved to the area. She said to me 'do you ever, when you've been on the road all day...get onto the M53 and you go, ohh, back on the Wirral.' And I know we take a lot for granted, we really do, but she said to me it's like being on holiday every weekend [in Wirral]." PAW20, female aged 53, New Brighton, east Wirral (6,897 average daily steps)

"There's some lovely places on the Wirral. I think the Wirral is, well it's my absolute favourite place in the whole world. When we go on holiday we go the Canary Islands, or when we go wherever...I always look forward to coming home. I love coming back to the Wirral; we've got everything in the Wirral haven't we?" PAW14, male aged 56, Frankby, Greasby and Irby, west Wirral (21,542 average daily steps)

6.6 Summary: Chapter six

This chapter has focused on the influence of physical environment features on physical activity; primarily the influence of perceived neighbourhood activity-friendliness. Chapters four, five and six, respectively, have now explored the influence of personal, social and physical environment features on physical activity in the context of where people live in Wirral. Chapter seven will focus on synthesising and interpreting mixed methods results using Kielhofner’s Model of Human Occupation (76) as an interpretive lens. Results will be discussed in line with existing literature and opportunities for further research. Firstly, the main results from chapter six have been summarised in table 6.6, to highlight core discussion points from this chapter. This summary is intended to provide an overview of the essence of chapter six in relation to core concepts presented.

Table 6.6 Influence of physical environment on physical activity

Physical environment and physical activity: Core results
Physical environments supporting physical activity can encourage participation
Local initiatives involving physical activity can influence community engagement
Perception of physical neighbourhood features are subjective to the individual
Perception of neighbourhood safety can influence physical activity behaviour
Seasonal fluctuations can influence personal volition toward physical activity
Natural physical environment features are supportive for physical activity
Wirral as a borough is perceived as supportive for physical activity

Discussion and conclusions: Mixed methods interpretation and reflections

“All meanings, we know, depend on the key of interpretation.”

George Eliot

7.1 Reminder of where we began

7.1.1 Reminder of research aims

The PAW study was designed to explore the influence of where people live on physical activity patterns, through mixed methods enquiry. Elements of the personal, social and physical environment were examined to generate understanding of the multifactorial factors influencing physical activity behaviour. Quantitative and qualitative data were triangulated to provide contextual insight into actual and perceived facilitators and barriers to physical activity, in relation to where people live. The study was conducted in the metropolitan borough of Wirral, Merseyside, in north west England. Wirral is a borough rich in geographic and socioeconomic diversity, divided loosely east and west by the M53 motorway.

Research into the factors influencing physical activity in the context of where people live has been primarily quantitative to date. There has been heavy focus on research exploring features of the built environment and manner in which the urban environment can influence physical activity. The addition of qualitative enquiry in this study, used alongside quantitative measurement tools, generated contextual understanding of numeric physical activity data. The PAW study explored the nature of physical activity in Wirral as part of daily routine and adopted a holistic approach to understanding what drives people to do what they do. This study had three aims:

1. Gather objectively-measured physical activity data for Wirral residents over a seven day period
2. Explore the influence of personal, social and physical environment features on physical activity behaviour
3. Generate understanding of the physical activity experiences of Wirral residents in the context of where they live

7.1.2 Reminder of research objectives

The research aims were achieved by adhering to six discrete objectives:

1. Identify Wirral participants from postcode areas with a range of Indices of Multiple Deprivation (75) scores
2. Collect objectively-measured daily step data over a seven day period
3. Gather questionnaire data relating to demographics, general health, mental health, physical activity and perception of neighbourhood environment
4. Conduct semi-structured interviews to explore the topics of health and wellbeing, physical activity and experiences of neighbourhood environment
5. Triangulate quantitative and qualitative data to generate contextualised understanding of physical activity behaviour
6. Examine data from east and west Wirral to establish whether associations are evident between socioeconomic and geographic diversity and physical activity behaviour

7.1.3 Reminder of central research question

Study aims and objectives were formulated into the primary research question:

What are the effects of personal, social and physical environment features on physical activity behaviour in relation to socioeconomic and geographic diversity?

7.2 Mixed methods amalgamation

7.2.1 Approach to mixed methods interpretation

Quantitative results were presented in chapter three to introduce and describe the sample. Qualitative results were presented in chapters four, five and six, and themed by influences of the personal, social and physical environment, respectively, on engagement with physical activity in Wirral. Kielhofner's Model of Human Occupation (MoHO) was used as the interpretative lens through which this study was designed and conducted; described on page 21. (76) MoHO's theoretical framework is based around four discrete, yet interconnected domains, each influencing human behaviour; volition, habituation, performance capacity and environment. These domains have been used to structure discussion of the PAW study's findings, based

around the principles of how individuals individually perceive, interpret, act upon and experience situations and circumstances in the world around them. Personal, social and physical environment themes were identified using thematic analysis as contextual categories influencing physical activity behaviour. MoHO was used as a framework by which to interpret key findings from this study and analyse against existing literature. Findings are compared and contrasted with findings from previous research into factors influencing physical activity behaviour in the context of where people live. The four main MoHO domains and sub-domains and are presented in Figure 7.2.

Figure 7.2 The Model Of Human Occupation (adapted) (81)

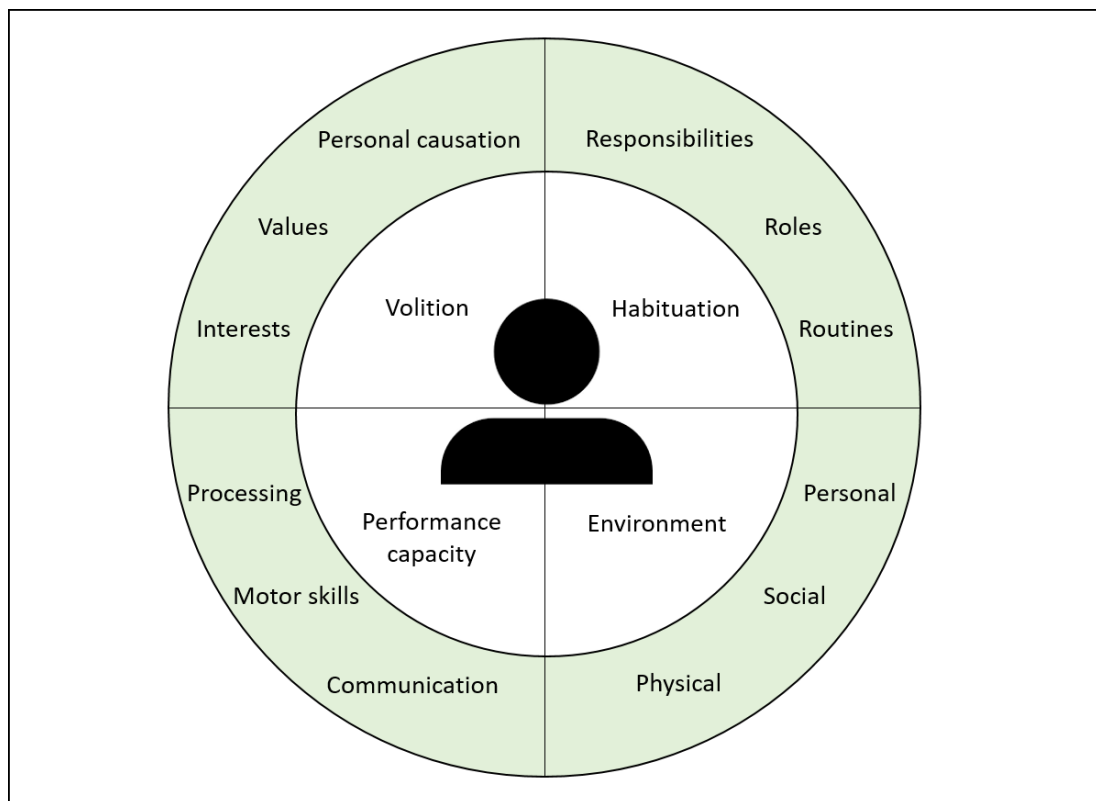


Table 7.2 overleaf presents this study's main findings, categorised according to MoHO domains. Discussion within this chapter will follow the structure outlined in the table, exploring results against existing literature and interpreting findings in the context of opportunities for further research. Strengths and limitations of this study have been included as part of the discussion. This enabled consideration of their implications and addressed the manner in which study findings may be applied to a real world setting.

Table 7.2 Main findings organised by MoHO domain

MoHO domain	Main findings and discussion topics
Volition	<p>Inner drive underpins self-directed physical activity</p> <p>Individual perception influences physical activity</p> <p>Individuality affects response to physical activity initiatives</p>
Habituation	<p>Routine and daily structure influence physical activity</p> <p>Roles and responsibilities influence physical activity</p>
Performance capacity	<p>Self-efficacy and personal agency influence physical activity</p> <p>Physical activity involves application of mind and body</p> <p>Concept of 'the quantified self' influences physical activity</p>
Environment	<p>Perceived companionship influences physical activity</p> <p>Subjectivity influences perceptions of neighbourhood</p> <p>Socioeconomic inequality is perceived as evident in Wirral</p>

7.3 Discussion

7.3.1 Volition

Volition is the cyclical process by which individuals are motivated to do things, driven by intrinsic factors such as personal values, interests and meaningfulness. (78) Life experiences provide continual feedback from which individuals draw understanding and context, subsequently influencing future volition toward forthcoming situations, circumstances and opportunities. (78)

Volition to engage in physical activity was a key theme arising from the PAW study sample. Keeness for and enjoyment from existing physical activities was reported, together with a desire for increased activity, but for the presence of reported intrinsic and external barriers. Intermittent disinclination for physical activity was spoken about as fluid and changeable, in line with fluctuating mood and the subjective

concept of tiredness. Tangible barriers to physical activity were not widely reported by interview participants. Volition to engage in physically active occupations was reported to outweigh perceived barriers and instead act as a facilitator. If the will to engage was there, participants found a way to fulfil their intention, regardless of subjective barriers of perceived lesser importance.

The concept of 'where there's a will, there's a way' supports the findings of Chevance *et al.* who found that attitude toward physical activity was positively associated with objectively measured physical activity. (137) Similarly, Elsborg and Elbe reported the same phenomenon, citing exercise-specific volition and intrinsic motivation as underpinning self-driven progress toward a meaningful goal. (138) Both studies were conducted with clinically obese participants and focused on exercise behaviour as a method of weight loss. This must be taken into account when relating findings to this sample, from whom no body mass index measurements were recorded, nor was weight management the focus of this study. The principle of the importance of intrinsic volition, however, remains relevant. In order to effectively implement a desired behaviour, especially over a protracted period, an individual must first actually want to engage in said behaviour.

Following the literature search during protocol development, literature returned by the search into the influence of where people live on physical activity did not return items describing volition. To understand how individuals feel toward physical activity as part of daily routine and to contextualise numeric data, factors influencing inner drive must be explored. Findings from this study indicate that personal volition is a core factor underpinning physical activity behaviour. Associations between volition toward being physically active in the context of where people live warrants further exploration. Personal volition is directly related to the concept of personal perception; how individuals feel about themselves and the world around them. The manner in which individuals perceive the world influences how they feel about situations and events; past, present and future. Existing research has touched upon the role of perception in the specific context of physical neighbourhood features and how perception influences activity close to participants' homes. The concept of how

participants in this study perceived their physical neighbourhood environment and associated impact on physical activity was discussed in section 6.3.2 on page 106.

Findings from the PAW study suggest that inclination toward physical activity, over and above energy expended by routine daily tasks, is governed by influences unique to the individual concerned. Personal differences, individual allocation of meaning and level of importance attributed to any given event/outcome can often influence volition to engage. With regard to individuals' motivation toward physical activity, interview participants spoke of what was important to them, personally. The concept of 'what's in it for me?' was also discussed. This describes the notion of undertaking an action only if it holds direct meaning and is of perceived benefit for the person concerned. Many factors influenced volition toward physical activity in this sample. Participants spoke of physical activity as meaningful, both during the act of 'doing' and in the context of future health benefits. This concept reflects the notion of 'doing, being and becoming'; a central occupational therapy theme focused on the balance between individual characteristics, occupation and self-actualisation. (139)

Mixed methods enquiry was supportive in exploring subjective concepts such as personal volition and the uniqueness of individual perception. Contextualisation of quantitative data with experiential description provided insight into personal motivations and barriers to being physically active in the context of where people live. Listening to participants' experiences of being physically active as part of daily routine facilitated greater understanding of what drives individuals to effect certain habits and routines. Qualitative data in this study suggested no difference in personal volition toward physical activity between residents of east and west Wirral. Every interview participant spoke positively of being physically active in Wirral. They described many facilitators and no insurmountable barriers, aside from naturally fluctuating intrinsic motivation. This suggested that, in this sample, where people live did not affect their perception of physical activity, nor intention to pursue active pastimes.

Results from this study indicate that if individuals want to be physically active, they will find ways and locations in which to do so. The subjective domain of volition toward physical activity has not been widely studied in the context of where people

live. Findings from the PAW study demonstrate the complexities of exploring subjective influential domains on physical activity. By engaging with participants directly and listening to their experiences, it was possible to generate contextualised understanding of numeric physical activity data and provide insight into facilitators and barriers to physical activity amongst this sample.

7.3.2 Habituation

Habituation describes the manner in which daily activities are organised into recurrent patterns, taking into account roles and responsibilities and in line with what is meaningful to the person. (78) These patterns become engrained and part of everyday life. Some may be perceived as detrimental to health, however, positive habits can be cultivated and sustained in pursuance of a healthy lifestyle. Habituation is influenced by internal and external factors, as circumstances change and routines fluctuate with life's moving tides.

Positive physical activity habituation was a core theme arising in this sample. Individuals reporting recurrent daily structure and routine spoke of repetitive behaviour and tendency toward the same activities. They were often undertaken at similar times in a similar way. Interview respondents reporting habituated physical activity accumulated on average greater daily step count than those describing lack of structured routine. Whilst personal volition often underpins development of perceived positive habits, it is not adequate to simply want to execute the action. Habits are formed only when the action has been repeated enough times for it to become automatic.

Hudson *et al.* conducted research into adapting one's personality traits to achieve behavioural change. Findings indicated that volitional change to personality traits requires conscious effort and active engagement with new behaviours over time for true behavioural change to take effect. (140) Participants were American university students studying personality psychology, which may suggest that they were more familiar with behavioural change techniques than the general public. This may have led to participants being more suggestible to research on this topic than a layperson,

but the foundations of habit-forming behaviour nonetheless indicate necessity for sustained personal application.

Participants in the PAW study spoke of habituation in relation to individual roles and responsibilities influencing daily routine. Roles for example of parent, spouse or teacher, with responsibilities such as raising children, home maintenance, dog ownership or student leadership. Those reporting daily routine involving multiple roles and responsibilities described dependents forming part of daily structure, with physical activity often undertaken with them and/or managed around them. These participants tended to accumulate on average greater daily steps than those reporting lack of, or not mentioning, regular structure and routine. The concept proposed by Benjamin Franklin – ‘if you want something done, ask a busy person’ – was evident in the lives of participants with multiple roles and responsibilities. They demonstrated successful amalgamation of their own physical activity with and around the needs of others. Incidentally, the concept of time was not mentioned by interview participants as a direct barrier to physical activity. Instead, individuals discussing time spoke of adapting routine in accordance with perceived available time and making meaningful and effective use of said time.

The second manner in which interview participants in this study spoke of habituation was in relation to regular physical activity in the company of others. Respondents described volition to engage in physical activity as increased when other people were involved. They reported increased motivation through perceived moral support, camaraderie, regular scheduling and not wanting to let others down through non-attendance. The presence of individual roles was again present, for example friend, competitor or team member. Similarly, responsibilities were again discussed, for example committing to shared attendance or demonstrating reliable team membership. Repetitive patterns of physical activity, undertaken in and around routine daily tasks and commitments, was reported to support regular engagement. Interview participants described enjoyment of their physical activity through the act of participation itself and through intrinsic rewards generated by fulfilling perceived responsibilities.

In this sample, there was no evidence of difference in reported physical activity habituation between residents of east and west Wirral. This suggested that habituation may be influenced more greatly by personal circumstances than where people live. Roles and responsibilities are always present, regardless of geographic location. Geographic location is, however, likely to impact roles and responsibilities and remains inextricably linked to daily routine in the context of personal circumstances. Geographic factors may, for example, impact accessibility to certain opportunities for physical activity, rather than physical environment features themselves directly impeding physical activity.

Following the literature search during protocol development, literature returned by the search exploring the influence of where people live on physical activity did not return items describing habituation. Findings from this study therefore lay foundations for more research into associations between habituation and physical activity in the context of where people live. Mixed methods enquiry facilitated contextual understanding of participants' physical activity habits, influenced by individual roles, responsibilities and routine. Further research is warranted to generate deeper understanding of motivational drivers for developing and maintaining physical activity habits in relation to neighbourhood influence. By exploring the personal experiences of daily habituation, it may be possible to better understand the factors underpinning unique roles, responsibilities and routines and how these influence physical activity behaviour.

It may be beneficial for future research to explore the weight of meaning attributed to individual roles, responsibilities and routine and how this may influence physical activity behaviour. For example the importance attributed to owning and walking a dog and associated impact on walking behaviour. Similarly, the importance of camaraderie and shared group/team activity – which may or not carry an associated financial cost – and whether the guaranteed presence of others outweighs financial outlay. What is meaningful to one person may not be particularly relevant for the next. It may be beneficial to understand the nuances of what is meaningful to individuals and groups and how this translates into the development of daily routine.

7.3.3 Performance capacity

Performance capacity is the unique capability of an individual to engage in the occupations of daily life, involving interconnected competencies and efficiencies of all body systems; the ability to achieve what one desires and the subjective experiences of such. (78) Neurological and physiological mechanisms work together to effect thinking and movement and to facilitate sensory feedback in a cyclical pattern. The individual manner in which someone may experience performance of an activity influences entities such as sense of agency, competence and perception of said experience. The nature of performance capacity therefore involves both objective and subjective elements.

Participants in the PAW study provided subjective quantification of perceived physical health, health-related challenges and components of mental wellbeing via questionnaire. These perceptions are likely to have influenced individuals' experiences of daily routine, yet the degree to which perception of performance capacity influenced physical activity behaviour was not measured. Responses were delivered by self-report, which carries inherent subjectivity due to the individuality of each participant. Previous research into the mechanism of self-report identified reporting bias at every stage, through individual cognitive capacity, attribution of meaning to the entity in question and perceived societal norms. (141) Results in the PAW study were interpreted with caution, on the basis that the element of response bias will have been present and that participants may have been influenced by what they perceived the 'correct' response to be.

Hall and McAuley explored the impact of self-reported functional limitations and perceived self-efficacy on attainment of 10,000 daily steps in the context of where people live. They found that in the presence of functional limitations, perceived self-efficacy was reduced and 10,000 daily steps was not achieved. (72) Their study was conducted on female participants with an average age of 69.9 years and so findings are not directly generalisable to this study's younger, mixed-gender sample. Results, however, indicated a direct relationship between how people perceive their health and the manner in which this influences daily activity. In the PAW study, residents of east and west Wirral did not appear to differ greatly in their perception of personal

health, wellbeing and volition toward physical activity. Residents of east Wirral reported marginally greater wellbeing and accumulated marginally higher average daily step count than those from west Wirral.

It is unwise to confidently attribute meaning to these minor differences on account of small sample size. If the study were to be repeated using a larger sample, it may be more possible to ascertain whether observed patterns were due to chance or may be attributed to Wirral region. A larger sample size may also facilitate statistical enquiry into whether greater accumulated physical activity was due to greater self-reported wellbeing, or the other way around, given the reported positive relationship between physical activity, health and wellbeing. The PAW study, however, sought not to explore causality, but instead gather observational data and produce descriptive findings.

Sample size in this study was influenced by mixed methods study design. Although qualitative data was unaffected and saturation was reached during thematic analysis, sample size was small for statistical analyses, with statistical tests underpowered. Future research with a larger quantitative dataset would provide the opportunity for increased confidence in findings being attributable to independent variables, rather than due to chance. It was the intention of the PAW study to gather quantitative and qualitative data from every participant, thus enabling true mixed methods synthesis for each participant. Seven participants declined to participate in semi-structured interview, resulting in a slightly skewed dataset weighted toward quantitative data. Qualitative enquiry by its nature involves the gathering of subjective experiential data. Eliciting rich description from one person carries the same importance as listening to the experiences of many. Exploring the lived experiences of 33 individuals in this study enabled thematic saturation to be reached and patterns of discussion to be identified within the sample.

Purposive sampling in this study may have resulted in a sample more amenable to engagement with research than the average member of the public. This may have led to participants being more physically active than members of general society and demonstrating above average interest in the variables under study. One of the positive elements of purposive sampling, however, is that the process endeavours to

ensure identification of appropriate candidates for recruitment who share experience of the same central phenomenon. (88) Prospective participants in this study were sought using a geographically structured sampling process to maximise potential for gathering diverse data according to postcode deprivation.

Responsibility for self in relation to health and wellbeing was a central theme arising in this sample, primarily in the context of engagement with Fitbit technology and receipt of digital activity feedback during the enrolment period. Interview participants spoke of having enjoyed the experience and having retained a heightened awareness of daily physical activity on removal of the device. Participants described Fitbit's delivery of immediate digital feedback as an incentive for ongoing activity, encouraging greater understanding of their body's response to physical activity, e.g. heart rate fluctuation. Many respondents described subtle changes in their perception of daily activity having worn the Fitbit, including effective ways to incorporate physical activity into routine. These respondents spoke of generation of new activity-related habits having used the Fitbit. This finding supports the notion of using personal technology to encourage physical activity. Researchers have found that leveraging the potential of personal technology providing digital feedback can encourage positive habit-forming behaviour with regard to physical activity. (142)

Receiving quantified feedback about body movement is the concept central to the notion of 'the quantified self'; the act of engaging with and enhancing understanding of one's body through monitoring technologies. The concept of quantifying one's behaviour in this manner is to encourage greater responsibility for self through greater understanding. Participants in the PAW study who reported enjoyment from learning about their own activity via Fitbit, described perceived positivity of the continuous activity-feedback cycle. This supports findings from Rodighiero and Rigal who described a cyclical process of personal self-development through visualisation, driven by technologies designed to support understanding of personal capabilities and activity achievements. (143)

Positivity toward Fitbit technology in this study may warrant further longitudinal research into the effectiveness of activity monitors as an intervention to promote physical activity habituation on a long term basis. Use of outcome measures at

baseline, during and post study follow-up may provide insight into the longevity of interventions such as this for effecting long term behaviour change. Enquiry into the effect of removing these technologies once the study period has ended, versus ongoing usage post study, may shed light on whether observed habituation is likely to continue in the absence of digital feedback. This may then address the question of whether long term behaviour change has occurred, with new habits engrained as a result of the intervention.

Given the limitations of Fitbit Charge HR in recording swimming and cycling activity, it may be prudent to ensure that monitoring units have the capability to record all manner of popular physical activity. Swimming and cycling were both mentioned by participants in this study as part of regular routine. These data were not accurately recorded by Fitbit Charge HR, which will have skewed activity data for some participants and influenced results in this study.

Whilst the body of literature surrounding the use of personal technology for physical activity is growing, findings from this study suggest that enquiry may go one step further. A number of interview participants in this study reported the positive addition of camaraderie and competition via the Fitbit Community platform. It may be beneficial for future research to include the element of structured social interaction to establish whether this additional element of camaraderie may influence engagement. Interaction with others could be achieved via designated web platform such as Fitbit Community, social communication networks such as WhatsApp groups or via face-to-face engagement. Research into interventions to support the concept of 'prevention being better than cure' may promote awareness of self and adoption of healthy routines through physical activity. Investment is warranted in this area to address the current increase in prevalence of avoidable chronic health conditions.

Reported enjoyment and raised awareness from using Fitbit technology may indicate the presence of bias in quantitative physical activity data. Participants were asked not to change their physical activity habits during involvement in the PAW study, but it is likely that activity patterns during study involvement will have already been influenced by taking part in the research itself. Known as 'The Hawthorne Effect', this

is the tendency for individuals to modify behaviour due to their awareness of being observed. The effect can cause participants to unconsciously skew results which can damage the integrity of research findings. (144) Care was taken during interpretation of results from this study and acknowledgement given to the fact that the effect of being observed will to a degree have influenced results.

Literature returned by the search strategy during protocol development did not return items describing engagement with objective monitoring technology in the context of where people live. There is currently a growing body of literature exploring the use of wearable devices to quantify daily activity. Quantification of neighbourhood perception via questionnaire is also a growing subject area. Research focus has more recently turned to the concept of geographically tracking physical activity behaviour. It was the original intention of the PAW study to conduct contextual enquiry into associations between type, volume and geographic location of physical activity in relation to where people live. Location data would have been triangulated with qualitative results to contextualise neighbourhood physical activity experiences. Complications with geographic monitoring equipment precluded this location-based element of holistic enquiry. It may be prudent to add geographic context to future enquiry into physical activity through objective location measurement. This may promote the concept of holistic enquiry into all manner of environmental influence on physical activity using combined quantitative and qualitative measures.

7.3.4 Environment

Environmental influence on individuals and on daily routine is, in turn, influenced by the characteristics of the person themselves. For example the manner in which they perceive and engage with daily routine and the intrinsic influence of tangible and intangible environmental features around them. An individual's environment can either support or hinder physical activity, but the nature and degree of influence will depend upon mental, physical and social characteristics of the person. Environmental influence can be either objective or subjective. Tangible and intangible environment features can be welcomed, adapted or avoided, in line with what is meaningful to, and achievable for, the individual concerned.

The influence of participants' social environment was a central theme arising in this sample, often spoken of in the context of roles, responsibilities and habituation. During interview, participants spoke of amalgamation of social and physical environment features as an important element in supporting physical activity. The discussion topic of accessibility in Wirral of shared physical activity spaces – all of which were outdoor spaces – was an associated central theme. Each interview participant spoke positively regarding accessibility of other areas of Wirral, regardless of where they personally lived. Respondents described moving easily between different parts of the borough in fulfilment of their preference for physical activity in green open spaces.

Straightforward movement between different parts of Wirral in pursuance of natural environments in which to be physically active, revisits the notion of 'where there's a will, there's a way'. Individuals' volition to seek out outdoor activity spaces important to them demonstrates that people will travel to places in which to be active. For this to occur, desire to be active must first be present and opportunities to fulfil this desire must also be available. Wirral's coastal path spans the peninsula and was mentioned so often by interview participants that this resource may warrant future investment to maximise its ongoing popularity and usage. Policy makers may consider ways in which to maximise its potential throughout the year, including improved lighting and review of public transport links to enable as many Wirral residents to access the resource as possible. It may be prudent for investment to be targeted toward existing facilities rather than installation and/or maintenance of additional resources, e.g. outdoor gym equipment in public parks. Making best use of already popular Wirral features would seem appropriate use of limited funds.

The concept of humans seeking natural and open green space in which to be physically active has been widely reported, yet not widely discussed in research focusing on the influence of neighbourhood environment on physical activity. The subject field appears to make a distinction between elements of the built environment versus natural environments. Manmade parks and gardens are the most commonly reported greenspace, rather than naturally-occurring open spaces. Use of computer-generated 'buffer zones' in neighbourhood-focused physical

activity research – typically one kilometre circumference around home postcode – may restrict holistic enquiry into physical activity in the context of wider geographic features.

Hypothetical buffer zones impose subjective neighbourhood boundaries, when in reality many people demonstrate a larger geographic footprint. Many will travel further for work and pleasure. In some regions, naturally-occurring greenspace may not be present within one kilometre of urbanisation and therefore buffer zone research may overlook physical activity further from home. Findings from the PAW study indicated that imposed geographic boundaries may preclude holistic enquiry and the study responded to calls for less geographically-restricted physical activity research. (58,59,61,145)

Much of the focus of existing literature regarding physical activity in the context of where people live has been toward elements of the built environment. Features such as street connectivity, pedestrian safety and access to amenities have been a core focus. Findings from previous studies have indicated a positive correlation between built environment features and physical activity; primarily cycling and walking activity. (48–51) The PAW study aimed to add depth to these findings by exploring participants' perception regarding supportiveness of their neighbourhood environment for physical activity. Also to explore the manner in which neighbourhood perception may influence type, nature and location of activity.

Findings from the PAW study supported existing evidence that perception of neighbourhood activity-friendliness is positively correlated with accumulated daily activity. This was, however, true only of residents from east Wirral, who also reported greater subjective wellbeing in line with increased neighbourhood activity-friendliness. These relationships were not observed in data from the west Wirral subsample. East Wirral is characterised by greater industry and residential density than west Wirral. West Wirral is home to more rural physical features and lower housing density. Findings from this study support suggestions that physical geography does have an influence on physical activity.

In the case of the PAW study, findings focused less on discrete built environment features and more on being physically active in open green spaces. Whilst rural surroundings and access to greenspace may be perceived as more attractive for physical activity, it may be that residents of west Wirral were less able to access amenities on foot/by bicycle due to lower housing density and more greenspace.

Perception of neighbourhood environment is based on cognitive amalgamation of subjective and objective environmental elements. Interpretation is influenced by previous experiences and feelings toward environment features. Collective perception of a deprivation divide between east and west Wirral was a theme arising in this sample, spoken about in different ways by residents of both regions. A shared descriptor of neighbourhood environment from every interview participant was that of suburban features throughout Wirral. Each interview respondent described their neighbourhood as a combination of residential property, local amenities, public parks and outdoor opportunities to be physically active. There was little difference between reflections of core physical environment features from residents of east and west Wirral. There was, however, a difference in reported feeling toward, and subjective experiences of, different Wirral wards.

Groups of youths and/or individuals demonstrating unwelcome behaviour were reported as more prevalent in Wirral's more deprived wards. Interview respondents mentioned instances of vandalism, misuse of public resources and perceived poverty within these wards. No reports of this nature were attributed to Wirral's more affluent wards, which instead were described as aspirational places to live. These findings support existing evidence of reported crime in Wirral over a five year period, concentrated within the most deprived wards. (92)

Findings from this study appeared to indicate a negative relationship between regional deprivation (dependent variable) and the independent variables under study. In this sample, deprivation appeared to negatively influence perception of neighbourhood activity-friendliness, self-reported wellbeing and accumulated average daily steps. Neighbourhood deprivation, scored using postcode data from the Wirral Indices of Multiple Deprivation (92), was the only variable for which east and west Wirral residents generated similar correlational data between dependent

and independent variables. Residents of east and west Wirral appeared to be influenced by perceived deprivation across the domains of health, wellbeing and physical activity. Caution was exercised during results interpretation given the small quantitative sample and possibility that statistical observations may have been due to chance.

It was acknowledged that participants in the PAW study may have been more physically active than those not responding to recruitment advertising. Efforts were made, however, to minimise bias where possible and identify a sample whose data may be generalisable to the wider Wirral population. Purposive sampling identified a diverse range of participants from the spectrum of postcode deprivation scores throughout Wirral. Whilst a larger sample size would be required to generate increased confidence in quantitative study findings, observations from this sample can be tentatively applied to the Wirral population and provide foundations for future research.

Statistical comparison using open source data demonstrated that this this sample was largely representative of the population of Wirral across demographic domains. Wirral is representative of the UK population with the exception of ethnic and religious diversity. Findings may therefore be broadly indicative of UK working age adults, but cultural differences between discrete ethnic and/or religious groups may influence results if the study were to be repeated. Findings from the PAW study may warrant further research of a similar nature with different population groups, ideally on a larger scale. For example with adolescents, older adults, or specific cultural groups.

7.4 Research reflections

7.4.1 Confidence in study findings

Every effort was made to ensure rigour, validity and reliability in results from the PAW study. Quantitative measurement tools were selected on the weight of pre-existing validation and extensive use in international research. Each tool was used in accordance with published guidelines and analysed using recommended methods and software. Qualitative data were managed according to recognised methods and

analysed using appropriate software in line with published guidance. Qualitative data gathering, analysis and interpretation will inherently have been influenced by the presence and characteristics of the researcher (author). An element of interpretation bias has therefore been acknowledged, however, qualitative enquiry necessitates active engagement with participants and interpretation is recognised as influenced by the researcher's epistemological lens.

This study was approached from an occupational therapy standpoint. Adoption of a holistic perspective via mixed methods enquiry sought to provide context to physical activity behaviour and generate understanding regarding why individuals demonstrate unique behaviour patterns. This was achieved by engaging with participants during interview and listening to their personal experiences of being physically active in relation to where they live in the context of individual roles, responsibilities and routine. The qualitative paradigm acknowledges the presence of multiple realities and uses language to produce contextual understanding of these realities. (146)

It was acknowledged that the author will have brought to this research personal beliefs, values and professional perspective. This self-awareness is the practice of reflexivity, which enhances the researcher's ability to evaluate and understand their own findings and enable their audience to do the same. (147) At various points within this thesis, the author's own views have been explicitly cited. It was hoped that this action would provide for the reader ongoing insight into the manner in which the author's epistemological lens may have influenced the PAW study.

Sample size was governed by the mixed methods design, which aimed to match the volume of quantitative and qualitative datasets and facilitate true mixed methods synthesis. A sample of 40 participants produced a volume of data manageable by one student researcher, yet if the study were to be repeated, larger quantitative and qualitative datasets may provide greater confidence in study findings. Larger sample size may also minimise the risk of emergent findings being due to chance. On account of small sample size, a linear relationship between quantitative variables was assumed. Basic statistical analysis produced results which were largely not

statistically significant and therefore further analysis was not conducted. It is possible that a non-linear relationship may have been overlooked.

On reflection, it may have been beneficial to pilot the study-specific demographic questionnaire prior to use. Piloting the tool may have highlighted poor phraseology with regard to the questionnaire item on employment type. This would have enabled this item to be rephrased. Another limitation was that not every Wirral ward was represented in the PAW study. It would have been useful, especially in the case of Birkenhead and Tranmere (ward of highest deprivation), for data from every Wirral ward to be included in both quantitative and qualitative analyses. A final limitation in relation to the mixed methods approach relates to the concurrent parallel study design. This method prevented noteworthy results identified through statistical analyses to be addressed during interview, due to data analysis taking place at a later date. An awareness of quantitative results prior to interview may have facilitated discussion around pertinent points, e.g. discrepancies between self-reported versus objectively measured physical activity data.

The PAW study generated rich descriptive accounts from participants regarding physical activity in relation to where they live. Contextual qualitative findings strengthened quantitative findings, and vice versa, through mixed methods data convergence and synthesis. Whilst it may have been useful to have gathered location data via GPS as intended, and have access to detailed hourly breakdown physical activity data via Fitbit, these quantitative limitations were outweighed by contextual mixed method gains. Unique individual stories emerged from cross-referencing quantitative and qualitative datasets. It was possible to gain personal insight into physical activity behaviour on an individual basis and observe conversational patterns between Wirral residents in relation to regional characteristics. The study achieved its aims and objectives in providing contextual understanding of physical activity behaviour in this sample, in the context of where participants live in Wirral.

The discussion presented in this chapter was framed in the context of existing literature and publications identified during the initial literature scoping review. A number of limitations regarding the manner in which the scoping review was approached were acknowledged. Initially, omission of the term 'deprivation' in the

original search strategy may have led to citations being overlooked which could have shed broader light on the subject field. With regard to systematic reviews, whilst they were omitted from the original literature selection process, it may have been helpful to include findings from each pertinent review article, to provide a more comprehensive overview of contemporary literature. It may have been beneficial to provide greater reflective depth on the manner in which cultural differences between and within countries may have impacted the generalisability of research findings to the UK setting. Finally, a more rigorous approach to the literature search, e.g. systematic review and/or meta-analysis, may have generated more focused literature findings. For the purposes of this study, however, involving a broad, holistic view of complex interconnected factors influencing physical activity, a more flexible approach to literature selection was deemed appropriate.

Using MoHo as an interpretive lens through which to approach the PAW study was invaluable in providing a structured framework by which to present research findings. Exploring the interconnected, multifactorial factors underpinning physical activity behaviour in relation to where people live in the context of personal motivations, roles, responsibilities and daily routine is inherently complex. It is challenging to comprehensively dissect the nuances and patterns of human behaviour. It is acknowledged that concepts and constructs presented in this thesis overlap and are influenced by the author's epistemology, however, MoHO provided a theoretical framework by which to interpret data and present findings in line with the four domains of volition, habituation, performance capacity and environment.

The complexities of presenting these data were demonstrated by the need to separate quantitative and qualitative data into separate thesis chapters. Originally, chapters four, five and six presented mixed methods results, positioned under the headings of 'personal', 'social' and 'physical' environment, as remains in the current format. The inherent challenges of comprehensively presenting data spanning multiple constructs resulted in quantitative and qualitative data being separated, for clarity. It is acknowledged that subjectivity in individual perception and interpretation influenced not only interpretation and presentation of data, but is also reflected in the reader's interpretation of this thesis. Whilst it may have been

beneficial to conduct more structured data triangulation, e.g. quantising qualitative data and/or the use of coding matrices, this was not deemed necessary, nor appropriate given the broad, exploratory nature of the PAW study. It is hoped that the current format, supported by detailed explanation of the methodological process, will provide the reader with an appreciation of how the PAW study was conducted, an understanding of the guiding principles of the research, and ultimately provide a clear presentation of core findings.

7.4.2 Contribution to knowledge

The PAW study was designed to build upon the body of literature surrounding environmental influence on physical activity in the context of where people live. Much of the research on this topic to date has focused upon features of the built environment through quantitative enquiry. This study sought to generate contextual understanding of physical activity behaviour in relation to personal experiences of being active in one's local neighbourhood. Mixed methods enquiry and the contextualisation of quantitative data with experiential description has provided insight into individual and collective experiences of physical activity in Wirral. Through interpretation of quantitative and qualitative data, results have generated broader, more meaningful findings than by using one paradigm alone. The PAW study has contributed mixed methods findings to a research field occupied primarily by quantitative enquiry. Diversity of findings has demonstrated the merit of bringing balance and meaning to the field, by exploring the individuality of the people behind the numbers.

To the author's knowledge, no previous study has used the Model of Human Occupation (76) as an interpretive lens through which to conduct physical activity research. The model provided a conceptual framework by which to approach study design, implementation and results interpretation. This novel approach ensured that a holistic perspective was adopted at every stage, in line with the core ethos of occupational therapy and its philosophy to always consider the full picture.

7.4.3 Implications for local policy

Findings in this study have demonstrated the importance of understanding the nuances underpinning physical activity behaviour prior to introducing policy change. In Wirral, interventions have been introduced previously affecting residents' physical activity behaviour and choices, for example the unpopular introduction of parking charges in Wirral's country parks. Public consultations regarding future initiatives have been undertaken by Wirral Metropolitan Borough Council recently, for example regarding proposed restricted access to public open spaces for dog walkers. Dog walking appeared to be a considerable facilitator for physical activity in this sample, therefore preventative measures of this nature may not be universally welcomed. Similarly, this particular initiative may generate negative connotations regarding restriction of socially-focused physical activity. In this sample, opportunities for physical activity in the company and proximity of others was identified as a major facilitator for physical activity. It may be advisable for policy makers in Wirral to continue to generate deeper understanding of what drives residents to be active and how best to maximise the borough's existing assets.

Wirral Metropolitan Borough Council (WMBC) appear to have acknowledged the importance of involving local residents in decisions affecting their borough. The opportunity to be involved in public consultations has been well received by the community, including recent debate regarding a proposed flood defence in West Kirby. Given the weight of public opposition toward the initiative, WMBC have paused to reflect on the best course of action. During data collection for the PAW study, contact was made with council commissioners to raise awareness for this research. A positive response was received and WMBC are awaiting publication of PAW results, which dovetail with the public consultations into public activity spaces they are already conducting. Participants in this study spoke of their affinity toward many of Wirral's existing public spaces in which to be physically active. Findings may shed light on practical ways in which WMBC can maximise existing public resources and identify opportunities for future consultations regarding encouraging physical activity in Wirral.

A number of opportunities for further research have been proposed within this chapter. Mixed methods enquiry has provided contextual findings regarding Wirral residents and their physical activity habits within the borough. Local budget allocation toward encouraging physical activity is limited. This demonstrates the importance of directing investment toward interventions with the potential for greatest impact. It will be prudent for policy makers to acknowledge the need for deeper understanding of the communities they serve, prior to considering future interventions and allocation of funding. Findings from the PAW study encompass personal, social, geographic, demographic and socioeconomic considerations for encouraging physical activity in Wirral. This research has provided evidence-based insight from which further conversations can take place.

The research process mirrored the initial steps of the occupational therapy process. A need was identified and information duly gathered. Information was assessed in the context of the individuals concerned and occupational facilitators and barriers were identified. Individual and collective goals were explored, together with potential opportunities for intervention. Further research into this subject field may provide greater understanding of the complexities of confounding factors influencing physical activity behaviour. The identified opportunities for further research may include trialling and evaluating the effectiveness of potential initiatives to encourage physical activity in Wirral. The conversation with Wirral residents regarding how best to encourage engagement with physical activity within their borough has begun.

“In literature and in life we ultimately pursue, not conclusions, but beginnings.”

Sam Tanenhaus

Thesis summary

Aims

The aim of the PAW study was to explore the influence of where people live on physical activity. Written from the perspective of an occupational therapist, the Model of Human Occupation (MoHO) was used as an interpretive lens. Existing literature exploring environmental influence on physical activity has focused largely on built environment features through quantitative enquiry. This study used mixed methods to explore the motivations and barriers to being physically active in relation to where people live. Wirral, Merseyside was the study location, given the borough's sociodemographic and geographic diversity. East Wirral is broadly characterised by greater deprivation, greater residential density and primarily urban features. West Wirral is more rural, with greater affluence and lower housing density. The study aimed to explore whether physical activity was influenced by residence of either east or west Wirral.

Methods

40 residents were recruited to represent each deprivation quintile across Wirral. Participants formed east/west sub-samples of 19 and 21, respectively. They completed self-report questionnaires on demographics, general health, personal wellbeing, physical activity and perception of neighbourhood environment. Participants wore a Fitbit Charge HR activity monitor for seven days during waking hours. 33 individuals completed one semi-structured interview exploring physical activity behaviour in Wirral, including perceived facilitators and barriers to being active. Quantitative and qualitative data were analysed independently and interpreted as mixed methods results, from which discussion and conclusions were drawn, using MoHO as the theoretical framework.

Results

Physical activity was found to be influenced more greatly by intrinsic motivation and daily routine than physical environment features. Participants describing habituated routine involving physical activity reported and demonstrated greater levels of daily activity than those describing less structured lifestyles. Physically active participants reported greater personal wellbeing than those reporting and demonstrating less daily activity. No difference was found between volition toward physical activity between residents of east and west Wirral. An inverse association was identified between deprivation (dependent variable) and the independent variables of physical activity, personal wellbeing and perception of neighbourhood environment. Residents of east Wirral described neighbourhood activity-friendliness as lower than in west Wirral. East Wirral residents, however, accrued more physical activity than west Wirral residents.

Conclusion

Physical activity is influenced more greatly by intrinsic characteristics, volition and the presence of habituated active routine than by built environment features. Roles, responsibilities and the degree of perceived meaningfulness and importance are greater influences on physical activity than external environment features. Interventions to encourage physical activity must focus on a person-centred approach, exploring the contextual needs and preferences of individuals and communities. Personally engaging with individuals on a one-to-one and community basis may shed light on how best to apply local insight to develop effective interventions to encourage physical activity.

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Appendix 1:

Literature search strategy

Boolean operators for seven search concepts: (1 or 2) and (3 and 4 and 5 and 6 and 7)

Concept 1 (sedentary behaviour)

"sedentary lifestyle" or sedentar* or "sedentary life style" or "sedentary behavio*" or inactiv* or sit* or seated or deskbound or "desk bound" or "sedentary time" or "inactive lifestyle"

Concept 2 (physical activity)

"motor activity" or "physical activity" or (physical* near/3 activ*) or "activities of daily living" or exercise or exercis* or "leisure activ*" or recreation or (recreation near/3 facilit*) or (leisure near/3 facilit*) or (public near/3 facilit*) or sport or (moderate near/3 vigorous) or "physical exercise" or "ADL" or ADL or "activities of living" or "leisure participation" or "sports participation" or "moderate intensity"

Concept 3 (environment)

environment or "environment design" or geography or geograph* or "green space*" or "open space*" or "land use" or neighbo*rhood or "neighbo*rhood regeneration" or rural or "rural area*" or urban or "urban area*" or local or "local area*" or "residence characteristics" or "residen* characteristics" or "urban renewal" or "city plan*" or "town plan*" or "urban plan*" or "environment* plan*" or "built environment" or "geographic location" or "landscape architecture" or "landscape design" or "neighbo*rhood environment" or "neighbo*rhood safety" or "rural communities" or "urban communities" or "urban development" or "local community" or "city parks" or "town and country planning"

Concept 4 (adult human)

humans or human* or adult or adult* or "young adult*" or "homo sapien*" or "middle aged" or "middle adulthood"

Concept 5 (inequalities)

"socioeconomic factors" or socioeconomic* or "time factors" or lifestyle or "life style" or "leisure time" or "health status" or "health status indicator*" or "health knowledge" or "health behavio*" or "rural health" or "urban health" or "social conditions" or "social environment" or "social environment*" or "social* support*" or econom* or inequalit* or disparit* or cultur* or ethnic* or minorit* or age* or gender or sex* or "socioeconomic status" or "socioeconomic class" or "socioeconomic inequality" or "health status disparities" or "quality of life" or "health standards" or "rural health disparities" or "urban health disparities" or "social class" or "health inequalities" or "social environmental factors" or "sexual orientation" or "leisure constraints" or "residential segregation"

Concept 6 (activity monitoring)

accelerometry or acceleromet* or actigraphy or actigraph* or "activ* monitor*" or "activ* track*" or (activ* near/3 monitor*) or (activ* near/3 track*) or "step count*" or pedomet*

Concept 7 (geographic information systems)

geocoding or geocod* or "geographic mapping" or "geographic map*" or "geographic information system" or "geographic information system*" or GIS or geospatial or monitor* or surveil* or "global positioning system*" or "global positioning system*" or "geospatial technologies" or "geospatial analysis" or "geospatial science" or "geospatial data" or "GIS mapping" or "GIS applications" or "surveillance technology" or "GPS tracking" or "GPS technology" or "GPS tracking systems" or "geographical information systems" or "geographic profiling" or geomatic* or "geospatial technology" or "geomatic engineering" or "geographic information" or "spatial analysis"

Appendix 2:

Database search list

1. AMED
2. Academic Search Complete
3. CINAHL Plus
4. eBook Clinical Collection via EBSCOHost
5. eBook Collection via EBSCOHost
6. EconLit
7. Education Research Complete
8. Environment Complete
9. ERIC
10. GeoRef
11. GeoRef in Progress
12. Global Health Archive
13. GreenFILE
14. Historical Abstracts with Full Text via EBSCOHost
15. Humanities International Complete
16. L'Annee Philologique
17. MEDLINE
18. MEDLINE with Full Text
19. Philosopher's Index
20. PsychARTICLES
21. PsychINFO
22. SPORTDiscus with Full Text
23. University of Liverpool Catalogue
24. ProQuest Dissertations and Theses UK and Ireland
25. ProQuest Dissertations and Theses Global
26. Web of Science Core Collection
27. Cochrane Library
28. Cochrane Database of Systematic Reviews
29. Cochrane Central Register of Controlled Trials
30. British Nursing Index
31. EMBASE
32. PubMed
33. Scopus
34. Social Care Online
35. Springer Link

Appendix 3:

Literature search results

Ref. No.	First author	Country	Date	Research date(s)	Data type	Primary focus				Methods									
						Physical activity location	Sedentary behaviour	Physical environment	Socio-economic status	Neighbourhood self-selection	Environment perception	Accelerometer	Questionnaire	Computer-aided interview	Geographic information system	Global positioning system	Focus groups	Semi-structured interview	Field notes
48	Van Dyck, D	Belgium	2010	2007-2008	Quantitative	Original	✓		✓		✓			✓					
49	Van Dyck, D	Belgium	2010	2007-2008	Quantitative	Original		✓		✓				✓					
50	Van Dyck, D	Belgium	2011	2007-2008	Quantitative	Secondary	✓		✓		✓			✓					
51	Van Holle, V	Belgium	2014	2010-2012	Quantitative	Original	✓		✓		✓			✓					
63	Hajna, S	Canada	2016	2007-2009	Quantitative	Secondary	✓		✓		✓			✓					
58	Hirsch, J	Canada	2016	2012	Quantitative	Secondary	✓		✓		✓			✓					
64	Kondo, K	Japan	2009	2006	Quantitative	Original	✓		✓		✓			✓					
65	Salvo, D	Mexico	2014	2011	Quantitative	Original	✓		✓		✓			✓					
52	Witten, K	New Zealand	2012	2008-2010	Quantitative	Secondary	✓		✓		✓			✓					
46	Sundquist, K	Sweden	2011	2008-2009	Quantitative	Original	✓		✓		✓			✓					
54	Awidsson, D	Sweden	2012	2008-2009	Quantitative	Secondary	✓		✓		✓			✓					
53	Awidsson, D	Sweden	2013	2008-2009	Quantitative	Secondary	✓		✓		✓			✓					
111	Robertson, L	UK	2012	2006-2007	Quantitative	Original	✓		✓		✓			✓					
74	Nomansell, R	UK	2014	2014	Qualitative	Original	✓		✓		✓			✓					✓
59	Hillsdon, M	UK	2015	2010-2011	Quantitative	Original	✓		✓		✓			✓					✓
57	Frank, L	USA	2005	2001-2003	Quantitative	Original	✓		✓		✓			✓					
68	King, W	USA	2005	2002-2003	Quantitative	Secondary	✓		✓		✓			✓					
60	Troped, P	USA	2010	2004-2005	Quantitative	Original	✓		✓		✓			✓					
72	Hall, K	USA	2010	Not reported	Quantitative	Original	✓		✓		✓			✓					
73	Grant, T	USA	2010	2007-2008	Qualitative	Original	✓		✓		✓			✓					✓
70	King, A	USA	2011	2005-2008	Quantitative	Original	✓		✓		✓			✓					
71	McAlexander, USA	USA	2011	2005-2010	Quantitative	Secondary	✓		✓		✓			✓					✓
66	Lee, R	USA	2012	2005-2010	Quantitative	Secondary	✓		✓		✓			✓					
61	Hurvitz, P	USA	2014	2008-2009	Quantitative	Original	✓		✓		✓			✓					
67	Braoy, N	USA	2014	2001-2008	Quantitative	Secondary	✓		✓		✓			✓					
55	Adams, M	USA	2015	2001-2005	Quantitative	Secondary	✓		✓		✓			✓					

WIRRAL WE NEED YOU!

Tell us about your daily routine... work, rest and play

We are looking for Wirral residents aged 18-65
to participate in research about patterns of daily
activity in Wirral:

- What do people do each day?
- Where does this take place? And why?
- Which factors influence physical activity patterns?
- What does the phrase 'active lifestyle' mean to you?
- What do people think about physical activity monitors?

Participation will involve questionnaires,
wrist-worn activity monitor,
GPS tracker and interview.
Travel expenses will be reimbursed.

For further details and to
discuss eligibility
contact 0151 529 5918
or rlyne@liverpool.ac.uk

Physical activity patterns in Wirral
Press v2.0 24.02.17



Collaboration for Leadership in
Applied Health Research and
Care North West Coast



Appendix 5:

PAW study press advertisement poster adaptation 1

WIRRAL WE NEED YOU!

Tell us about your daily routine...

Incentives and barriers to physical activity:

- What do people do each day?
- Where? And why?
- What influences physical activity patterns?
- What does the phrase 'active lifestyle' mean?
- What do people think about physical activity monitors?



What is involved?

- Aged 18-65
- Wirral resident
- Five questionnaires
- Fitbit activity monitor
- Audio-recorded interview
- Travel expenses reimbursed

Please contact the team via:
rlyne@liverpool.ac.uk or 07377 875508

Physical activity patterns in Wirral
Press v3.2 01.03.18

 UNIVERSITY OF
LIVERPOOL

Collaboration for Leadership in
Applied Health Research and Care
North West Coast

 **NHS**
National Institute for
Health Research

Appendix 6:

PAW study press advertisement poster adaptation 2

EAST WIRRAL RESIDENTS

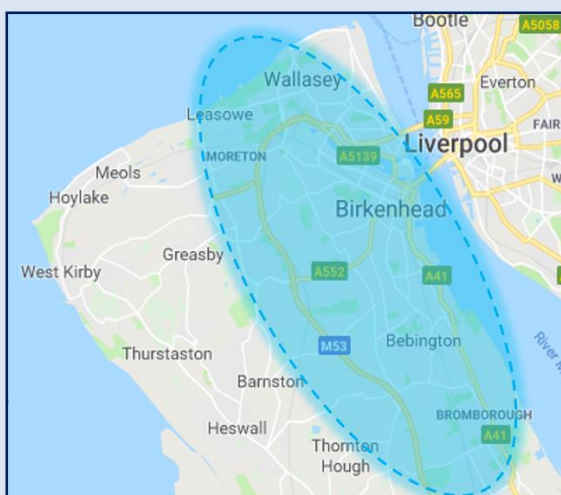
Physical activity and lifestyle research study

- What do people do each day?
- Where? And why?
- What influences physical activity?
- What does the phrase 'active lifestyle' mean?



Eligibility and involvement

- Aged 18-65
- East Wirral resident
- Five questionnaires
- Fitbit activity monitor
- Audio-recorded interview
- Travel expenses reimbursed



Please contact the team via:
rlyne@liverpool.ac.uk or 07377 875508

Physical activity patterns in Wirral
Press v3.2E 01.03.18



Collaboration for Leadership in
Applied Health Research and Care
North West Coast



Appendix 7:

PAW study protocol (version 3.1 29.01.18)

Full title: Physical activity, neighbourhood environment and socioeconomic status in Wirral: An exploratory study

Short title: Physical activity patterns in Wirral

Student Investigator:

Rosemary Lyne¹

Co-investigators:

Dr Daniel Cuthbertson², Dr John Blakey¹,
Dr Mark Goodall¹, Professor John Wilding²

Affiliations:

National Institute for Health Research Collaboration for Leadership in Applied Health
Research and Care North West Coast (NIHR CLAHRC NWC)

¹Institute of Psychology, Health and Society, University of Liverpool

²Institute of Ageing and Chronic Disease, University of Liverpool

Study centre:

Clinical Sciences Centre, Aintree University Hospital, Liverpool

Protocol version 3.1 Version date: 29.01.18

Appendix 7:

PAW study protocol (version 3.1 29.01.18)

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Appendix 7:

PAW study protocol (version 3.1 29.01.18)

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Appendix 7:

PAW study protocol (version 3.1 29.01.18)

Section 1 Administrative information

1.1 General information

Funding organisation

National Institute for Health Research, Collaboration for Leadership in Applied Health Research and Care, North West Coast (NIHR CLAHRC NWC), University of Liverpool, Department of Health Services Research, 2nd Floor, Block B, Waterhouse Building, Liverpool, Merseyside, N69 3GL

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Telephone: 0151 529 5918.

1.2 Study administrative centre

Clinical Sciences Centre, Aintree Hospital, Lower Lane, Liverpool, L9 7AL

1.3 Study dates

September 2016 – December 2018

1.4 Research aims and outcome measures

Research question

- What is the influence of neighbourhood environment upon people's physical activity?
 - How much physical activity is taking place?
 - What are the facilitators for and barriers to physical activity?
 - How does where people live influence the physical activity patterns?

Primary outcome

- Evaluate the real and perceived influence of environment features upon physical activity patterns, measured using mixed methods data triangulation

Secondary outcomes

- Number of minutes of sedentary, low, moderate and vigorous physical activity, per participant, per day, as measured by Fitbit Charge HR in 'active minutes' (≥ 3 metabolic equivalents (METs))
- Step count per participant, per day, as measured by Fitbit Charge HR

Appendix 7:

PAW study protocol (version 3.1 29.01.18)

- Record of self-reported general health and wellbeing, mental health, physical activity and perceptions of neighbourhood environment, measured by participant questionnaire
- Record of self-reported factors influencing physical activity patterns measured by participant interview responses
- Contextualised analysis of Wirral Peninsula using geographic information systems to collate geographic, economic and health data

Section 2 Background

2.1 Lay summary

People seem to have become less physically active in recent years, but we do not know why this is the case. Physical inactivity is one of the UK's most important health issues and said to be the main cause of avoidable health problems such as obesity, type II diabetes and cardiovascular disease. Government guidelines highlight the recommended amount and type of physical activity needed to stay healthy, but we do not know why some people still seem to be moving less and sitting more.

It would be helpful to know how much physical activity people are doing each day, but also understand their personal reasons for being either active or inactive. It may be useful also to explore how these reasons might link to people's neighbourhood environment, e.g. where activity broadly takes place in relation to coastal, inland, rural or urban regions. By asking people about their physical activity habits, as well as collecting information about the amount and location of activity, it may be possible to understand why some people are more active than others and which environment features may promote physical activity.

Our research study will take place in Wirral; a Merseyside borough known to have differences in health and life expectancy between residents living in the east of the region to those in the west. Wirral is a 60 square mile borough of rural and urban areas, with a combination of busy commercial and residential regions alongside green open spaces and coastal paths. We would like to find out how much physical activity people living in Wirral are doing, where this takes place geographically and the reasons residents give for how active they are.

We will use activity monitors worn on the wrist to find out how much physical activity they do over a 7 day period.

Participants will be asked to complete questionnaires about their physical activity, general health, mental health and thoughts about their neighbourhood environment. Participants will be asked to take part in one-to-one interviews following their 7 days' monitoring, to find out what they find helpful in allowing them to be active and/or what they think may be preventing them from being active.

The aims of this study are to understand more about physical activity in Wirral in terms of volume of activity and where/why this takes place in relation to local environment features, as well as exploring perceived barriers to an active lifestyle. As physical activity is one of the most important pieces in the jigsaw of good health, we

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need to understand what is happening in our local area, to make sure that everything is being done to help people sit less and move more.

2.2 Background and justification for study

It is widely accepted that the rising tide of sedentary behaviour has been linked to increased prevalence of preventable chronic conditions such as type II diabetes, obesity and cardiovascular disease (1). Targeted efforts are being made by the government, local authorities, NHS and health care providers to understand the reasons for people becoming increasingly less active. Whilst the advent of social media and advancements in technology may be responsible for a proportion of the issue, these are disparate elements of a wider problem, comprising interconnected factors such as time pressures, financial challenges, access, education, cultural influences and personal volition.

Mindset is often a barrier to participation in healthy occupations (2). Reported obstacles, whether real or perceived, influence activity behaviour, as do local environment features which have a bearing on overall health and levels of physical activity. People living in the vicinity of green spaces demonstrate better mental health and a greater propensity to be active than those living in more urban areas (3). The majority of previous studies exploring environmental influences have reported similar findings, and a propensity for increased physical activity in well-designed areas with good street connectivity, adequate street lighting, pedestrianised measures, amenities and reliable transport infrastructure. Availability of green spaces, perception of safety and environmental aesthetics also have a bearing; thus reinforcing the interconnectivity of multiple influences (4,5,6).

Responsibility for self is at the core of many public health interventions. Individuals are encouraged to be experts in their own health and wellbeing, including adhering to recommended levels of physical activity. Technology has enabled engaged individuals to take this one step further, facilitating the phenomenon known as 'the quantified self'. Put simply, this is the notion of engaging with one's health on a physical level using monitoring technologies for components such as heart rate; step count; calories burned, blood pressure; blood glucose and cholesterol levels. Personal global positioning system (GPS) units have similarly enabled geographic tracking of one's activity patterns; data from which can be synchronised with physical activity data to provide a holistic picture of one's activity patterns.

Physical activity studies have reported that people demonstrate greater levels of physical activity when using personal monitoring devices such as pedometers or activity trackers (7,8). One common factor reported by previous studies is the tendency for participants to over- or under-estimate activity levels via self-report versus accurate objective monitoring (9). To comprehensively explore physical activity patterns, both objective and subjective influencing factors must be understood, to learn not only what people are doing, but the reasons underpinning these behaviours.

This study intends to recruit participants aged 18 to 65 years, from the metropolitan borough of Wirral. The Wirral peninsula comprises a unique blend of urban and rural

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areas within a compact land area of 60 square miles. Wirral is home to 25 miles of coastline adjacent to parks, gardens and densely populated industrialised regions. There is a diverse range of built- and natural environment features and a range of socioeconomic groups within the borough. In 2015, there was difference in life expectancy of 12.3 and 10.0 years for males and females, respectively, between east and west Wirral (10). Using a mixed methods approach to explore real and perceived facilitators and barriers to physical activity, these data will be supported by objectively measured physical activity volumes, collected via wrist-worn physical activity monitors. Geographic information systems will be used contextualise activity data in relation to Wirral environment features and to identify associations between self-reported physical activity, objectively measured activity and identified environment characteristics.

Section 3 Study design

3.1 Study type

The study will be a cross-sectional, concurrent mixed methods triangulation design exploring three broad research questions ('what', 'where' and 'why') and encompassing three principal research aims:

1. What: Measure how much physical activity is taking place in Wirral?
2. Where: Where does physical activity taking place in relation to participant lifestyles and neighbourhood environment?
3. Why: Identify participants' real and perceived facilitators for and barriers to physical activity

The study will comprise four distinct quantitative and qualitative methods:

- Participant questionnaires
- Objective physical activity monitoring
- Participant semi-structured interviews
- Geospatial analysis using geographic information systems (GIS)

Section 4 Study participants

Wirral residents will be recruited from east and west of the region in acknowledgement of the socioeconomic east/west divide. 20 participants will be recruited from east Wirral, 20 from west Wirral. Informed consent will be obtained in writing prior to any study tasks taking place.

4.1 Sample size

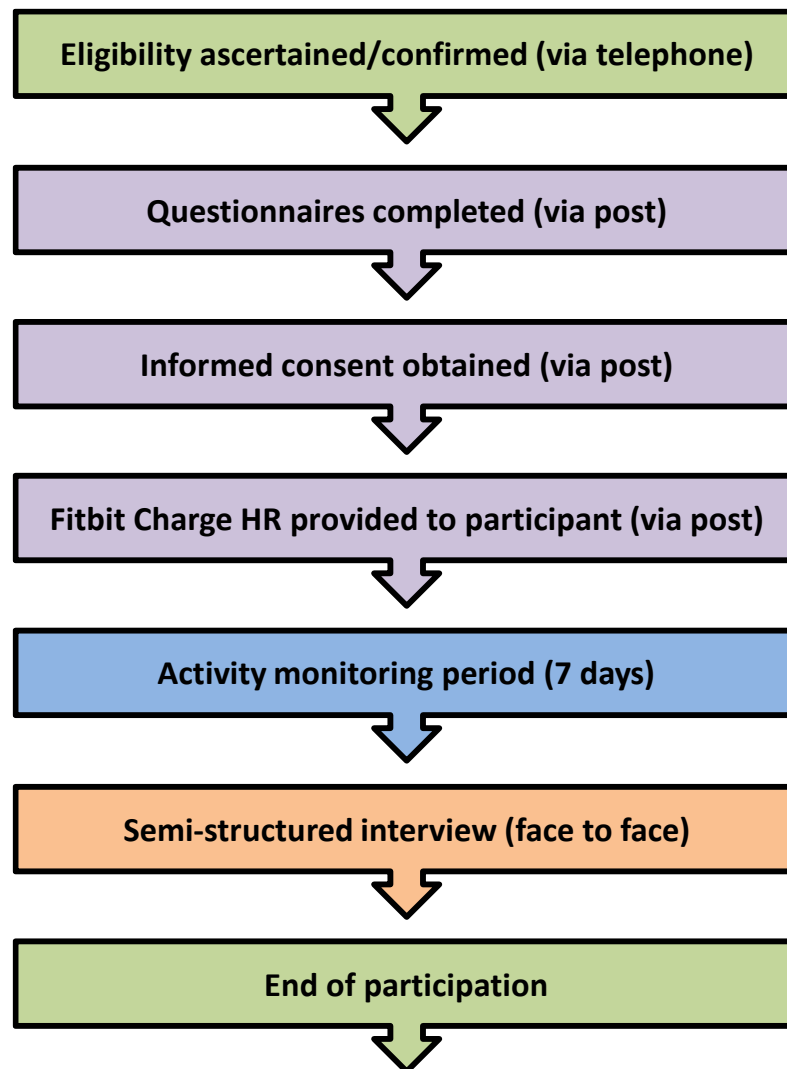
Taking into account potential participant attrition of $\geq 20\%$, recruitment will remain open until qualitative data saturation is achieved, up to a maximum of 50 participants. Ongoing thematic analysis will inform this decision. The figure of between 40 and 50

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participants takes into account recognised guidelines for optimal participant numbers for semi-structured interview research of between 30 and 50 (11). Target recruitment has also been informed by ensuring that data remains a manageable size for one postgraduate researcher.

4.2 Study flow chart (participant journey)



Section 5 Participation details

5.1 Eligibility criteria

- Age 18-65 years
- Self-reported score of 2-6 on Functional Mobility Scale (FMS) (12) (see below)
- Able to provide written consent for study participation
- Able to commit to completing all study tasks

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Functional Mobility Scale (FMS) (12)

Rating	Description
1	Uses wheelchair: May stand for transfers, may do some stepping supported by another person or using a walking/frame
2	Uses a walker or frame: Without help from another person
3	Uses crutches: Without help from another person
4	Uses sticks (one or two): Without help from another person
5	Independent on level surfaces: Does not use walking aids or need help from another person*. Requires a rail for stairs.
6	Independent on all surfaces: Does not need any walking aids or need help from another person when walking over all surfaces including uneven ground, curbs etc. and in a crowded environment

- *If uses furniture, walls, fences, shop fronts for support, please use 4 as the appropriate description.

5.2 Exclusion criteria

- Aged <18 years or >65 years
- Self-reported score of 1 on Functional Mobility Scale (FMS) (12)
- Unable to provide written consent for study participation
- Unable to wear wrist-worn activity monitoring device due to allergy/preference
- Unable to commit to completing all study tasks

5.3 Informed consent procedure

A participant information sheet will be provided to all interested parties. Queries from prospective participants will be addressed in person/via telephone and eligibility established verbally, prior to scheduled participant consent form being posted to each eligible party. Participants will be asked to complete and sign the participant consent form and return it to the study team in a stamped addressed envelope (provided by the study team) prior to any further study tasks being completed, to confirm eligibility and intention to participate.

5.4 Study withdrawal procedure

Participants will be advised that they are able to withdraw from the study at any time and need provide no explanation. Withdrawn participants will be asked whether any existing, anonymised data may be retained for subsequent analysis. If permission is granted, data will be stored securely and confidentially until analysis commences. If

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permission is not granted, data from withdrawn participants will be deleted/destroyed in a confidential manner, as per University of Liverpool statutory procedure.

5.5 Study duration

Engagement with the study will take approximately two weeks, given the time required for paperwork and equipment to be posted back and forth between participant and study team. Participation in the physical activity phase will take approximately 7 days. Participation in the semi-structured interview phase will take approximately one hour, allowing for introductory and valedictory scripts and participant comfort breaks. Interviews will not be scheduled at weekends. There will be no scheduled follow-up visits, however participants will be asked to consent to a potential post-interview telephone call, should clarification be required following interview transcription and/or analysis. All participants will be provided the opportunity to receive a copy of published results following study completion.

5.6 Potential benefits of participation

- Opportunity to share experiences and thoughts relating to physical activity in Wirral
- Opportunity to utilise and engage with physical activity monitoring equipment
- Develop understanding of personal physical activity habits (instant feedback via wearable physical activity monitor)
- Develop understanding of physical activity patterns in Wirral in relation to neighbourhood environment features (deferred feedback via reported study findings)
- Opportunity to contribute to the advancement of knowledge

5.7 Potential disadvantages of participation

- Inconvenience of wearing objective monitoring equipment for 7 days
- Voluntary offering of time, knowledge and personal experiences with no financial reward (with the exception of reasonable travel expenses)

5.8 Study venues

Participant interviews will take place at a pre-arranged, public venue (one venue will be secured in east Wirral; one in west Wirral) e.g. quiet study room within community library or community centre, or meeting room within academic institution. Unnecessary travel to the study's administrative centre (Aintree University Hospital) was deemed inappropriate and would incur avoidable travel time and expense. Selection of public venues will promote personal safety and minimise vulnerability for both participant and researcher. Members of the research team will adhere to University of Liverpool's lone working policy. The student investigator who will

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facilitate study visits is a Health and Care Professions Council (HCPC) registered occupational therapist, familiar with community working and accustomed to adhering to lone working and off-site working practices.

Section 6 Recruitment

6.1 Sampling strategy

Prospective participants will be identified using a purposive, non-random snowball sampling strategy. The east-west Wirral socioeconomic divide has been evidenced using data from the Indices of Multiple Deprivation (IMD) for Wirral, 2015 (13).

Wirral is divided into 206 Lower Super Output Areas (LSOAs); of which there are 32,844 in England. IMD is a measure of relative deprivation at a small area level, covering each of the 32,844 LSOAs. Ultimately, it is a score generated by each LSOA based upon 7 deprivation domains (13): Income; employment; health, deprivation and disability; education, skills and training; barriers to housing and services; crime; living environment. IMD scoring identifies disadvantaged areas, thus enabling policy makers to target resources to the areas of greatest need. The colour-keyed map overleaf indicates the 206 LSOAs by IMD score, supporting the recognised east/west divide in terms of relative deprivation. The borough will be hypothetically divided by the line of the M53 motorway, which dissects the borough roughly centrally. The imaginary divide will be extended to the northern coast of the borough, continuing further north than the M53, which actually curves toward Birkenhead at the northern tip of the peninsula. This divide is indicated on the map overleaf by a red line.

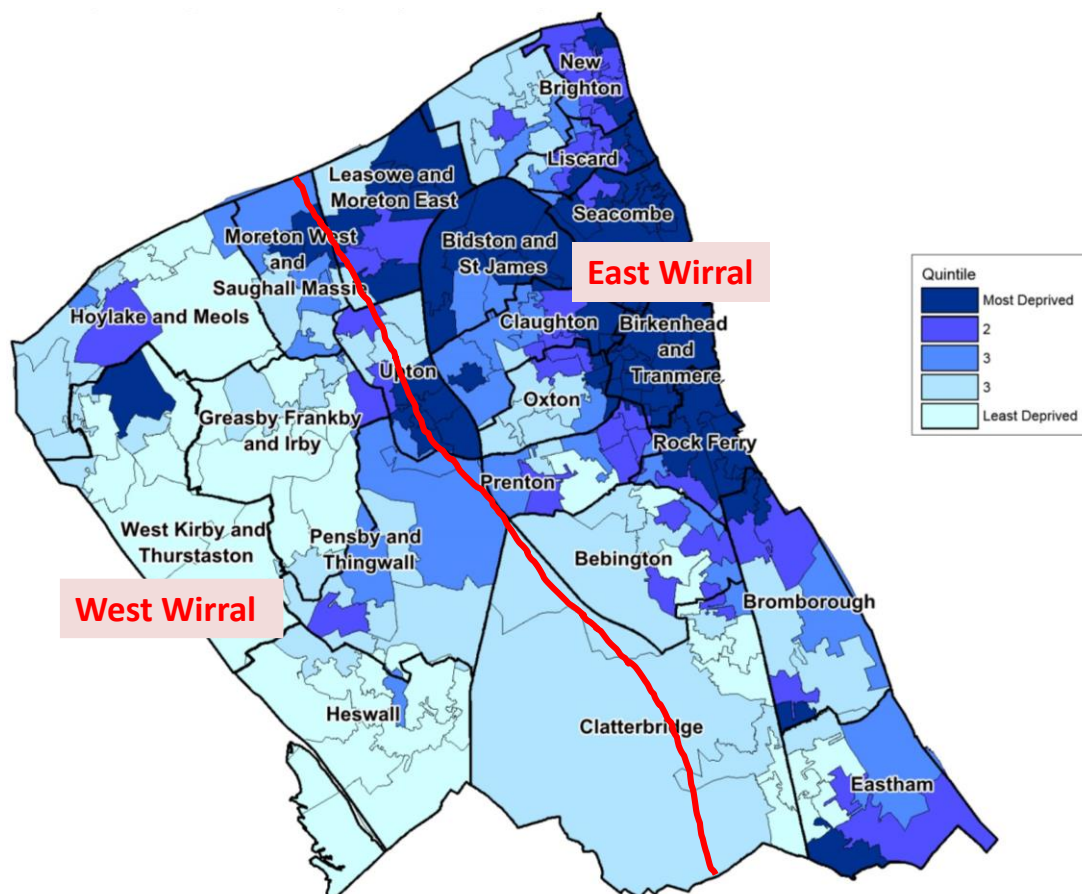
To ensure that interested parties are representative of a range of physical activity levels, prospective participants will be asked to answer four questions regarding their current activity patterns as part of the sampling process. Purposive sampling will also ensure a reasonable spread of participants from a range of Wirral postcode areas, which will be cross-referenced to IMD score. The self-report measure of physical activity patterns will be a simple form by which to capture basic activity data to enable further stratified sampling, should the need arise. The project aims to recruit a diverse participant group and should interested parties seem too homogenous in nature (e.g. too many male participants; too many participants in the same age bracket; too many people competing in sport for pleasure), supplementary stratified sampling should help to alleviate this situation. Contact details will be collected from all interested parties and retained confidentially within the investigator site file to enable sample stratification if appropriate.

Anonymised data regarding disinclination to participate from initially interested parties will also be collected on a basic form and retained within the investigator site file. These data may be helpful in determining any aspect of the study design which appears unappealing to prospective participants.

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Wirral LSOA map with IMD-scored colour key



6.2 Recruitment strategy

In order to ensure that every effort is made to raise awareness of the study in a non-biased manner, the study will be promoted via press advertisement in each of Wirral's two free printed newspapers; Wirral News (readership 99,310) and Wirral Globe (readership 98,196). Each paper is delivered weekly throughout the borough. The press advertisement will state the purpose of the study, participant requirements, participant eligibility, affiliate organisations and research team contact details. The study will also be generated by word of mouth by the study team and interested parties encouraged to discuss the study with acquaintances to encourage the snowball sample.

Section 7 Methods

7.1 Participant questionnaires

Participants will be asked to complete five questionnaires during their baseline visit; one non-standardised demographic questionnaire and four standardised, validated questionnaires relating to physical health, mental health, physical activity and perceptions of local neighbourhood environment.

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Non-standardised questionnaire

Demographic questionnaire developed using questions adapted from Office of National Statistics Census 2011 (14).

Standardised questionnaires

- General health (EuroQol EQ-5D (EQ-5D-3L)) (15)
- Mental health (5-item World Health Organization Well-Being Index (WHO-5)) (16)
- Physical activity (International Physical Activity Questionnaire (IPAQ long form)) (17)
- Perceptions of neighbourhood (International Physical Activity Prevalence Study Self-administered Environmental Module: Physical Activity Neighborhood Environment Survey (PANES)) (18)

7.2 Objective activity monitoring

It is acknowledged that any intervention is likely to introduce bias and behavioural change and the research team acknowledges that the use of physical activity monitoring equipment may in itself influence participants' physical activity patterns. As this study is exploratory and observational in nature, a control group will not be used. This will be acknowledged as a limitation of the study, yet the decision can be justified given the unique study focus.

Participants will be asked to wear a Fitbit Charge HR wrist-worn activity monitor for 7 days following completion and return of five questionnaires via post. The recommended wear duration for accurately recording physical activity is 2-7 days (dependent upon activity intensity) (19), which has been deemed appropriate for this study. Activity monitors, alongside a device information sheet, will be posted to each participant upon receipt of completed questionnaires by the study team. Fitbit Charge HR offers the following functionality, via downloadable software for home computers and mobile devices:

- Continuous heart rate
- Active minutes
- Calories burned
- Steps taken
- Floors climbed
- Distance travelled

Participants will not be required to synchronise their Fitbit Charge HR with an online Fitbit account, as the device will store detailed physical activity data for 7 days. Should the device be worn for longer than 7 days, data stored from day 8 onwards will replace the earliest recorded day's data (day one, in the case of this example). This has been perceived by the study team as unlikely to impact upon results, as a 7 day wear period will incorporate a full week and therefore hopefully provide an authentic

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week-long activity snapshot for each participant, comprising both week and weekend days. Participants will, however, be asked to charge the battery of the Fitbit Charge HR every two days, to maximise the likelihood of collecting 7 full days' activity data. A charging wire will be provided to them alongside the monitoring device, which is compatible with a USB port/plug. A telephone call will be made by a member of the study team to each participant to ensure safe receipt of the Fitbit Charge HR and to answer any queries regarding its usage. One online Fitbit account will be activated per participant, by the study team using a pseudonym and study-specific email address, to set up the device prior to use by each participant based upon age, height, weight and dominant wrist details. This will enable the study team to download participant-specific activity data once the device has been collected, following the 7 day activity monitoring period. Following completion of the study, each Fitbit Charge HR device will be deleted from each online account and all data erased, following data download by a member of the study team.

Example data report (dashboard and heart rate only) and device image for Fitbit Charge HR:



7.3 *Semi-structured interviews*

Participants from east and west Wirral (selected in order of recruitment to minimise selection bias) will be asked following the physical activity phase to take part in a semi-structured interview, facilitated by a member of the study team, to explore their perceptions and views of physical activity as a concept, facilitators for and barriers to an active lifestyle and their perceptions about how their physical activity patterns are influenced by where they live. The interview will take approximately 30-40 minutes.

The interview guide will be constructed to elicit rich data from participants; avoiding leading or closed questions. Should any interview digress from the interview guide, the facilitator will either direct conversation back to topic if not applicable to the subject area, or otherwise adapt the guide accordingly in the event of unforeseen, useful data which may be of benefit during subsequent analysis. Each interview will

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be approached as a unique and fluid process, whilst referring to the interview guide as an aide memoir.

7.4 Geospatial analysis

Wirral geographic, economic and health data will be analysed using geographic information systems to understand broad characteristics of the physical and social environments local to participants. Using this bespoke Wirral map, physical activity data, questionnaire data and interview data can be examined against local geographic, socioeconomic and health statistics to explore associations between physical activity, geographic location, perceptions of local environment and health inequalities across the borough.

Section 8 Data management

8.1 Data analysis

Anonymised quantitative data (physical activity, questionnaire responses and appropriate mapping data) will be managed and analysed using Excel and SPSS software. Anonymised qualitative data (interview transcripts) will be analysed using NVivo software. Excel and SPSS data will subsequently be imported into NVivo to enable integration of both data sets for triangulation and synthesis.

Quantitative data may be analysed using univariate and multivariate regression analyses. Assuming that all variables will be considered equal and with no *a priori* reason to include specific variables, data will be modelled using backwards selection and Collett's method. Qualitative data will be coded to enable thematic analysis and identification of patterned meaning across the dataset.

Physical activity data will be analysed to identify the volume of sedentary, low, moderate and vigorous physical activity taking place in Wirral. The mixed methods approach will enable contextualisation of physical activity, questionnaire and mapping data via one-to-one, rich dialogue, to facilitate greater understanding of factors influencing patterns of physical activity in Wirral.

8.2 Data storage

Recruited participants will be allocated a unique study number, used thereafter to identify participants and their data anonymously throughout the study. One central recruitment log will be retained within the investigator site file, comprising participant contact details and unique study number, to enable contact by other members of the study team in the event of unforeseen circumstances.

The investigator site file, study documentation and anonymised data will be stored within a secure office at Aintree University Hospital for the duration of the study. Only the principal investigator and four academic supervisors will have access to these records. Data will be archived for seven years following study completion, in line with

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University of Liverpool statutory requirements. Any data requiring deletion will be destroyed as per University of Liverpool data management policy.

Section 9 Ethical considerations

9.1 Participant distress or disclosures

No contentious issues are foreseen as a result of participation in this study, however, every effort will be made to ensure that participants are fully informed and continue to provide their consent for involvement at each stage. Should participants become distressed or disclose information pertinent to the health and safety of themselves or others, action will be taken as necessary as per University of Liverpool safeguarding policy.

9.2 Participant financial reimbursement

Participants will receive no financial incentive for their involvement in the study, apart from travel expenses incurred by baseline and final study visits.

Section 10 Finance and insurance

10.1 Study finances

Sponsor organisation information is outlined on page five. The research team will receive £2,100 per annum for project expenses. Additional grant applications will be submitted if allocated project funds are insufficient as the study progresses.

10.2 Study insurance

The study will be covered by University of Liverpool statutory insurance agreement for student research projects.

Section 11 Quality assurance

11.1 Research quality

The project will be overseen by two affiliate organisations, each requesting regular and formal progress reports. Each member of the research team will hold up to date Good Research Practice certificates and professional registration. The principal investigator will also hold a certificate of Good Research Practice issued by the Medical Research Council, as per University of Liverpool statutory requirements for postgraduate researchers. Signed copies of these certificates will be retained within the investigator site file.

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11.2 Conflicts of interest

No foreseen conflicts of interest.

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Appendix 8:

Participant information sheet (version 3.0 07.11.17)

Committee on Research Ethics

PARTICIPANT INFORMATION SHEET

Title of study (full title): Physical activity, neighbourhood environment and socioeconomic status in Wirral: An exploratory study

Short title: Physical activity patterns in Wirral

You are invited to take part in a research study about physical activity in Wirral. Before you decide whether or not to take part, it is important that you understand fully the aim of the research and what will be involved. Please take the time to read this document carefully and contact the study team using the contact details on the back page if you have any questions or would like to discuss any aspect in more detail. Participation is entirely optional and you should only agree to take part if the research is of interest to you and you would like to be involved.

What is the purpose of the study?

People seem to have become less physically active in recent years, but we do not know why. Physical inactivity is one of the UK's most important health issues and said to be the main cause of avoidable health problems such as obesity, type II diabetes and cardiovascular disease. Government guidelines highlight the recommended amount and type of physical activity needed to stay healthy, but we do not know why some people still seem to be moving less and sitting more.

It would be helpful to know how much physical activity people are doing each day and understand their personal reasons for being either active or inactive. It may be useful also to explore how these reasons might link to people's neighbourhood environment, e.g. coastal, inland, rural or urban. By asking people about their physical activity habits, as well as collecting information about the amount and general location of physical activity, it may be possible to understand why some people are more active than others.

Our research study will take place in Wirral; a Merseyside borough known to have differences in health and life expectancy between residents living in the east of the region to those in the west. Wirral is a 60 square mile borough of rural and urban areas, with a combination of commercial and residential regions alongside green open spaces and coastal paths. We would like to find out how much physical activity people living in Wirral are doing, where this takes place and the reasons residents give for how active they are.

The study will use activity monitors worn on the wrist to find out how much physical activity people do over a 7 day period. Participants will be asked to complete questionnaires about their physical activity, overall health and wellbeing, mental health and thoughts about their neighbourhood environment.

Appendix 8:

Participant information sheet (version 3.0 07.11.17)

Participants will be asked to take part in one-to-one interviews after the activity monitoring period, to find out what they find tend to helpful in allowing them to be active and/or what they think may prevent them from being more active. The main purpose of the study is to understand more about the patterns of physical activity in Wirral. As physical activity is one of the most important pieces in the jigsaw of good health, we need to understand what is happening in our local area, to make sure that everything is being done to help people sit less and move more.

Why have I been chosen to take part?

You have been asked to take part because you live in Wirral. Participants will be between the ages of 18 and 65 years and we will recruit 40 people in total. Participants must be able to walk freely, without assistance from another person and be willing to participate in all aspects of the study, as detailed below.

Do I have to take part and what happens if I change my mind?

Participation is entirely voluntary and you are free to withdraw at any time. You do not need to give any reason for withdrawal and any existing information held about you can be confidentially destroyed if you would prefer. Alternatively, you may yourself choose to take no further part but permit the use of any existing information within the study's results. The study team will ensure that your wishes are respected and followed.

What is the study about and what will happen if I take part?

Study information

The research study will be undertaken as part of a PhD programme associated with the University of Liverpool. There are five researchers on the study team:

- Rosemary Lyne (PhD student; University of Liverpool)
- Dr Daniel Cuthbertson (Reader and Honorary Consultant Physician; University of Liverpool and Aintree University Hospital)
- Dr John Blakey (Senior Clinical Lecturer and Honorary Consultant Physician; University of Liverpool and Aintree University Hospital)
- Dr Mark Goodall (Research Fellow; University of Liverpool)
- Professor John Wilding (Professor of Medicine and Honorary Consultant Physician; University of Liverpool and Aintree University Hospital)

The study will use five different techniques to collect information about physical activity in Wirral. Each method will capture information relating to one of the study's main research aims.

The study will focus upon three research aims:

- How much physical activity is taking place in Wirral?
- What are the factors influencing residents' physical activity?
- How much influence do local environment features have upon physical activity behaviours

Appendix 8:

Participant information sheet (version 3.0 07.11.17)

The methods to gather information will be as follows:

- Participant questionnaires
- One-to-one interviews (discussion based around a flexible set of pre-written questions)
- Wrist-worn physical activity monitor
- Computer mapping technology to generate map of Wirral using geographic, economic and health data

Recruitment

If you decide that you would like to take part and are eligible to participate, you will be asked to sign an informed consent form. This will confirm your understanding of the study and intention to take part. The informed consent form will be posted to you following confirmation of eligibility via telephone conversation with one of the study team. A stamped, addressed envelope will be provided, in which to post your completed, signed consent form back to the study team.

Participant questionnaires

Upon receipt of your signed informed consent form, you will be sent, via post, five questionnaires to complete; once again these will be accompanied by a stamped, addressed envelope in which to return the questionnaires to the study team. The five questionnaires will be as follows:

- Demographic questionnaire (e.g. postcode; property type; employment status; income)
- General health questionnaire (overall health and wellbeing)
- Mental health questionnaire (your views about your mental wellbeing)
- Physical activity (details about type, regularity and length of activity)
- Neighbourhood environment (e.g. safe; well-lit; pedestrianised; public transport)

Wrist-worn activity monitor

Upon receipt of your completed questionnaires, a wrist-worn Fitbit Charge HR physical activity monitor will be posted to you, alongside an information sheet with details about the equipment. A member of the study team will telephone you to discuss how to wear the device and to answer any questions you may have. You will be asked to wear the Fitbit Charge HR for the next 7 days. The Fitbit Charge HR will remain the property of University of Liverpool and must be returned to the study team during the final study visit. Equipment must be returned in the same condition as provided and include all components. All items of equipment are securely marked as property of University of Liverpool.

Appendix 8:

Participant information sheet (version 3.0 07.11.17)

Fitbit Charge HR physical activity monitor



You will be asked to charge the battery in the Fitbit Charge HR every two days to ensure that a full week's activity information can be safely stored within the device. During the 7 day activity monitoring period, we would like you to go about your daily life as usual and try not to increase/decrease your physical activity in any way. We are not attempting to change your activity behaviour, but instead collect information about your usual routine. After 7 days you will be asked to meet with a member of the study team to complete a one-to-one interview and return the Fitbit Charge HR and charging cable.

Final study visit

Following your activity monitoring period, you will be invited to attend a meeting with a member of the study team, to complete a one-to-one interview regarding your physical activity patterns. The meeting will take place in a community meeting room in Wirral, available to the public for hire; this is to minimise unnecessary travel inconvenience for you. The interview will involve a flexible set of questions brought to the meeting by the member of the study team conducting the interview.

The interview will focus upon your usual physical activity patterns, including the factors you consider to be helpful toward maintaining an active lifestyle and any barriers you may have experienced. We will also discuss your physical activity patterns in relation to your local neighbourhood environment. To enable full details of our discussion to be captured accurately, we will audio record the interview using a dictaphone. If you are not comfortable with this, please speak with a member of the study team prior to signing your informed consent form.

During this visit you will be asked to return all items of equipment to the study team and will be thanked for your participation in the study. You will be invited to discuss any queries or feedback you may have from the activity monitoring period.

You are also free to contact the study team following your participation in the study to discuss any queries arising.

Participant expenses

You will not receive any payment for your participation in the study, however, we will reimburse any travel costs associated with transport to and from the final study visit.

Appendix 8:

Participant information sheet (version 3.0 07.11.17)

We will ask you to sign an expenses form and provide evidence of tickets/receipts if available (e.g. taxi fare; bus/train ticket).

Are there any risks in taking part?

The equipment and methods used in the study are considered low risk and we do not foresee danger relating to participation. As with all interactions and discussions, however, there is a chance that items from the questionnaires or discussions during interview may stimulate thoughts and feelings which may be uncomfortable, but if you experience discomfort at any stage, please let the study team know and we can take necessary action.

With regard to activity monitoring equipment, the wrist-worn device is made from a flexible, rubber-like material with stainless steel buckle. If you suffer from allergies which you believe may be exacerbated by this item of equipment, please let the study team know as soon as possible.

Are there any benefits in taking part?

There are no physical or financial benefits from taking part, however, you may find the experience useful and/or interesting on a personal level. The study will enable you to borrow the Fitbit Charge HR activity monitoring device, which you may find interesting. The monitor will enable you to track your own daily physical activity and energy expenditure, which can be informative. You will help to generate valuable results which can be used to understand more about physical activity in Wirral. It is hoped that the results of this study will guide future research into how to encourage people to be more physically active and overcome identified barriers which may be preventing participation.

What if I am unhappy or if there is a problem?

If you are unhappy at any stage, or experience a problem, please share your concerns with the study team in the first instance and we can endeavour to address the issue. Please contact Rosemary Lyne on 0151 529 5918 or by email via rlyne@liverpool.ac.uk. If you do not feel that your issue has been resolved or do not feel able to speak with the study team directly, please contact the Research Governance Officer at University of Liverpool via ethics@liv.ac.uk. Please provide details of the title and description of the study (study title can be found on page one of this document), the research team members and details of the issue you would like to raise.

Will my participation be kept confidential?

After you have signed your informed consent form, you will be allocated a unique study number which will be used on all documentation in place of your personal details. This means that your personal information will be kept strictly confidential and not shared with anyone other than study members. None of the information collected from you will be identifiable and all anonymised information will be stored in a secure office at Aintree University Hospital for the duration of the study.

Appendix 8:

Participant information sheet (version 3.0 07.11.17)

Written questionnaire documentation, audio interview recordings and physical activity information will be collected during your involvement in the study. As indicated on your informed consent form, it may be that at some stage in the future, information from this study may be identified as beneficial for use in other related research, however at present further research has not been planned. Unless participant information is required for related research, participant information will be archived securely for seven years after the study has been completed. After this time, information will be securely destroyed. Storage and disposal of participant information will be undertaken as per University of Liverpool statutory guidelines.

Disclosure of criminal activity

Any information provided or disclosure made by you will remain confidential, unless we believe that withholding this information from appropriate parties may endanger either yourself or others. In this instance we have a moral and legal obligation to share this information with the necessary person(s)/institution(s) to allow appropriate action to be taken.

What will happen to the results of the study?

Results of this study will be formulated into publishable format and a copy sent to you, should you have indicated this on your informed consent form. Details of where the results will be published, if applicable, will be shared with you. If results are not submitted for publication, you will be notified of where and how to access these results. No personally identifiable information will be presented in the results. All participant information will remain anonymised, as detailed above.

Who can I contact if I have further questions?

If you have any questions, please contact the Student Investigator:

Rosemary Lyne
University of Liverpool
Clinical Sciences Centre
Aintree University Hospital
Lower Lane
Liverpool
L9 7AL

Tel: 0151 529 5918
Email: rlyne@liverpool.ac.uk

Appendix 9:

Participant consent form (version 3.0 07.11.17)

Committee on Research Ethics

PARTICIPANT CONSENT FORM

Title of Research Project: Physical activity, neighbourhood environment and socioeconomic status in Wirral: An exploratory study

Short title: Physical activity in Wirral

Researcher(s): Rosemary Lyne¹, Dr Daniel Cuthbertson², Dr John Blakey¹, Dr Mark Goodall¹, Professor John Wilding²

Affiliations: ¹Institute of Psychology, Health and Society, University of Liverpool; ²Institute of Ageing and Chronic Disease, University of Liverpool; Sponsorship organisation: National Institute for Health Research Collaboration for Leadership in Applied Health Research and Care North West Coast (NIHR CLAHRC NWC)

- | | Please
initial box |
|---|--------------------------|
| 1. I confirm that I have read and have understood the information sheet v3.0 dated 07/11/2017 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. | <input type="checkbox"/> |
| 2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my rights being affected. In addition, should I not wish to answer any particular question or questions, I am free to decline. | <input type="checkbox"/> |
| 3. I understand that, under the Data Protection Act, I can at any time ask for access to the information I provide and I can also request the destruction of that information if I wish. | <input type="checkbox"/> |
| 4. The information you have submitted may be published, anonymously, within a journal article or report. Please indicate whether you would like to receive a copy. | <input type="checkbox"/> |
| 5. I understand that confidentiality and anonymity will be maintained and it will not be possible to identify me in any publications. | <input type="checkbox"/> |
| 6. I agree for the data collected from me to be used in relevant future research and understand that any such use of identifiable data would be reviewed and approved by a research ethics committee. | <input type="checkbox"/> |
| 7. I agree to being contacted after the activity monitoring phase for involvement in an audio-recorded one-to-one interview which will be transcribed and analysed alongside my physical activity data. | <input type="checkbox"/> |
| 8. I understand that I have read and understood the eligibility (inclusion/exclusion) criteria. | <input type="checkbox"/> |
| 9. I understand that my responses will be kept strictly confidential and only accessible to members of the research team. I give permission for members of the research team to have access to my responses. I understand that my name will not be linked with the research materials, and I will not be identifiable in any reports or published research that result from this study. | <input type="checkbox"/> |
| 10. I would like to receive a copy of the results of this study. | <input type="checkbox"/> |

Appendix 9:

Participant consent form (version 3.0 07.11.17)

11. I agree to take part in the above study.

12. I agree to return all items of study equipment in the same condition as they were provided to me, including individual devices, protective casing, charging devices and outer packaging.

_____	_____	_____
Participant name	Date	Signature
_____	_____	_____
Name of person taking consent	Date	Signature
_____	_____	_____
Researcher	Date	Signature

Student Researcher:

Rosemary Lyne
Institute of Psychology, Health and Society
University of Liverpool
Clinical Sciences Centre, Aintree University Hospital
Lower Lane, Liverpool L9 7AL

Supervisor:

Dr Daniel Cuthbertson
Institute of Ageing and Chronic Disease
University of Liverpool
Clinical Sciences Centre, Aintree University Hospital
Lower Lane, Liverpool L9 7AL

Appendix 10:

Research ethics committee approval letter



Health and Life Sciences Committee on Research Ethics (Human participants, tissues and databases)

15 November 2016

Dear Dr Cuthbertson,

I am pleased to inform you that your application for research ethics approval has been approved. Details and conditions of the approval can be found below:

Reference: 0557
Project Title: Physical activity patterns in Wirral
Principal Investigator: Dr Dan Cuthbertson
Co-Investigator(s): Miss Rosemary Lyne, Prof John Wilding
Student Investigator(s): -
Department: Musculoskeletal Biology II
Reviewers: Dr Geraint Davies, Dr Mal Horsburgh
Approval Date: 15/11/2016
Approval Expiry Date: Three years from the approval date listed above

The application was **APPROVED** subject to the following conditions:

Conditions

- All serious adverse events must be reported to the Committee within 24 hours of their occurrence, via the Research Integrity and Ethics Officer (ethics@liv.ac.uk).
- If it is proposed to extend the duration of the study beyond the expiry date listed above, the Committee should be notified.
- If it is proposed to make an amendment to the research, you should notify the Committee by following the Notice of Amendment procedure.
- If the named Principal Investigator or Supervisor leaves the employment of the University during the course of this approval, the approval will lapse. Therefore please contact the Committee (details below) in order to notify them of a change in Principal Investigator or Supervisor.

Kind regards,

Health and Life Sciences Committee on Research Ethics (Human participants, tissues and databases)

edreseth@liverpool.ac.uk

0151 795 4358

Appendix 11:

Demographic questionnaire (version 2.1 30.03.17)

Physical activity, neighbourhood environment and socioeconomic status in Wirral: An exploratory study

Demographic Questionnaire

Please complete the questionnaire by ticking the appropriate box from the options available for each question

1. What is your date of birth? _____

2. How would you identify your gender?

- Male
- Female
- Other
- Prefer not to say

3. Which age bracket is appropriate to you?

- 18 to 29 years
- 30 to 39 years
- 40 to 49 years
- 50 to 59 years
- 60 to 65 years
- Prefer not to say

4. What is your religion?

- No religion
- Christian (all denominations)
- Buddhist
- Hindu
- Muslim
- Jewish
- Sikh
- Other (please specify): _____
- Prefer not to say

5. What is your ethnic group?

- White
- Mixed (please specify): _____
- Asian
- Black
- Other (please specify): _____
- Prefer not to say

Appendix 11:

Demographic questionnaire (version 2.1 30.03.17)

6. What is your postcode? _____

7. What type of accommodation do you live in?

- Terraced house
- Semi-detached house
- Detached house
- Bungalow
- Flat
- Maisonette
- Mobile/temporary structure
- Other (please specify): _____
- Prefer not to say

8. What is your status within the property?

- Owner
- Part owner
- Tenant
- Lodger
- Family member
- Other (please specify): _____
- Prefer not to say

9. Do you own a car?

- Yes
- No
- Prefer not to say

10. What is your main mode of transport?

- On foot
- Bicycle
- Car
- Bus
- Train
- Other (please specify): _____
- Prefer not to say

11. What is the highest educational level you have achieved?

- No secondary education
- GCSEs or equivalent
- A Levels or equivalent
- Undergraduate degree
- Masters degree
- Postgraduate degree
- Other (please specify): _____
- Prefer not to say

Appendix 11:

Demographic questionnaire (version 2.1 30.03.17)

12. What is your current employment status?

- Unemployed
- Temporary/ fixed term contract (part time)
- Temporary/fixed term contract (full time)
- Permanent contract (part time)
- Permanent contract (full time)
- Other (please specify): _____
- Prefer not to say

13. If you are currently employed, what is your work postcode?

14. If you are currently employed, which description best describes your employment?

- Administrative/clerical
- Manual work
- Managerial
- Other (please specify): _____
- Prefer not to say

15. Which option best describes your household salary?

- £0 to £9,999 per annum
- £10,000 to 19,999 per annum
- £20,000 to £29,000 per annum
- £30,000 to £39,999 per annum
- £40,000 to £49,000 per annum
- £50,000 to £59,999 per annum
- £60,000 to £69,000 per annum
- £70,000 to £79,999 per annum
- £80,000 to £89,000 per annum
- £90,000 to £99,999 per annum
- In excess of £100,000 per annum
- Prefer not to say

Thank you for taking the time to complete this questionnaire

Appendix 12:

EQ-5D-3L Health Questionnaire



Health Questionnaire

English version for the UK

(Validated for Ireland)

Appendix 12:

EQ-5D-3L Health Questionnaire

By placing a tick in one box in each group below, please indicate which statements best describe your own health state today.

Mobility

I have no problems in walking about

I have some problems in walking about

I am confined to bed

Self-Care

I have no problems with self-care

I have some problems washing or dressing myself

I am unable to wash or dress myself

Usual Activities (*e.g. work, study, housework, family or leisure activities*)

I have no problems with performing my usual activities

I have some problems with performing my usual activities

I am unable to perform my usual activities

Pain / Discomfort

I have no pain or discomfort

I have moderate pain or discomfort

I have extreme pain or discomfort

Anxiety / Depression

I am not anxious or depressed

I am moderately anxious or depressed

I am extremely anxious or depressed

Appendix 12:

EQ-5D-3L Health Questionnaire

To help people say how good or bad a health state is, we have drawn a scale (rather like a thermometer) on which the best state you can imagine is marked 100 and the worst state you can imagine is marked 0.

We would like you to indicate on this scale how good or bad your own health is today, in your opinion. Please do this by drawing a line from the box below to whichever point on the scale indicates how good or bad your health state is today.

**Your own health
state today**

Best imaginable
health state

100



9

8

7

6

5

4

3

2

1

0

Worst imaginable
health state

Appendix 13:

WHO (Five) Well-Being Index



Psychiatric Research Unit
WHO Collaborating Centre in Mental Health

WHO (Five) Well-Being Index (1998 version)

Please indicate for each of the five statements which is closest to how you have been feeling over the last two weeks. Notice that higher numbers mean better well-being.

Example: If you have felt cheerful and in good spirits more than half of the time during the last two weeks, put a tick in the box with the number 3 in the upper right corner.

	<i>Over the last two weeks</i>	All of the time	Most of the time	More than half of the time	Less than half of the time	Some of the time	At no time
1	I have felt cheerful and in good spirits	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
2	I have felt calm and relaxed	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
3	I have felt active and vigorous	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
4	I woke up feeling fresh and rested	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
5	My daily life has been filled with things that interest me	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

Scoring:

The raw score is calculated by totalling the figures of the five answers. The raw score ranges from 0 to 25, 0 representing worst possible and 25 representing best possible quality of life.

To obtain a percentage score ranging from 0 to 100, the raw score is multiplied by 4. A percentage score of 0 represents worst possible, whereas a score of 100 represents best possible quality of life.

Appendix 13:

WHO (Five) Well-Being Index

Interpretation:

It is recommended to administer the Major Depression (ICD-10) Inventory if the raw score is below 13 or if the patient has answered 0 to 1 to any of the five items. A score below 13 indicates poor wellbeing and is an indication for testing for depression under ICD-10.

Monitoring change:

In order to monitor possible changes in wellbeing, the percentage score is used. A 10% difference indicates a significant change (ref. John Ware, 1995).

Appendix 14:

International Physical Activity Questionnaire (Long)

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE (October 2002)

LONG LAST 7 DAYS SELF-ADMINISTERED FORMAT

FOR USE WITH YOUNG AND MIDDLE-AGED ADULTS (15-69 years)

The International Physical Activity Questionnaires (IPAQ) comprises a set of 4 questionnaires. Long (5 activity domains asked independently) and short (4 generic items) versions for use by either telephone or self-administered methods are available. The purpose of the questionnaires is to provide common instruments that can be used to obtain internationally comparable data on health-related physical activity.

Background on IPAQ

The development of an international measure for physical activity commenced in Geneva in 1998 and was followed by extensive reliability and validity testing undertaken across 12 countries (14 sites) during 2000. The final results suggest that these measures have acceptable measurement properties for use in many settings and in different languages, and are suitable for national population-based prevalence studies of participation in physical activity.

Using IPAQ

Use of the IPAQ instruments for monitoring and research purposes is encouraged. It is recommended that no changes be made to the order or wording of the questions as this will affect the psychometric properties of the instruments.

Translation from English and Cultural Adaptation

Translation from English is encouraged to facilitate worldwide use of IPAQ. Information on the availability of IPAQ in different languages can be obtained at www.ipaq.ki.se. If a new translation is undertaken we highly recommend using the prescribed back translation methods available on the IPAQ website. If possible please consider making your translated version of IPAQ available to others by contributing it to the IPAQ website. Further details on translation and cultural adaptation can be downloaded from the website.

Further Developments of IPAQ

International collaboration on IPAQ is on-going and an *International Physical Activity Prevalence Study* is in progress. For further information see the IPAQ website.

More Information

More detailed information on the IPAQ process and the research methods used in the development of IPAQ instruments is available at www.ipaq.ki.se and Booth, M.L. (2000). *Assessment of Physical Activity: An International Perspective*. Research Quarterly for Exercise and Sport, 71 (2): s114-20. Other scientific publications and presentations on the use of IPAQ are summarized on the website.

LONG LAST 7 DAYS SELF-ADMINISTERED version of the IPAQ. Revised October 2002.

Appendix 14:

International Physical Activity Questionnaire (Long)

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** and **moderate** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

PART 1: JOB-RELATED PHYSICAL ACTIVITY

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?

Yes

No →

Skip to PART 2: TRANSPORTATION

The next questions are about all the physical activity you did in the **last 7 days** as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, heavy construction, or climbing up stairs **as part of your work**? Think about only those physical activities that you did for at least 10 minutes at a time.

_____ **days per week**

No vigorous job-related physical activity →

Skip to question 4

3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?

_____ **hours per day**
_____ **minutes per day**

4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.

_____ **days per week**

No moderate job-related physical activity →

Skip to question 6

LONG LAST 7 DAYS SELF-ADMINISTERED version of the IPAQ. Revised October 2002.

Appendix 14:

International Physical Activity Questionnaire (Long)

5. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work?
- _____ **hours per day**
_____ **minutes per day**
6. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.
- _____ **days per week**
- No job-related walking → **Skip to PART 2: TRANSPORTATION**
7. How much time did you usually spend on one of those days **walking** as part of your work?
- _____ **hours per day**
_____ **minutes per day**

PART 2: TRANSPORTATION PHYSICAL ACTIVITY

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

8. During the **last 7 days**, on how many days did you **travel in a motor vehicle** like a train, bus, car, or tram?
- _____ **days per week**
- No traveling in a motor vehicle → **Skip to question 10**
9. How much time did you usually spend on one of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle?
- _____ **hours per day**
_____ **minutes per day**

Now think only about the **bicycling** and **walking** you might have done to travel to and from work, to do errands, or to go from place to place.

10. During the **last 7 days**, on how many days did you **bicycle** for at least 10 minutes at a time to go **from place to place**?
- _____ **days per week**
- No bicycling from place to place → **Skip to question 12**

LONG LAST 7 DAYS SELF-ADMINISTERED version of the IPAQ. Revised October 2002.

Appendix 14:

International Physical Activity Questionnaire (Long)

11. How much time did you usually spend on one of those days to **bicycle** from place to place?

____ hours per day
____ minutes per day

12. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time to go **from place to place**?

____ days per week

No walking from place to place



**Skip to PART 3: HOUSEWORK,
HOUSE MAINTENANCE, AND
CARING FOR FAMILY**

13. How much time did you usually spend on one of those days **walking** from place to place?

____ hours per day
____ minutes per day

PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY

This section is about some of the physical activities you might have done in the **last 7 days** in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, shoveling snow, or digging **in the garden or yard**?

____ days per week

No vigorous activity in garden or yard



Skip to question 16

15. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard?

____ hours per day
____ minutes per day

16. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or yard**?

____ days per week

No moderate activity in garden or yard



Skip to question 18

LONG LAST 7 DAYS SELF-ADMINISTERED version of the IPAQ. Revised October 2002.

Appendix 14:

International Physical Activity Questionnaire (Long)

17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?

_____ hours per day
_____ minutes per day

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home**?

_____ days per week

No moderate activity inside home



**Skip to PART 4: RECREATION,
SPORT AND LEISURE-TIME
PHYSICAL ACTIVITY**

19. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home?

_____ hours per day
_____ minutes per day

PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY

This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?

_____ days per week

No walking in leisure time



Skip to question 22

21. How much time did you usually spend on one of those days **walking** in your leisure time?

_____ hours per day
_____ minutes per day

22. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?

_____ days per week

No vigorous activity in leisure time



Skip to question 24

LONG LAST 7 DAYS SELF-ADMINISTERED version of the IPAQ. Revised October 2002.

Appendix 14:

International Physical Activity Questionnaire (Long)

23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?
- _____ **hours per day**
_____ **minutes per day**
24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis **in your leisure time**?
- _____ **days per week**
- No moderate activity in leisure time → **Skip to PART 5: TIME SPENT SITTING**
25. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?
- _____ **hours per day**
_____ **minutes per day**

PART 5: TIME SPENT SITTING

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekday**?
- _____ **hours per day**
_____ **minutes per day**
27. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekend day**?
- _____ **hours per day**
_____ **minutes per day**

This is the end of the questionnaire, thank you for participating.

Appendix 15:

Physical Activity Neighbourhood Environment Scale

International Physical Activity Prevalence Study SELF-ADMINISTERED ENVIRONMENTAL MODULE

There is increasing interest in the contextual (environmental) barriers that prevent or limit the opportunity to walk and cycle in areas around where we live and work. Factors that are emerging as important include land use, housing density, accessibility to public transport systems, and perceived safety from traffic and crime. Research in this field is still in its infancy and many other factors are also being researched. Moreover currently there are very few well-developed survey instruments addressing this topic.

The International Physical Activity Prevalence Study (IPS) has developed an optional ENVIRONMENTAL MODULE that can be used to assess the environmental factors for walking and bicycling in your neighborhoods. We offer it for use in the IPS Study *in addition to the IPAQ (short form)*. Countries participating in IPS are encouraged to consider ways in which they can extend their participation and study protocols to include the optional ENVIRONMENTAL MODULE.

The ENVIRONMENTAL MODULE has three sets of carefully chosen items that reflect current thinking in this field and in which the reliability and validity of each item has been assessed. We tried to keep the module as short as possible, include the variables that have already shown to be associated with different levels of activity in different countries, and select items that would be of interest and relevant to all countries regardless of the stage of economic development.

The three sets of items re grouped as follows:

- CORE (Items 1-7)
- RECOMMENDED (Items 8-11)
- OPTIONAL (Items 12-17)

All countries that use the ENVIRONMENTAL MODULE *must* ask all CORE items. We encourage you to ask as many RECOMMENDED items as possible. If you have space in your survey and if you are interested in the environmental aspects of physical activity, we provide a small set of OPTIONAL items for use. If your country is able to add more questions on different aspects of the environment than provided here, we can provide other tested items (not shown here) and would be willing to help you make a selection.

We recognize it is unlikely that all the items (CORE, RECOMMENDED AND OPTIONAL) will be asked in a country.

Please note - The wording of items and the response scales should not be changed because this will most likely change the meaning of the questions and prohibit comparison between countries. The relevancy and responses to items will vary greatly across countries, so it is critical to document national differences. We provide guidelines at the end of the survey for the translation process and cultural adaptation to make the items relevant to your country and the language spoken.

IPS SELF-ADMINISTERED version. Revised November 2002.

Appendix 15:

Physical Activity Neighbourhood Environment Scale

INTERNATIONAL PREVALENCE STUDY [IPS] ON PHYSICAL ACTIVITY

Think about the different facilities in and around your neighborhood by this we mean the area ALL around your home that you could walk to in **10-15 minutes**.

1. What is the main type of housing in your neighborhood?

- 1 Detached single-family housing
- 2 Townhouses, row houses, apartments, or condos of 2-3 stories
- 3 Mix of single-family residences and townhouses, row houses, apartments or condos
- 4 Apartments or condos of 4-12 stories
- 5 Apartments or condos of more than 12 stories
- 77 Don't know/Not sure

The next items are statements about your neighborhood related to walking and bicycling.

2. Many shops, stores, markets or other places to buy things I need are within easy walking distance of my home. Would you say that you...

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Somewhat agree
- 4 Strongly agree
- 77 Don't know/Not sure

3. It is within a 10-15 minutes walk to a transit stop (such as bus, train, trolley, or tram) from my home. Would you say that you...

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Somewhat agree
- 4 Strongly agree
- 77 Don't know/Not sure

IPS SELF-ADMINISTERED version. Revised November 2002.

Appendix 15:

Physical Activity Neighbourhood Environment Scale

4. There are sidewalks on most of the streets in my neighborhood. Would you say that you...
- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Somewhat agree
- 4 Strongly agree
- 88 Does not apply to my neighborhood
- 77 Don't know/Not sure
5. There are facilities to bicycle in or near my neighborhood, such as special lanes, separate paths or trails, shared use paths for cycles and pedestrians. Would you say that you...
- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Somewhat agree
- 4 Strongly agree
- 88 Does not apply to my neighborhood
- 77 Don't know/Not sure
6. My neighborhood has several **free or low cost** recreation facilities, such as parks, walking trails, bike paths, recreation centers, playgrounds, public swimming pools, etc. Would you say that you...
- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Somewhat agree
- 4 Strongly agree
- 77 Don't know/Not sure

IPS SELF-ADMINISTERED version. Revised November 2002.

Appendix 15:

Physical Activity Neighbourhood Environment Scale

7. The crime rate in my neighborhood makes it unsafe to go on walks at night. Would you say that you...

- 1 Strongly disagree
2 Somewhat disagree
3 Somewhat agree
4 Strongly agree
77 Don't know/Not sure

8. There is so much traffic on the streets that it makes it difficult or unpleasant to walk in my neighborhood. Would you say that you...

- 1 Strongly disagree
2 Somewhat disagree
3 Somewhat agree
4 Strongly agree
88 There are no streets or roads in my neighborhood
77 Don't know/Not sure

9. I see many people being physically active in my neighborhood doing things like walking, jogging, cycling, or playing sports and active games. Would you say that you...

- 1 Strongly disagree
2 Somewhat disagree
3 Somewhat agree
4 Strongly agree
77 Don't know/Not sure

IPS SELF-ADMINISTERED version. Revised November 2002.

Appendix 15:

Physical Activity Neighbourhood Environment Scale

10. There are many interesting things to look at while walking in my neighborhood. Would you say you...
- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Somewhat agree
- 4 Strongly agree
- 77 Don't know/Not sure
11. How many motor vehicles in working order (e.g., cars, trucks, motorcycles) are there at your household?
- ___ Motor Vehicles
- 77 Don't know/Not sure
12. There are many four-way intersections in my neighborhood. Would you say that you...
- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Somewhat agree
- 4 Strongly agree
- 88 There are no streets or roads in my neighborhood
- 77 Don't know/Not sure
13. The sidewalks in my neighborhood are well maintained (paved, with few cracks) and not obstructed. Would you say that you...
- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Somewhat agree
- 4 Strongly agree
- 77 Don't know/Not sure

IPS SELF-ADMINISTERED version. Revised November 2002.

Appendix 15:

Physical Activity Neighbourhood Environment Scale

14. Places for bicycling (such as bike paths) in and around my neighborhood are well maintained and not obstructed. Would you say that you...
- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Somewhat agree
- 4 Strongly agree
- 77 Don't know/Not sure
15. There is so much traffic on the streets that it makes it difficult or unpleasant to ride a bicycle in my neighborhood. Would you say that you...
- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Somewhat agree
- 4 Strongly agree
- 77 Don't know/Not sure
16. The crime rate in my neighborhood makes it unsafe to go on walks during the day. Would you say that you...
- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Somewhat agree
- 4 Strongly agree
- 77 Don't know/Not sure

IPS SELF-ADMINISTERED version. Revised November 2002.

Appendix 15:

Physical Activity Neighbourhood Environment Scale

17. There are many places to go within easy walking distance of my home. Would you say that you...

- 1 Strongly disagree
2 Somewhat disagree
3 Somewhat agree
4 Strongly agree
77 Don't know/Not sure

This is the end of the questionnaire, thank you for participating.

Appendix 16:

Semi-structured interview guide (version 3.1 29.01.18)

Full title: Physical activity, neighbourhood environment and socioeconomic status in Wirral: An exploratory study

Short title: Physical activity patterns in Wirral

Interview topic guide

This interview guide is designed as an aide memoire to facilitate participants' free-flowing discussion based around the following topics:

- Overview of physical activity as a concept and their own physical activity patterns
- Perceived facilitators for and barriers to physical activity from their perspective
- Personal opinion surrounding the advent and use of objective monitoring equipment

The guide has been written in a non-prescriptive manner, to enable participants to discuss their views and experiences regarding the topic areas. Discussion surrounding related issues, to which participants may attribute importance is also encouraged, yet the interview guide will encourage the interviewer to redirect tangential discussion as necessary.

The following pages comprise a list of themes and sub-themes; each of which will be explored with every participant. Question delivery will be responsive to participants' preceding answers and discussion will be co-created between interviewee and interviewer. Ordering of questions may vary from one participant to another, given the importance of exploring each answer fully to elicit rich data surrounding views, behaviours and experiences. Specific wording of questions will be adapted for individual participants as necessary, to promote clarity and understanding. The interviewer will remain mindful of time, yet ensure that participants are not rushed; a consequence of which could be pertinent points overlooked. Each interview will be approached as a unique and fluid process.

Introduction

The introductory script will welcome the participant to the meeting and provide background information about the forthcoming discussion. The script will comprise the following elements:

- Introduce self
- Welcome participant
- Introduce study
- Recap eligibility criteria and group allocation process
- Reiterate voluntary nature of participation and right to withdraw
- Explain set of pre-written questions with objective to facilitate open discussion
- Confirm flexibility of interview guide, should supplementary, pertinent points arise
- Encourage relaxed, conversational style

Appendix 16:

Semi-structured interview guide (version 3.1 29.01.18)

- Encourage full and open responses to share unique thoughts and experiences
- Confirm interview length (approximately 60 minutes)
- Reiterate audio recording using dictaphone
- Explain principles of confidentiality and data protection
- Explain data storage and analysis
- Welcome participant questions

Introductory script

"Thank you for coming along today, to chat about various aspects of your physical activity, and, in particular, being physically active within your neighbourhood. Please feel free to talk openly and elaborate on answers where you can. There are no right or wrong answers and please be as honest as possible. By sharing your thoughts and opinions, you will really help us to understanding of the level of physical activity currently being enjoyed by Wirral residents and the factors influencing these activity patterns. We will begin by focusing on physical activity in general and then on your own physical activity patterns. We will then explore your opinions surrounding aspects of your lifestyle and/or local environment which you think encourage physical activity. It would be extremely useful also to learn about any barriers you have experienced which you think may prevent you from being as physically active as you would like. The third and final topic will be your experiences of using the physical activity monitoring equipment for the 14 day period.

The interview should take around 60 minutes and if you would like a break at any time, please let me know. You are free to withdraw from the discussion at any stage, should you prefer not to answer any more questions. Please also feel free to decline to answer any particular questions, should you so wish. The interview will be recorded using a dictaphone, which enables us to talk freely and for me not to take notes. The recording will be transcribed word for word at a later date and entered into a computer programme called NVivo. Our conversation will remain confidential and only members of the study team will have access to the audio recording and transcribed script. We will only use your unique study number to identify information belonging to you and anything you share will remain anonymous.

Do you have any questions about what I have just said, or is there anything you are unsure about?"

Topic questions and prompts

Question 1: Physical activity and personal physical activity patterns

Aim: Elicit participant's views regarding physical activity in general and their own physical activity patterns

1.1 'Can you tell me what you consider the phrase 'physical activity' to mean?'

Prompts:

- First awareness of this phrase
- Society's perception of the phrase

Appendix 16:

Semi-structured interview guide (version 3.1 29.01.18)

- Connotations/associations
- Examples of physically active behaviour in daily life

Intermediate script

'I'll share with you the World Health Organisation's definition of physical activity as it is interesting to know what other people understand the phrase to mean... They define physical activity as 'any bodily movement produced by skeletal muscle that requires energy expenditure' (9); so therefore any physical movement brought about by using our muscles and which burns calories. Another way to think about it, is any activity which means that the body is moving about and producing an increase in heart rate and respiratory rate (or breaths per minute). It can be anything from light housework to gardening, to walking to the bus stop, to enjoying structured exercise and sport, to a physically demanding job. Working on the basis of this definition of getting one's body up and moving about, let's talk more about what tends to influence your own activity patterns.'

1.2 'Are you able to think about the physical activities you tend to engage in and describe what they entail?'

Prompts:

- Duration/frequency
- Prolonged sitting/standing/walking
- Manual tasks
- Feeling out of breath
- Mental energy/concentration
- Solitary/social
- Enjoyable or chore
- Location/venue

1.3 'How physically active do you consider yourself to be?'

Prompts:

- Unit of measurement (personal choice/external influences)
- Frequency of physical activity
- Reason for own physical activity

1.4 'Are you able to describe to me your daily routine on a typical...'

- a) week day? (Mon-Fri employment)*
- b) weekend day? (Mon-Fri employment)*
- c) day off? (shift work)*
- d) day? (unemployed)*

Prompts:

- Household chores
- Responsibilities
- Dependents

Appendix 16:

Semi-structured interview guide (version 3.1 29.01.18)

- Leisure time
- Travel/transport

1.5 (If applicable) Can you describe how physically active you are as part of your work?

Prompts:

- Journey to and from work
- Work-related physical tasks
- Nature of work (manual labour/clinical/administrative)
- Stairs versus lift
- Seated desk versus standing
- Ethos of company/colleagues with regard to physical activity

Question 2: Facilitators for and barriers to physical activity

Aim: Explore participant's perceptions of the factors (internal/external) within their own lives which either encourage or prevent physical activity

2.1 'Can you tell me the factors which lead to or enable you be physically active in your daily life?'

Prompts:

- Imposed, i.e. Employment responsibilities (self/others)
- Enjoyment
- External influences (people/organisations)
- Pressure/obligation (individuals/society/organisations)
- Accessibility
- Health promotion (physical/mental)
- Sociability
- Structure/routine
- Meaningfulness/purpose

2.2 'Can you describe any factors which you think may hinder/influence your ability to be as physically active as you might like?'

Prompts:

- Time
- Money
- Inclination
- Confidence
- Company
- Opportunities
- Variety
- Accessibility
- Safety
- Transport

Appendix 16:

Semi-structured interview guide (version 3.1 29.01.18)

2.3 'Can you think of any solutions which may enable you to be more physically active (based upon your previous answer)?'

Prompts:

- *increased available free time*
- *Increased disposable income*
- *Company from others (moral support)*
- *More physically active job*

2.4 'Can you think of examples of anything which may motivate people to be more active and encourage more physical activity in daily routine?'

Prompts:

- Increased variety of opportunities
- Improvements to environment features
- Greater awareness of activities locally
- Inspiration/suggestions
- Socially-orientated events/company
- Self-imposed targets/externally-derived targets
- Education/understanding of benefits of physical activity
- Education/understanding of risks associated with physical inactivity
- Incentive (financial/personal)
- Equipment/funding/information
- Gamification

Question 3: Engagement with one's local environment in relation to physical activity

Aim: Ascertain how residents engage with their local environment as part of their physical activity patterns

3.1 What type of physical activity do you tend to enjoy/participate in within your local neighbourhood?

Prompts:

- *Walking*
- *Jogging*
- *Cycling*
- *Water sports*
- *Swimming (open water/pool)*
- *Gym membership*
- *Park gym equipment*
- *Team sports*
- *Dog walking*

Appendix 16:

Semi-structured interview guide (version 3.1 29.01.18)

3.2 How would you describe the main features of your local environment?

Prompts:

- *Rural/urban*
- *Coastal/inland*
- *Safe/unsafe*
- *Well maintained/poorly maintained*
- *Pedestrian friendly/motor-vehicle friendly*
- *Community feel/unfriendly*
- *Pleasant/unpleasant*

3.3 To what extent do you feel that your neighbourhood environment supports or hinders your ability to be physically active?

Prompts:

- *Availability of facilities*
- *Standard of maintenance*
- *Accessibility*
- *Aesthetics*
- *Appropriateness of facilities*
- *Affordability*
- *Appropriateness of opening/closing times*

3.4 Please can you name the public facilities in your neighbourhood which encourage/enable residents to be physically active?

Prompts:

- *Parks*
- *Gardens*
- *Coastal/inland paths*
- *Cycle paths*
- *Leisure centres*
- *Public sports facilities*
- *Public transport (accessibility/affordability)*
- *Street lighting*
- *Street connectivity*
- *Pedestrian crossings*

3.5 Can you think of any measures to improve your neighbourhood in terms of encouraging physical activity?

Prompts:

- *Improved volume of facilities*
- *Improved variety of facilities*
- *Reduced cost of public facilities*
- *Improved standard of maintenance*
- *Improved public transport infrastructure*

Appendix 16:

Semi-structured interview guide (version 3.1 29.01.18)

- *Improved aesthetics*
- *Improved safety measures (objective and subjective)*

3.6 To what extent do you feel that your local environment influences your choices/options to be physically active?

Prompts:

- *Strong influence (in what way?)*
- *Negligible influence (in what way?)*
- *Positive influence (reasoning?)*
- *Negative influence (reasoning?)*
- *No influence (describe actual influences instead)*
- *Indifferent (reasoning? Not considered this before? Disinterested?)*
- *Unsure (reasoning? Not considered this before? Disinterested?)*

3.7 On a scale of 1-10 (1 being least important influence and 10 being most important influence), how would you rate the influence of your local environment on your physical activity choices/patterns?

Question 4: Engagement with Fitbit Charge HR and influence upon physical activity patterns

Aim: Ascertain the degree to which participants' activity patterns were influenced by wearing an activity monitor

4.1 To what degree did you find yourself interacting with the Fitbit Charge HR?

Prompts:

- *No interaction*
- *Looked at Fitbit screen (frequency?)*
- *Personal challenges based upon screen data*
- *Challenges with others owning an activity monitor*

4.2 To what extent do you think that wearing the Fitbit Charge HR influenced your physical activity patterns?

Prompts:

- *No influence*
- *Positive influence (increased physical activity)*
- *Negative influence (reduced physical activity)*
- *Influenced type of physical activity*
- *Influenced awareness of self (physical activity levels)*
- *Influenced interest in further activity monitoring (with/without monitoring device)*

Appendix 16:

Semi-structured interview guide (version 3.1 29.01.18)

Valedictory script

'That was my final question, so thank you very much for taking the time to share your views. Is there anything else you wish to add in relation to what we have just discussed?

Thank you very much for taking part in the study and the interview. Unless there is anything from today's discussion which would be helpful for us to clarify, there is nothing else which we need to ask of you in relation to the research. Thank you again for your involvement.

Appendix 17:

Statistical analysis syntax (IBM SPSS Statistics 22.0)

Section 3.5 (page 53)

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/VARIABLES=AGE_2019
/CRITERIA=CI(.95).
```

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/VARIABLES=Steps_AveDay
/CRITERIA=CI(.95).
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/VARIABLES=IMDScore
/CRITERIA=CI(.95).
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Section 3.6.2 (page 55)

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/VARIABLES=Steps_AveDay
/CRITERIA=CI(.95).
```

Section 3.6.2 (page 57)

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/PRINT=TWOTAIL NOSIG
/MISSING=PAIRWISE.
```

Section 3.6.3 (page 58)

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CROSSTABS
/TABLES=EOW BY ACT_ACC
/FORMAT=AVALUE TABLES
/STATISTICS=CHISQ
/CELLS=COUNT
/COUNT ROUND CELL
/METHOD=EXACT TIMER(5).
```

Appendix 17:

Statistical analysis syntax (IBM SPSS Statistics 22.0)

Section 3.7.1 (page 59)

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/CRITERIA=CI(.95).
```

```
CORRELATIONS
/VARIABLES=RAT Steps_AveDay
/PRINT=TWOTAIL NOSIG
/MISSING=PAIRWISE.
```

Section 3.7.4 (page 63)

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T-TEST GROUPS=EOW(1 2)
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/CRITERIA=CI(.95).
```

```
CORRELATIONS
/VARIABLES=RAT WHO5_Percent
/PRINT=TWOTAIL NOSIG
/MISSING=PAIRWISE.
```

Section 3.8.1 (page 65)

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/CRITERIA=CI(.95).
```

Section 3.8.3 (page 66)

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CORRELATIONS
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/PRINT=TWOTAIL NOSIG
/MISSING=PAIRWISE.
```

Appendix 17:

Statistical analysis syntax (IBM SPSS Statistics 22.0)

Section 3.8.3 (page 67)

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CORRELATIONS  
/VARIABLES=Overall_PANES Steps_AveDay  
/PRINT=TWOTAIL NOSIG  
/MISSING=PAIRWISE.
```

Section 3.8.4 (page 68)

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CORRELATIONS  
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/PRINT=TWOTAIL NOSIG  
/MISSING=PAIRWISE.
```

Section 3.8.4 (page 69)

```
CORRELATIONS  
/VARIABLES=WHO5_Percent IMDScore  
/PRINT=TWOTAIL NOSIG  
/MISSING=PAIRWISE.
```

Section 3.8.4 (page 70)

```
CORRELATIONS  
/VARIABLES=Steps_AveDay IMDScore  
/PRINT=TWOTAIL NOSIG  
/MISSING=PAIRWISE.
```

Appendix 18:

Thematic coding structure (QSR NVivo 10)

Nine overarching coding titles (sub-code lists below)

Code name
Activities
Activities of daily living
Environment
Health
Influences
Locations
Technology
Transport
Wirral wards

Code name	Sources	References	Author	Created On
Activities	0	0	RL	03/10/2018 14:15
Charitable	7	33	RL	04/12/2018 12:48
Creative pursuits	1	4	RL	04/12/2018 12:38
Cycling	18	114	RL	08/01/2019 14:35
For pleasure	17	105	RL	17/01/2019 12:29
For transportation	11	31	RL	17/01/2019 12:29
Drinks and dining	14	53	RL	23/10/2018 14:12
Fitness	30	332	RL	04/12/2018 12:40
Positive experience	13	33	RL	17/01/2019 12:30
Push self to go	13	34	RL	17/01/2019 12:29
Home and garden	14	44	RL	24/10/2018 11:47
Mindfulness	6	15	RL	04/12/2018 12:43
Outdoor pursuits	10	35	RL	04/12/2018 12:52
Religion	1	1	RL	04/12/2018 12:39
Running	14	98	RL	24/09/2018 11:41
In a group	4	10	RL	17/01/2019 12:30
On one's own	6	27	RL	17/01/2019 12:30
Sedentary pursuits	20	66	RL	14/09/2018 16:23
Shopping	2	2	RL	11/10/2018 13:05
Social group activities	8	27	RL	24/10/2018 11:38
Sport	21	130	RL	27/09/2018 14:02
Individual sport	2	7	RL	17/01/2019 12:36
Team sport	8	38	RL	17/01/2019 12:36
Swimming	19	100	RL	24/09/2018 13:09
Solitary swim	1	1	RL	17/01/2019 12:31
With children	1	2	RL	17/01/2019 12:31
The Arts	3	30	RL	04/12/2018 12:36
Walking	24	178	RL	04/12/2018 12:49
Pleasure stroll	15	111	RL	17/01/2019 12:31
Travel from A to B	12	53	RL	17/01/2019 12:32

Appendix 18:

Thematic coding structure (QSR NVivo 10)

Code name	Sources	References	Author	Created On
Activities of daily living	0	0	RL	03/10/2018 14:16
Dietary habits	24	145	RL	09/10/2018 18:20
Employment	33	383	RL	14/09/2018 15:53
Active at work	26	232	RL	16/01/2019 11:49
Sedentary at work	24	144	RL	16/01/2019 11:49
Housework and chores	31	150	RL	14/09/2018 15:51
Routine and habituation	34	256	RL	14/09/2018 16:10
Active patterns	24	105	RL	16/01/2019 17:12
Sedentary patterns	13	26	RL	16/01/2019 17:13

Code name	Sources	References	Author	Created On
Environment	0	0	RL	03/10/2018 14:47
Neighbourhood influence	22	93	RL	24/09/2018 13:45
Negative influence	7	26	RL	16/01/2019 17:32
No influence	14	61	RL	21/01/2019 13:54
Positive influence	27	173	RL	16/01/2019 17:32
Outside Wirral	27	155	RL	24/09/2018 17:11
Safety	13	83	RL	24/09/2018 13:23
Feel safe	17	45	RL	16/01/2019 17:32
Feel unsafe	26	202	RL	16/01/2019 17:32
Seasons and weather	19	92	RL	14/09/2018 15:55
Minimal influence	9	29	RL	21/01/2019 14:17
Negative influence	25	98	RL	16/01/2019 17:33
Positive influence	29	95	RL	16/01/2019 17:33
Wirral description	21	137	RL	25/09/2018 10:02
Negative view	11	56	RL	16/01/2019 17:34
Positive view	28	159	RL	16/01/2019 17:33

Appendix 18:

Thematic coding structure (QSR NVivo 10)

Code name	Sources	References	Author	Created On
Health	0	0	RL	03/10/2018 14:17
Body image	2	7	RL	17/01/2019 17:13
Confident	2	3	RL	17/01/2019 17:13
Self-conscious	6	77	RL	17/01/2019 17:13
Concept of physical activity	33	101	RL	11/10/2018 10:11
Mental health	9	28	RL	24/09/2018 18:22
Poor mental health	8	46	RL	16/01/2019 17:34
Positive mental health	15	72	RL	16/01/2019 17:34
Overall health	28	169	RL	24/09/2018 18:25
Detrimental to health	16	61	RL	16/01/2019 17:35
Health and longevity	23	102	RL	16/01/2019 17:35
Perceived activity	18	89	RL	14/09/2018 16:04
Perceived active	24	71	RL	16/01/2019 17:35
Perceived average	7	20	RL	23/01/2019 17:51
Perceived inactive	12	24	RL	16/01/2019 17:36

Code name	Sources	References	Author	Created On
Influences (continued overleaf)	0	0	RL	03/10/2018 14:18
Accessibility and availability	16	152	RL	09/10/2018 18:31
Open access	28	159	RL	17/01/2019 11:42
Restricted	20	144	RL	17/01/2019 11:42
Awareness and education	9	37	RL	23/10/2018 14:30
Furnished	12	49	RL	17/01/2019 11:42
Limited	11	60	RL	17/01/2019 11:43
Campaigns and interventions	19	184	RL	11/10/2018 10:49
Negative impact	16	229	RL	17/01/2019 11:43
Positive impact	21	144	RL	17/01/2019 11:43
Dependants	12	124	RL	09/10/2018 18:26
SD activity hindrance	16	109	RL	17/01/2019 11:44
SD activity incentive	10	42	RL	17/01/2019 11:44
Finite finances	15	113	RL	09/10/2018 18:28
Expense highlighted	30	352	RL	17/01/2019 11:44
Free of charge	12	22	RL	17/01/2019 11:44
Finite space	1	4	RL	21/11/2018 11:12
Space available	0	0	RL	17/01/2019 11:45
Space restricted	2	5	RL	17/01/2019 11:45
Finite time	15	92	RL	14/09/2018 16:33
Time available	20	76	RL	17/01/2019 11:45
Time restricted	29	191	RL	17/01/2019 11:45

Appendix 18:

Thematic coding structure (QSR NVivo 10)

Code name	Sources	References	Author	Created On
Influences (continued)	0	0	RL	03/10/2018 14:18
Fitbit	31	625	RL	24/09/2018 12:01
Fitness fad	9	61	RL	17/01/2019 11:46
Fitness incentive	30	450	RL	17/01/2019 11:46
No change	15	63	RL	22/01/2019 11:51
Getting older	11	41	RL	11/10/2018 10:34
Avoid poor health	14	46	RL	17/01/2019 11:46
Relax the boundaries	0	0	RL	17/01/2019 11:46
Health and safety	2	18	RL	23/10/2018 11:52
Fair changes	4	25	RL	17/01/2019 11:47
Nanny state	5	33	RL	17/01/2019 11:47
Mindset	19	506	RL	09/10/2018 18:24
Affects activity	32	541	RL	22/01/2019 12:03
Enables activity	27	358	RL	17/01/2019 11:47
Hinders activity	19	118	RL	17/01/2019 11:47
Outdoors and greenspace	13	37	RL	01/11/2018 10:32
Green incentive	20	59	RL	17/01/2019 11:47
Outdoor mention	8	17	RL	17/01/2019 11:48
Pet ownership	17	112	RL	14/09/2018 15:54
Activity mention	22	156	RL	17/01/2019 11:48
Activity willingly	13	109	RL	17/01/2019 11:48
School and upbringing	25	254	RL	11/10/2018 10:46
Good old days	5	13	RL	17/01/2019 11:49
Lacking today	6	26	RL	17/01/2019 11:50
Social and community	16	313	RL	14/09/2018 16:03
Social hindrance	6	33	RL	17/01/2019 11:51
Social support	31	419	RL	17/01/2019 11:51
Weight	17	75	RL	11/10/2018 12:26
Weight change	16	69	RL	17/01/2019 11:52
Weight maintenance	3	35	RL	17/01/2019 11:52

Appendix 18:

Thematic coding structure (QSR NVivo 10)

Code name	Sources	References	Author	Created On
Locations	0	0	RL	03/10/2018 14:19
Allotment	1	3	RL	24/10/2018 11:36
Beach	12	34	RL	14/09/2018 16:27
Sand avoidance	2	2	RL	17/01/2019 11:53
Sandy incentive	19	68	RL	17/01/2019 11:53
Children's playground	5	22	RL	23/10/2018 11:41
Encourage activity	5	21	RL	17/01/2019 11:54
Poor standard	1	3	RL	21/01/2019 22:21
Unsavoury usage	0	0	RL	17/01/2019 11:54
Coastal path	15	75	RL	23/10/2018 11:03
Enabler	25	158	RL	17/01/2019 11:55
Obstacle	3	8	RL	17/01/2019 11:55
Community centre	4	4	RL	27/09/2018 15:42
Community gardens	1	8	RL	24/10/2018 11:35
Country park	11	33	RL	27/09/2018 16:36
Avoided place	2	34	RL	17/01/2019 11:56
Positive place	15	71	RL	17/01/2019 11:56
Cycle paths	9	36	RL	11/10/2018 12:51
Enjoyable usage	15	36	RL	17/01/2019 11:56
Lacking in lanes	8	35	RL	17/01/2019 11:57
National Trust	1	1	RL	24/09/2018 17:08
Nature reserve	1	1	RL	27/09/2018 16:37
Outdoor gym facilities	5	18	RL	24/09/2018 13:32
Mis- and underused	5	13	RL	17/01/2019 11:58
Positive addition	3	12	RL	17/01/2019 11:58
Public gardens	4	4	RL	27/09/2018 15:48
Public parks	20	122	RL	27/09/2018 15:48
Could be better	9	50	RL	17/01/2019 12:00
Enjoyable space	17	80	RL	17/01/2019 11:59
Public shared space	8	20	RL	24/10/2018 11:32
Call for better	4	28	RL	17/01/2019 12:00
Well utilised	4	8	RL	17/01/2019 12:00
Woods	7	11	RL	27/09/2018 16:38
Youth club	4	18	RL	24/10/2018 15:49

Code name	Sources	References	Author	Created On
Technology	0	0	RL	03/10/2018 14:25
GPS unit experience	1	4	RL	24/09/2018 12:03
PAW study participation	9	22	RL	25/09/2018 09:48
Technology and gamification	9	54	RL	25/09/2018 09:27
Negative report	7	30	RL	16/01/2019 17:36
Positive addition	13	59	RL	16/01/2019 17:36

Appendix 18:

Thematic coding structure (QSR NVivo 10)

Code name	Sources	References	Author	Created On
Transport	0	0	RL	24/09/2018 16:32
Car ownership	18	69	RL	24/09/2018 12:17
Preferred mode	9	25	RL	16/01/2019 17:37
Used when necessary	20	55	RL	16/01/2019 17:37
Public transport	15	44	RL	24/09/2018 18:23
Negative or neutral	5	19	RL	16/01/2019 17:38
Positive feedback	11	20	RL	16/01/2019 17:37

Code name	Sources	References	Author	Created On
Wirral wards (continued overleaf)	0	0	RL	24/09/2018 16:11
1. Birkenhead and Tranmere	14	64	RL	09/10/2018 13:00
B&T cross	11	51	RL	17/01/2019 12:02
B&T tick	12	57	RL	17/01/2019 12:02
10. Bromborough	3	6	RL	09/10/2018 13:03
Brom cross	1	6	RL	17/01/2019 12:02
Brom tick	4	8	RL	17/01/2019 12:02
11. Moreton West and S.Massie	6	36	RL	09/10/2018 13:03
MW&S cross	4	43	RL	17/01/2019 12:02
MW&S tick	5	35	RL	17/01/2019 12:02
12. Prenton	2	19	RL	09/10/2018 13:04
Pren cross	1	10	RL	17/01/2019 12:02
Pren tick	3	5	RL	17/01/2019 12:02
13. Oxtan	2	38	RL	09/10/2018 13:04
Ox cross	1	6	RL	17/01/2019 12:03
Ox tick	2	28	RL	17/01/2019 12:03
14. Eastham	2	3	RL	09/10/2018 13:04
East cross	2	3	RL	17/01/2019 12:03
East tick	2	2	RL	17/01/2019 12:03
15. Bebington	4	29	RL	09/10/2018 13:04
Beb cross	1	10	RL	17/01/2019 12:03
Beb tick	3	10	RL	17/01/2019 12:03
16. Pensby and Thingwall	5	23	RL	09/10/2018 13:04
P&T cross	2	15	RL	17/01/2019 12:03
P&T tick	6	26	RL	17/01/2019 12:03
17. Wallasey	5	24	RL	09/10/2018 13:05
Wal cross	3	12	RL	17/01/2019 12:04
Wal tick	7	27	RL	17/01/2019 12:04
18. Hoylake and Meols	13	54	RL	09/10/2018 13:05
H&M cross	4	8	RL	17/01/2019 12:04
H&M tick	16	112	RL	17/01/2019 12:04

Appendix 18:

Thematic coding structure (QSR NVivo 10)

Code name	Sources	References	Author	Created On
Wirral wards (continued)	0	0	RL	24/09/2018 16:11
19. Clatterbridge	2	17	RL	09/10/2018 13:05
Clat cross	1	1	RL	17/01/2019 12:04
Clat tick	2	11	RL	17/01/2019 12:04
2. Bidston and St James	2	5	RL	09/10/2018 13:01
B&SJ cross	3	3	RL	17/01/2019 12:05
B&SJ tick	3	6	RL	17/01/2019 12:04
20. West Kirby and Thurstaston	17	99	RL	09/10/2018 13:05
WK&T cross	8	44	RL	17/01/2019 12:05
WK&T tick	27	201	RL	17/01/2019 12:05
21. Greasby Frankby and Irby	4	19	RL	09/10/2018 13:05
GF&I cross	4	27	RL	17/01/2019 12:05
GF&I tick	14	82	RL	17/01/2019 12:05
22. Heswall	8	30	RL	09/10/2018 13:06
Hes cross	2	12	RL	17/01/2019 12:05
Hes tick	11	52	RL	17/01/2019 12:05
3. Seacombe	5	36	RL	09/10/2018 13:02
Sea cross	6	17	RL	17/01/2019 12:06
Sea tick	5	18	RL	17/01/2019 12:06
4. Rock Ferry	1	5	RL	09/10/2018 13:02
RF cross	2	5	RL	17/01/2019 12:06
RF tick	1	3	RL	17/01/2019 12:06
5. Leasowe and Moreton East	10	70	RL	09/10/2018 13:02
L&ME cross	5	50	RL	17/01/2019 12:06
L&ME tick	9	78	RL	17/01/2019 12:06
6. Liscard	2	2	RL	09/10/2018 13:02
Lis cross	1	1	RL	17/01/2019 12:06
Lis tick	4	6	RL	17/01/2019 12:06
7. Cloughton	4	24	RL	09/10/2018 13:03
Clau cross	3	9	RL	17/01/2019 12:06
Clau tick	2	10	RL	17/01/2019 12:06
8. Upton	6	65	RL	09/10/2018 13:03
Up cross	6	98	RL	17/01/2019 12:07
Up tick	5	43	RL	17/01/2019 12:07
9. New Brighton	11	112	RL	09/10/2018 13:03
NB cross	2	12	RL	17/01/2019 12:07
NB tick	12	104	RL	17/01/2019 12:07

Appendix 19:

Manual thematic structuring by MoHO domain

