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An exploration of gender differences and gender-specific influences on the physical activity and sedentary behaviours of adults with intellectual disabilities

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Abstract

Background. Women with intellectual disabilities experience greater risk of health inequalities. Low physical activity (PA) and high sedentary behaviour (SB) levels may contribute to this. The influence of gender on PA and SB is unknown for adults with intellectual disabilities. This thesis aimed to 1. Investigate and quantify gender differences in the PA and SB of adults with intellectual disabilities; 2. Identify potential gender-specific influences on the PA and SB of adults with intellectual disabilities. Sequential studies addressed these aims.

Study 1. A systematic review and meta-analysis were conducted to quantify gender differences in the PA and SB levels of adults with intellectual disabilities in the extant literature. Seven databases were searched. Significant gender differences were observed for step counts and moderate to vigorous PA (MVPA), with women less active than men. Mixed findings were reported for SB with limited studies identified.

Study 2. This study aimed to identify gender-specific correlates and to quantify gender differences in objectively measured MVPA and SB. A secondary data analysis was conducted using pooled baseline data of two Glasgow based interventions (n = 143 adults with intellectual disabilities: 51.7% women). Bivariate, followed by multivariate linear regressions identified gender-specific correlates using data split by gender. Independent samples t-tests assessed gender differences. No gender differences were reported in MVPA and SB levels. Gender differences in influences were reported; all variables were at an intrapersonal level.

Study 3. Gender-specific correlates, and gender differences in self-reported PA and SB were assessed in a secondary data analysis of a population-based study. Participants included n = 725 adults with intellectual disabilities (44.9% women) living in Greater Glasgow. Correlates were at an individual and environmental level. Gender differences in PA and SB levels were measured using Chi-square tests. Multivariate logistic regression with purposeful selection of variables were conducted, using data split by gender. Men were significantly more likely to meet physical activity guidelines. Gender differences in the correlates identified were observed.

Study 4. Feasibility of social support network methods in the context of the leisure activities promoted was assessed using a mixed-methods design. Data were collected to assess gender differences in the sources of support, types of activities promoted (PA or SB), and perceptions of social support for PA. This study was cancelled due to the COVID-9 pandemic. N = 3 adults with intellectual disabilities participated prior to cancellation. The data were analysed through thematic analysis, and descriptive statistics calculated for quantitative data. Attempts to adapt the study for remote working were not feasible.

Study 5. This study was developed to mitigate the impact of the COVID-19 pandemic. The study aimed to identify gender-specific social and environmental correlates, identify gender differences in PA and SB levels, and the types of activities engaged in by adults with intellectual disabilities. A secondary data analysis was conducted using the British Cohort Study age 46 sweep. Cognitive tests at age 5 and 10 sweeps were used to identify people with potential intellectual disabilities. Outcome data included objectively measured PA and SB, and self-reported activities engaged in. Independent samples t-test assessed gender differences in PA and SB levels. Chi-square tests were used to explore gender differences in the types of activities engaged in. Using data split by gender, bivariate linear regressions, and multivariate linear regression were conducted to identify gender-specific correlates. No significant gender-specific correlates were identified, other than health limiting moderate activities associated with lower step counts for women. Descriptively, men engaged in more sports than women, but rates were low for both genders. Women were significantly more likely to be involved in daily household activities contributing to PA. There were no significant gender differences in the types of SB engaged in.

Conclusions. Men with intellectual disabilities engaged in more PA than women, but there were no gender differences present in SB. The PA levels were low for both men and women. There was evidence of gender-specific influences, however more research is required. Exploration into gender differences in PA and SB provides an in-depth understanding of the lifestyles of adults with intellectual disabilities. Failure of past research to consider the influence of gender exacerbates the health inequalities experienced.

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Conference proceedings

International Association for the Scientific Study of Intellectual and Developmental Disabilities (IASSID), Glasgow, August 2019: Poster presentation. Investigation of gender-specific correlates of physical activity and sedentary behaviour in adults with intellectual disabilities

Scottish Physical Activity Research Congress (SPARC), Edinburgh, November 2018: Oral presentation (Identified as one of the best submitted abstracts and asked to provide an oral presentation when poster presentation was selected). Gender differences in physical activity and sedentary behaviour in adults with intellectual disabilities: A systematic review and meta-analysis.

Author's declaration

"I hereby declare that I am the sole author of this thesis, except where the assistance of others has been acknowledged. It has not been submitted in any form for another degree or professional qualification."

Sophie Claire Westrop

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Abbreviations

COVID-19 - Novel coronavirus identified in 2019

CPM – Counts per minute

LPA - Light physical activity

LTPA - Leisure time physical activity

METs – Metabolic equivalent tasks

MPA - Moderate physical activity

MRC – Medical Research Council

MVPA - Moderate to vigorous physical activity

M - Mean

NHS - National health service (in the UK)

IQ – Intelligence quotient

PA - Physical activity

PAG – Physical activity guidelines or recommendations

PCA – Principal components analysis

SB – Sedentary behaviour

SD – Standard deviation

SIMD – Scottish index of multiple deprivation

RCT – Randomised controlled trial

WHO – World Health Organisation

Chapter One: Thesis Introduction

1.1 Overview of this chapter

This chapter introduces the topic of intellectual disabilities, the health inequalities experienced by adults with intellectual disabilities, and highlights the importance of physical activity (PA) and sedentary behaviour (SB) levels of adults with intellectual disabilities. An overview of literature relating to gender differences in PA and SB in the general population is presented, along with research exploring gender and adults with intellectual disabilities. This chapter introduces the extant literature to form a rationale for this thesis exploring gender differences, and gender-specific influences on PA and SB of adults with intellectual disabilities.

1.2 Intellectual disabilities: definition, causes, and prevalence

1.2.1 Definition of intellectual disabilities

People with intellectual disabilities experience impairments in intellectual and adaptive functioning which occur before the onset of adulthood, during the developmental period (American Association on Intellectual and Developmental Disabilities [AAIDD], 2021; Diagnostic and Statistical Manual of Mental Disorders, 5th ed., DSM-5, American Psychiatric Association [APA], 2013). In the current AAIDD definition published in 2021, this age period extends to before 22 years of age. However, previous editions and published diagnostic criteria describe age 18 years as the cut point for a diagnosis (AAIDD, 2010; APA, 2013).

The impairments in intellectual functioning relate to mental capacity such as learning, reasoning, and problem-solving abilities (AAIDD, 2021; APA, 2013). Adaptive functioning includes skills required for daily living. Specifically, a person with intellectual disabilities has impairments in conceptual skills, such as language and numeracy, social skills, and practical skills, including those needed for travelling (AAIDD, 2021; APA, 2013).

The severity of intellectual disabilities can range from mild, where a person can still live independently but potentially requires support, to severe and profound, where a person requires daily support and supervision (Boat & Wu, 2015). People can be identified as having intellectual disabilities based on standardised tests of intellectual and adaptive functioning (AAIDD, 2021; APA, 2013). Scores approximately two standard deviations below the mean are used, indicating an intelligence quotient (IQ) score < 70 (AAIDD, 2021; APA, 2013). Table 1.1 presents the approximate IQ scores typically used to identify mild to profound intellectual disabilities (Whitaker, 2013).

Table 1.1 Level of intellectual disabilities and associated IQ range

Level of intellectual disabilities	IQ Score
Mild	50-69
Moderate	35-49
Severe	20-34
Profound	<20

Note: IQ = Intelligence quotient score

There have been criticisms over the use of arbitrary cut-points of IQ when measuring intellectual impairment, as an IQ < 70 is solely based on being two standard deviations below the mean (Burack et al., 2021). People with low IQ scores above this threshold (e.g., IQ < 85) may still experience significant limitations and inequalities throughout their life course (Peltopuro et al., 2014). The most recent definition of intellectual disabilities in the AAIDD is more flexible and has an upper limit of IQ < 75 as an indicator of intellectual impairments (AAIDD, 2021).

Different terms are used to describe intellectual disabilities. The International Classification of Diseases, 10th edition (ICD-10) used the term “mental retardation” to describe the same disability (World Health Organisation [WHO], 1993). However, this has changed to “disorders of intellectual development” in the revised ICD-11 (WHO, 2018). The term intellectual disabilities replaced “mental retardation” as the international definition, as this term was less offensive to people with disabilities (Schalock et al., 2007). Additionally, unique to the United Kingdom, the term “learning disabilities” is used, however internationally “intellectual disabilities” is recognised (Emerson & Heslop, 2010). Intellectual disabilities will be the term used throughout this thesis. Additionally, within this thesis, the term “general population” will be used to refer to the people without intellectual disabilities.

1.2.2 Causes of intellectual disabilities

Intellectual disabilities can have genetic and environmental causes (Boat & Wu, 2015). Genetic factors can include chromosomal abnormalities, for example an additional copy of chromosome 21 causing Down syndrome, and inherited conditions, such as Fragile X syndrome which affects males (Boat & Wu, 2015). Environmental causes can include prenatal exposure to alcohol, and maternal infection with viruses such as rubella (Boat & Wu, 2015). Intellectual disabilities can also be caused by postnatal environmental factors, such as traumatic brain injuries or brain infections during childhood (Boat & Wu, 2015). Living in an area or country of lower socio-economic status has been thought to increase exposure to these environmental risk factors (Emerson & Hatton, 2014). However, despite this, most intellectual disabilities are due to unknown causes (Boat & Wu, 2015).

1.2.3 Prevalence of intellectual disabilities

In Scotland, the prevalence of intellectual disabilities is approximately 0.5% of people (Scottish Learning Disability Observatory, 2021), while in England, the estimated prevalence is 2.5% (Public Health England, 2016). A meta-analysis of population-based studies reported the international prevalence to be approximately 1% (Maulik et al., 2011). However, there is significant variability in the prevalence rates (0.05% to 1.55%), with limited research explicitly reporting incidence of intellectual disabilities (McKenzie et al., 2016).

Higher rates of intellectual disabilities occur in low- and middle-income counties, with this linked to numerous factors, including less advanced health care (Maulik et al., 2011). There are methodological issues relating to measures used to identify people with intellectual disabilities, which may contribute to variations in prevalence across studies (Maulik et al., 2011; McKenzie et al., 2016). Although there is no exact prevalence level for intellectual disabilities, it has been consistently reported that mild intellectual disabilities are the most prevalent, and that more males are identified as having intellectual disabilities than females (Maulik et al., 2011; McKenzie et al., 2016; Public Health England, 2016; Scottish Learning Disability Observatory, 2021).

1.3 Health inequalities experienced by adults with intellectual disabilities

Adults with intellectual disabilities experience numerous health inequalities. This includes reduced life expectancy, increased risk of non-communicable diseases, and increased risk of underweight and obesity (Emerson & Baines, 2010; Emerson & Hatton, 2014; Ranjan et al., 2018). A Scottish population-based study uncovered significantly poorer health among adults with intellectual disabilities compared to the general population (Hughes-McCormack et al., 2018). Additionally, as little as 12.5% of people with intellectual disabilities, versus 80.7% of the general population, reported no limitations to daily life caused by long term health conditions (Hughes-McCormack et al., 2018).

A systematic review of studies relating to death rates of people with intellectual disabilities, reported reduced life-expectancy of up to 20 years compared to the general population (O’Leary et al., 2018). The main causes of death were respiratory conditions and circulatory diseases (O’Leary et al., 2018). These findings were reflected in a population based confidential inquiry of premature deaths in England (Heslop et al., 2014). The leading causes of death among people with intellectual disabilities were identified as being heart and circulatory disease, cancer, nervous system related diseases and respiratory disorders (Heslop et al., 2014). It was noted that the reduced life expectancy for adults with intellectual disabilities may be linked to sedentary lifestyles increasing risk of poor health outcomes (O’Leary et al., 2018). Subsequently, health behaviours, such as low PA and high SB levels, may contribute to the increased risk and must receive more attention.

1.3.1 Gender differences in health inequalities and the potential impacts of low physical activity and high sedentary behaviour levels

The confidential inquiry of premature deaths reported that although median age of death was comparable between genders, the greatest reduction in life expectancy was experienced by females (Heslop et al., 2014). Males with intellectual disabilities were reported to die a median of 13 years younger, and females died a median of 20 years younger than people in the general population (Heslop et al., 2014). This was reflected in the systematic review of death rates, where greatest inequalities in life expectancy were reported for females with intellectual disabilities (O'Leary et al., 2018).

Expert researchers were consulted in 2019 on the gender differences in inequalities in life-expectancy (Robertson et al., 2020). Physical inactivity was a risk factor that received high agreement among experts as an important topic (Robertson et al, 2020). Overall, however, experts believed there to be inadequate evidence around gender differences relating to inactivity, and this was identified as a priority area for future research (Robertson et al., 2020).

The importance of considering PA and SB is also highlighted by the gender differences in obesity rates, with women most at risk (Emerson, 2005; Emerson & Hatton, 2014; de Winter et al., 2012; Melville et al., 2007; Melville et al., 2008; Ranjan et al., 2018). Obesity is a leading preventable risk factor for numerous serious non-communicable diseases (WHO, 2020). Increasing PA and reducing SB can reduce the risk of obesity by increasing energy expenditure. Being a woman is associated with increased overweight and obesity among adults with intellectual disabilities when exploring correlates (Ranjan et al., 2018). Additionally, the increased risk of obesity among women is not linked to genetic syndromes (Melville et al., 2008), and may therefore be linked to lifestyle factors, such as PA and SB.

Females with intellectual disabilities were also reported to have poorer self-reported general health than males in the 2011 Scotland Census (Hughes-

McCormack et al., 2018). A cross-sectional study in Norway reported similar findings, as women with intellectual disabilities had poorer perceived health than men (Olsen et al., 2021). In addition to this, not meeting 30 minutes of daily PA was associated with poorer perceived health outcomes (Olsen et al., 2021). These findings may suggest that PA levels contribute to the poorer self-reported health of women with intellectual disabilities. However, the study did not determine if there were gender differences in the activity data.

Gender differences were also reported in cardiovascular risk factors in the large cross-sectional Healthy Ageing in Intellectual disabilities (HA-ID) study (de Winter et al., 2012). Compared to the general population, women with intellectual disabilities had a higher prevalence of metabolic syndrome, diabetes, and hypertension (de Winter et al., 2012). However, men with intellectual disabilities experienced reduced probability of these risk factors (de Winter et al., 2012). Additionally, within the HA-ID study, although PA levels were very low for all adults, women had lower PA step counts than men (Hilgenkamp et al., 2012). Therefore, low PA should be considered as lifestyle influences of the gender differences in health outcomes.

There is mounting evidence of gender differences in the negative health outcomes experienced by adults with intellectual disabilities. Women have increased risk of obesity, general poor health, cardiovascular risk factors, and inequalities in life expectancy. PA and SB are two modifiable lifestyle behaviours that could contribute to these negative health outcomes. It is therefore essential to determine if there are any gender differences in PA and SB of adults with intellectual disabilities. If there are gender differences in PA and SB, this may provide a focus for interventions aiming to reduce the health inequalities.

1.4 Physical activity and sedentary behaviour

1.4.1 Defining physical activity and sedentary behaviour

PA was defined by Caspersen et al. (1985) as any bodily movement produced by skeletal muscles that results in increased energy expenditure. Exercise is a form of structured PA that is planned and conducted with a purpose of maintaining or improving physical fitness (Caspersen et al., 1985). Exercise is characterised as a form of leisure time PA (Howley, 2000). Leisure time PA occurs during a person's free and non-working time (Howley, 2000). It consists of PA for non-essential activities a person chooses to do, including formal exercise, recreational walking, gardening, and sports (Bull et al., 2020). PA is also conducted in other domains, including PA related to work tasks, i.e., occupational PA (Bull et al., 2020). Additionally, through PA acquired through active transport, such as walking or cycling to a destination, and PA in the home, including PA relating to cleaning and other domestic tasks (Bull et al., 2020). PA is often defined by intensity, relating to the associated level of energy expenditure. This includes, light, moderate, vigorous, or moderate to vigorous PA (MVPA; Bull et al., 2020).

SB is distinct from low levels of PA or "inactivity" and does not increase energy expenditure beyond the resting metabolic rate (≤1.5 METs; Tremblay et al., 2017). SB consists of all waking behaviours in sitting, lying, and reclining positions (Tremblay et al., 2017). This can include watching television or using a computer, or reading in a sitting or reclining position, but can also include sitting in transportation such as a car, bus, or train (Tremblay et al., 2017). It is therefore important to note that low PA and high SB are separate behaviours.

1.4.2 Measuring physical activity and sedentary behaviour

Various measurement methods have been developed to assess PA and SB, considering aspects such as intensity of PA, walking for PA, self-reported PA and SB, and time spent sedentary. These include both objective direct measurements and self- and proxy reported subjective measurements. Objective measurements include wearable devices that directly monitor signs of PA, such as acceleration or heat rate (Strath et al., 2013). However, subjective measurements rely on PA or SB being recorded or recalled (Strath et al., 2013).

In intellectual disabilities research, objective measurement methods for PA include accelerometers and pedometers (Dairo et al., 2016; Pitchford et al., 2018). For SB, accelerometers and inclinometers are used (Melville et al., 2017).

Accelerometers are both feasible to use and have improved validity compared to devices, such as pedometers (Esliger & Tremblay, 2007). Accelerometers, such as the ActiGraph, are small and light weight devices that collect activity data on intensity, duration, and frequency, providing the opportunity to explore PA intensities, e.g., MVPA, and SB (Actigraph, LLC, Pensacola, FL, USA). Accelerometers gather raw biomechanical data on acceleration, which is converted into activity counts. Cut points are used to convert counts into data on intensity, e.g., <100 counts per minute indicating SB (Atkin et al., 2012).

Rather than collecting intensity data based on counts per minute, inclinometers collect data relating to elevation and slope. This includes activPAL accelerometery devices which detect limb position and activity, to gather data on SB, through a person's posture, and PA intensity through information on cadence or stepping rates (PALtechnologies, 2021). Inclinometers have also been incorporated in third generation ActiGraph accelerometers to gather data on posture (e.g., sitting or standing) which is relevant for SB (Clemes et al., 2012).

Step counts over a set period are collected through pedometers (e.g., steps per day). Unlike accelerometers and inclinometers, pedometers only collect data on step counts, and cannot provide data relating to intensity or SB. Pedometers have reduced validity compared to accelerometer devices but are more feasible to administer (Esliger & Tremplay, 2007).

Subjective measurements are more feasible than objective measures, including pedometers (Esliger & Tremblay, 2007). Subjective measurements are less costly and time consuming, and do not rely on the measurement of PA and SB over multiple days using potentially costly devices. The associated measurement methods include self-reported PA and SB, self-and proxy (e.g., caregiver) completed questionnaires, semi-structured interviews, and activity diaries (Dairo et al., 2016; Melville et al., 2017; Pitchford et al., 2018). These subjective measurements can subsequently be administered at a larger scale, and studies with large representative samples tend to use subjective measures of PA or SB (e.g., in samples n = > 1000; Emerson, 2005; Hsieh et al., 2014).

Limited agreement has been reported between objective measurement methods, such as accelerometers, and self- and proxy- completed subjective measures (Matthews et al., 2011; Moss & Czyz, 2018). This suggests issues with the validity and reliability of subjective measurement methods for PA and SB. There have also been concerns about the reliance on recalling information and the abstract nature of subjective methods when used with adults with intellectual disabilities (Melville et al., 2017; Pitchford et al., 2018). This further reduces the validity of subjective measures.

Although objective measures have higher validity than subjective measures, there are still methodological issues when considering their use with adults with intellectual disabilities. For example, difficulties have been reported when using pedometers with adults with intellectual disabilities, such as recording step counts (Matthews et al., 2016; Mitchell et al., 2018; Ptomey et al., 2017). Additionally, a review of accelerometers used in intellectual disabilities research reported no consistent accelerometer protocol which reduces understanding of PA or SB (Leung et al., 2017). For instance, there were differences in the cut points used and the number of days the accelerometers were worn (Leung et al., 2017). Accelerometers are also primarily used with adults with mild to moderate intellectual disabilities, with limited knowledge of their use with adults with severe to profound intellectual disabilities (Leung et al., 2017).

There are clear methodological issues for PA and SB measurement with adults with intellectual disabilities. It is necessary to interpret the data with caution, even with methods with improved validity, such as accelerometers. However, the available objective and subjective measurements still provide the opportunity to explore these lifestyle behaviours. Due to the potential limitations with the measurement methods, researchers emphasised the use of both objective and subjective measurements (Melville et al., 2017).

1.4.3 Health impacts of physical activity and sedentary behaviour

1.4.3.1 Mental health impacts

Both PA and SB have been directly linked to mental health outcomes in the general population. Meta-analyses of prospective cohort studies have identified self-reported PA as important for mental health benefits (Schuch et al., 2018; Schuch et al., 2019). Additionally, lower risk of developing depression is associated with higher PA levels (Schuch et al., 2018). This was observed across countries, for all ages, and after adjusting for publication bias (Schuch et al., 2018). Similar findings were observed for an association between greater PA, and risk for anxiety or anxiety disorders (Schuch et al., 2019). Conversely, meta-analysis of prospective studies observed that SB, especially passively watching television, were associated with increased risk of depression (Huang et al., 2020).

For adults with intellectual disabilities, a study of correlates of SB reported that mental health problems were associated with greater SB (Harris et al. 2018). However, systematic reviews of correlates of SB indicate the association between mental health and SB is mixed (Oppewal et al. 2018). For PA, greater levels are associated with not having depression (Hsieh et al. 2017). Although the evidence base is limited compared to the literature for the general population, the findings indicate an interaction between mental health and these lifestyle behaviours. Thus, emphasising that both PA and SB are important health behaviours that contribute to mental wellbeing.

1.4.3.2 Physical health impacts

PA and SB have significant impacts on an individual’s physical health. It is essential to promote PA as it is associated with numerous physical health benefits (Warburton et al., 2006). PA in the form of exercise is essential for physical fitness, which consists of cardiorespiratory and muscular endurance, muscular strength, body composition and flexibility (Caspersen et al., 1985). Subsequent high fitness levels associated with PA reduces the risk of all-cause mortality resulting from cardiovascular disease, with higher levels of PA associated with greater risk reduction (Warburton et al., 2006). Regular PA can also reduce the risk of cardiovascular disease, type-2 diabetes, and specific cancers, such as colon and breast (Warburton et al., 2006).

Although PA has major health benefits, low PA is associated with numerous negative health outcomes. A study published in The Lancet assessed the worldwide burden of disease attributed to physical inactivity (Lee et al., 2012). Physical inactivity has been attributed to approximately 6 – 10% of non-communicable diseases, such as coronary heart disease, type 2 diabetes, along with breast and colon cancers (Lee et al., 2012). Additionally, physical inactivity contributed to 9% of premature mortality, and was associated with increased risks similar to those associated with smoking and obesity (Lee et al., 2012).

Nevertheless, an individual can engage in sufficient levels of PA, but still be at risk of the negative health outcomes associated with SB. An overview of systematic reviews exploring health consequences of SB reported strong evidence for SB to be an independent risk factor for cardiovascular disease, type 2 diabetes, and metabolic syndrome, and all-cause mortality in adults (de Rezende et al., 2014).

A systematic review with a harmonised meta-analysis consisting of >1 million participants explored whether PA would attenuate the risk of SB on mortality (Ekelund et al., 2016). The review uncovered that exceeding 60-75 minutes of moderate intensity PA each day eliminated mortality risk associated with sitting time, but only attenuated the risk associated with high television viewing time (Ekelund et al., 2016). This suggests that PA can reduce risk of negative health outcomes of SB, however SB is still associated with health risks independent of PA.

Low levels of PA and high SB of adults with intellectual disabilities have been linked to poor physical health. Both low PA and high SB are potentially associated with obesity among adults with intellectual disabilities (Melville et al. 2018; Oviedo et al. 2017; Hsieh et al. 2017). Although systematic reviews of obesity have identified low levels of PA as a risk factor for adults with intellectual disabilities, systematic reviews of correlates of SB have reported mixed findings for an association with obesity (Oppewal et al. 2018; Ranjan et al. 2018).

In addition to obesity, low levels of PA have been linked to poorer physical health among adults with intellectual disabilities. Cardiorespiratory fitness of people with intellectual disabilities are low and decrease with age (Oppewal et al. 2013). One of the potential factors that can contribute to this is the low levels of PA among adults with intellectual disabilities (Oppewal et al. 2013). Additionally, low levels of PA were associated with poorer perceived health (Olsen et al. 2021). However, low PA and high SB are also correlated with presence of mobility issues (Hsieh et al. 2017; Melville et al. 2018), with poor physical health a barrier to PA (Bossink et al. 2017). This suggests that although low PA and high SB contribute to poor health, existing health conditions can also further reduce ability to increase PA and reduce SB. It is therefore essential to address and explore both PA and SB when considering the health inequalities experienced by adults with intellectual disabilities. More specifically, the negative health outcomes associated with low PA and high SB may be reflective of the increased health inequalities experienced by women with intellectual disabilities (section 1.3.1).

1.4.4 Recommended levels of physical activity and sedentary behaviour

To mitigate the risks of SB and to promote health inducing PA, scientifically informed PA guidelines have been developed. In 2021, the WHO published PA and SB guidelines for people with disabilities, to inform policies, research and increase opportunities (Carty et al., 2021). Research relating to intellectual disabilities was used to inform these guidelines. However, a range of other health conditions contributing to disabilities were included, such as Parkinson’s disease, major clinical depression, schizophrenia, and multiple sclerosis. There were limited studies relating to SB and disabilities, so evidence from the general population was used to inform the findings. Therefore, it is essential for intellectual disabilities research to consider SB to improve understanding of this health behaviour.

The recommendations emphasise that some PA is better than no PA, and that PA should be increased gradually for people with disabilities. The benefits of PA were deemed stronger than the potential risks of PA among people with disabilities. However, it may be necessary for people with disabilities to receive professional guidance when increasing PA. For SB, it was recommended to reduce time spent doing SB, replace SB with PA, and increase MVPA to counteract the health risks of SB.

Due to the lack of specific guidelines for adults with intellectual disabilities, past research has used the guidelines developed for non-disabled adults. The current UK guidelines for adults without disabilities have incorporated the growing evidence that SB independently impacts health (Department of Health and Social Care, 2019). Subsequently, the guidelines recommend that adults minimise sedentary time, and break up periods of SB with PA (Department of Health and Social Care, 2019). However, there were no specifics regarding time spent in SB each day, and the recommendations are simply focusing on reducing SB. The lack of specific guidelines for SB emphasises a need to better understand this behaviour, to develop more accurate recommendations to reduce health risks.

More comprehensive guidelines are present for PA. Adults are recommended to achieve a minimum of 150 minutes of moderate, or 75 minutes of vigorous intensity activities, with strength training on a minimum of two separate days (Department of Health and Social Care, 2019). To differentiate between moderate and vigorous PA, the guidelines refer to the “talk test”. During moderate intensity activities, a person will be able to talk but would have difficulty singing, while vigorous activity would result in difficulties talking without stopping the activity (Department of Health and Social Care, 2019).

The guidelines emphasise that even light PA, such as cleaning, provides potential health benefits, however moderate to vigorous or very vigorous activities (e.g., strength training or hill sprints) provide the most benefits (Department of Health and Social Care, 2019). The current UK PA guidelines also provided recommendations for disabled adults; however, recommendations did not specify intellectual disabilities. The recommendations were geared towards making PA a daily habit and emphasising the benefits of PA (Department of Health and Social Care, 2019).

Recommendations available for adults with disabilities are generalised and not focused on specific disabilities (Carty et al., 2021; Department of Health and Social Care, 2019). The lived experiences and lifestyle barriers of people with intellectual disabilities will be different to people with disabilities such as major clinical depression or schizophrenia. Recommendations should be developed to reflect the PA and SB of people with intellectual disabilities specifically. However, to enable this, more research is required investigating PA and SB in adults with intellectual disabilities.

1.4.5 Physical activity and sedentary behaviour levels of adults with intellectual disabilities

One systematic review has been conducted that investigates the PA levels of adults with intellectual disabilities (Dairo et al., 2016). The systematic review and meta-analysis were conducted in 2016 and examined PA levels of adults with intellectual disabilities and used recommended PA guidelines from the general population to quantify activity (Dairo et al., 2016). The review identified n = 15 studies for the narrative summary of the findings, with n = 14 included in the meta-analysis. The studies were conducted in Western high income countries. Sample sizes ranged from n = 17 to n = 1542 and included both objective and subjective PA measurements. The small number of studies showed considerable variability in design and quality, which is reflective of PA research in adults with intellectual disabilities.

Across the studies, 0 – 46% of adults achieved 150 minutes of weekly MVPA, while 7 – 45 % achieved ≥10, 000 steps/day, based on the recommendation by Tudor-Locke et al. (2008). Across the studies that reported steps/day, the average was 6794.7 steps/day (Dairo et al., 2016). This was below the recommended 10,000 steps/day, and the 7,000 steps/day threshold that is indicative of 150 minutes of weekly MVPA (Tudor-Locke et al., 2011). However, these step/day targets were based on research for the general population and may not be appropriate for adults with intellectual disabilities. The average, weighted by sample size across studies, was 9 % of adults with intellectual disabilities meeting minimum activity recommendations. This is very low compared to the approximate 72% of adults in the general population that are meeting PA recommendations (WHO, 2020).

The PA recommendations within this review were based on the guidelines for the general population. The focus on PA guidelines in this review prevents a wider understanding and quantification of the PA levels of adults with intellectual disabilities. Nevertheless, the PA of adults with intellectual disabilities were low. This is concerning as low PA may contribute to the health inequalities experienced by adults with intellectual disabilities (section 1.3 & 1.4.3). It is therefore necessary for more research to explore PA in adults with intellectual disabilities.

There is growing attention on SB as it is independently associated with poor health outcomes (section 1.4.3). One systematic review has explored prevalence of SB for adults with intellectual disabilities (Melville et al., 2017). SB within the review included specific modes, such as watching TV, as a proxy measure of SB, or total SB of adults with intellectual disabilities. The review reported the prevalence of SB to be high and ranged between 522 – 642 minutes/day, with one study reporting SB to be as high as 1123 minutes/day. However, it was observed that within most of the studies included the sample sizes were small reducing the generalisability of conclusions made. Additionally, this review reported that studies incorrectly described low levels of PA as SB (Melville et al., 2017). This suggests that there is limited knowledge regarding SB among the intellectual disabilities research community and that SB should become a research priority for adults with intellectual disabilities (Melville et al., 2017).

Although PA and SB are important lifestyle behaviours, they are still relatively overlooked by intellectual disabilities research. There is a need for research to focus on these behaviours and understand how to effectively target PA and SB to improve health outcomes.

1.4.6 Increasing physical activity and reducing sedentary behaviour in adults with intellectual disabilities

Interventions have been developed to target and improve lifestyle behaviours, including PA and SB, in adults with intellectual disabilities (Hassan et al., 2019; Willems et al., 2018). However, there has been limited effectiveness in increasing PA levels and reducing SB (Hassan et al., 2019; Melville et al., 2015; Willems et al., 2018). Qualitative studies associated with these interventions have reported numerous influences on behaviour change, such as time constraints of caregivers, attitudes of caregivers, freedom of choice of adults with intellectual disabilities, greater reliance on caregivers, along with personal preferences of adults with intellectual disabilities in the delivery of PA (Dixon-Ibarra et al., 2018; Matthews et al., 2016; Mitchell et al., 2016; Umb-Carlsson et al., 2019). This emphasises that there are complex influences on PA and SB of adults with intellectual disabilities that must be considered prior to developing effective interventions.

1.4.7 Understanding physical activity and sedentary behaviour levels of adults with intellectual disabilities

To understand the processes that lead to behaviour change, theoretical frameworks are used, and this is considered essential for the development of effective complex interventions (Craig et al., 2009). However, most activity research and lifestyle interventions for adults with intellectual disabilities are not theoretically informed (Hassan et al., 2019; Pitchford et al., 2018; Willems et al., 2017; Willems et al., 2018). When theories are used, they were developed for the general population. Theories developed for the general population have been considered appropriate for addressing motivational influences of behaviour change (Oliver et al., 2021). The most frequently used theories include Social Cognitive Theory and Theory of Planned Behaviour (Hassan et al., 2019; Pitchford et al., 2018; Willems et al., 2017; Willems et al., 2018).

In the broadest terms, Social Cognitive Theory proposes that behaviour is influenced both directly and indirectly through self-efficacy (Bandura, 2004).

Self-efficacy is a person's confidence to control a behaviour and influences the expected outcomes resulting from (not) performing a behaviour (Bandura, 2004). This then influences behavioural goals and behaviour directly. Additionally, wider socio-structural factors influence behavioural goals (Bandura, 2004). Theory of Planned Behaviour shares similarities and argues that perceived ability to control a behaviour directly and indirectly impacts behaviour through intentions (Ajzen, 1991). Furthermore, attitudes towards a behaviour, and how a person believes others appraise the behaviour (subjective norms), influence intentions (Ajzen, 1991).

Theories of behaviour change developed for the general population rely on abstract concepts, e.g., perceived behavioural control, outcome expectations, self-efficacy, and subjective norms. There is also no consideration of the unique lived experiences of people with intellectual disabilities, who have impairments in intellectual and adaptive functioning. Researchers have expressed concerns over the suitability of theories generalised for the general population to adults with intellectual disabilities (McGarty et al., 2018).

No theoretical frameworks have been developed specifically for PA and SB in adults with intellectual disabilities, which inhibits understanding of the process leading to behaviour change. However, conceptual models have been developed for the PA of people with disabilities (van der Ploeg et al., 2004). The model developed by van der Ploeg et al. (2004) considered environmental factors such as social influence, which interact with personal factors. These personal factors include, health conditions, intentions, attitudes and self-efficacy, and broad barriers and facilitators, to influence levels of PA functioning (van der Ploeg et al., 2004).

This provides a more relevant framework; however, it was applied to disabilities with common causes, rather than being specific to people with intellectual disabilities. This included musculoskeletal and connective tissue disorders, circulatory disorders, endocrine disorders, visual and hearing impairments, and mental disorders (van der Ploeg et al., 2004). The literature used to synthesise this framework for common disabilities were based on keywords relating to "chronic disease", with only one of three databases searched including the term "disability". This would result in important research relating to the PA of adults with intellectual disabilities being omitted. Additionally, the lived experiences of adults with intellectual disabilities, who experience significant impairments in intellectual and adaptive functioning, will be different to people with disabilities linked to circulatory disorders. Therefore, it does not reflect the processes leading to PA that are unique to adults with intellectual disabilities.

Research for adults with intellectual disabilities have used ecological frameworks, with the socio-ecological model frequently cited by systematic reviews of correlates of PA and SB (Harris et al., 2018; Oppewal et al., 2018; Sutherland et al., 2021; Vancampfort et al., 2021). Rather than providing an individual level theory of behaviour change, the influences of PA or SB can be organised and classified, making it relevant to intellectual disabilities research. Interacting multi-level influences of behaviour are emphasised, at the individual level, sociocultural and broader environmental levels (Sallis et al., 2015). The multi-level influences include intrapersonal factors, a person's social environment, the physical environment, along with organisational resources, the wider community and policy (Sallis et al., 2015; Stokols et al., 1996).

Table 1.2 Categories of the levels of influence used in this thesis

Levels of influence	Description and examples
Individual influences	Personal influences, such as, psychological factors (e.g., self-efficacy and motivation), demographic and biological factors (e.g., age, health conditions)
Social influences	Interpersonal influences, such as, social support and social network related influences.
Wider environmental influences	Multi-level environmental factors, reflecting the built and physical environment, organisational factors, policy, and wider society.

Reflecting this, adults with intellectual disabilities experience numerous interacting influences on PA and SB, ranging from individual factors to the broader environment. The multi-levels factors contributing to these health behaviours are presented below and will be categorised in this thesis across wider environmental, social, and individual level influences (Table 1.2).

1.4.7.1 Wider environmental influences

At the broadest level, the multi-dimensional environmental factors range from the physical environment to the wider infrastructural and organisational environmental impacts. In a systematic review of influences of low levels of PA in individuals with intellectual disabilities, environmental factors were primarily barriers (Bossink et al., 2017). People with intellectual disabilities experience greater deprivation and poverty than people in the general population (Emerson, 2007). Lower socioeconomic status and limited financial support is a barrier to PA for people with intellectual disabilities (Bossink et al., 2017). Reflecting this, limited community aid was reported as a barrier to PA, including limited discounted PA classes, the availability and accessibility of PA activities (Bossink et al., 2017). This emphasises a lack of a supportive environment, with limited accessible forms PA available within the community.

Walking is a free and accessible activity that has been reported as the main form of PA for adults with intellectual disabilities (Draheim et al., 2002). However, there are still numerous environmental barriers to participating in accessible forms of PA. This includes poor weather conditions, and perceived safety walking along roads and getting lost (Mitchell et al., 2016). There is a greater reliance on support to go for a walk, which is impacted by organisational issues, such as staffing levels and time available for paid carers (Mitchell et al., 2016). The impact of staffing levels and work pressure has been consistently reported as an organisational issue that impacts the ability of paid support staff to promote PA more generally (Bossink et al., 2019), with caregivers needing to prioritise everyday tasks over encouraging PA (Sundblom et al., 2015). This emphasises that multi-level environmental factors interact with social factors to impact the ability of caregivers to support PA. This may result in the adoption of more SB.

The organisational barriers for caregivers to support PA have implications for individuals living in supported residential settings. The proportion of participants living in residential care were significantly and negatively associated with meeting PA recommendations in a meta-analysis of the literature (Dairo et al., 2016). This was supported in a systematic review exploring correlates of SB in adults with intellectual disabilities, where living arrangement was reported as the only environmental influence (Oppewal et al., 2018). Level of independence has also contributed to accessible PA, such as walking (Mitchell et al., 2016). For adults with greater independence, longer walking distances were reported (Mitchell et al., 2016). However, staffing limitations impact walking opportunities for some adults with less independence (Mitchell et al., 2016).

Reflecting this there are numerous organisational barriers, such as prioritising treating health conditions over modifiable lifestyle behaviours, including PA (O'Leary et al., 2018). Additionally, there are no clear policies or recommendations in place relating to PA promotion or reducing SB for adults with intellectual disabilities (O'Leary et al., 2018). Subsequently, care staff have restricted opportunities to improve their knowledge of promoting healthy lifestyles (O'Leary et al., 2018).

The wider environment has a major influence on the ability of adults with intellectual disabilities to engage in PA over SB. The environment is multi-dimensional, ranging from the physical and built environment, to organisational issues. These environmental factors also interact with social factors and can inhibit the ability of caregivers to support PA. Although the aforementioned research have considered the environmental influences of all adults with intellectual disabilities, there is no consideration if there may be differences in environmental influences between men and women, which may contribute to the gender differences in negative health outcomes (Section 1.3.1).

1.4.7.2 Social influences

Social influences are an integral aspect of PA and SB in adults with intellectual disabilities, as there is a greater reliance on social support with daily living (section 1.2.1). Adults with intellectual disabilities have restricted social contact compared to people in the general population, with main sources of interaction coming from their family members and paid support staff (Harrison et al., 2021). The social support people with intellectual disabilities experience interacts with the wider environmental and organisational factors outlined previously. This includes staffing levels and time constraints of family caregivers (Bossink et al., 2017), with support staffing limitations adding pressure on family members (Mitchell et al., 2016). Subsequently, a social environment that is conducive to PA promotion, and less SB, is not always present for adults with intellectual disabilities. Therefore, social support has been reported as both a barrier and facilitator of PA (Bossink et al., 2017).

Positive experiences of social support for PA has been linked to a person-centred approach, carers having greater self-efficacy, increased motivation, and collaboration between paid and family caregivers (Bains & Turnbull, 2020). Conversely, a lack of communication between caregivers has been reported as a barrier, with paid and family caregivers passing responsibility for supporting PA to the other (Cartwright et al., 2016). This emphasises that social support for PA is complex and relies on both paid and family caregivers. This could lead to adults with intellectual disabilities not receiving the necessary support.

The caregivers and supports may not have the expertise necessary to provide adequate social support for PA. This has been reflected in the literature as caregivers have limited knowledge of recommended PA levels and healthy lifestyles (Melville et al., 2009; Michalsen et al., 2020). Caregivers have been found to rationalise SB and describe it as a normal or “inherited” thing (Frey et al., 2005). There is also limited awareness among paid caregivers of appropriate and accessible PA for adults with intellectual disabilities (Bossink et al., 2019). This has huge implications for the opportunities for social support for PA experienced by adults with intellectual disabilities.

The impact of social influences has also been reported to interact with individual level factors. Opportunities for social interaction also increase motivation for PA (Michalsen et al., 2020). However, this is not the case for all adults with intellectual disabilities, with personal preference being important when promoting PA (Mitchell et al., 2016). Some adults with intellectual disabilities prefer to be alone, others like to meet new people, or to be with people already known to them (Mitchell et al., 2016). Additionally, women with intellectual disabilities describe social support as a benefit for PA and that it provides opportunities to meet people (Frey et al., 2005). However, men may be more motivated by aesthetic physical goals, emphasising a potential influence of gender (Frey et al., 2005).

Social support from family members has been reported to directly predict leisure time PA (Peterson et al., 2008). Social support from peers was reported to be mediated by self-efficacy for PA among adults with intellectual disabilities (Peterson et al., 2008). This was also reported to interact with age, as support from family directly and indirectly (through self-efficacy) predicted leisure PA of young adults with intellectual disabilities (Peterson et al., 2008). For older adults, social support from staff was directly associated with leisure PA, and social support from peers indirectly impacted leisure PA through self-efficacy for PA (Peterson et al., 2008). However, interaction between social support and self-efficacy was only measured for adults with mild to moderate intellectual disabilities (Peterson et al., 2008). Therefore, this may not exert an impact over adults with severe to profound intellectual disabilities.

Differences in social support have been linked to the level of intellectual disabilities a person has. The degree of independence adults have determines their ability to engage in PA, such as being able to walk alone and chose routes or having a reliance on caregivers to facilitate the activities (Mitchell et al., 2016). Although adults with mild intellectual disabilities may have more independence to engage in PA, caregivers over-estimating the abilities of people with mild intellectual disabilities can be a barrier (Bains & Turnbull, 2020). This emphasises that when considering social factors, it is important to consider the needs, abilities, and motivations of adults with intellectual disabilities at an individual level.

1.4.7.3 Individual level influences

Adults with intellectual disabilities experience numerous individual level influences of PA and SB. Psychological aspects, such as motivation, contribute to PA (Bossink et al., 2017). However, this is commonly a barrier due to low motivation for PA and sedentary preferences (Bossink et al., 2017). Even if motivated, adults with intellectual disabilities may have to get permission from caregivers to engage in PA, such as going for a walk (Powers et al., 2021). Caregivers have also reinforced that motivation alone is not the main issue, with practical challenges, such as transportation and physical abilities preventing PA (Michalsen et al., 2020).

Reflecting this, behavioural problems and health issues, such as being overweight, are frequently reported barriers to PA for people with intellectual disabilities (Bossink et al., 2017). However, overweight and obesity are modifiable, and associated with energy intake and expenditure. Additionally, reductions in problem behaviours, such as challenging and aggressive behaviours, have been associated with exercise interventions among people with intellectual disabilities (Ogg-Groendaal, Hermans & Classens, 2014). This emphasises that although health issues may be barriers to PA, increasing PA of adults with intellectual disabilities may reduce these negative health outcomes.

People with profound intellectual disabilities are also at greater risk of health inequalities (O’Leary et al., 2018). Having severe and profound intellectual disabilities is also associated with lower PA levels, but findings are mixed for SB (Dairo et al., 2016; Oppewal et al., 2018). The mixed findings for SB may be due to the different types of SB conducted and measurement issues. People with severe and profound intellectual disabilities may watch less television due to impairments in communication and processing, but still engage in SB (Oppewal et al., 2018).

Older adults with intellectual disabilities are also at a higher risk of poor health and experience multimorbidity (Hermans & Evenhuis, 2014). No association has been observed between age and SB (Oppewal et al., 2018), suggesting all age groups are sedentary. However, age is negatively associated with PA among adults with intellectual disabilities (Dairo et al., 2016), with older adults having very low PA levels (Hilgenkamp et al., 2012). The very low levels of PA among older adults with intellectual disabilities was linked to mobility issues, having a more severe intellectual disability, and even being a woman (Hilgenkamp et al., 2012).

This influence of gender was supported in the systematic review exploring PA levels of adults with intellectual disabilities (Dairo et al., 2016). The proportion of male participants within a study sample was significantly and positively associated with meeting recommended PA levels (Dairo et al., 2016). This indicates that males may engage in more PA than females with intellectual disabilities. Findings for SB were mixed with only three studies identified in a systematic review as including gender as a potential correlate (Oppewal et al., 2018).

There is a tendency for existing PA and SB intellectual disabilities research to neglect the influence of gender. The impact of gender was not considered in the systematic review reporting SB of adults with intellectual disabilities (Melville et al., 2017). Additionally, the systematic review on PA levels only considered an association based on number of males in a sample and did not quantify gender differences (Dairo et al., 2016). Reflecting this, interventions have not explored gender differences in PA and SB in both primary and secondary outcomes of the trials (e.g., Bergstrom et al., 2013; Melville et al., 2015; Melville et al., 2010; Harris et al., 2017; Spanos et al., 2016). This highlights a significant gap in the literature that limited research has considered gender differences in the influences of PA, SB, or behaviour change for adults with intellectual disabilities.

As outlined in this section on influences of PA and SB, there are numerous complex barriers and facilitators experienced by all adults with intellectual disabilities. The influences are only considered across adults with intellectual disabilities, with a failure to consider whether there are differences between men and women. It is essential to explore this as gender differences are present in the health inequalities experienced which reflect the negative health outcomes associated with low PA and high SB (section 1.3.1 & section 1.4.3).

1.5 Gender and Sex: definitions and terminology in this thesis

When considering if there are differences between men and women, it is essential to first understand the concepts of sex and gender, and how they interact. Sex relates to the biological characteristics of males, females, and intersex people (Mauvais-Jarvis et al., 2020; Springer et al., 2012). This relates to hormonal, reproductive organ and chromosomal differences (Springer et al., 2012). Conversely, gender is a psychosocial construct relating to the "appropriate" roles, relationships, behaviours, attributes, and opportunities for men and women (Mauvais-Jarvis et al., 2020; Shannon et al., 2019; Springer et al., 2012).

Gender norms are rules about acceptable behaviours and attributes, relating to masculinity for men and femininity for women, and are socially constructed and entrenched within institutions and society (Cislaghi & Heise, 2020; Heise et al. 2019). To facilitate research and interventions, a cross-theoretical definition of gender norms was developed:

> "Gender norms are social norms defining acceptable and appropriate actions for women and men in a given society. They are embedded in formal and informal institutions, nested in the mind, and produced and reproduced in social interaction. They play a role in shaping women and men's (often unequal) access to resources and freedoms, thus affecting their voice, power and sense of self." (Cislaghi & Heise, 2020, p. 415 - 416).

These gender norms are believed to be internalised in childhood through modelling and observing same-gender and opposite-gender family members, peers, and wider society (Bussey & Bandura, 1999). The gender appropriate characteristics and behaviours are also learned through other people's reactions when expressing gender normative behaviours (Bussey & Bandura, 1999). They are reinforced by family and the wider social context, such as school, the working environment, and the media (Cislaghi & Hiese, 2020).

Although sex and gender are distinct constructs, they are “entangled” (Springer et al., 2012). The biological mechanisms associated with a person’s sex and a person’s socially constructed gender can contribute to health differences, both independently and together (Springer et al., 2012). For example, in the general population, males are at an increased risk of cardiovascular disease, with biological sex differences identified in fat processing which contributes to this risk (Springer et al., 2012). Gender norms are also present around masculine and feminine physiques contributing to differences in diets, with men consuming more red meat which may also contribute to this risk (Springer et al., 2012). A person’s sex also influences physiology that provides (dis)advantages around engaging in specific behaviours (Rosenfield, 2017; Lunsdgaard et al., 2017), while gender will influence the types of behaviours engaged in (Peters & Norton, 2018).

However, it is important to emphasise that a person’s gender may not align with their sex assigned at birth. A person can be cisgender, when an individual’s gender reflects their biological sex, and a person can be transgender or gender nonconforming, when a person’s sex assigned at birth does not reflect their gender (APA, 2015).

Gender is a complex and multifaceted construct; however, a nuanced exploration of gender is not within the scope of this thesis. This thesis will be focusing on PA and SB, as health behaviours potentially contributing to the differences in health inequalities between men and women (Section 1.3.1). Subsequently, this thesis will focus on men and women/male and female adults with intellectual disabilities. Although a dichotomous conceptualisation is used, gender will be referred to over sex. Gender is linked to the behaviours enacted by men and women, and PA and SB are lifestyle behaviours with multiple interacting individual level, social, and environmental influences (Section 1.4.7). Therefore, “gender” will be the term used within this thesis. However, the term gender is used with the understanding that it is intertwined with the biological influences of sex.

1.6 Gender and health inequalities

To explore how gender contributes to health inequalities, a conceptual framework was developed for The Lancet based on existing literature (Heise et al., 2019). The framework describes that long-term health outcomes associated with biological sex contribute to sex differences in health, while gender contributes to inequalities. Starting at birth, gender norms influence an individual’s opportunities and life outcomes by governing action and behaviours, with this becoming more prominent in adolescence and adulthood (Heise et al., 2019).

The framework argues that privileged men (e.g., white, wealthy, young and having no disability), followed by privileged women, experience the greatest advantages and least inequalities (Hesie et al., 2019). However, a marginalised woman experiencing other intersecting sources of disadvantage, such as having a disability, would experience the most inequalities (Heise et al., 2019). This reflects the increased inequalities in health experienced by women with intellectual disabilities (section 1.3.1).

This draws on the analytic framework of intersectionality, and emphasises overlapping, or intersecting, sources of inequality with gender, such as race, social status, age, and ability (Heise et al., 2019). Intersectionality was initially developed by African American feminists to emphasise the complex interacting social inequalities faced based on being a woman and an ethnic minority (Collins & Bilge, 2016). In the most basic terms, intersectionality argues that social inequality is not determined by a single axis of inequality, and that multiple sources of disadvantage, including race, gender, and class, are mutually interacting (Collins & Bilge, 2016).

The pathways that contribute to health inequalities may also be gendered, contributing to gender differences in health outcomes (Heise et al., 2019). The most important in the context of this thesis is through the behaviours enacted by men and women, with gender norms described as contributing to PA participation (Heise et al., 2019). Although not explicitly addressed within this article, this may also have implications for SB. Additionally, gender biases in research were emphasised, with internalised gender norms and assumptions contributing to biases and gaps in the literature. This is reported to be most pronounced in medical research with women being under-represented (Heise et al., 2019).

This potentially has implications when interpreting existing PA and SB research for adults with intellectual disabilities as there has been a tendency to neglect the influence of gender (section 1.4.7.3). Additionally, at the time of developing the rationale for this thesis, a gender bias in PA research was observed with studies often recruiting disproportionately more or exclusively male participants (Shields et al., 2017; Hawkins & Look. 2006; Vogt et al., 2012). However, these studies still generalised results to describe PA of all individuals with intellectual disabilities, which highlights the need for more research considering the influence of gender.

Additionally, the argument presented by Heise et al. (2019) that marginalised women, such as women with intellectual disabilities, are at greater risk of inequalities, is reflected in the increased risk of reduced life expectancy, obesity, general poor health, and cardiovascular risk factors observed for women with intellectual disabilities (Section 1.3.1). As these inequalities are reflective of health outcomes associated with low PA and high SB (Section 1.3.1 & 1.4.3), these health behaviours may be a potential pathway to the gender differences in health inequalities. This further reinforces a need for PA and SB intellectual disabilities research to examine potential gender differences and if there are any gender-specific influences.

1.7 General population: Gender and activity levels

In the general population, gender differences in PA levels have been widely reported. A pooled-data analysis of surveys administered between 2001-2016 across 168 countries was conducted to describe global and regional trends in PA (Guthold et al., 2018). The total sample included 1.9 million participants aged ≥18 years old (Guthold et al., 2018). This study identified consistent gender differences with women less physically activity than men, in both 2001 and 2016, and across countries (Guthold et al., 2018). Additionally, being male was associated with increased PA in a review of the literature in the general population (Bauman et al., 2012). However, within this review, gender was identified as correlate and not a determinant of PA levels (Bauman et al., 2012), suggesting that other influences may contribute to PA.

For SB, a systematic review focusing on correlates for adults reported mixed findings for gender with limited evidence supporting gender differences (Rhodes et al., 2012). However, the findings suggested that men were more likely to participate in specific forms of SB, such as playing video games (Rhodes et al., 2012). Nevertheless, a cross-sectional population-based study using data from the UK Biobank reported a potential influence of gender on SB (Patterson et al., 2018). For overall sedentary time, males who had not attended college were most at risk (Patterson et al., 2018). This suggests a potential interaction between gender and other factors such as education level, impacting SB. This may have potential implications for men with intellectual disabilities who have impairments in intellectual and adaptive functioning.

There are a wide range of multi-level influences contributing to the gender differences in PA. At the individual level, there are physiological differences between men and women, relating to their sex. This contributes to differences in capacity for PA, such as, women having less skeletal muscle mass and lower maximal cardiac output (Lunsdgaard et al., 2017). However, women are under-represented in sports and exercise physiology research (Lunsdgaard et al., 2017).

In addition to physiological factors, psychosocial factors have been identified as important contributors to gender differences in activity levels (Edwards & Sackett, 2016). Social support is a psychosocial influence of gender differences in inactivity levels (Edwards & Sackett, 2016). The review indicated that greater social support or different sources of support between genders, may lead to gender differences in PA, although this was based on limited literature (Edwards & Sackett, 2016). Still, this study identified self-efficacy as the key psychological influence (Edwards & Sackett, 2016).

Self-efficacy for PA levels was reported to be higher among men, with this observed in both childhood and adulthood (Edwards & Sackett, 2016). Self-efficacy for PA was consistently identified as having a positive association with PA (Young et al., 2014), and is one of the key constructs of social cognitive theory (Bandura, 2004). Self-efficacy beliefs are also proposed as a mechanism for enforcing and regulating gender roles, relating to masculinity in men and femininity in women (Bussey & Bandura, 1999).

Internalised gender roles are present regarding the PA behaviours that men and women should engage in (Chalabaev et al., 2013). Additionally, sex-stereotypes, i.e., prescriptive statements and beliefs regarding PA participation and performance for men and women, influence participation and performance in PA, such as sports (Chalabaev et al., 2013). These relate to the activities being considered masculine, feminine or gender neutral, with "masculine" activities linked to "masculine" traits like strength and face-to-face opposition, and feminine PA to grace and aesthetics (Chalabaev et al., 2013). For example, strength-based exercises, football, and wrestling have been described as masculine, while gymnastics, dance and balance related sports are feminine (Gentile et al., 2018; Sobal et al., 2019).

These gender norms regarding masculine and feminine behaviours shapes how adults engage with their environment. Gender norms influence areas and equipment used within a gym by men and women, and activities reflect concepts of masculinity and femininity, such as weight-lifting and cardiovascular PA, respectively (Coen et al., 2018). Women may also experience micro-aggressions from men at the gym (Coen et al., 2018). This includes sexual advances, being criticised, and being pressured to finish with equipment to give access to men (Coen et al., 2018). Women also attempt to reduce the space required to exercise (Coen et al., 2018). This reinforces opposite genders have different experiences and opportunities for PA.

Additionally, broader environmental factors may contribute to the pronounced gender differences in PA. Women have been identified as more concerned about neighbourhood safety and will not engage in PA at night or in areas that are not well-lit (Salvo et al., 2018). Safe spaces and familiar environments were more conducive to PA among women (Salvo et al 2018), while walkability of an area has been linked to reduced SB for women (O'Donoghue et al., 2016).

Research in the general population relating to PA has widely established that gender differences are present. The literature also suggests a potential influence on SB; however, this is under researched in comparison to the literature on PA. As a result of this research, gender-sensitised interventions and campaigns have been developed to successfully target PA and SB in men and women.

1.8 Gender-sensitised interventions in the general population

The literature in the previous section highlights some of the research relating to gender differences in PA and SB and identifying gender-specific influences for men and women. In the general population, this has resulted in a comprehensive understanding of differences in activity levels and what contributes to these behaviours, resulting in interventions that are specifically tailored to men and women.

Gender-sensitised interventions have been developed for men, such as Football Fans in Training (FFIT; Wyke et al., 2015). This study was gender sensitised to consider gender and masculinity in the context of the intervention, the content and how it was delivered (Wyke et al., 2015). This included the context of football clubs and men-only groups, providing football club branded materials, and a participatory programme that facilitated “banter” (Wyke et al., 2015). The intervention resulted in significant improvements in weight loss, self-reported PA, and wellbeing (Wyke et al., 2015). However, the study did not observe long-term improvements in SB (Wyke et al., 2015), which highlights a need for research to explore gender specific influences of SB.

Qualitative research was conducted with participants involved in the pilot programme (Hunt et al., 2013). The context of the football clubs for the weight loss programme did not threaten their masculinity as it was seen as training with the football club (Hunt et al., 2013). The football club was valued and increased motivation to take part for the men (Hunt et al., 2013). Men taking part in focus groups after the FFIT randomised controlled trial also reported positive perceptions (Bunn et al., 2016). Men appreciated being with other men of similar age and physique, and it minimised comparisons (Bunn et al., 2016). Ultimately, the qualitative research highlighted that considering masculinity may have supported participation and adherence with the intervention (Bunn et al., 2016).

For women, most notably, This Girl Can was a campaign developed by Public Health England to increase PA in girls and women. The aims were to change thinking patterns around PA, such as sport, and improve the opportunities available to girls and women (O'Keefe, 2020). It was developed to address barriers such as fears about appearance, including being sweaty, changing in front of others, and not being perceived as feminine. Fears around ability were also addressed, including fitness levels and not being "good enough". Additionally, women reported having other priorities over PA, such as time with friends and family (O'Keefe, 2020).

Phase one of the campaign was in 2015 and used a media campaign showing relatable women participating in sports. As a result of the first phase, 2.8 million girls and women aged 14-40 reported increasing their PA because of the campaign (O'Keefe, 2020). Phase two was in 2017 and was focused on long-term impacts of promoting PA and included women between 40 and 60 in the target audience (O'Keefe, 2020). The second phase was also successful in increasing PA of 2.9 million women and girls aged 14-60. Phase three was launched in 2018 focusing on addressing inequalities among women relating to PA, taking into consideration social, cultural, and economic barriers, however the results have not yet been recorded (O'Keefe, 2020).

Overall, there are vast benefits to considering the role of gender in interventions to increase PA and reduce SB. Interventions tailored for a specific gender allow for the unique influences of lifestyle behaviours of men and women to be addressed. This may have significant implications for research in adults with intellectual disabilities relating to the understanding of PA and SB and designing effective interventions. There are gender differences in health outcomes, and mixed-gender lifestyle interventions have been largely unsuccessful in adults with intellectual disabilities (section 1.4.6). This highlights the need for a new and more focused approach, that considers the influence of gender. However, for this to be done, research exploring gender differences and gender specific influences of PA and SB for adults with intellectual disabilities is required.

1.9 Identifying an evidence base

Understanding the interaction between gender and lifestyle behaviours would allow for gender-tailored health programmes to be developed. However, first an evidence base must be identified before complex interventions, such as gender-tailored interventions, can be developed (Medical Research Council; MRC; Craig et al., 2009). Mixed gender interventions targeting these lifestyle behaviours have largely been unsuccessful for adults with intellectual disabilities (section 1.4.6). Developing gender-sensitised interventions will allow for more nuanced and focused interventions to be developed.

Table 1.3 Phases of the Behavioural Epidemiological Framework

	Description of phases
Phase 1	Establish links between behaviours and health
Phase 2	Develop methods for measuring the behaviour
Phase 3	Identifying factors that influence the behaviour
Phase 4	Evaluate interventions to change the behaviour
Phase 5	Translate research into practice

Note: Based on phases outlined in Sallis et al. (2000)

The Behavioural Epidemiological Framework proposes phases for developing evidence-based interventions (Sallis et al., 2000; Table 1.3). Reflecting the first phase, a link is widely established between health, PA, and SB (section 1.4.3). PA and SB may also contribute to the increased risk of negative health outcomes experienced by women with intellectual disabilities (section 1.3.1). Meeting the second phase, measurement methods have also been established for both PA and SB (section 1.4.2). However, there is no solid understanding of whether gender differences exist in the PA and SB levels of adults with intellectual disabilities. There is also no understanding of gender-specific influences of the behaviours. Therefore, there is no evidence relating to the third phase of identifying factors that influence the behaviour. This will require further attention to develop an evidence base to address these significant gaps in the literature.

The evidence base regarding the link between gender and PA and SB of adults with intellectual disabilities is lacking. This is concerning as the negative health outcomes associated with low PA and high SB reflect the increased risk of health inequalities among women. The lack of research considering if there are gender differences in these behaviours, or gender-specific influences, inhibits the development of gender-sensitised interventions. At present, there is no understanding of if gender-sensitised interventions would be appropriate or required. It is imperative to determine if there are differences in PA and SB levels, and any of the factors that may contribute to these behaviours.

1.10 Gender and adults with intellectual disabilities: what is the existing evidence base?

Although gender is a prevalent influence on PA and SB in the general population, it is unclear if it exerts the same impact for adults with intellectual disabilities. Researchers have argued that expressions of gender, such as masculinity, are influenced by cognitive impairments associated with intellectual disabilities, and the level of support to engage in this aspect of gender (Wilson et al., 2013). Gender development theories also rely on a level of abstraction which may be difficult for people with intellectual disabilities. For example, Gender Schema Theory proposes that cognitive structures around gender are learned based on cultural norms, which influence self-evaluations based on these “gender schemas” (Bem 1981).

People with intellectual disabilities are also potentially treated by others as gender neutral with the focus being on a person's disability (Umb-Carlsson & Sonnander, 2006). This has implications for the formation of gendered conduct and gender roles for adults with intellectual disabilities. Gender development is influenced by other people's responses or social outcomes of enacting gender (in)appropriate behaviours (Bussey & Bandura, 1999). Reflecting this concept of people with intellectual disabilities being appraised as gender neutral, intellectual disabilities research has also been described as gender blind and focused specifically on a person's disability (O'Shea & Frawley, 2020; Dusseljee et al., 2012).

Nevertheless, marginalised women, such as women with a disability, are at greater risk of health inequalities (Hesie et al., 2019; section 1.3.1). Research has reflected this intersection between gender and disability, in attitudes towards men and women with disabilities (Coleman et al., 2015). University students rated a greater desire for social distance from women with intellectual disabilities compared to women with physical disabilities, however there was no impact of type of disability on the appraisals of men (Coleman et al., 2015). This suggests that men with intellectual disabilities may be evaluated and potentially treated differently or more favourably than women.

Conversely, a review of gendered topics in intellectual disabilities reported more research around men with intellectual disabilities focused on criminal and sexually deviant behaviour (Wilson et al., 2010). However, for women there was more focus on health promotion, such as breast screening (Wilson et al., 2010). This potentially indicates a negative focus on men with intellectual disabilities. This reflects the appraisal of men with intellectual disabilities as being sexually aggressive, and women with intellectual disabilities as being more vulnerable (Young et al., 2012). These appraisals may have implications for how men and women with intellectual disabilities are treated.

A qualitative study based in Iceland reported differences in the experiences of men and women with intellectual disabilities (Bjornsdottir et al., 2017). Men living in an institutional setting were given job roles, such as mail delivery and outdoors maintenance, while women were given tasks relating to cleaning or assisting others, reflecting concepts of masculinity and femininity (Bjornsdottir et al., 2017). Both men and women across a range of residential settings had limited autonomy, freedom of choice or control over their lives (Bjornsdottir et al., 2017). However, this freedom of control and choice was observed as reduced for women with intellectual disabilities, compared to men. This study found that some older women had experienced non-consensual sterilisation, while no men had been subjected to this (Bjornsdottir et al., 2017). This reinforces the potential differences in how men and women with intellectual disabilities are treated and emphasises that marginalised women may experience greater inequalities.

Gendered service delivery has been observed in qualitative research relating to teenage boys and men with intellectual disabilities (Wilson et al., 2011). Female care staff reported fears of safety around men and teenage boys with intellectual disabilities, and protective strategies in place to minimise risk of assault (Wilson et al., 2011). In addition to this, gender roles relating to masculinity and femininity were adopted by care staff. Male care staff were reported to engage in more physical tasks, and doing “male things, such as swimming” (Wilson et al., 2011, p. 345). There were also descriptions by female care staff about activities, such as football, being a gendered activity appropriate for male care staff (Wilson et al., 2011). It suggests that the internalised gender norms held by caregivers may influence the behaviours supported, and result in differences in the sources of support for adults with intellectual disabilities. This emphasises how the lack of autonomy and reliance on caregivers as an adult may contribute to the reinforcement of gender norms relating to appropriate behaviours.

Qualitative research has indicated that gender normative activities are promoted in day centres, with women supported to sew while men were supported to engage in woodwork (Fitzgerald & Withers, 2013). Additionally, adults with intellectual disabilities have reported gender normative ideas surrounding masculinity and femininity (Fitzgerald & Withers, 2013; Wilton & Fudge

Schormans, 2019; Zierkiewicz & Cytowska, 2019). However, qualitative research has indicated that although participants with intellectual disabilities were adults, men felt like they were being treated “like a kid” (Wilton & Fudge Schormans, 2019). Women also perceived themselves as “girls” (Fitzgerald & Withers, 2013). Being a woman was associated with the freedom of choice that comes with adulthood that may not be afforded to adults with intellectual disabilities (Zierkiewicz & Cytowska, 2019).

The research relating to gender and intellectual disabilities is limited and primarily using context specific qualitative research. Although this allows for an in-depth exploration of perceptions of gender, masculinity, and femininity, it cannot be generalised. Caregivers appear to exhibit gender norms relating to PA, and the promotion of PA for men with intellectual disabilities and by male caregivers (Wilson et al., 2011; Wilson et al., 2013). However, the direct impact of gender on PA and SB of adults with intellectual disabilities is unknown and under researched.

Gender is an important area of research for people with intellectual disabilities, but it appears to have a different impact on daily lives compared to the general population. It is unknown whether there will be gender differences in participation in lifestyle behaviours, such as PA and SB, and whether there will be gender differences in the factors that contribute to these lifestyle behaviours.

1.11 Exploration into gender differences and gender-specific influences on the physical activity and sedentary behaviours of adults with intellectual disabilities: Thesis rationale

Adults with intellectual disabilities engage in unhealthily low levels of PA and high rates of SB (section 1.4.5). The negative health outcomes associated with these lifestyle behaviours contribute to the health inequalities experienced by adults with intellectual disabilities (sections 1.4.3 & 1.3, respectively). All adults with intellectual disabilities are at risk of health inequalities. However, a trend has been identified where women have an increased risk of obesity, general poor health, cardiovascular risk factors and inequalities in life expectancy compared to men with intellectual disabilities (see section 1.3.1). This reflects the health risks of low PA and high SB (section 1.4.3).

In the general population, the link between gender and activity levels has been widely explored, and women are identified as most inactive (section 1.7). This has resulted in research exploring potential determinants, and the development of gender-sensitised interventions that have been successful in promoting PA and reducing obesity in both genders (section 1.8). Research exploring gender and health inequalities has emphasised that marginalised women are most at risk (section 1.6). Intersections of multiple forms of disadvantage, such as between being a woman and having a disability, contribute to this (section 1.6).

However, limited research has explored the influence of gender in people with intellectual disabilities. The research available suggests that gender is important to people with intellectual disabilities (1.10). However, this is impacted by freedom of choice, the support from caregivers, perceptions of the wider society and a person's cognitive ability to internalise gender norms (section 1.10). It is unknown whether gender will exert the same influence over PA and SB of adults with intellectual disabilities, and whether there are any gender differences in participation rates and influential factors.

It is essential for research to explore the potential gender differences and whether there are any gender-specific influences of PA and SB. Doing so will allow for the formation of an evidence base that can inform future interventions aiming to target PA, SB, or health inequalities. It will also help determine if gender-sensitised programmes would be justified. Ultimately, determining if there are gender differences in PA and SB, or gender-specific influences, will provide a more detailed understanding of these lifestyle behaviours that directly impact the health and wellbeing of people with intellectual disabilities.

1.12 Thesis aims and objectives.

The objective of this PhD thesis is to provide an initial exploration into the presence of potential gender differences in PA and SB in adults with intellectual disabilities to address the pervasive gap in the literature. As little is known about this area of research, this thesis will focus on establishing if gender influences PA and SB exist to inform the development of an initial evidence base.

This thesis will address two broad aims:

1. Investigate and quantify gender differences in the PA and SB levels of adults with intellectual disabilities

2. Identify potential gender-specific influences on the PA and SB of adults with intellectual disabilities

1.13 Outline of thesis

This thesis provides the results of an initial exploration into gender differences in PA and SB in adults with intellectual disabilities. The thesis is formed of individual studies conducted sequentially, with each based on the findings or gaps identified in the preceding chapter(s).

Chapter two: Gender differences in physical activity and sedentary behaviour in adults with intellectual disabilities: A systematic review and meta-analysis.
This chapter quantifies the gender differences in PA and SB in adults with intellectual disabilities and partially addresses aim 1 of the thesis.

Chapter three: Exploration of gender differences and gender-specific correlates of objectively measured physical activity and sedentary behaviour of adults with intellectual disabilities.
Gender differences in PA and SB, and potential correlates were assessed using objectively measured pooled baseline accelerometer data from two Glasgow based randomised controlled trials (thesis aims 1 & 2).

Chapter four: Identifying gender differences, and gender-specific correlates, of physical activity and sedentary behaviour of adults with intellectual disabilities using a large population-based data set.
Assesses the same research questions as chapter three but uses subjective PA and SB from a large population-based study to determine if the findings are supported in a more representative sample (thesis aims 1 & 2).

Chapter five: Social support for physical activity, the types of activities promoted, and the presence of gender differences among adults with intellectual disabilities: Research impacted by the COVID-19 pandemic.
Presents the initial results study that was halted due the COVID-19 pandemic, an attempt to mitigate the study and a reflection of the impact of COVID-19. The study was originally developed to focus on social support, which is a core influence of PA and SB of adults with intellectual disabilities, and the types of activities promoted, which may reflect gender norms (thesis aim 2).

Chapter six: Gender differences in the social and environmental correlates of physical activity and the types of activities engaged in by adults with intellectual impairments.

This study was developed to mitigate the impact of COVID-19 and was developed to address the aims outlined in chapter four using a secondary data study. This secondary data study explored social and environmental correlates of PA and SB, and gender differences in the types of leisure activities engaged in, potentially indicating gender norms (thesis aims 1 & 2).

Chapter seven: Reflection on the PhD process.

This chapter provides reflection on the PhD process, and highlights the new knowledge and skills acquired.

Chapter eight: General discussion.

Synthesis and discussion of the thesis findings in relation to the thesis aims, with reflection on past literature.

Chapter Two. Gender differences in physical activity and sedentary behaviour of adults with intellectual disabilities: A systematic review and meta-analysis

2.1 Overview of this chapter

This chapter presents a systematic review and meta-analysis to determine if gender differences in PA and SB were observed in the extant literature. The main body of text from this systematic review has been published (Westrop et al., 2019). Permissions have been provided to use this within the thesis by John Wiley and Sons Copyright Clearance Centre (Appendix 1).

2.2 Introduction

In the general population, gender differences in activity levels have been explored extensively, resulting in the identification of men as engaging in more PA than women (Chapter 1, section 1.7). Although mixed findings have been reported for SB, research has still considered if gender differences are present (Chapter 1, section 1.7). The research conducted has allowed for a detailed understanding of potential gender-specific influences and the development of gender-tailored interventions (Chapter 1, section 1.7 & 1.8). However, limited attention has been afforded to the potential gender differences in PA and SB of adults with intellectual disabilities.

As outlined in the previous chapter, adults with intellectual disabilities experience numerous health inequalities (Chapter, 1 section 1.3). Women are potentially more at risk of reduced life expectancy, general poor health, cardiovascular risk factors and obesity (Chapter 1, section 1.3.1). This reflects the negative health outcomes associated with low PA and high SB (Chapter 1, section 1.4.3). Adults with intellectual disabilities have been reported to engage in low levels of PA and high rates of SB, emphasising the necessity of targeting these lifestyle behaviours (Chapter 1, section 1.4.5).

Expert researchers, when consulted on the gender differences in premature deaths, considered physical inactivity as a potential risk factor requiring more research (Robertson et al., 2020). Marginalised women, including women with intellectual disabilities, experience greater disadvantages (Heise et al., 2019). Therefore, it is important to understand the pathways leading to potential inequalities. Behavioural pathways, such as PA or SB, can contribute to gender differences in health inequalities experienced by women (Heise et al., 2019). Nevertheless, scant literature is available considering potential gender differences in PA and SB of adults with intellectual disabilities.

The research exploring levels of PA and SB of adults with intellectual disabilities has been limited and of varying quality (Chapter 1, section 1.4.5). Additionally, the extant SB literature has been identified as misclassifying low PA levels and inactivity as SB (Melville et al., 2017). Existing systematic reviews have also not explicitly quantified the PA and SB of men or women or determined if there are gender differences (Dairo et al., 2016; Melville et al., 2017). The lack of focus on the influence of gender on PA and SB impedes the ability to determine if these are modifiable influences of gender differences in health inequalities experienced by adults with intellectual disabilities. This also prevents the formation of a comprehensive evidence base to inform the development of future lifestyle modification interventions.

To determine if gender differences are present in the PA and SB explored in the extant literature, the evidence base would benefit from a comprehensive systematic review and meta-analyses. Systematic reviews follow set stages and guidelines, to minimise potential bias when synthesising results. Due to the relatively limited literature available on the PA and SB levels of adults with intellectual disabilities, it is important to consider all research available across multiple domains of PA and forms of SB. This systematic review and meta-analysis will bridge this wide gap in the literature and provide much needed insight.

2.2.1 Review Aim

To investigate the presence of gender differences in the PA and SB levels of adults with intellectual disabilities through a systematic review and meta-analysis.

2.3 Methods

This systematic review was reported in accordance with the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" guidelines (Moher et al., 2009), and a protocol was registered on PROSPERO (CRD42018085544).

2.3.1 Search Strategy

Seven databases were searched from database inception up to, and including, January 2018: MEDLINE (via Ovid); Embase (Via Ovid); PsycINFO (via EBSCO host); Eric (via EBSCO host); Cumulative Index to Nursing and Allied Health Literature (CINAHL; via EBSCO host); Cochrane Library (trials); Web of Science (core collection). Search strategies were developed based on medical subject headings (MeSH) terms and published search strategies (Appendix 2). The search used truncated terms for PA, SB, and intellectual disabilities, with papers limited to English, full text, humans, and adult. Hand searches were conducted through reference lists of relevant systematic reviews identified by the search strategy and studies selected for full-text screening.

2.3.2 Primary Outcomes

- Gender differences in the PA of adults with intellectual disabilities across multiple PA domains such as frequency, intensity, duration, and mode.
- Gender differences in SB of adults with intellectual disabilities including engagement in SB and time spent sedentary (sedentary time; ST).

2.3.3 Eligibility Criteria

The following eligibility criteria determined the inclusion of papers during screening:

Inclusion Criteria

- Adults (≥18 years) with intellectual disabilities.
- Quantitative objective and/or subjective data for PA and/or SB.

Exclusion Criteria

- ≤50% of participants are adults (indicated by age range, mean or ability to extract data separately for adults).
- ≤50% of participants have intellectual disabilities.
- PA or SB not reported for men or women with intellectual disabilities.
- Literature reviews, meta-analyses, protocols, and qualitative research.
- Not English language.

A cut-off of 50% was used as criteria for adults and intellectual disabilities to ensure all potentially relevant papers were included.

2.3.4 Study Selection

Records were transferred into Covidence software (https://www.covidence.org) for screening, and duplicates were removed. Title and abstract screening and full text screening were conducted independently by two researchers (SW & AMcG). Conflicts were discussed between researchers until a consensus was reached. Cohen’s kapa scores were calculated using SPSS (version 23; IBM, NY, USA) to assess inter-rater reliability, which demonstrated substantial agreement (Landos & Koch, 1977) for both title and abstract screening (K = .633) and full text screening (K = .789).

2.3.5 Data Extraction

Two reviewers independently extracted all relevant data (SW & AMcG). A data extraction tool was developed using Microsoft Excel to ensure extracted data described the general study characteristics (bibliographic data; study aim; country; study design; recruitment; sample characteristics), PA and SB measurement (objective or subjective; measurement tool; measurement method), and the PA or SB outcomes reported for men and women.

2.3.6 Data Synthesis

A narrative synthesis was conducted for all PA and SB data reported in the studies with findings compared between genders. Where appropriate, weighted averages were calculated for PA and SB data. The averages were weighted by the number of men or women within a study (Appendix 3). Meta-analyses were conducted to assess the direction and magnitude of the effect of gender for PA and SB using Reviewer Manager (RevMan, Version 5.3. Copenhagen, The Cochrane Collaboration, 2014). Separate meta-analyses were conducted for step counts, MVPA and sedentary time where sufficient citations were available. Mean scores, standard deviations, and total numbers of men and women in a study were used. Standardised mean difference was used as the summary statistic to calculate the effect size as studies used different measures for the same outcome. A random effects model was implemented as a common effect size could not be assumed (Borenstein et al., 2010). Cohen's d effect sizes are classed as small ($d = 0.20$), medium ($d = 0.50$), large ($d = 0.80$) and very large ($d = 1.20$; Cohen, 1988).

2.3.7 Quality Appraisal

Quality was appraised using The Standard Quality Assessment Criteria for Evaluating Primary Research Papers from a Variety of Fields quantitative checklist (Kmet et al., 2004). This tool can be applied to a range of study designs and therefore fits the design of this systematic review. Studies were assessed against a 14-item checklist and scores based on the attainment of each item: yes = 2; partial = 1; no = 0; N/A. N/A responses were removed to provide an accurate calculation of quality as a percentage. Quality ratings were presented as a calculated percentage, which indicated weak (<55%), moderate (55-75%) or strong (>75%) quality (Eddens et al. 2018; Sutherland et al. 2021). Quality appraisal was independently conducted by two researchers, with discrepancies discussed (SW & AMcG). Cohen's kappa scores were calculated using SPSS (version 23; IBM, NY, USA) to assess inter-rater reliability for all quality appraisal questions, which demonstrated substantial agreement (K = 0.679; Landos & Koch, 1977).

2.4 Results

2.4.1 Literature Search

Following duplicate removal, n = 11238 titles and abstracts and n = 79 full text articles were screened. Twenty-six papers were included in the review, with one study originating from the hand search. Most papers were excluded at full-text screening because gender differences in PA or SB were not assessed (Figure. 2.1, PRISMA flow chart). Two studies (Stanish & Draheim, 2005; Stanish & Draheim, 2007) used the same data, but assessed different outcomes; therefore, both studies were included.

2.4.2 Study Characteristics

The review primarily included papers from the USA, Canada, UK, and other European countries, with two papers included from Australia and South Africa (Table 2.1). Fifteen studies objectively measured PA or SB, via accelerometers or pedometers (Barnes et al., 2013; Bodde et al., 2013; Finlayson et al., 2011; Hilgenkamp et al., 2012; Johnson et al., 2014; Lante et al., 2011; Moss & Czyz, 2018; Nordstrom et al., 2013; Oviedo et al., 2017; Phillips & Holland, 2011;

Stanish, 2004; Stanish & Draheim, 2005; Stanish & Draheim, 2007; Sundahl et al., 2016; Temple & Stanish, 2009; Table 2.1).

Subjective self-report or proxy measurements were utilized in 14 studies (Draheim et al., 2002; Emerson, 2005; Finlayson et al., 2009; Finlayson e tal., 2011; Fujiura et al., 1997; Hsieh et al., 2015; Hsieh et al., 2017; Johnson et al., 2014; McGuire et al., 2007; Melville et al., 2018; Moss & Czyz, 2018; Robertson et al., 2000; Soler Marin & Graupera, 2011; Stancliffe & Anderson, 2017; Table 2.1). Three studies combined objective and subjective measurements of PA or SB (Finlayson et al., 2011; Johnson et al., 2014; Moss & Czyz, 2018).

2.4.3 Participant Characteristics

Sample size ranged from n = 2 (Lante et al., 2011) to n = 8636 (Stancliffe & Anderson, 2017). Participant age ranged from 12 – 94 years. The percentage of female participants ranged from 36.9% (Stanish & Draheim, 2005; Stanish & Draheim, 2007) to 62% (Nordstorm et al., 2013). All studies included participants with mild to moderate intellectual disabilities, with ten studies additionally including severe and profound levels (Finlayson et al., 2009; Fujiura et al., 2011; Hsieh et al., 2015, 2017; McGuire et al., 2007; Melville et al., 2018; Oviedo et al., 2017; Phillips & Holland, 2011; Soler Marin & Graupera, 2011; Stancliffe & Anderson, 2017).

Race/ethnicity was only reported by eight studies (Barnes et al., 2013; Bodde et al., 2013; Emerson, 2005; Finlayson et al., 2011; Fujiura et al., 2011; Hsieh et al., 2015; Hsieh et al., 2017; Robertson et al., 2000). Barnes et al., (2013) reported most of their participants to be non-Hispanic Black (58.8%), while the remaining seven studies stated that 70.1% (Hsieh et al., 2015) to 98% (Emerson, 2005) of participants were White/Caucasian.

Figure 2.1 PRISMA flow chart of study selection

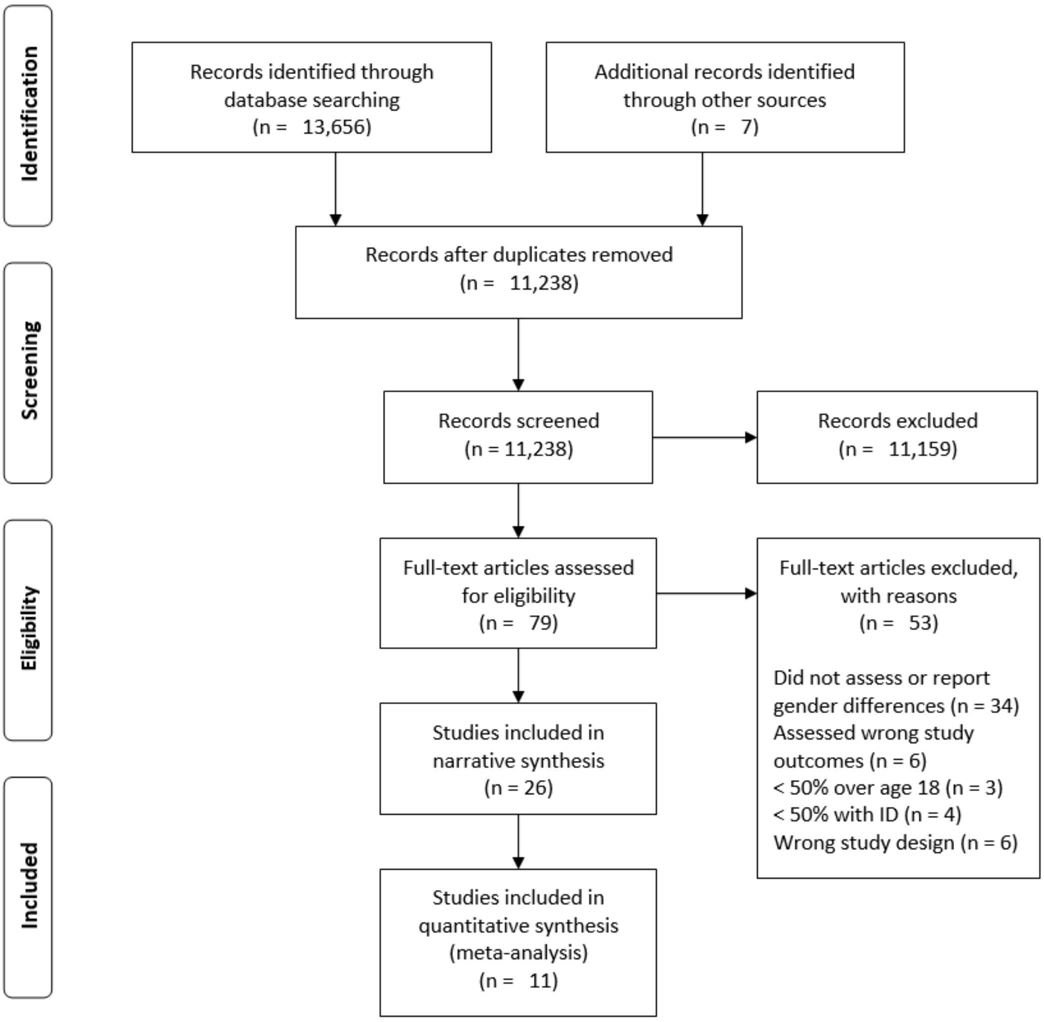


Table 2.1 Study characteristics and quality appraisal scores

Author (Year)	Country	Sample size (% female; % f)	Study Design	Age range	ID level	PA Assessed	Objective measurement PA	Subjective measurement PA (Respondent)	SB assessed	Objective measurement SB	Subjective measurement SB	Quality Score
Barnes et al. (2013)	USA	n = 131 (PA data; 46.6% f)	Cross-sectional	18-65	Mild to moderate	MVPA (min/ week)	ActiGraph accelerometer	N/A	N/A	N/A	N/A	90%
Bodde et al. (2013)	USA	n = 42 (50% f)	Cross-sectional “Part of larger intervention study”	19 - 62	Mild to moderate	MVPA (min/ day)	ActiGraph accelerometer	N/A	N/A	N/A	N/A	65%
Draheim et al. (2002)	USA	n = 150 (49.33% f)	Cross-sectional	19 - 65	Mild to moderate	LTPA: No / Little to No / Moderate to Vigorous	N/A	The National Health and Nutrition Examination Survey III, PA Survey (participant and carer)	N/A	N/A	N/A	85%

Emerson (2005)	England	n = 1458 (PA data) (47.5% f)	Cross-sectional	16 - 75+ (M = 49.3)	NS	Percentage inactive	N/A	Health Survey for England 1993 – 1998 PA scale (“key informant”)	N/A	N/A	N/A	90%
Finlayson et al. (2009)	Scotland	n = 433 (46.4% f)	Prospective cohort design	NR (M = 44.1)	Mild to profound	Levels of PA / regular low levels of PA	N/A	Purpose-designed semi-structured interviews (participants)				95%
Finlayson et al. (2011)	Scotland	n = 41 (56.1% f) full PA data	Observational cohort design	18-60 (PA data)	Mild to moderate	Steps; Moderate PA; ≥30 minute bouts of moderate PA	ActivPAL Accelerometer	Semi-structured interviews: self-reported regular level and pattern of PA over 7 days (Participant)	ST	ActivPAL Accelerometer	N/A	90%

Fujiura et al. (1997)	USA	n = 49 included in analyses (42.9% f)	Cross-sectional	16-59 (M = 29.5)	Mild to severe	PA levels	N/A	Telephone interview: adapted "Health Habits and History Questionnaire"; HHHQ (parents; other family members)	N/A	N/A	N/A	70%
Hilgenkamp et al. (2012)	Netherlands	n = 257 (48.2% f) sub-sample of n = 1050	Cross-sectional	50 – 94	Mild to Severe *Borderline (4.4%); Unknown (1.9%)	Steps; PAG	NL-1000 pedometer.	N/A	N/A	N/A	N/A	90%
Hsieh et al. (2015)	USA	n = 4282 (43.4% f)	Secondary data analysis	20 - 60+	Mild to Profound	PAG	N/A	Background information from section I & II through of the adult consumer survey (Caregiver)	N/A	N/A	N/A	85%

Hsieh et al. (2017)	USA	n = 1618 (44.8% f)	Baseline of longitudinal study	18-86	Mild to profound ID; *27% had data missing or an unknown level of ID	Low levels PA	N/A	Self/proxy report response to a questionnaire (Parents; healthcare providers; residential or day program staff; relatives other than parents or non-related live-in carers; adult with ID)	ST (hours spent watching TV)	N/A	Self/proxy reported time watching TV (Parents; healthcare providers; residential or day program staff; relatives other than parents or non-related live-in carers; adult with ID)	85%
Johnson et al. (2014)	USA	n = 37 (56.8% f)	Cross-sectional	19-74	NS	Steps (pedometer); activity cpm (accelerometer);	Actiwatch Accelerometer; Pedometers (Omron HJ-112)	NHANES III PA interviewer administered survey	N/A	N/A	N/A	90%

						PA bouts (interview)		(participant with assistance)				
Lante et al. (2011)	Australia	n = 2 (50% f)	Case study	21-22	Mild	Light intensity min/hour; MVPA min/ hour; Steps /hour	ActiGraph Accelerometer (GT1M)	N/A	N/A	N/A	N/A	65%
McGuire et al. (2007)	Republic of Ireland	n = 157 (46.5% f)	Cross-sectional	16-65 (M = 37)	Mild to Profound *N = 1 borderline; N = 1 unknown	PA intensity (no exercise; mild; moderate; strenuous)	N/A	Questionnaire adapted from the National health and lifestyles survey (Carer)	N/A	N/A	N/A	65%
Melville et al. (2018)	Scotland	n = 725 (45% f)	Population-based, cross-sectional study	18-90	Mild to Profound	N/A	N/A	N/A	Screen time as a proxy for ST (hours monthly to daily)	N/A	Interview question (Participants with support from carers)	95%

Moss & Czyz (2018)	S.Africa	n = 56 (50%f)	Cross-sectional	25-62	Mild to moderate	PA levels; Continuous habitual activity energy expenditure; IPAQS Total PA in minutes	Actiheart Accelerometer	International physical activity questionnaire (IPAQ-S) (caregiver)	Sedentary Mets (<1.4)	Actiheart Accelerometer	N/A	85%
Nordstrom et al. (2013)	Norway	n = 87 (62% f)	Cross-sectional	16-45 (M = 28.5)	Mild to moderate *based on intellectual disabilities associated with developmental disabilities	Steps/day; PA intensity (light PA; MVPA) min/day; lifestyle PA; Bouts MVPA (min/day)	ActiGraph Accelerometer (GT3X+)	N/A	ST (min/day)	Actigraph Accelerometer (GT3X+)	N/A	90%

Oviedo et al. (2017)	Spain	n = 84 included in analysis (41.6% f)	Cross-sectional	NR (M = 44)	Mild to Severe	Total PA cpm; steps/day; PA levels	ActiGraph accelerometer (GT3X)	N/A	ST (min/day)	ActiGraph accelerometer (GT3X)	N/A	80%
Phillips & Holland (2011)	England	n = 152 included in the analysis (51% f)	Cross-sectional	12 - 70yrs (M = 33.6)	Mild to severe	Total PA cpm; PAL; MVPA min/day; Steps	ActiGraph GT1M accelerometer	N/A	ST (min/day)	ActiGraph accelerometer (GT1M)	n/a	95%
Robertson et al. (2000)	United Kingdom	n = 500 (39.8% f; estimated)	Cross-sectional	m = 40.1 (village group); M = 47.5 (NHS campus); M = 45.5 (Dispersed housing)	NR	Percentage inactive	N/A	Semi-structured interview: Health Survey For England 1993 & 1996; Tameside and Glossop Health Needs Survey (Caregiver)	N/A	N/A	N/A	45%

Soler Marin & Graupera (2011)	Spain	n = 38 (39.5% f)	Cross-sectional	16 - 38 (female M = 23.4; male M = 23.5)	NR	PA levels	N/A	"Validated questionnaire of physical activity" (Relative / Caregiver)	N/A	N/A	N/A	60%
Stancliffe & Anderson. (2017)	USA	n = 8636 (43% f)	Secondary data analysis	18-94	Mild to Profound	PAG	N/A	Survey. Background section of the NCI-ACS; (setting administrator, case managers, direct support providers)	N/A	N/A	N/A	65%
Stanish (2004)	Canada	n = 20 (60% f)	Cross-sectional	19-65	Mild	Steps/day	Yamax Digiwalker pedometers (model SW-500)	N/A	N/A	N/A	N/A	75%

Stanish & Draheim (2005)	Canada	n = 103 (36.9% f)	Cross-sectional	19-65	Mild to moderate	Steps	Yamax Digiwalkers (SW-500 and SW-700)	N/A	N/A	N/A	N/A	95%
Stanish & Draheim (2007)	Canada	n = 103 (36.9% f)	Cross sectional	19-65	Mild to moderate	Steps; PAG	Yamax Digiwalkers (SW-500 and SW-700)	N/A	< 5000 steps	Yamax Digiwalkers (SW-500 and SW-700)	N/A	85%
Sundahl et al. (2016)	Sweden	n = 52 with intellectual disabilities (51.9% f)	cross-sectional	16-20 (M = 18.2)	Mild to moderate ID	Steps; PAG	2x Pedometers: Keep Walking LS2000 and LS7000 (Yamax SW200/LS2000)	N/A	N/A	N/A	N/A	85%
Temple & Stanish (2009)	Canada	n = 154 (42.3% f)	Secondary data analysis	Males: 18-69 years. Females: 19-57 years.	Mild to moderate	Steps	Yamax digi-walkers (SW-500& 700)	N/A	N/A	N/A	N/A	95%

Abbreviations: NS = not specified; N/A = not applicable; PA = physical activity; SB = Sedentary behaviour; ST = sedentary time; LTPA = leisure time PA; MVPA = moderate to vigorous PA; PAG = physical activity guidelines; cpm = counts per minute; % f = % females; TV = television

2.4.4 Quality Appraisal

Quality appraisal was conducted for all studies (Table 2.1). The quality of papers was variable and ranged from weak (lowest score of 45%; Robertson et al., 2000) to strong quality (highest score of 95%; Finlayson et al., 2009; Melville et al., 2018; Phillips & Holland., 2011; Stanish & Draheim, 2005; Temple & Stanish, 2009; Hsieh et al., 2017). Only one paper was identified as being of "weak" quality (< 55%; Robertson et al., 2000). This paper was only included in the narrative reporting of the findings and the paper's quality has been discussed in the context of interpreting the findings.

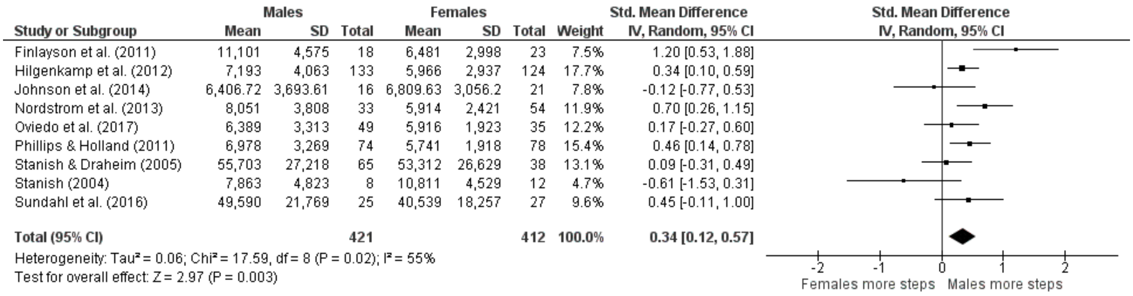
2.4.5 Gender Differences in Physical Activity

Twenty-five of the included studies assessed PA. Gender differences within this section are reported according to the PA outcomes described in the studies: step counts; MVPA; total PA; PA levels and intensity; physical inactivity; PA frequency; LTPA.

2.4.5.1 Gender Differences in Steps

Step counts were reported as steps per day (Finlayson et al., 2011; Hilgenkamp et al., 2012; Johnson et al., 2014; Nordstorm et al., 2013; Oviedo et al., 2017; Phillips & Holland, 2011; Stanish, 2004) and per week (Stanish & Draheim, 2005; Sundahl et al., 2016). One study reported that gender differences in weekly steps were not significant, without supporting descriptive statistics (Temple & Stanish, 2009). Significant gender differences were reported by four studies, with men accumulating more steps (Finlayson et al., 2011; Hilenkamp et al., 2012; Nordstorm et al., 2013; Phillips & Holland, 2011). Steps/week ranged from 49,590 to 55,703 for men and 40,539 to 53,312 for women. The daily number of steps reported for men across the studies (range: 6,389 to 11,101 steps/day) was higher than that accumulated by women (range: 5,741 to 10,811 steps/day). The weighted average was calculated for studies reporting daily step counts. The findings suggest men were more active, accumulating 7,289.38 steps/day compared to 6,135.2 steps/day for women.

Figure 2.2 Meta-analysis results and forest plot for gender differences in steps



	Males			Females				Std. Mean Difference
Study or Subgroup	**Mean**	**SD**	**Total**	**Mean**	**SD**	**Total**	**Weight**	**IV, Random, 95% CI**
Finlayson et al. (2011)	11,101	4,575	18	6,481	2,998	23	7.5%	1.20 [0.53, 1.88]
Hilgenkamp et al. (2012)	7,193	4,063	133	5,966	2,937	124	17.7%	0.34 [0.10, 0.59]
Johnson et al. (2014)	6,406.72	3,693.61	16	6,809.63	3,056.2	21	7.8%	-0.12 [-0.77, 0.53]
Nordstrom et al. (2013)	8,051	3,808	33	5,914	2,421	54	11.9%	0.70 [0.26, 1.15]
Oviedo et al. (2017)	6,389	3,313	49	5,916	1,923	35	12.2%	0.17 [-0.27, 0.60]
Phillips & Holland (2011)	6,978	3,269	74	5,741	1,918	78	15.4%	0.46 [0.14, 0.78]
Stanish & Draheim (2005)	55,703	27,218	65	53,312	26,629	38	13.1%	0.09 [-0.31, 0.49]
Stanish (2004)	7,863	4,823	8	10,811	4,529	12	4.7%	-0.61 [-1.53, 0.31]
Sundahl et al. (2016)	49,590	21,769	25	40,539	18,257	27	9.6%	0.45 [-0.11, 1.00]
Total (95% CI)			**421**			**412**	**100.0%**	**0.34 [0.12, 0.57]**

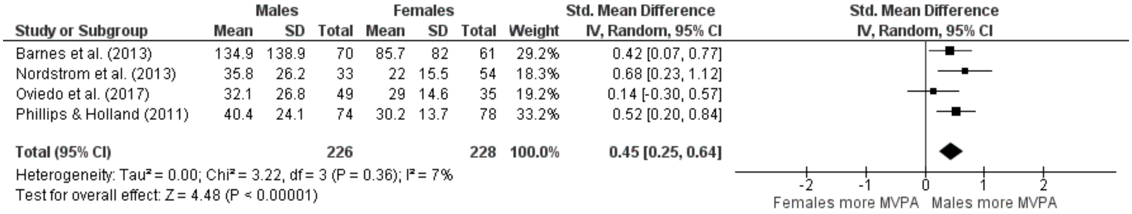
Heterogeneity: Tau^2 = 0.06; Chi^2 = 17.59, df = 8 (P = 0.02); I^2 = 55%
Test for overall effect: Z = 2.97 (P = 0.003)

The meta-analysis uncovered a significant small overall effect of gender, *d* = 0.34, 95% CI (0.12, 0.57), *P* = 0.003, in the direction of men accumulating more steps (Figure. 2.2). This included both steps/day and steps/week. Significant heterogeneity between studies was found (*P* =0.02, I^2 = 55%) and an I^2 > 50% suggests that inconsistencies were due to factors within the papers rather than chance. Large confidence intervals indicate limited precision in the findings. However, overall, the meta-analysis demonstrates that men with intellectual disabilities accumulate more steps than women with intellectual disabilities.

2.4.5.2 Gender differences in Moderate to Vigorous Physical Activity

Gender was significantly associated with MVPA with fewer men (33.3%) than women (61.9%) accumulating 0 min/day of MVPA (Bodde et al., 2013). Weekly MVPA was significantly higher in men (*M* = 134.9 min/week) than women (*M* = 85.7 min/week; Barnes et al., 2013). These gender differences were present in daily MVPA measured using ActiGraph accelerometers, with men most active (men = 32.1 to 40.4 MVPA min/day; women = 22 to 30.2 MVPA min/day; Nordstorm et al., 2013; Oviedo et al., 2017; Phillips & Holland, 2011). The gender differences in daily MVPA were reported as significant by two studies (Nordstorm et al., 2013; Phillips & Holland, 2011). The calculated weighted average reflected these differences, with men (36.8 min/day) accumulating more minutes of daily MVPA than women (27.3 min/day).

Figure 2.3 Meta-analysis results and forest plot for gender differences in MVPA



	Males			Females				Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI
Barnes et al. (2013)	134.9	138.9	70	85.7	82	61	29.2%	0.42 [0.07, 0.77]
Nordstrom et al. (2013)	35.8	26.2	33	22	15.5	54	18.3%	0.68 [0.23, 1.12]
Oviedo et al. (2017)	32.1	26.8	49	29	14.6	35	19.2%	0.14 [-0.30, 0.57]
Phillips & Holland (2011)	40.4	24.1	74	30.2	13.7	78	33.2%	0.52 [0.20, 0.84]
Total (95% CI)			**226**			**228**	**100.0%**	**0.45 [0.25, 0.64]**

Heterogeneity: Tau² = 0.00; Chi² = 3.22, df = 3 (P = 0.36); I² = 7%
Test for overall effect: Z = 4.48 (P < 0.00001)

The meta-analysis (Figure 2.3) supported the presence of gender differences for MVPA with a significant small overall effect reported for men, $d = 0.45$, 95% CI (0.25, 0.64), $P < 0.001$. Limited variability in the effect sizes were identified with the test for heterogeneity reporting insignificant results ($P = 0.36$; $I^2 = 7\%$). Overall, the results show that men with intellectual disabilities participated in more MVPA than women with intellectual disabilities. This included both MVPA per day, and per week.

2.4.5.3 Gender Differences in Recommended Physical Activity Levels

Percentage meeting recommended PA levels across the five studies ranged from 5.6% to 42.9% of men and 2.9% to 29% of women, indicating men were more active. Being female was reported to be significantly associated with not meeting the PA recommendation of 150 minutes/week of MVPA in adults with intellectual disabilities (Hsieh et al., 2015). However, across the studies different definitions of recommended PA levels were: 30 minutes of MVPA/day (Stancliffe & Anderson, 2017); 150 minutes of MVPA/week (Hsieh et al., 2015; Oviedo et al., 2017); high levels of PA (Finlayson et al., 2009); 10,000 steps/day (Hilgenkamp et al., 2012; Oviedo et al., 2017; Sundahl et al., 2016); 7500 steps/day (Hilgenkamp et al., 2012). Although the recommended PA ranges indicate that men were most active, it is difficult to make comparisons due to variations in recommended PA levels.

2.4.5.4 Gender Differences in Total Physical Activity

Subjectively measured total weekly PA identified men as engaging in significantly more PA [*M* = 259.9 (*SD* = 390) min/week] than women [*M* = 80.5 (*SD* = 123.9) min/week; Moss & Czyz, 2018]. Descriptively, daily total PA was higher for men [*M* = 131,654.11 (*SD* = 69159.18) counts/day] than women [*M* = 128,962.24 (*SD* = 49269.98) counts/day; Johnson et al., 2014]. However, women had more self-reported PA bouts [*M* = 13.36 (*SD* = 6.75) bouts] than men [*M* = 11.91 (*SD* = 4.08) bouts; Johnson et al., 2013]. Results for objectively measured total PA as counts per minute (cpm) using ActiGraph GT1M and GT3X accelerometers ranged from 260.2 to 665.0 cpm for men compared to 240.2 to 564.1 cpm for women (Nordstorm et al., 2013; Phillips & Holland, 2011; Oviedo et al., 2017), with men significantly more active (Nordstorm et al., 2013; Phillips & Holland, 2011). A weighted average based on gender found men (470.5 cpm) to be more active than women (398.5 cpm).

2.4.5.5 Gender Differences in Physical Activity Levels and Intensity

Varying measurements and definitions were used for PA levels and percentage time spent within PA intensities reducing the ability to make comparisons. One paper used cut off points of PA levels based on a ratio between total energy expenditure and resting energy expenditure, resulting in sedentary (<1.40), light PA (1.40 – 1.60), moderate PA (1.61-1.99), heavy PA (2.00-2.40), extremely heavy PA (2.00-2.40; Moss & Czyz, 2018). When using these PA level cut points, women were reported to engage in light PA (1.45) while men were classified as sedentary (1.33; Moss & Czyz, 2018). Light intensity PA assessed as min/day using ActiGraph accelerometers ranged from 130.5 to 227 min/day in men, and 125.2 to 203 min/day for women (Nordstorm et al., 2013; Oviedo et al., 2017) highlighting that more men engage in light PA.

Percentages of low levels of PA ranged from 55.5% to 68% for men, and 65.2% to 68% for women (Finlayson et al., 2009; Hseih et al., 2017) with low PA described as ≤ 3 occasions of MVPA/month (Finlayson et al., 2009) or little to no PA (Hsieh et al., 2017). Significant gender differences were reported by Hseih et al. (2017), with women having the lowest levels of PA. Soler Marin and Graupera (2011) used a subjective measure of PA that classified both men and women as engaging in low PA levels reporting insignificant gender differences, however this methodology prevents comparisons with other studies.

When assessing percentages within PA levels, Finlayson et al. (2009) reported that 27% of both genders engaged in medium PA levels (4 – 19 occasions of MVPA/month), and 5% of women and 6% of men engaged in high intensity PA (≥ 20 occasions of MVPA/month). The percentage engaging in regular PA at any intensity was 74.1% of men and 70.6% of women for 2.9 hr/week and 2.5 hr/week respectively (Finlayson et al., 2009). Thirty-five percent of both men and women engaged in at least moderate intensity PA during one week (men - 1.8 hour/week; women – 1.5 hour/week; Finlayson et al., 2009).

Reported percentages of men and women in low active to somewhat active categories based on steps indicated the presence of gender differences (low active – 63% men/37% women; somewhat active – 68% men/32% women; active – 64% men/36% women). However, percentages reflected the relative proportion of men/women in each group rather than gender differences (Stanish & Draheim, 2007).

One study reported percentages of men and women engaging in each intensity across a week, segmented for age: light intensity PA (16 – 29 years:

men = 46.2%; women = 44.4%/30 – 59 years: men = 40%; women = 66.7%), moderate intensity PA (16 – 29 years: men = 38.5%; women = 27.8%/30 – 59 years: men = 6.7%; women = 66.7%) and strenuous intensity PA (16 – 29 years: men = 7.7%; women = 5.6%/30 – 59 years: men = 6.7%; women = 0%; Fujiura et al., 1997). Participants aged 30 – 59 years had the greatest gender differences, with older women more likely to engage in light or moderate PA, but report less strenuous PA.

2.4.5.6 Gender Differences in Physical Inactivity

Physical inactivity, the lack of PA, was assessed by two studies (Emerson, 2005; Robertson et al., 2000). One study reported female gender to be significantly associated with physical inactivity (Emerson, 2005) while the other found insignificant gender differences (Robertson et al., 2000). Importantly, quality appraisal classified Robertson et al., (2000) as being of weak quality, while Emerson (2005) was of strong quality with a low risk of bias. Emerson (2005) reported percentage inactive, and classified participants based on physical abilities. Descriptively the biggest gender differences were found in the ages 16 – 24 years (excluding participants with intellectual disabilities who were “physically incapable”: men = 83%; women = 100%/all adults with intellectual disabilities: men = 88%; women = 100%) and ages 35 - 44 years (excluding participants with intellectual disabilities who were “physically incapable”: men = 89%; women = 97%/all adults with intellectual disabilities: men = 93%; women = 98%). These results suggest that age and physical capability influence the effect of gender.

2.4.5.7 Gender Differences in Physical Activity Frequency

The frequency that adults with intellectual disabilities exercise per week was subjectively assessed by one study (McGuire et al., 2007). No significant difference was identified in the frequency of weekly exercise (men = 4.36 times/week; women = 4.28 times/week). Although this suggests no gender differences in PA frequency, these findings were based on one study.

2.4.5.8 Gender Differences in Leisure Time Physical Activity

Physical activity conducted during leisure time (LTPA) was assessed in two studies in adults with intellectual disabilities (Nordstorm et al., 2013; Draheim et al., 2002). No significant gender differences were reported across the categories of no LTPA/week (men = 10.5%; women = 14.9%), little to no LTPA/week (men = 51.3%; women = 47.3%), regular vigorous LTPA/week (men = 1.3%; women = 1.4%) and recommended LTPA/week (men = 42.1%; women = 47.3%; Draheim et al., 2002). However, men were significantly more active than women when assessed as minutes per day [M = 86.0 (SD = 39.6) min/day and M = 62.3 (SD = 25.6) min/day respectively; Nordstorm et al., 2013].

Lante et al., (2011) compared the PA of two participants (n = 1 male; n = 1 female) during their participation in leisure facility-based PA programme and non-programme weekdays and weekends, with data collected two years apart. During the PA programme MVPA/hour (man = 4.27 – 6.13 min/hour; woman = 9.21 – 14.34 min/hour), steps/hour (man = 864.55 – 1144.76 steps/hour; woman = 1268.88 – 1333.64 steps/hour) and light PA/hour (man = 45.02 – 40.67 min/hour; woman = 45.54 – 33.39 min/hour) were assessed. PA measured during non-programme days would have originated from daily activities with data on MVPA/hour (man = 0.67 – 2.09 min/hour; woman = 0.4 – 1.56 min/hour), steps/hr (man = 297.7 – 560.62 steps/hour; woman = 208.32 – 386.04 steps/hour) and light PA/hr (man = 57.91 – 59.32 min/hour; woman = 58.44 – 59.60 min/hour) gathered. A significant difference was only reported between the participants during the PA programme, with the female participant accumulating significantly more MVPA min/hour. However, although this study met eligibility criteria, the design and reporting of PA outcomes prevents comparisons with other studies or conclusions regarding gender differences being formed.

2.4.6 Gender Differences in Sedentary Behaviour

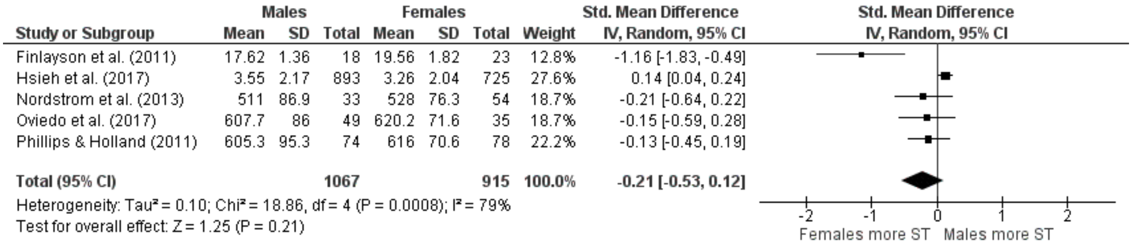
Eight studies made comparisons between genders for SB (Finlayson et al., 2011; Hseih et al., 2017; Melville et al., 2018; Moss & Czyz, 2018; Nordstorm et al., 2013; Oviedo et al., 2017; Phillips & Holland, 2011; Stanish & Draheim, 2007; Table 2.1). One study misclassified SB as engaging in <5000 steps/day, with more men classed as sedentary (men = 58%; women = 42%; Stanish & Draheim, 2007); however, percentages represented proportion of each gender in a category. One study identified only men as meeting a criterion for being sedentary using a cut-off point based on a ratio between total energy expenditure and resting energy expenditure (Moss & Czyz, 2018).

Sedentary time has been measured both objectively (Finlayson et al., 2011; Nordstorm et al., 2013; Oviedo et al., 2017; Phillips & Holland., 2011) and subjectively (Hsieh et al., 2017; Melville et al., 2018). When assessed subjectively using proxy measures of sedentary time, such a screen time, men had higher levels of sedentary time (Melville et al., 2018; Hseih et al., 2017). Descriptively more men were classified in a high sedentary time category (men = 53.6%; women = 47.7%), while more women engaged in low sedentary time (men = 46.4%; women= 52.3%). However, gender was only found to be significantly associated with sedentary time within the multivariate analysis; it was insignificant in bivariate analysis (Melville et al., 2018). Hsieh et al. (2017) also reported males to be more sedentary, with men accumulating significantly more hours watching television [*M* = 3.55 (*SD* = 2.17) hours] than women [*M* = 3.26 (*SD* = 2.04) hours].

Contrasting findings were reported for objectively measured sedentary time, with significantly higher sedentary time reported for women than men (Finlayson et al., 2011; Phillips & Holland, 2011). Men were reported as sedentary for *M* = 17.62 (*SD* = 1.36) hr/day and women for *M* = 19.56 (SD = 1.82) hr/day (Finlayson et al., 2011). Minutes of daily sedentary time ranged from 511 to 607.7 min/day for men, and 528 to 620.2 min/day for women (Nordstorm et al., 2013; Oviedo et al., 2017; Phillips & Holland, 2011). A weighted average was calculated for sedentary minutes per day assessed objectively (Nordstorm et al., 2013; Oviedo et al., 2017; Phillips & Holland, 2011). No gender differences were supported by the weighted average (men = 586.1 min/day; women = 588.5 min/day); however, this was based on limited studies.

The results of the meta-analysis supported this (Figure. 2.4) with an insignificant overall effect of gender on sedentary time, *d* = -0.21, 95% CI (-0.53, -0.12), *P* = 0.21. There was significant heterogeneity among the studies, with an I^2 that indicates that inconsistencies in results were due to a factor within studies rather than chance (*P* <0.001, I^2 = 79%).

Figure 2.4 Meta-analysis and forest plot for gender differences in sedentary time



	Males			Females				Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI
Finlayson et al. (2011)	17.62	1.36	18	19.56	1.82	23	12.8%	-1.16 [-1.83, -0.49]
Hsieh et al. (2017)	3.55	2.17	893	3.26	2.04	725	27.6%	0.14 [0.04, 0.24]
Nordstrom et al. (2013)	511	86.9	33	528	76.3	54	18.7%	-0.21 [-0.64, 0.22]
Oviedo et al. (2017)	607.7	86	49	620.2	71.6	35	18.7%	-0.15 [-0.59, 0.28]
Phillips & Holland (2011)	605.3	95.3	74	616	70.6	78	22.2%	-0.13 [-0.45, 0.19]
Total (95% CI)			**1067**			**915**	**100.0%**	**-0.21 [-0.53, 0.12]**

Heterogeneity: $Tau^2 = 0.10$; $Chi^2 = 18.86$, df = 4 (P = 0.0008); $I^2 = 79\%$

Test for overall effect: Z = 1.25 (P = 0.21)

Note: ST = Sedentary time

2.5 Discussion

This systematic review was the first to quantify gender differences in PA and SB in adults with intellectual disabilities. The studies selected were international with research originating from numerous different countries. Full-text screening highlighted a tendency for PA or SB research to neglect the role of gender in adults with intellectual disabilities. Mixed findings reported by the narrative synthesis of PA contrast with the significant gender differences reported by the meta-analysis of step counts and MVPA. For SB, the results were inconclusive due to insufficient studies, varying methodologies, and mixed findings.

2.5.1 Gender Differences in Physical Activity

Gender differences were assessed across numerous PA domains, reducing the ability to make comparisons between studies. This could be partially attributed to PA not always being a primary outcome, which resulted in the measurement method not being optimal. The narrative synthesis identified women as accumulating less steps and MVPA but reported mixed findings relating to gender in the other PA domains. This was due, in part, to varying definitions of recommended PA levels and the measurements employed to assess PA.

The measurement method was identified as potentially important when investigating gender differences, as two studies reported discrepancies in results dependent on the measurement used (Johnson et al., 2014; Moss & Czyz, 2018). Moss & Czyz (2018) identified men as more active based on the international PA questionnaire – short form, completed by caregivers, and women as more active based on objective measurement using an ActiHeart device. Therefore, caregivers may perceive men with intellectual disabilities as engaging in more PA, even when women are more active. Johnson et al. (2014) reported men as engaging in more PA based on accelerometer data, while women were more active based on pedometer data. This could indicate that men participate in higher intensity PA than women, while women engage in light PA, such as walking. However, the meta-analyses conducted for this study suggest that men engaged in more MVPA and had higher step-counts.

The results of the meta-analyses of objectively measured step counts and MVPA offers the best evidence, as pedometer and accelerometers provide more valid measurements than subjective self-reported PA (Esliger & Tremblay, 2007). The results indicate that men with intellectual disabilities engage in more PA, which is reflective of the general population. A stronger effect of gender was reported for MVPA ($d = 0.45$) compared to step counts ($d = 0.34$). This finding is supported in the general population, as men are reported to engage in significantly more sports and exercise, yet there are no gender differences present in recreational walking (Scottish Government, 2015). Sports in the general population can also be appraised as being stereotypically masculine, feminine, or neutral which can influence participation (Chapter 1, section 1.7). This suggests the type of PA may be important to future research exploring the role of gender in the PA of adults with intellectual disabilities. Although this review provides insight into the presence of gender differences, the ability to make meaningful conclusions is threatened by recurring limitations in the literature.

Sampling limitations such as the recruitment from single locations (Fujiura et al., 1997; McGuire et al., 2007; Oviedo et al., 2017) and the use of very small samples (Bodde et al., 2013; Fujiura et al., 1997; Johnson et al., 2014; Moss & Czyz, 2018; SolerMarin & Graupera., 2011; Stanish, 2004; Sundahl et al., 2016) reduced the reliability and the generalisability of the results to the wider population of adults with intellectual disabilities. The inclusion of studies such as Stanish (2004), with a sample of n = 8 males and n = 12 females, into the meta-analysis of step counts contributed to the wide confidence intervals, significant heterogeneity, and inconsistencies in the results. The varying definitions of PA, such as recommended PA levels ranging from 7,500 steps/day to 150 min of weekly MVPA, impaired the ability to make comparisons.

Nonetheless, the meta-analyses of MVPA and step counts, and the narrative synthesis of studies with large representative samples (Emerson, 2005; Hsieh et al., 2015; Hsieh et al., 2017; Stancliffe & Anderson, 2017), identified women with intellectual disabilities as being least active. This is an important finding as it reflects the distribution of associated negative health outcomes in this population (Emerson, 2005; Hsieh et al., 2014; Melville et al., 2008).

The review also identified non-modifiable influences of the effect of gender such as age (Fujiura et al., 1997; Emerson, 2005), and physical capability (Emerson, 2005). In adults with intellectual disabilities, numerous multi-level factors influence PA and SB participation (Chapter 1, section 1.4.7). In the general population, gender-specific influences have been identified for PA and SB (Chapter 1, section 1.7). However, little is known about individual level, social or wider environmental factors that may influence the impact of gender on the PA levels of adults with intellectual disabilities, suggesting a need for more research. Fully understanding the role of gender will inform the development of interventions to target inactivity, which have been largely unsuccessful in this population (Chapter 1, section 1.4.6).

2.5.2 Gender Differences in Sedentary Behaviour

Gender differences were not consistently reported for SB, with an insignificant overall effect reported by the meta-analysis. The absence of significant gender differences was surprising based on the distribution of health inequalities in adults with intellectual disabilities, with women most at risk (Chapter 1, section 1.3.1). However, the discrepancies in results based on objective total sedentary time and subjective screen time are reflective of the inconsistent findings in the general population, with men only identified as significantly more sedentary for specific behaviours such as video game playing (Rhodes et al., 2012). This may provide an explanation for the presence of gender differences among adults with intellectual disabilities when measuring television viewing as a proxy measure for SB (Hsieh et al., 2017). However, it is difficult to generalise findings for specific SB, such as screen time and television viewing, to describe gender differences in all SB in adults with intellectual disabilities. Although more feasible when assessing SB in large samples, subjective and proxy measures of SB are less valid than objective assessments of ST, such as accelerometers.

The lack of gender differences in SB contradicts results for PA, reinforcing that these behaviours are distinct. It is therefore alarming that one study included in this review misclassified low PA (5,000 daily steps) as SB, which is a recurring limitation in intellectual disability research (Melville et al., 2017). It is also difficult to make robust conclusions regarding gender differences in

SB, as limited studies were identified. There is a dearth of literature specifically assessing SB in adults with intellectual disabilities, which reduces the ability to make conclusions. Therefore, more research is required that assess SB in adults with intellectual disabilities considering the role of gender, with the definition of SB taken into consideration as a potential influence.

2.5.3 Strengths and limitations

This systematic review followed PRISMA guidelines, thus reducing risk of bias. Two researchers conducted the screening, data extraction and quality appraisal, further reducing bias in the review. Numerous papers were screened, and additional hand searches were conducted reducing the omission of relevant papers. This systematic review also addressed an important gap in the literature, and the results can be used to guide future research. However, limitations are present that were partly unescapable due to the nature of the research reviewed.

The studies included in this systematic review used varied PA and SB definitions and measurements, reducing the reliability of comparisons made. Numerous studies assessed PA and SB as secondary outcomes, and as a result the measurement methods used were often subjective with reduced validity. Important participant characteristics such as ethnicity/race were only reported by eight studies reducing the representativeness and generalisability of the results.

Due to capacity within the research department to translate papers, studies were excluded if they were not published in English language. This has implications for the scope of papers included and introduces potential bias. The inclusion of studies from primarily North America and Europe is reflective of PA and SB research described in systematic reviews relating to adults with intellectual disabilities (Dairo et al. 2016; Melville et al. 2017). This could result in a biased understanding of the lifestyles of people with intellectual disabilities, with limited understanding of the impact of cultural differences.

There were also limited studies included in the meta-analyses. However, this was unavoidable due to the tendency of intellectual disabilities research in PA and SB to neglect the role of gender and due to the variations in PA and SB constructs assessed. Studies with small samples may have also impaired the precision and reliability of the meta-analyses. Due to the potential for a low number of included studies, and previous reflections that intellectual disabilities PA and SB research is of mixed quality (Dairo et al. 2016; Melville et al. 2017), the decision was made to not exclude papers based on quality. This resulted in the inclusion of a low or “weak” quality paper (<55% quality appraisal score; Robertson et al. 2000). This reduces the generalisability of the findings relating to this paper. Although this has the potential to impact the findings of the systematic review, the remaining studies were of moderate and strong quality. Additionally, the quality of this paper provides an indication of the rigour of intellectual disabilities research and emphasises a need to improve the overall quality.

2.6 Conclusion

This study was the first to quantify gender differences in the PA and SB of adults with intellectual disabilities. Women with intellectual disabilities were identified as engaging in less PA, which is reflective of the general population and prevalence of associated negative health. No clear gender differences were reported for SB, with results based on limited studies. A tendency for PA and SB research involving adults with intellectual disabilities to neglect the influence of gender was identified during screening, with most excluded papers not reporting results for males and females separately. Recurring limitations within the included articles were also highlighted, indicating a need for improved quality research considering gender differences in the PA and SB of adults with intellectual disabilities using valid measurements. Future research should also aim to understand the role of gender in these health behaviours, to inform the development of successful interventions to target the unhealthy low levels of PA in adults with intellectual disabilities.

Chapter Three. Exploration into gender-specific correlates of objectively measured physical activity and sedentary behaviour in adults with intellectual disabilities.

3.1 Overview of this chapter

No research has considered gender specific influences of PA and SB, which inhibits a deep understanding of these health behaviours. The previous chapter synthesised the extant literature to quantify gender differences, however a need for more research was identified. Specifically, a need for more research using objective measurements of PA and SB was identified. To build upon the evidence base, this chapter explores gender differences in objectively measured PA and SB, and potential gender specific correlates.

3.2 Introduction

In the general population, gender-tailored interventions have been successfully administered to target PA and SB of men and women (Chapter 1, section 1.8). These interventions were designed using an extensive body of literature that has investigated gender differences in participation rates, and influences of these lifestyle behaviours (Chapter 1, section 1.7). Mixed-gender interventions conducted for adults with intellectual disabilities have been largely unsuccessful, and scant literature has considered the influence of gender on PA and SB (Chapter 1, section 1.4.6 & 1.10). This results in a gap in the literature that inhibits the reduction of health inequalities, where women have been identified as most at risk (Chapter 1, section 1.3.1). Women are most at risk of reduced life expectancy, cardiovascular risk factors, general poor health, and obesity, which reflect the negative health outcomes associated with low PA and high SB (Chapter 1, section 1.3.1 & 1.4.3). It is imperative that gender differences in these lifestyle behaviours are investigated, and potential gender-specific influences are identified.

The first step towards developing an evidence base around gender, PA, and SB of adults with intellectual disabilities, was to quantify gender differences from the extant literature (Chapter 2). The systematic review and meta-analysis identified that men may engage in more PA than women, with the most evidence surrounding MVPA and step counts. However, for SB mixed findings were reported. The screening process for this review identified a trend in the literature of not exploring gender differences in PA and SB. Additionally, although this systematic review investigated differences in the levels of these behaviours, it did not consider potential gender-specific influences.

The behavioural epidemiological framework outlines the identification of factors influencing a behaviour as one of the key stages to inform intervention development (Sallis et al., 2000). This phase involves identifying demographic correlates, broader influences, and determinants of a behaviour (Sallis et al., 2000). At this stage, the primary focus within intellectual disabilities PA research has been considering correlates (Pitchford et al., 2018). Numerous studies have explored correlates of both PA and SB for adults with intellectual disabilities, however fewer studies have considered SB (Oppewal et al., 2018; Vancampofort et al., 2021). Correlates have been organised to reflect the multi-level stages of the social ecological model and have primarily been at an individual level (Oppewal et al., 2018). Although research has considered influences of PA and SB for adults with intellectual disabilities, no research has considered potential gender-specific correlates. Therefore, it is unknown whether there are important influences of PA and SB unique to men or women.

Before influences can be explored, reliable and valid measurement methods of the target behaviours must be identified (Sallis et al., 2000). The systematic review of gender differences in Chapter 2 emphasised a need for more research utilising objectively measured PA and SB when assessing gender differences among adults with intellectual disabilities (Chapter 2). The meta-analysis identified significant gender differences in MVPA; however, this was based on a limited number of studies (Chapter 2). Further exploration of gender differences in MVPA is warranted, as PA at this intensity is recommended to achieve health benefits (Chapter 1, section 1.4.4). Additionally, very few studies explored gender differences in SB, and there were concerns over the accuracy of subjective proxy measurements (Chapter 2). Subsequently, exploration of gender differences in MVPA and SB would benefit from objectively measured data using accelerometers.

Objective measurements for PA and SB have greater validity compared to subjective measurements (Esliger & Tremblay, 2007). Accelerometers have improved validity when collecting activity data compared to other objective measurements, such as pedometers, while still being feasible (Eslinger & Tremblay, 2007). Accelerometers collect activity data on intensity, duration, and frequency, providing the opportunity to measure MVPA and SB (Chapter 1, section 1.4.3).

Research based in the general population has also been critical over the use of subjective self-reported measurements of MVPA and SB, with high variations reported compared to accelerometer data (Dyrsstad et al., 2013). Methodological issues have been reported for subjective self-reported and proxy-reported measurements used with people with intellectual disabilities, such as difficulties understanding questions due to impairments in cognitive ability (Emerson et al., 2013). Additionally, there are low levels of agreement between subjective measurements of PA, such as PA questionnaires completed by caregivers, compared to total PA, MVPA and SB measured through accelerometers (Moss & Czyz, 2018; Matthews et al., 2011). It is therefore necessary for research to assess gender differences in MVPA and SB using objectively measured accelerometer data.

This study will build upon the weak evidence base by assessing the presence of gender differences and gender-specific influences on objectively measured MVPA and SB. Reflecting the first phase of the behavioural epidemiological framework, correlates will focus on demographic, health related individual and environmental level influences (Sallis et al., 2000). However, important psychosocial influence, such as self-efficacy for PA will also be considered, as this is a known influences of gender differences in the general population (Edwards & Sackett, 2016). A secondary data analysis will facilitate this exploration, overcoming potential difficulties with collecting accelerometer data from adults with intellectual disabilities, such as adherence to the protocol and wearing the accelerometer device (Leung et al., 2017; Pitchford et al., 2018).

Therefore, to address these significant gaps in the literature, this study aims to assess gender-specific correlates of objectively measured MVPA and SB, using accelerometer data. To add further to the paucity of literature available, a secondary aim of this study is to investigate gender differences in MVPA and SB levels.

3.3 Method

3.3.1 Design

Secondary data analysis was carried out to identify gender-specific correlates of objectively measured MVPA and SB, and gender differences in participation rates in adults with intellectual disabilities.

3.3.2 Description of the data

Data derives from the pooled baseline data of two Glasgow, Scotland, based randomised controlled trials (RCTs) targeting physical inactivity (n = 102; Melville et al., 2015) and obesity (n = 50; Harris et al., 2017) in adults with intellectual disabilities. This pooled data set has been used previously to identify correlates and patterns of objectively measured SB (Harris et al., 2018; Harris et al., 2019). The data was identified for this study as it included

MVPA and SB data collected using accelerometers, had an even split of men and women, and included relevant data to explore gender-specific correlates.

3.3.3 Ethical Approval and Consent

Ethical approval was granted for the two primary studies by the University of Glasgow College of Medical, Veterinary and Life Sciences (MVLS) ethics committee (Melville et al., 2015; Harris et al., 2017). The University of Glasgow, MVLS College ethics committee confirmed that further ethical approval would not be required to conduct a secondary data analysis (Appendix 4).

3.3.4 Participants and Location

The pooled sample consisted of n = 143 (51.7% female) participants who had complete MVPA and SB accelerometer data. A multi-point recruitment strategy was employed by both studies, recruiting participants from organisations within the Greater Glasgow and Clyde area of Scotland between 2013 and 2014. The studies had the inclusion criteria of adults (≥18 years old) diagnosed with intellectual disabilities. Harris et al. (2017) also included participants that had obesity [body mass index (BMI) ≥30kg/m^2] and were ambulatory, excluding individuals who were on weight management medication, individuals who had intentionally lost ≥3kg of weight, or had been diagnosed with Prader-Willi syndrome, Cohen syndrome, or Bardet-Biedl syndrome. Participants were also excluded if they had severe challenging behaviour, required constant support, or had mobility problems (Melville et al., 2015).

3.3.5 Measures

3.3.5.1 Outcome variables

The study outcomes of MVPA and SB were measured using the ActiGraph GT3X+ accelerometer (Actigraph, LLC, Pensacola, FL, USA). The device was to be worn for seven days during all waking hours excluding time spent showering, bathing, and swimming. For inclusion in the analysis, participants were required to wear the accelerometer a minimum of three days for six hours. Activity counts per minute (cpm) were calculated from the counts of four consecutive 15-second intervals (epochs). Cut points of <100 cpm (Atkin et al., 2012) and ≥1952 cpm (Freedson, Melanson & Sirad, 1998) were used for SB and MVPA, respectively. Accelerometers were worn by participants for 3 to 13 days, with total wear time ranging from 360 to 1440 minutes. To account for this variance in wear time, percentage time spent in SB and MVPA adjusted for wear time were used as the outcome measures. However, gender differences in levels of MVPA and SB (minutes/day) were descriptively assessed using mean values.

3.3.5.2 Independent variables

3.3.5.2.1 Intrapersonal correlates

3.3.5.2.1.1 Demographic factors.

Self-reported age was included as a continuous variable. Level of intellectual disabilities was included and measured using a short review of abilities and skills (C21st Health Check - II; p. 63-64). Results from this measure are significantly correlated with the developmental levels reported by the survey form of the validated Vineland Adaptive Behaviour Scale (Cooper et al., 2007). Level of intellectual disabilities was included as a categorical dummy variable (mild to moderate vs severe to profound). Ethnicity was not included as a demographic variable as most participants were White/Caucasian (98.6%).

3.3.5.2.1.2 Health related factors.

The presence of obesity (no/yes) was based on participants having a BMI ≥$30kg/m^2$, calculated from objective measurement of height (m) and weight (kg). Health related variables also included presence of physical health (no/yes), mental health (no/yes) or behavioural problems (no/yes) based on self- or proxy reported data.

3.3.5.2.1.3 Self-efficacy for physical activity

Self-efficacy for PA was included as a correlate in this study as it is one of the core contributors to gender differences in PA in the general population (Edwards & Sackett, 2016). It was assessed by one of the data sets (Melville et al., 2015; n = 102 participants) using The Self-Efficacy for Activity for Persons with Intellectual Disabilities scale (Peterson et al., 2009). Participants reported level of agreement (no = 1; maybe = 2; yes = 3) to six statements that reflected self-efficacy for PA (e.g., Can you make time for physical activity almost every day?), with a higher score indicating greater self-efficacy (potential score range 6 – 18).

3.3.5.2.2 Environmental correlates

3.3.5.2.2.1 Type of support

Type of support originated from self- or proxy reported accommodation type, with level of support recorded for people living in supported, residential or nursing homes. This was classified within the data set as participants receiving the following types of support: Independent (lives independently without paid support; lives independently with paid support; lives independently with spouse or partner); Family support (lives in parents' home; other family carers home); Paid support (individual supported living; group supported living; residential care; nursing home; national health service [NHS] accommodation). When included in the analysis, "independent" was used as the reference category, resulting in "independent vs family support" and "independent vs paid support" as the included variables.

3.3.5.2.2.2 Scottish index of multiple deprivation (SIMD).

The SIMD provides an indication of socio-economic status based on the level of deprivation associated within an individual's postcode area (http://www.scotland.gov.uk/Topics/Statistics/SIMD; Scottish Government, 2020). The quintiles ranged from the most deprived (SIMD 1) to least deprived (SIMD 5). This was included as a categorical variable: SIMD 1 vs SIMD 2; SIMD 1 vs SIMD 3; SIMD 1 vs SIMD 4; SIMD 1 vs SIMD 5. Most deprived was used as the reference group due to the higher proportion of participants being from the most deprived areas of Greater Glasgow.

3.3.6 Statistical Analysis

All statistical analyses were conducted using SPSS (version 23; IBM, NY, USA).

3.3.6.1 Data transformation

The Shapiro-Wilk test was conducted to assess normal distribution of data in both the gender aggregated (not split by gender) and gender disaggregated (split by gender) data sets, as this is the recommended test of normality (Yap & Sim, 2011). In both the gender aggregated ($W = .90$, $p < .001$) and gender disaggregated data (men: $W = .91$, $p < .001$/women: $W = .88$, $p < .001$) the MVPA data were not normally distributed with a positive skew present. Square root transformation was used to reduce the positive skew (Field, 2018) and resulted in normally distributed data (gender aggregated: $W = .99$, $p > .05$/men: $W = .98$, $p > .05$/women: $W = .97$, $p > .05$). The test of normality was not violated in the SB data. The transformed MVPA data was used when assessing gender-specific correlates.

3.3.6.2 Data analysis

Descriptive statistics were calculated for both genders for MVPA and SB. Independent samples t-tests were used to assess the presence of gender differences in MVPA and SB of adults with intellectual disabilities. The t-test is considered robust to violations of normality and considered preferable to non-parametric tests and data transformation (Field, 2018; Rasch & Guiard, 2004).

3.3.6.2.1 Gender-specific correlates of physical activity and sedentary behaviour

The data were split by gender to allow for four multiple linear regression models to be conducted (percentage time in daily MVPA for men and women, separately; percentage time in SB for men and women, separately). The variables included in this study as potential correlates were based on the researchers understanding of the wider literature around PA and SB of adults with intellectual disabilities. As this secondary data set would be split by gender when conducting the analyses, it resulted in smaller sample sizes for the regression models for men (n = 69) and women (n = 74). Stepwise variable selection procedures were used to identify the correlates to be retained in the final regression models and ensure the regression models were not too complex for the sample size.

Although stepwise methods limit the replicability of the findings, it is justifiable when little is known about the area of interest (Field, 2018). This was an initial exploration of gender-specific influences of PA and SB of adults with intellectual disabilities, and there was limited past knowledge to inform which variables to include in the regression models for men and women. Although this meant basing inclusion of variables based only on statistical association, it provided a method to prevent over-fitting the regression model. Additionally, the main limitations associated with stepwise procedures are more pronounced in data sets with very large numbers of variables (Smith, 2018), which was not reflected in this study.

To establish the variables for inclusion in the final regression models, firstly, bivariate analyses (simple linear regression) were conducted between each correlate and the outcome variables. To be included in the multivariate regression model, variables required an f-statistic with a significance value of $p < .25$ (Bendel & Afifi, 1977). Following selection of variables for the multiple linear regression model, backward elimination was used to remove non-significant variables with $p > .05$. Assumptions were then checked for each final linear regression model.

Self-efficacy data were only available in the Melville et al. (2015) data set for n = 94 participants and therefore was not included in the multivariate model. Subsequently, separate bivariate correlations were conducted between percentage time in MVPA and percentage time in SB for each gender.

3.4 Results

3.4.1 Participants

The average age of participants was M = 45.28 (SD = 13.64) years and ranged from 18 – 81 years. Most participants had mild (48.6%) to moderate (35.9%) intellectual disabilities, compared to severe (12.7%) and profound (2.8%) levels. Table 3.1 presents participant characteristics split by gender.

Table 3.1 Participant characteristics and independent variables split by gender

	Female	Male
	n = 74	n = 69
Age (years)	M = 44.2 (SD = 13.17; Range = 18 - 71)	M = 46.41 (SD = 14.13; Range = 21 – 81)
Self-efficacy for PA*	M = 14.9 (SD = 2.49)	M = 14.0 (SD = 2.49)
Level of Intellectual Disabilities		
Mild	47.3%	50%
Moderate	32.4%	39.7%
Severe	16.2%	8.8%
Profound	4.1%	1.5%
Missing data		n = 1
Ethnicity		
White	100%	97.1%
Asian		2.9%
Presence of Obesity		
No	21.9%	35.6%
Yes	77%	64.7%
Missing data	n = 1	n = 1
Physical Health Problems		
No	55.4%	66.2%
Yes	44.6%	33.8%
Missing data		n = 1
Mental Health Problems		
No	65.7%	59%
Yes	34.3%	41%
Missing data	n = 7	n = 8
Behavioural Problems		
No	69.4%	72.1%
Yes	30.6%	27.9%
Missing data	n = 2	n = 8
Marital Status		
Married	5.4%	1.4%
Divorced	2.7%	1.4%
Single	91.9%	97.1%
Type of Support		
Independent	8.1%	4.3%
Family	43.2%	46.4%
Paid	48.6%	49.3%
SIMD Quintile		
SIMD 1 (most deprived)	55%	43%
SIMD 2	20%	21%
SIMD 3	15%	27%
SIMD 4	7%	6%
SIMD 5 (least deprived)	3%	3%
Missing data	n = 3	n = 2

*Notes: M = mean; SD = standard deviation; SIMD = Scottish index of multiple deprivation; *self-efficacy recorded for Melville et al (2015) data set only.*

3.4.2 Gender differences in MVPA and SB

Table 3.2 Descriptive statistics of MVPA and SB in men and women

	Women				**Men**			
Outcome	**M**	**SD**	**Mdn**	**IQR**	**M**	**SD**	**Mdn**	**IQR**
MVPA (min/day)	28.82	20.04	21.55	21.80	29.53	17.51	28.35	23.00
% time MVPA	4.43	2.92	3.58	3.59	4.72	3.19	4.20	3.80
SB (min/day)	474.58	106.25	462.55	127.86	492.79	149.62	470.93	135.16
% time SB	72.68	7.72	73.35	12.16	73.07	9.67	73.56	14.80

Notes: M = mean; SD = standard deviation; Mdn = median; IQR = interquartile range; MVPA = moderate to vigorous physical activity; SB = sedentary behaviour

Descriptive statistics of MVPA and SB split by gender are presented in Table 3.2. When assessing gender differences in percentage time spent in daily MVPA, no significant gender differences were reported; t(141) = .23, $p > .05$. For SB, no significant gender differences were reported for percentage time SB; t(141) = -.27, $p > .05$.

3.4.3 Correlates of percentage time in MVPA.

Bivariate analyses were conducted between percentage time in MVPA and each correlate for men and women (Table 3.3). For women, only presence of mental health problems and obesity were eligible for inclusion in the multivariate analysis ($p < .25$). However, for men, four correlates were statistically significant ($p < .25$) and eligible for inclusion in the multivariate analysis: age; presence of physical health problems; presence of mental health problems; type of support (independent vs paid support/independent vs family support).

Table 3.3 Bivariate analysis of each correlate and percentage time MVPA

	Women			Men		
	B (SE)	ß	p-Value	B (SE)	ß	p-Value
Intrapersonal						
Age	-.01(.01)	-.10	.405	-.02 (.01)	-.46	.000***
Mild to moderate intellectual disabilities vs Severe to profound intellectual disabilities (0, 1)	-.10(.19)	-.06	.611	-.34 (.29)	-.14	.253
Presence of obesity (no/yes; 0, 1)	-.27(.19)	-.17	.148*	-.06(.19)	-.04	.745
Physical health problem (no/yes; 0, 1)	-.12(.15)	-.09	.445	-.43(.18)	-.29	.018**
Mental health problem (no/yes; 0, 1)	-.25(.17)	-.18	.149*	-.27(.18)	-.19	.143*
Behavioural problem (no/yes; 0, 1)	.11(.17)	.08	.528	.08(.20)	.05	.687
Environmental						
Independent vs family support (0 , 1)	-.10(.15)	-.08	.503	.28(.17)	.19	.116*
Independent vs paid support (0, 1)	.10(.15)	.08	.516	-.30(.17)	-.21	.084*
SIMD 1 vs SIMD 2 (0, 1)	.15 (.20)	.09	.467	-.03(.22)	-.02	.892
SIMD 1 vs SIMD 3 (0, 1)	.11(.22)	.06	.610	-.06 (.20)	-.04	.780
SIMD 1 vs SIMD 4 (0, 1)	-.13(.31)	-.05	.685	-.01(.38)	-.00	.978
SIMD 1 vs SIMD 5 (0, 1)	-.01(.48)	-.00	.978	-.47(.529)	-.11	.378

Notes: p < .25; p < .05**; p < .001***; 0 = reference category; SE = standard error; SIMD = Scottish index of multiple deprivation (SIMD 1 = most deprived / SIMD 5 = least deprived); MVPA = moderate to vigorous physical activity*

For women, no correlates were significantly correlated with the outcome variable of percentage time in MVPA the final regression model. However, for men, age and presence of physical health problems were significant (p < .05) in the final model, with levels of MVPA decreasing with older age and the presence of physical health problems (Table 3.4). This model resulted in a significant regression equation, $F(2, 57) = 10.17$, $p < .001$, with an R^2 of .26.

Table 3.4 Final model for correlates of percentage time MVPA in men

	B (SE)	β	p-Value
Intrapersonal			
Age	-.02 (.01)	-.35	.004**
Presence of physical health problem (no/yes; 0, 1)	-.43 (.17)	-.30	.014**
Constant	2.98 (.27)		.000***

*Notes: p < .05**; p < .001***; 0 = reference category; SE = standard error; MVPA = moderate to vigorous physical activity*

3.4.4 Correlates of percentage time in SB

The bivariate analyses (Table 3.5) identified three variables that were eligible for inclusion in the multivariate analysis for women: intellectual disability level; presence of obesity; presence of a mental health problems. For men, bivariate analyses indicate that age; presence of physical health problems; presence of mental health problems; family support and paid support were eligible for inclusion.

For women, the final multivariate regression model for the outcome variable of percentage time SB retained two variables (Table 3.6). The regression equation was significant, $F(2,63) = 6.49$, $p < .05$, $R^2 = .17$. The presence of obesity and presence of a mental health problems were significantly associated with increased percentage time SB in women. For men, following backward elimination, only one variable (presence of physical health problems) was retained (Table 3.6). The final regression model was statistically significant, $F(1, 58) = 4.25$, $p < .05$, $R^2 = .07$, with the presence of a physical health problem significantly associated with increased percentage time SB ($p < .05$).

Table 3.5 Bivariate analysis of correlates of percentage time SB

	Women			Men		
	B (SE)	ß	p-Value	B (SE)	ß	p-Value
Intrapersonal						
Age	.00 (.07)	.00	.991	.12(.08)	.18	.137*
Mild to moderate intellectual disabilities VS Severe to profound intellectual disabilities (0, 1)	4.72(2.18)	.25	.033**	-.61(3.88)	-.02	.875
Presence of obesity (no/yes; 0, 1)	4.88(2.10)	.27	.023**	2.68(2.47)	.13	.281
Physical health problem (no/yes; 0, 1)	1.91(1.80)	.12	.294	4.59(2.44)	.23	.064*
Mental health problem (no/yes; 0, 1)	3.36(1.98)	.21	.095*	4.07(2.50)	.21	.108*
Behavioural problem (no/yes; 0, 1)	1.83(2.00)	.11	.363	2.17(2.74)	.10	.431
Environmental						
Independent vs family support (0 , 1)	-1.40(1.82)	-.09	.444	-3.12(2.32)	-.16	.183*
Independent vs paid support (0, 1)	.69(1.81)	.05	.704	3.07(2.32)	.16	.190*
SIMD 1 vs SIMD 2 (0, 1)	-2.35(2.31)	-.12	.313	.48(2.93)	.02	.870
SIMD 1 vs SIMD 3 (0, 1)	-.11(2.56)	-.01	.966	-.17(2.69)	-.01	.950
SIMD 1 vs SIMD 4 (0, 1)	3.36(3.59)	.11	.353	-4.10(5.01)	-.10	.416
SIMD 1 vs SIMD 5 (0, 1)	4.74(5.56)	.10	.396	2.83 (7.00)	.05	.687

Notes: p < .25*; p < .05**; 0 = reference category; SE = standard error; SIMD = Scottish index of multiple deprivation (SIMD 1 = most deprived / SIMD 5 = least deprived) ; SB = sedentary behaviour

Table 3.6 Final multivariate model of correlates of percentage time SB

Multivariate correlates of percentage time in SB in women			
	B (SE)	**ß**	**p-Value**
Intrapersonal			
Presence of obesity (no/yes; 0, 1)	6.71(2.23)	.35	.004**
Mental health problem (no/yes; 0, 1)	4.32(1.86)	.27	.024**
Constant	65.64(2.23)		.000***
Multivariate correlates of percentage time in SB in men			
Intrapersonal			
Physical health problem (no/yes; 0, 1)	5.29(2.57)	.26	.044**
Constant	71.62(1.52)		.000***

Notes: *p* < .05**; *p* < .001***; *0 = reference category; SE = standard error; SB = sedentary behaviour*

3.4.5 Self-efficacy as a correlate of MVPA and SB

Table 3.7 Results for self-efficacy reported for men and women.

	Association between self-efficacy and percentage time MVPA		
	B(SE)	**ß**	**p-value**
Men	-.01 (.03)	-.05	.74
Women	.07(.03)	.31	.04**
	Association between self-efficacy and percentage time SB		
	B(SE)	**ß**	**p-value**
Men	-.11(.45)	-.03	.82
Women	-1.11 (.38)	-.41	.01**

*Note: SD = Standard deviation; p<0.05**; SE = standard error; MVPA = moderate to vigorous physical activity; SB = sedentary behaviour*

Results of the bivariate analyses between self-efficacy and percentage time in MVPA and SB are presented in Table 3.7. Greater self-efficacy was significantly associated with increased percentage time in MVPA for women, $F(1, 42) = 4.54$, $p < 0.05$, $R^2 = .10$. Greater self-efficacy was significantly associated with decreased percentage time SB of women, $F(1, 42) = 8.71$, $p < .05$, with an R^2 of .15. There were no significant association between self-efficacy and percentage time in MVPA and SB for men (Table 3.7).

3.5 Discussion

Past PA and SB literature involving adults with intellectual disabilities frequently neglects the potential influence of gender (Chapter 2), even though women with intellectual disabilities are most at risk of health inequalities (Chapter 1, section 1.3.1). This study is the first to explore gender-specific correlates of PA and SB in adults with intellectual disabilities, which addresses a significant gap in the literature. The findings suggest that there are minimal differences in participation rates with all adults with intellectual disabilities engaging in low PA and high SB. However, this study identified potential gender differences in the factors associated with these health behaviours, which will have important implications for future research.

An interaction between gender, age, and health for MVPA was observed. Presence of physical health problems and older age were negatively associated with MVPA in men only. Low levels of PA in older adults with intellectual disabilities are related to mobility issues, with older adults also experiencing poor physical fitness, and greater risk of multimorbidity (Hermans & Evenhuis, 2014; Hilgenkamp et al., 2012). The identification of this as a potentially gender specific influence, suggests that older age and associated poor health have a greater impact on the MVPA levels of men. This implies that younger men may have greater PA levels when unrestricted by health limitations.

Poor physical health was also positively associated with SB in men only, emphasising that being physically healthy is important to both MVPA participation and low SB in men. For women, SB was positively associated with obesity and presence of mental health problems. The association between obesity and SB in women only is reflective of the general population (Rhodes et al., 2012). This may be of importance for adults with intellectual disabilities as women are most at risk of obesity (Chapter 1, section 1.3.1). It suggests that SB is a lifestyle influence of obesity in women, emphasising a need for more research regarding the association between SB and obesity in women with intellectual to inform future interventions.

An important finding was also the lack of variables retained in the multivariate model of MVPA in women. This indicates that the demographic and health related variables included may not be associated with MVPA for women. However, self-efficacy was a significant bivariate correlate of MVPA and SB in women only. This could suggest that the PA and SB levels of women with intellectual disabilities are influenced by wider psychosocial factors, such as their perceived ability to engage in PA or reduce SB. In the general population, self-efficacy has been identified as a core contributor to the gender differences in PA (Edwards & Sackett, 2016), and has been described as regulating gendered conduct and gender roles (Bussey & Bandura, 1999). Nevertheless, this finding must be interpreted with considerable caution. There were no observable differences in self-efficacy scores. The mean scores (Table 3.1) indicate that most participants selected the “maybe” response and may not have understood the question or used the scale appropriately, minimising the meaningfulness of this finding.

The variables included in multivariate model reflect primarily demographic or health related factors. Although this can identify the important characteristics of people that may contribute to participation rates in a behaviour (Sallis et al., 2000), it ignores wider influences of PA and SB.

Adults with intellectual disabilities experience numerous multi-level influences of PA and SB, with social influences identified as key to participation in these behaviours (Chapter 1, section 1.4.7 & section 1.4.7.2, respectively). This indicates that broader correlates should be explored to determine if there is a gender specific influence.

An important observation (though with no statistically significant association with PA and SB in this study) was the high percentage of participants living in the most deprived areas of Greater Glasgow (SIMD 1; women = 55%; men = 43%; Table 3.1). This high level of deprivation was also observed in large population-based research including adults with intellectual disabilities (Kinnear et al. 2018). In this study involving n = 1023 participants, 52.6% were from the most deprived areas of Greater Glasgow (Kinnear et al. 2018). This indicates that a high number of adults with intellectual disabilities live in the most deprived areas based on a range of factors including income, health, and access to services. This has major implications for the lives of people with intellectual disabilities and the opportunities they experience, with low income also identified as a barrier to PA (Bossink et al. 2017).

3.5.1 Limitations and Strengths

The novelty of addressing gender-specific correlates of PA and SB in adults with intellectual disabilities is a major strength of this study. This study also assessed correlates using objective measures of MVPA and SB. Objective measures of data collection, such as accelerometers, are more valid than subjective self-or proxy-report measures (Esliger & Tremblay, 2007). The pooled data used in this study also had a large sample size (n = 143) compared to the extant literature that used accelerometers to assess MVPA and SB while reporting results of each gender separately (Chapter 2).

However, the data set originated from the baseline data of two RCTs, resulting in an unrepresentative sample with a majority being classified as obese and engaging in low levels of physical activity. This may have influenced the presence of gender differences, reducing the generalisability. In addition to this, accelerometer cut points used in this secondary data set for MVPA and SB were not population specific. There is a need to develop accelerometer protocols that are specific to people with intellectual disabilities (Leung et al., 2017). Research has reported that the thresholds of calibrated accelerometer cut points for the SB and MVPA of children with intellectual disabilities are different to those for the general population (McGarty et al., 2016). This suggests that failure to use population specific accelerometer cut points may result in questionable validity and accuracy of the activity data and reduces the generalisability of the findings.

There were concerns over the data relating to the self-efficacy scale for PA. It was included as it has been identified as a key contributor to gender differences in PA in the general population (Edwards & Sacket, 2016), and is highly associated with social support (Hamilton et al., 2017; Young et al., 2014), which is a key influence of PA and SB among adults with intellectual disabilities (Chapter 1, section 1.4.7). However, self-efficacy for PA relates to the abstract concept of perceived ability to engage in PA. Melville et al. (2015) observed that the concept was too complex for some participants included in the study. Although the scale created by Peterson et al. (2008) was developed for adults with intellectual disabilities, it was focused on mild to moderate intellectual disabilities and assessed using relatively small sample sizes (up to n = 152; Peterson et al., 2008; Peterson et al., 2009; Lee et al., 2010). More research is required to determine how to measure abstract concepts accurately and reliably, such as self-efficacy, in adults with intellectual disabilities.

3.5.2 Recommendations for future research based on study findings

There is a need for research to take into consideration gender-specific correlates or characteristics that contribute to the PA and SB levels of adults with intellectual disabilities. As this study had an unrepresentative sample, it is also necessary for gender differences and gender-specific influences to be explored using a large representative sample. Research should consider the refinement of measurement methods for both PA and SB, and psychosocial constructs to allow for their assessment as correlates. This study mainly focussed on demographic and health related factors and future research should therefore consider wider influences of PA and SB of men and women with intellectual disabilities, such as social support. However, there is a need to consider the best ways to assess these influences. Research should also consider the types of physical and sedentary activities engaged in, and if there are any gender differences. Considering influences of PA and SB unique to men and women with intellectual disabilities will broaden understanding of these health behaviours and help to inform future interventions.

3.6 Conclusions

This study adds vital knowledge to the scant literature and identified unique influences of SB and MVPA for men and women with intellectual disabilities. The main finding was the association between age and health related factors, emphasising that this exerts an influence over PA and SB of men and women. By exploring the characteristics of men and women that uniquely contribute to MVPA and SB, it improves understanding of the potential influence of gender. Subsequently, future research can work towards effectively promoting a healthy lifestyle and subsequently reduce the risk for negative health outcomes experienced by all adults with intellectual disabilities.

Chapter Four. Identifying gender differences, and gender-specific correlates, of physical activity and sedentary behaviour of adults with intellectual disabilities using a large population-based data set.

4.1 Overview of this chapter

The previous chapter assessed gender differences in MVPA and SB levels and explored potential gender specific correlates. Although the findings from the previous chapter provide vital initial evidence, the results cannot be generalised as the sample size was small and unrepresentative. This current chapter aims to explore gender differences in PA and SB levels, and identify gender specific correlates using a large, representative, population-based data set. Similar correlates were included within the analysis as the previous chapter; however, it is not possible to provide a direct comparison of correlates as different PA and SB domains were assessed. This chapter will provide essential new knowledge that will contribute towards an initial understanding of gender differences in PA and SB of adults with intellectual disabilities, and the potential gender specific influences.

4.2 Introduction

There is limited understanding of the presence gender differences in PA and SB levels of adults with intellectual disabilities, and gender-specific influences on these behaviours. Exploration using objective accelerometer data in the previous chapter found minimal gender differences in MVPA and SB across all participants. However, potential gender-specific influences were identified. Intrapersonal factors such as age, poor health, and problem behaviours were associated with MVPA for men, however no correlates were identified for women. SB was also associated with presence of a mental health problem and obesity for women, and physical health problems in men.

Accelerometer data was used in Chapter 3 as this objective measurement method has improved validity compared to subjective measurements (Esliger & Tremblay, 2007). However, there are limitations using accelerometers with adults with intellectual disabilities as there is no standardised, rigorously tested and population specific protocol for their use (Leung et al., 2017). Wider PA and SB literature for adults with intellectual disabilities have been criticised for having small sample sizes (Dairo et al., 2016; Melville et al., 2017). Although, the pooled sample in Chapter 3 had a comparatively large sample size, it was still unrepresentative preventing the ability to generalise the findings.

Subjective measurements of PA and SB are more feasible to administer than objective activity monitors (Esliger & Tremblay, 2007). As a result, subjective measurements can be administered to large sample sizes, which would increase the reliability of the findings generated. This allows for PA and SB data to be collected in representative population-based studies conducted with adults with intellectual disabilities. This subsequently improves the generalisability of the study findings relating to PA and SB. Recommendations have been made for the use of both objective and subjective measurements, as each have potential concerns over the validity and reliability when used with adults with intellectual disabilities (Melville et al., 2017).

This study will explore gender differences in PA and SB levels and investigate gender-specific influences of these behaviours. Reflecting Chapter 3, gender-specific demographic and health related individual and environmental influences will be explored reflecting the first stage of the behavioural epidemiological framework (Sallis et al., 2000). This will be conducted using subjective measurements of PA and SB in a population-based study, to determine if correlates are identified in a large representative sample. This study will contribute towards the construction of an evidence base regarding the influence of gender on the PA and SB of adults with intellectual disabilities.

Therefore, this chapter aims to identify-gender specific correlates of PA and SB in adults with intellectual disabilities, using a large and representative sample. A secondary aim is to assess the presence of gender differences in PA and SB outcomes to add to the limited existing literature.

4.3 Method

4.3.1 Ethical Approval and Consent

The initial data was collected by the University of Glasgow. Ethical approval was granted by Multicentre Research Ethics Committee – Scotland A (Reference: 06/MRE00/31). Consent was individually taken to participate in research for each participant, in keeping with Scottish law. In 2018, the University of Glasgow, MVLS College ethics committee confirmed that further ethical approval would not be required to use this data (Appendix 4).

4.3.2 Design

Secondary data analysis of a large Scottish population-based cross-sectional study.

4.2.2 Data description

Data derived from the C21st Health Check developed for the University of Glasgow (Glasgow U.C.E.D.D. 2001). The C21st Health Check was completed by trained health professionals and implemented as a semi-structured interview and physical examination (Cooper et al., 2007; Melville et al., 2018). This was conducted with people with intellectual disabilities and their caregivers (Cooper et al., 2007; Melville et al., 2018). The people with intellectual disabilities were known to intellectual disabilities health services, and/or used social work services, day services, or financial support services for people with intellectual disabilities. An intellectual disabilities nurse reviewed each person to confirm they had an intellectual disability and were eligible to be included. This data set was selected for this study as it was a large population-based data set with data on self-reported PA and SB, and a range of demographic and health related questions that reflected the correlates included in Chapter 3.

4.3.3 Participants and Location

A total of n = 836 participants (43.7% female) were recruited for the original study between 2007 – 2010 from the Greater Glasgow and Clyde Health Board area of Scotland (Cooper et al., 2007; Melville et al., 2018). Participants recruited were representative of this geographical area due to a range of socioeconomic backgrounds and urban to rural locations. The data set available for secondary analysis included n = 727 adults who provided consent for their data to be used in future research. All participants were legally adults in Scotland (>16 years old), with 98.6% ≥ 18 years of age.

4.3.4 Outcome variables and associated measures

4.3.4.1 Participation in any physical activity

PA data was self-reported and gathered from participants, with the support from caregivers, if needed. It was based on responses to the following question: “Does the person do any physical activity which makes her/him sweaty or out of breath, such as fast walking, heavy housework, gardening, exercise, or sport?”. This was answered with a dichotomous “Yes” or “No” response and scored as “Yes” if PA lasted for a minimum of fifteen-minute bouts.

4.3.4.2 Physical activity guidelines (PAG)

If the response was “Yes” to engaging in any PA lasting for a minimum of fifteen-minute bouts, then the number of days the participant engaged in PA, and the average amount of time per day spent on these activities, were recorded. Meeting PAG (Yes/No; based on recommendations for the general population of 150 minutes of weekly MVPA) was calculated by multiplying the number of active days and average time spent PA.

4.3.4.3 Engaging in high screen time

SB was assessed through the proxy measure of screen time, as screen time, including watching television, is a type of SB (Melville et al., 2017; Owen et al., 2011). Participants were asked how many hours they spent watching television, DVDs, videos or on the PC. They were provided with a total of eight possible responses, ranging from “None, does not watch TV” to “1 – 3 hours/month” to “6 or more hours/day”. The dependent variable for SB was based on the median value and categorised as low screen time (< 4 hours per day) or high screen time (≥ 4 hours per day; Melville et al., 2018).

4.3.5 Correlates and associated measures

4.3.5.1 Individual level Correlates

Data were present on demographic factors, disability, and health related factors. This included age, which was coded in the secondary data set as (≤44 years old/≥ 45 years old), presence of Down syndrome (Yes/No); the level of intellectual disabilities reported for a participant (mild/moderate/severe/profound); and presence of problem behaviour (yes/no). Intellectual disabilities level was established using the Vineland Scale (survey form; Sparrow & Cicchetti, 1985) or based on a short review of abilities, which is highly correlated with the Vineland Adaptive Behaviour Scale (Cooper et al., 2007). Presence of problem behaviour was assessed using the C21st Health Check data.

Within the data set, presence of obesity (Yes/No) was reported and based on body mass index (BMI; obesity ≥30kg/m^2). Responses to presence of a long-standing illness, disability, or infirmity, excluding learning disabilities (Yes/No) was used to indicate physical health problems. Mental health issues were included using the variable in the data set defined as presence of mental ill health (Yes/No).

4.3.5.2 Environmental Correlates

Type of support/accommodation was established based on responses to nine options of accommodation type. This ranged from parental home to NHS accommodation, with the level of support assessed for participants living in supported living (C21st Health Check – II; p. 22-23, C.1 & C.3). Within the data set, responses were then streamlined to fit four accommodation types/support types: lives with family carers; lives independently; lives with paid carers; lives in congregate setting. Socioeconomic status was measured using the SIMD for socioeconomic status. SIMD was calculated using the participant's postcode to assign a SIMD quintile ranging from most deprived to least deprived. This data set had scored the areas of deprivation as 1 = least deprived to 5 = most deprived.

4.3.6 Statistical Analysis

All statistical analyses were conducted using SPSS (version 23; IBM, NY, USA).

Participant characteristics were analysed for men and women with intellectual disabilities. This was done by calculating descriptive statistics for continuous data (mean; standard deviation; range), and frequencies for categorical data, after splitting the data set by gender.

4.3.6.1 Gen*der differences in physical activity and sedentary behaviour*

To assess gender differences in PA participation and SB, three Pearson’s chi square tests were conducted. The chi-square tests were conducted for screen time (High/Low), participating in any PA (Yes/No) and meeting PAG (Yes/No).

4.3.6.2 Gender specific correlates of physical activity and sedentary behaviour

To identify correlates specific to men and women, the data were split by gender. Four regression models were built: correlates of men engaging in any PA; correlates of women engaging in any PA; correlates of men engaging in high screen time; correlates of women engaging in high screen time. The initial correlates included in this study were selected based on their potential relevance (e.g., disability, demographic, and health related factors). However, splitting the dataset by gender reduced the sample size for the logistic regression models of men (n = 399) and women (n = 326). Logistic regression requires large sample sizes, so it was necessary to adopt variable selection methods. As little is known in the wider literature of gender specific correlates of PA and SB of men and women with intellectual disabilities, it was decided to base selection on purposeful selection for logistic regression (Hosmer et al., 2013; Hosmer, 1989). Purposeful selection was used as it has been found to retain more correct models than stepwise procedures when using logistic regression (Bursac et al., 2008).

Following the stages of purposeful selection, bivariate analyses were initially conducted between each independent variable (correlate) and dependent variable (outcome). Predictor variables were included in the initial multivariate analysis if the Wald-statistic had a *p*-value of $p \leq 0.25$, which suggests the variable potentially correlates with the outcome. For variables with multiple levels such as, level of intellectual disabilities, accommodation type and SIMD, the Wald-statistic *p*-value of the reference group was used to represent the significance of the overall variable.

An initial multivariate logistic regression model was then conducted using variables identified by the bivariate analyses. A backward elimination Wald approach was used to eliminate variables based on traditional levels of statistical significance ($p < .05$), resulting in the development of a smaller regression model. Next, the estimated coefficients (Beta) for each predictor variable in the small model were compared to the estimated coefficients of the initial larger model. If there was substantial change in the estimated coefficient (>20%), then one or more of the eliminated variables influenced the results. This variable was then identified and added back to the model.

Following this, variables excluded at the bivariate analysis stage were individually added to the model using forced entry. Variables that made a significant contribution ($p < .05$) were retained. Interactions between variables within the model were tested individually and added to the model if the likelihood ratio test was significant at $p < 0.01$. Significant interactions were added to the multivariate model, but only retained if the Wald statistic was significant at $p < 0.05$. The fit of the final model was then tested using the Hosmer & Lemeshow test and R^2 values, with the logistic regression assumptions and residual statistics (Cook’s distance; standardised residuals; leverage values; DFBeta) assessed for the final regression models.

4.4 Results

4.4.1 Participant characteristics

A total of n = 725 (n = 326 women; n = 399 men) participants had self-reported activity data. The average age of participants was M = 43.49 (SD = 14.54; range = 16.15 – 90.32 years). Most participants were of Caucasian ethnicity (total: 96.8%; males = 96.5%; females = 97.2%). Level of intellectual disabilities ranged from mild (35.6%) to profound (20%). Participant characteristics of the total sample disaggregated by gender are presented in table 4.1.

Table 4.1 Participant characteristics

Variables	Female N = 326	Male N = 399
Age		
16 – 44 years old	N = 180 (55.2%)	N = 213 (53.4%)
≥45 years old	N = 146 (44.8%)	N = 186 (46.6%)
Marital status		
Married/live in partner	N = 11 (3.4%)	N = 12 (3.0%)
Separated/divorced	N = 11 (3.4%)	N = 7 (1.8%)
Single	N = 300 (92.0%)	N = 378 (94.7%)
Widow(er)	N = 4 (1.2%)	N = 2 (.5%)
Level of intellectual disability		
Mild	N = 126 (38.7%)	N = 132 (33.1%)
Moderate	N = 84 (25.8%)	N = 108 (27.1%)
Severe	N = 54 (16.6%)	N = 76 (19%)
Profound	N = 62 (19.0%)	N = 83 (20.8%)
Presence of Down syndrome		
Yes	N = 44 (13.5)	N = 53 (13.3%)
No	N = 282 (86.5%)	N = 346 (86.7%)
BMI category		
Underweight	N = 13 (4.6%)	N = 14 (4.1%)
Normal weight	N = 56 (19.9%)	N = 96 (28%)
Overweight	N = 58 (20.6%)	N = 126 (36.7%)
Obese	N = 154 (54.8%)	N = 107 (31.2%)
Missing cases	N = 45	N = 56
Accommodation type		
Lives with family carer	N = 122 (37.8%)	N = 140 (35.1%)
Lives independently	N = 45 (13.9%)	N = 61 (15.3%)
Lives with paid support	N = 146 (45.2%)	N = 189 (47.4%)
Congregate setting	N = 10 (3.1%)	N = 9 (2.3%)
SIMD quintile*		
1 = Least Deprived	N = 14 (4.3%)	N = 29 (7.3%)
2	N = 44 (13.5%)	N = 39 (9.8%)
3	N = 39 (12.0%)	N = 47 (11.8%)
4	N = 54 (16.6%)	N = 92 (23.2%)
5 = most deprived	N = 174 (53.5%)	N = 190 (47.9%)
Missing cases	N = 1	N = 2
Long-standing illness		
Yes	N = 178 (54.6%)	N = 216 (54.3%)
No	N = 148 (45.4%)	N = 182 (45.7%)
Missing		N = 1
Mental ill health		
Yes	N = 96 (29.4%)	N = 100 (25.1%)
No	N = 230 (70.6%)	N = 299 (74.9%)
Problem behaviour		
Yes	N = 87 (26.7%)	N = 125 (31.1%)
No	N = 239 (73.3%)	N = 274 (68.7%)

*Notes: BMI = Body mass index; SIMD = Scottish index of multiple deprivation; *SIMD quintile coded in this data set as 1 - 5 (least to most deprived)*

4.4.2 Gender differences in PA and SB

Table 4.2 PA and SB levels of men and women

Engages in any PA	Women	Men
Yes	N = 56 (17.2%)	N = 89 (22.4%)
No	N = 270 (82.8%)	N = 309 (77.6%)
Missing cases		N = 1
Meets PAG		
Yes	N = 14 (4.3%)	N = 35 (8.8%)
No	N = 312 (95.7%)	N = 364 (91.2%)
≥ 4 hours of screen time		
Yes	N = 155 (47.7%)	N = 214 (53.6%)
No	N = 170 (52.3%)	N = 185 (46.4%)
Missing cases	N = 1	

Note: PA = physical activity; PAG = physically activity guidelines of 150 minutes weekly moderate to vigorous PA; screen time = proxy for sedentary behaviour.

Descriptively more men engaged in any PA than women (Table 4.2). However, the chi square test found no significant association between gender and any PA, X(1) = 3.01, $p = .083$. Attainment of the PAG was low, with males more likely to meet the PAG than females (Table 4.2). There was a statistically significant association between gender and meeting the PAG, X(1) = 5.71, $p = .017$. A higher percentage of males than females engaged in over 4 hours of screen time per day (Table 4.2). However, the association between gender and screen time was not statistically significant, X(1) = 2.53, $p = .112$.

4.4.3 Gender specific correlates of physical activity

4.4.3.1 Correlates for women

In the initial bivariate analyses, age (Wald = 2.23, df = 1, $p < .25$), intellectual disabilities level (Wald = 6.47, df = 3, $p < .25$), presence of Down syndrome (Wald = 7.25, df = 1, $p <.05$), presence of a physical health problem (Wald = 2.675, df = 1, $p < .25$) and accommodation type (Wald = 5.73, df = 3, $p < .25$), were eligible for inclusion in the initial multivariate model.

Following purposeful selection, the final regression model retained the intrapersonal variable of presence of Down syndrome (Yes/No; Table 4.3). Women without Down syndrome were significantly less likely to participate in any PA (OR = .38; *p* = .007) than women with Down syndrome. It is however important to note that 68.18% (n = 30) of women with Down syndrome and 63.83% of women without Down syndrome had mild to moderate intellectual disabilities. For men, 50.94% with Down syndrome and 61.56% without Down syndrome had mild to moderate intellectual disabilities.

Table 4.3 Final model of correlates of engaging in physical activity in women

	B	SE B	Wald X^2	P - value	OR	95% CI OR
Presence of Down Syndrome						
No (1), Yes (ref)	-.98	.36	7.25	.007**	.38	[.18, .77]
Constant	-.76	.32	5.55	.019**	.47	

Notes: ref = reference category; p < 0.05**; *significant fit of the model* $X^2(1) = 6.662$, *p = .010;* $R^2 = .020$ *(Cox and Snell); .034 (Nagelkerke); Overall percentage correct = 82.8%*

4.4.3.2 Correlates for men

The initial bivariate analysis identified age (Wald = 2.35, df = 1, *p* < .25), intellectual disabilities level (Wald = 10.65, df = 3, *p* < .05), presence of obesity (Wald = 2.91, df = 1, *p* < .25), SIMD (Wald = 9.77, df = 4, *p* < .05), presence of a mental illness (Wald = 6.48, df = 1, *p* < .05) and presence of a physical health problem (Wald = 1.71, df = 1, *p* < .25) as eligible for the initial multivariate model.

Following the procedures of purposeful selection, the final model (table 4.4) indicated an overall significant association between level of intellectual disabilities (*p* = .003) and PA. Compared to the reference group of mild intellectual disabilities, participants with profound (OR = .28, *p* = .002) and severe (OR = .37, p = .012) intellectual disabilities were significantly less likely to engage in any PA. Additionally, not having a mental illness (OR = 2.96, p < .002), being in the least deprived (OR = 2.52, p = .049) and third least deprived (OR = 2.39, p = .020) SIMD quintiles significantly increased odds of engaging in any PA compared to the reference category of most deprived SIMD. Participants without problem behaviours were significantly less likely to participate in any PA (OR = .56, p = .046).

Table 4.4 Final model of predictors of physical activity in men

	B	SE B	Wald X^2	P - value	OR	95% CI OR
Age						
16 – 44 years (1) vs > 45 years (0; ref)	.44	.26	2.86	.091	1.55	[.93, 2.59]
Intellectual Disabilities Level						
Mild (0; ref)			13.72	.003**		
Profound (1)	-1.29	.42	9.25	.002**	.28	[.12, .63]
Severe (2)	-1.01	.40	6.35	.012**	.36	[.17, .80]
Moderate (3)	-.12	.31	.16	.693	.89	[.48, 1.62]
Presence of obesity						
Yes (0; ref), No (1)	-.34	.28	1.50	.221	.71	[.41, 1.23]
Social index of multiple deprivation						
1 = least deprived (1)	.92	.47	3.88	.049**	2.52	[1.01, 6.32]
2 (2)	-.18	.48	.14	.714	.84	[.33, 2.14]
3 (3)	.87	.38	5.39	.020**	2.39	[1.15, 5.00]
4 (4)	.30	.33	.84	.360	1.35	[.71, 2.55]
5 = most deprived (0; ref)			8.72	.068		
Mental Illness						
Yes (0; ref) vs No (1)	1.09	.36	9.36	.002**	2.96	[1.48, 5.94]
Problem Behaviour						
Yes (0; ref)/No (1)	-.59	.29	3.97	.046**	.56	[.31, .99]
Constant	-1.53	.47	10.47	.001**	.22	

*Notes: ref = reference category; p < .05**; p < .001***;* R^2 *= .09 (Cox & Snell* R^2*); .14 (Nagellerke* R^2*); Hosmer and Lemeshow Test indicates a good overall fit (p = .95); overall percentage correct = 77.5%*

4.4.4 Gender specific correlates of high screen time

4.4.4.1 Correlates for women

Initial bivariate analyses found that age (Wald = 2.02, df = 1, *p* < .25), intellectual disabilities level (Wald = 29.22, df = 3, *p* < .001), obesity (Wald = 2.82, df = 1, *p* < .25), presence of physical health problem (Wald = 1.73, df = 1, *p* <. 025) and problem behaviours (Wald = 4.49, df = 1, *p* < .05) met criterion for initial inclusion in the multivariate model.

Following purposeful selection, the final model (Table 4.5) included intellectual disabilities level as a correlate of engaging in over four hours of screen time (high screen time). At standard significance levels, there was a significant overall effect of intellectual disabilities level as indicated by the reference category of mild intellectual disabilities (*p* < .001). Women with profound intellectual disabilities were less likely to engage in high screen time compared to the reference group of mild intellectual disabilities (OR = .14, *p* < .001).

Table 4.5 Final model of correlates of high screen time in women

	B	SE B	Wald X^2	P - value	OR	95% CI OR
Intellectual Disabilities Level						
Mild (ref)			29.22	.000***		
Profound (1)	-2.00	.39	26.36	.000***	.14	[.06, .29]
Severe (2)	-.62	.33	3.49	.062	.54	[.28, 1.03]
Moderate (3)	-.06	.29	.05	.819	.94	[.54, 1.64]
Constant	.35	.18	3.80	.051	1 .42	

*Notes: ref = reference category; p < .05**; p < .001***; Significant fit of model: $X^2(3) = 36.98$, $p < .001$; $R^2 = .11$ (Cox and Snell); .14 (Nagelkerke)*

4.4.4.2 Correlates for men

Table 4.6 Final model of predictors of high screen time in men

	B	SE B	Wald X^2	P - value	OR	95% CI OR
Intellectual Disability Level						
Mild (ref)			32.19	.000***		
Profound (1)	-1.65	.31	28.18	.000***	.19	[.11, .35]
Severe (2)	-1.07	.30	12.59	.000***	.34	[.19, .62]
Moderate (3)	-.48	.27	3.09	.079	.62	[.36, 1.06]
Presence of obesity						
Yes (ref), No (1)	-.50	.25	4.12	.042**	.61	[.37, .98]
Constant	1.20	.27	20.36	.000***	3.31	

*Notes: ref = reference category; p < .05**; p < .001***;* R^2 *= .10 (Cox & Snell);* R^2*=.14 (Nagelkerke); Hosmer and Lemeshow Test indicates a good overall fit (p = .744); overall percentage correct = 63.4%*

Bivariate analyses identified level of intellectual disabilities (Wald = 35.56, df = 3, *p* < .001), presence of obesity (Wald = 8.04, df = 1, *p* < .05), presence of problem behaviours (Wald = 5.67, df = 1, *p* < .05), accommodation type (Wald = 10.98, df = 3, *p* < .05) and SIMD (Wald = 5.65, df = 4, *p* < .25) as eligible for the initial multivariate model.

Following purposeful selection, level of intellectual disabilities and obesity were retained in the final model (Table 4.6). Having profound (OR = .19, *p* < .001) and severe (OR = .34, *p* < .001) intellectual disabilities resulted in reduced likelihood of engaging in over four hours screen time. Additionally, presence of obesity resulted in increased likelihood of engaging in over fours screen time (OR = .61, *p* < .05).

4.5 Discussion

This is the first study to explore gender-specific correlates of PA and SB in adults with intellectual disabilities using a large population-based sample.

Past PA and SB literature has a propensity to group the results of men and women together (Chapter 2), inhibiting investigation into the role of gender. In the general population, gender has been widely researched in the context of PA and SB. It is therefore interesting that in this study gender differences in correlates were observed for both PA and SB. However, there were no clear gender differences reported in PA and SB levels, with PA participation being unhealthily low for both men and women.

4.5.1 Gender specific correlates of PA

Clear differences were observed in the variables retained for PA, with one variable included in the multivariate model for women, compared to six for men. For women, the model suggests that presence of Down syndrome is the central influence for increasing PA. However, it is important to note that only 13.3% of women had Down syndrome in this study. Therefore, a more focused exploration of the impact of gender on the PA of adults with Down syndrome would be beneficial. The lack of variables retained in the multivariate model for women, suggests that the influence on PA may not have been captured by the demographic and health related variables included in this study.

At an intrapersonal level, problem behaviour was associated with increased PA levels in men only. This contrasts with past gender-aggregated literature where challenging behaviour was reported as a barrier (Bossink et al., 2017). Additionally, support workers have indicated reduced capability for supporting PA in people with intellectual disabilities that engage in challenging behaviour (Bossink et al., 2019). Research has also indicated that there are no clear gender differences in challenging behaviours in people with intellectual disabilities (Bowring et al., 2016). However, testosterone in men is associated with more aggressive behaviour (Batrinos, 2012), and the problem behaviours included in this study were linked to aggressive, destructive, and challenging behaviours. Research suggested that exercise interventions can be used to target aggression and problem behaviours in people with intellectual disabilities (Ogg-Groenendaal et al., 2014). It is therefore possible that the increased PA in men with problem behaviours is linked to greater promotion of PA to reduce aggressive problem behaviours.

At a broader environmental level, men living in the least and third least deprived SIMD quintiles had increased PA compared to the most deprived areas. In Scotland, more deprived SIMD quintiles have less access to private PA facilities (Lamb et al., 2010). This is concerning as closer proximity to private PA facilities is associated with greater PA frequency (MacDonald, 2019). For adults with intellectual disabilities, limited financial resources has been identified as a consistent barrier to PA (Bossink et al., 2017). Caregivers promoting PA refer to such resources as influencing opportunity to support PA in people with intellectual disabilities (Bossink et al., 2019). Men with intellectual disabilities in this sample may therefore experience greater support and encouragement to be active, resulting in SIMD and subsequent access to resources, being a gender-specific correlate. This concept of gendered support has been reported in qualitative research, as men and boys with intellectual disabilities are supported to do “male things” such as sports (Wilson et al., 2011). This suggests a need to explore wider social factors that may contribute to gender differences in PA.

Wider sociocultural factors may also explain why more severe intellectual disabilities were associated with significantly reduced PA in men only. Research has indicated that support workers perceive more barriers to PA for those with severe intellectual disabilities, such as less understanding of available options and difficulties with travel and access (Hawkins & Look, 2006). Individuals with more severe intellectual disabilities also have less social contact (Kamstra et al., 2014). Combined with the social norms relating to gender appropriate activities (Heise et al., 2019), this may result in men with less severe intellectual disabilities receiving greater support for PA. Subsequently, level of intellectual disabilities may exert a greater influence over PA levels in men. As this was retained as a variable for men only, it suggests that wider inter- and intrapersonal constructs may exert an effect on the gender differences in PA. Therefore, it is essential that this is further investigated in future research.

4.5.2 Gender specific correlates of SB

Compared to the correlates for PA, fewer variables were retained for SB. Reflecting the lack of consistent gender differences reported for SB in this population (Chapter 2), the correlates retained were similar for both men and women. For both genders, people with profound intellectual disabilities engaged in less screen time compared to individuals with mild intellectual disabilities. The direction of this association has been reported in past literature, with screen time as a proxy measure for SB thought to have reduced validity (Oppewal et al., 2018). This was related to more severe intellectual disabilities having complex impairments that reduced likelihood of television viewing (Oppewall et al., 2018). Level of intellectual disabilities was the only variable retained for women; however, for men, the regression model also included presence of obesity. For men, this could indicate that SB is an important lifestyle behaviour to target obesity.

4.5.3 Gender differences in PA and SB levels

Reflecting past literature, no gender differences were reported for SB (Chapter 2). There were also no significant gender differences in engagement in PA in 15-minute bouts, however men were significantly more likely to meet the PAG of 150 minutes/week MVPA. Nevertheless, meeting the PAG was very low in both men and women, emphasising a need to target inactivity in both genders. This suggests that although there are differences in the correlates that influence PA of men and women, it is equally important to target inactivity in both genders as all adults with intellectual disabilities are insufficiently active.

4.5.4 Strengths and limitations

This study was the first to explore the role of gender in PA and SB of adults with intellectual disabilities and identify gender specific correlates, using a large representative sample. This large sample of adults with intellectual disabilities was deemed representative of the geographical area (Greater Glasgow). This is a core strength as past literature exploring gender differences in PA and SB of adults with intellectual disabilities has often recruited small and unrepresentative samples (Chapter 2).

Issues may be present within the PA data, as residual statistics had multiple leverage values and showed influential standardised residuals. Meeting the PAG was also based on calculated weekly minutes of MVPA, using self/proxy-reported minutes of MVPA. This was only recorded for participants who responded “Yes” to engaging in any PA in 15-minute bouts. However, participation in 15-minute bouts of daily exercise has been identified as reducing all-cause mortality by 14% (Wen et al., 2011). Recent research also indicates that sporadic and MVPA bouts as low as 5 minutes reduce all-cause mortality risk (Saint-Maurice et al, 2018). It is therefore necessary for research to be conducted using more sensitive measurements when assessing gender differences, such as objectively measured MVPA and sedentary time.

Limitations in the SB data derive from the assessment of the outcome, as screen time was used as a proxy measure making it difficult to generalise these findings. The correlates included were also restricted to the data collected by the C21st Health Check data set. This resulted in potential psychosocial and environmental factors that contribute to gender differences in the general population being neglected.

4.5.5 Recommendations for future studies

Future research should aim to add to the evidence base generated in this study, and the study reported in Chapter 3, by further investigating gender differences in PA and SB levels and correlates. Research would benefit from appraising gender differences in the types of PA or SB engaged in. It was out with the scope of this current study to explore the interaction between gender and social support, which is one of the core influences of adults with intellectual disabilities. Future research should therefore consider whether gender differences occur in social support for PA, SB and the types of activities promoted.

4.6 Conclusion

This study was the first to examine gender-specific correlates of PA and SB in adults with intellectual disabilities and investigate levels of PA and SB in a population-based UK sample. The sample size was large and representative of Greater Glasgow increasing the generalisability of the results. Gender differences were reported in correlates of PA, with substantially more variables retained for men. For SB, there were no clear gender-specific correlates reported, reflecting the lack of gender differences in previous literature. When exploring gender differences, men were significantly more likely to meet the PAG. However, meeting the PAG was low for both men and women, emphasising a need to target PA in all adults with intellectual disabilities. The results indicate the role of gender needs to be explored in this population to fully understand and target inactivity and high SB in all adults with intellectual disabilities.

Chapter Five. Social support for physical activity, the types of activities promoted, and the presence of gender differences among adults with intellectual disabilities: Research impacted by the COVID-19 pandemic

5.1 Overview of this chapter

The previous chapters have quantified gender differences in PA and SB and explored potential gender-specific correlates. However, none of these studies have considered gender differences in social support, with social support for PA and SB an integral influence on participation rates (Chapter 1 section 1.4.7.2). The following chapter presents two studies that were impacted by the COVID-19 pandemic. Both were developed to broadly explore social support for PA, and the types of leisure activities promoted.

Within this chapter, study one was the feasibility stage of a cancelled study. This study aimed to explore gender differences in the social support networks of adults with intellectual disabilities in the context of PA and SB, identify the leisure activities promoted, and perceptions of social support. The study was designed to be conducted face-to-face, in a safe location, such as a participant's home. Therefore, due to the COVID-19 pandemic, the study was halted. It became evident that the study would not be resumed during this PhD, so amendments were made to allow for remote working (study two). However, the trajectory of infections was uncertain, and priorities of groups and organisations was with the health and wellbeing of people with intellectual disabilities, and not with facilitating recruitment.

5.2 Introduction

Social support is an essential part of PA participation among adults with intellectual disabilities, and caregivers' influence on engagement in SB (Chapter 1, section 1.4.7.2). Social support includes emotional support through provision of empathy, love, and trust; instrumental support through tangible support, such as financial aid; informational support; and appraisal support by giving feedback and information for self-evaluation (House, 1981). Social support also derives from a person's social network (Berkman et al., 2000; Scott & Carrington, 2014).

Social-cultural conditions and the inequalities people experience shape a person's social network (Berkman et al., 2000). An individual's personal social network consists of the social actors, such as other people, an individual knows and is connected to (Crossley et al., 2015). The social connections within a person's social network provide opportunities for social support, including emotional, instrumental, informational, and appraisal support (Berkman et al., 2000).

Social networks contribute to social capital, which relates to access to tangible resources (Bourdieu, 1986). Social capital also describes social structures such as trust, mutual aid, and norms of reciprocity, which is the giving and receiving with others for mutual benefit (Putnam, 1994; Putnam, 2001; Kawachi & Berkman, 2000; Berkman et al., 2000). As social capital relates to access to resources, social capital is a source of social support (Song et al., 2016).

Social support is one of the ways a social network can impact pathways to health, including behavioural pathways such as PA (Berkman et al., 2000). This was outlined in a widely cited conceptual model of the impact that social networks have on health (Berkman et al., 2000). A person's social network also influences behavioural pathways to health through social influences via social norms relating to a behaviour (Berkman et al., 2000). Social networks also impact behaviours through social engagement, such as seeing friends and family, and through accessing resources (Berkman et al., 2000). This makes social networks one of the key social contributors to a person's lifestyle. Social networks should therefore be considered when addressing social support for PA and considering whether network members promote PA or SB.

In the general population receiving social support is consistently reported as being positively associated with PA (Bauman et al., 2012; Trost et al., 2002). In addition to this, social support was identified as a social-cultural environmental influence of SB (Owen et al., 2011). Increased PA has been associated with social networks, specifically having more active network members (Motteli & Dohle, 2017), and having diverse social networks with greater access to resources and social support for PA (Legh-Jones & Moore, 2012). Small and homogenous social networks have also been linked to reduced social capital (Borgatti et al., 1998). This subsequently reduced access to tangible resources, and access to social support, which may be necessary for participating in PA over SB.

It has been consistently reported that adults with intellectual disabilities have small and restricted social networks, consisting primarily of family members, paid support staff and other people with intellectual disabilities (Harrison et al., 2021). In the general population, an adult’s social network typically consists of over 100 people (Hill & Dunbar, 2003). However, the social networks of people with intellectual disabilities range between 0 to 42 people (Harrison et al., 2021). Individuals with intellectual disabilities who have small social networks potentially have reduced opportunities and access to resources (Roll & Koehly, 2020). This may have implications for the opportunities, tangible resources, and social support to increase PA and reduce SB. This is especially important given social support is important to participation in these lifestyle behaviours (Chapter 1, section 1.4.7.2).

Adults with intellectual disabilities are reported to have low levels of PA and high levels of SB (Dairo et al., 2016; Melville et al., 2017). Potential gender differences have also been reported, with women engaging in less PA than men, however more research is required for both lifestyle behaviours (Chapter 2). A lack of research has considered gender differences in social influences of these health behaviours for adults with intellectual disabilities. Therefore, this is a substantial gap in the literature that needs to be addressed.

Studies have identified that caregivers of people with intellectual disabilities are thought to facilitate gender norms (Wilson et al., 2011). Ideas of gender appropriate caregiving tasks, and PA, such as swimming and football, are promoted more by male caregivers (Wilson et al., 2011). Reflecting this, men with intellectual disabilities engage in more sports than women (Draheim et al., 2002). The gender differences in the types of activities engaged in reflects the gender norms around suitable behaviours, which has been widely reported as influencing participation rates in PA, such as sport (Chalabaev et al., 2013).

There may be potential gender differences in social support for PA, and the types of leisure activities promoted by network members, with caregivers supporting more PA for men, and SB for women. However, people with intellectual disabilities may be seen as gender neutral (Umb-Carlsson & Sonnader, 2006). Therefore, the impact of gender on social support for PA, and differences in the types of leisure activities promoted, may not be as pronounced. Additionally, intellectual disabilities research tends to focus on a person's disability and be "gender blind" (O'Shea & Frawley, 2020; Dusselijee et al., 2012). It is essential to address this, by providing an understanding of gender difference in the types of activities engaged in and supported. Doing so will help broaden understanding of the influence of gender on PA and SB of adults with intellectual disabilities. The studies described in this chapter were developed to address the paucity of literature surrounding this area, with studies focused on exploring gender differences in social support for PA, and the types of leisure activities promoted.

5.3 Study One: Exploratory study investigating the social support networks of adults with intellectual disabilities in the context of PA, while considering the influence of gender

Social support is integral to the participation in PA of adults with intellectual disabilities; however, SB is often promoted instead, resulting in engagement in low PA and high SB (Chapter 1, section 1.4.7.2). It is unknown if there are gender differences in perceived social support for PA, the sources of support for PA, and whether PA or SB leisure activities are promoted for men and women with intellectual disabilities. To understand sources of social support for PA, and how PA or SB is promoted it is necessary to consider a person's social network. Social support should be explored using support related network methods (Scott & Carrington, 2016; Song et al., 2016), such as methods looking at important social support relationships (Antonucci, 1986).

Study one was the first stage of a proposed project that aimed to assess gender differences in the types of activities engaged in, sources of social support and perceptions of social support for PA. This study had a primary focus on social support for PA and to determine if there were gender differences in the support received. However, the study also considered the lifestyle activities engaged in and aimed to determine if SB and PA were promoted.

This study aimed to assess the feasibility of social support network methods to identify sources of social support as described by adults with intellectual disabilities, and the types of leisure activities promoted by members of their social support networks, and if these were PA or SB. The study was also conducted to pilot the data analysis methods for assessing gender differences in social support network methods in the context of promotion of PA or SB, and perceptions of social support for PA. Specifically, this feasibility study assessed:

1. Is it feasible to recruit the proposed sample of adults with mild intellectual disabilities, with an even mix of men and women to assess gender differences?
2. Is the length of time required to conduct the study procedures feasible?
3. Are social support network methods suitable, in the context of the types of leisure activities promoted and their intensity, to determine if network members support PA?

4. Are the data-analyses appropriate for a quantitative analysis of gender differences in the social support network features in the context of support for PA, and for qualitative analysis of themes relating to perceived social support for PA for men and women with intellectual disabilities?

5.3.1 Methods

5.3.1.1 Ethical approval

The University of Glasgow Medical Veterinary and Life Science Ethics Committee provided ethical approval for this study on October 12th, 2019 (Appendix 5).

5.3.1.2 Design

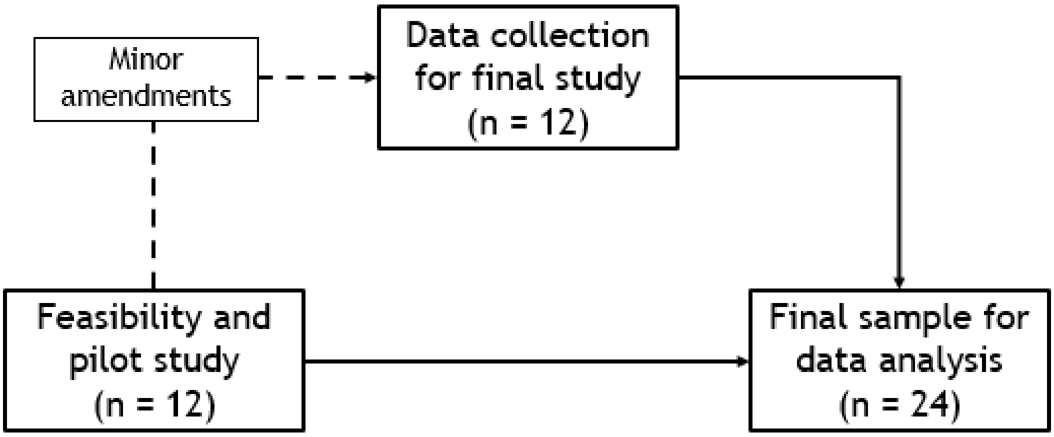
Feasibility and pilot study as part of a wider planned project assessing the social support networks in the context of support for PA and SB in adults with mild intellectual disabilities, and perceptions of social support received. A mixed-methods approach was planned as it can improve interpretation of the social network data (Edwards, 2010), and to allow for perceptions of social support to be appraised. However, due to the COVID-19 pandemic this study was halted prematurely.

5.3.1.3 Sampling

This study aimed to recruit a purposive sample of n = 12 (n = 6 men/n = 6 women) adults (>18 years) with mild intellectual disabilities living within the Greater Glasgow area. An even split of men and women were sought to allow for gender differences to be assessed. A sample of n = 12 were sought as it is considered sufficient for the saturation of themes (Guest et al., 2006). Adults with mild intellectual disabilities were included as the study covered abstract concepts, such as relative closeness of network members to the participants and retrospective activities engaged in. Past research has suggested difficulties employing social network methods with people with moderate or more severe levels of intellectual disabilities (Giesbers et al., 2019).

If the methods assessed in this study were deemed feasible and only required minor changes, the sample for this study would be part of a full-scale study with a sample of n = 24 (n = 12 men/n = 12 women). The data would be combined with data collected for the final study when conducting the main data analysis (Figure 5.1).

Figure 5.1 Proposed stages of sampling for the feasibility and full-scale study



5.3.1.4 Recruitment

A four-month recruitment and data collection period were proposed to assess feasibility (January to end of April 2020). Gatekeepers were to be contacted at relevant Scottish organisations developed for people with intellectual disabilities, such as The Advisory Group and Enable Scotland, along with social groups and clubs that work with people with intellectual disabilities. The organisations were responsible for initiating contact between the researcher and potential participants. Information packs were given directly to potential participants or indirectly through gatekeepers. These packs included information sheets (Appendix 6 – standard information sheet; Appendix 7 – accessible easy read format; Appendix 8 – support person information sheet) and reply-sheets (Appendix 9) with a stamped and addressed envelope to be sent to the researcher's University office. Potential participants could register interest in taking part by returning reply-sheets, or by asking the gatekeeper to contact the researcher on their behalf. Once a person registered interest in taking part, a date and location for the interview was established. This was in a safe location that the participant identified, such as their home.

On the day of taking part, the researcher provided opportunities for the participant and the support person (if present) to ask any questions. The researcher went through the information sheet and privacy notices with the participant, with accessible easy read formats provided (Appendix 10 – easy read; Appendix 11 – standard format; Appendix 12- version for a support person). Opportunities were provided to ask further questions. The researcher ensured the participant understood the information by asking them to describe the study in their own words. After this, the participant (and support if taking part) completed the consent forms (Appendix 13 – easy read; Appendix 14 – standard format; Appendix 15 – version for support person). All participants with intellectual disabilities requested easy read versions of materials.

5.3.1.5 Measures and procedures

5.3.1.5.1 Measuring intellectual disabilities

Gatekeepers identified all participants with mild intellectual disabilities. For descriptive purposes, the Wechsler Abbreviated Scale of Intelligence (WASI) was implemented to get an additional measure of cognitive ability. The short form, Full-Scale IQ-2 Subtests (FSIQ-2) was employed consisting of the Vocabulary and Matrix Reasoning subtests, taking 15 minutes (Wechsler, 1999). The FSIQ-2 provides an indication of full-scale intelligence and a general summary of cognitive ability making it appropriate when there is limited time available (Wechsler, 1999).

5.3.1.5.2 Demographic information

A demographic questionnaire was verbally administered next. Self-reported gender, ethnicity and accommodation type were recorded (Appendix 16). Age was calculated from the date of birth of the participant. Socioeconomic status was established based on the participants' postcode using the Scottish Index of Multiple Deprivation (SIMD; Scottish Government, 2020). The SIMD ranks areas from 1, most deprived, to 5, indicating least deprived, based on data relating to health, housing, level of employment, education levels, serivce access and crime rates in a postal code area.

5.3.1.5.3 Semi-structured interview

The semi-structured interview schedule covered triangulation of methods, collecting data on the social support networks, the types of leisure activities engaged in and general perceptions of social support (Appendix 17). The interviews were conducted face-to-face in a safe location of the participants' choosing, with the option of an adult the prospected participant trusted being present. All the interviews were conducted by a PhD student, identifying as a woman, in her mid-twenties. The PhD student had prior experience of conducting interviews, but no previous experience of interviewing adults with intellectual disabilities. However, the PhD supervisors had substantial experience working with people with intellectual disabilities and were able to provide support and guidance. Questions were not framed around gender to avoid potentially biasing the responses, instead the influence of gender would be explored when analysing the data. The PhD student researcher had no prior relationship or contact with any of the participants or gatekeepers.

5.3.1.5.3.1 Social support network

The qualitative hierarchical mapping technique of concentric circles was used as it allows participants to develop a social support network of individuals that participants identify as most important to them (Antonucci, 1986). Concentric circle methodology has been used previously to gather social network data for people with intellectual disabilities (Lippold & Burns, 2009; Lunsky & Neely, 2002; Jahoda & Pownall, 2013; Roll & Koehly, 2020). This method was used to identify network members most important to the participant by allocating them to a corresponding ring of three concentric circles of closeness printed on white A3 paper (Figure 5.2). Network members were placed on the concentric circles using sticky notes so that participants could change their mind about the positioning.

Figure 5.2 The concentric circles used to collect data.

Note: Developed as an example; numbers were not present on the diagram presented to participants; 1 – closest to the participant; 2 – middle "closeness"; 3 – least close to the participant

The centre of the three concentric circles represented the participant, with the concentric rings representing closeness to the participant. This resulted in a participant aided visual representation of a social network being produced, called a sociogram (Hogan & Wellman, 2007). Following the hierarchical mapping technique, interview questions gathered data relating to the social support network structure (Appendix 18). At each stage, the gender, approximate age (e.g., older adult), and relationship to the participant (e.g., friend) were recorded for each network member. Where multiple people with same relationship were described, they were retrospectively numbered by order reported in the transcript (e.g., Friend, 1). To establish connections between network members, participants were asked whether network members knew each other. This method was piloted with the PhD student researcher’s primary supervisor before administering it with participants.

5.3.1.5.3.2 The leisure activities supported

Participants were asked about the activities they enjoy, and what activities they have done recently. For any leisure activities identified, participants were asked who they did them with to determine if PA or SB were promoted by social support network members. Activities were not framed as healthy vs. unhealthy, or as SB vs. PA, to limit bias.

5.3.1.5.3.3 Social support for physical activity

Questions were included to establish perceived social support for PA (Appendix 16). The social support for activity for persons with intellectual disabilities (SS-AID) family scale (Peterson et al., 2009) was used as a guide as the questions have been developed for people with intellectual disabilities. The questions were altered from “*Does anyone in your family…*” to “Do any of the *people important to you…*” to collect data on emotional, instrumental, information or appraisal social support for PA. Although these were closed-ended questions, the interview was in a semi-structured format. Follow-up open-ended questions and detail-oriented, elaborative probes were used to elicit qualitative data on a participant’s perceptions of social support.

5.3.1.5.4 Visual aids

Visual aids have been found useful when conducting social network analyses and interviews with adults with intellectual disabilities (Beail & Williams, 2014; Giesbers et al., 2019). Visual aids were identified for social support network related content (Appendix 19). These visual aids have been designed specifically for people with intellectual disabilities by the National Health Service (NHS) based on the “Easy on the I” service. “Easy on the I” provides infographics and visual aids designed for people with intellectual disabilities. Additional royalty free images that clearly displayed an activity were included. These were supported with text such as "We go for a walk" (Appendix 20). These images were only used to provide examples of the activities described.

5.3.1.5.5 Additional equipment and software

A Dictaphone (Olympus Digital Voice Recorder: VN-731PC) was used to audio record the interview. A camera was used to take a photograph of the sociogram to protect the data from damage, the photograph of the sociogram was deleted upon creation of a digital pseudonymised sociogram.

5.3.1.6 Procedure

After formal consent procedures, the researcher conducted the WASI FSIQ-2, followed by gathering demographic data. The semi-structured interview and concentric circles methodology was administered, and the audio of the interview was recorded. After data collection, the data were stored appropriately and securely to follow the University of Glasgow data protection regulations. The WASI FSIQ-2 was scored by the researcher after returning to the University office. The audio was transcribed verbatim and checked for accuracy by listening to the audio while reading the transcripts. Any names were omitted from these transcripts, and pseudonyms (e.g., Friend 1) were used to preserve confidentiality. Digital pseudonymised versions of the sociograms were developed using VennMaker with no identifiable information present. Connections between network members were completed retrospectively using VennMaker and the interview transcripts. VennMaker is a free software previously used in research to develop computer generated sociograms (Jasperson & Stein, 2019).

The types of leisure activities promoted by network members were identified from the participant transcripts. The intensity of the activities was then coded using the compendium of PA, to determine if network members support PA or if SB is primarily promoted. The compendium of PA is a coding scheme of 605 activities and their metabolic equivalent of tasks (METs; Ainsworth et al., 2000; Ainsworth et al., 2011). This was used to guide the researcher when classifying leisure activities as SB (≤ 1.5 METs; e.g. “sitting quietly watching television = 1.0 METs; Ainsworth et al., 2000) or PA (> 1.5 METs; e.g. “bicycling, general” = 8.0 METs; Ainsworth et al., 2000). This was to reduce the possibility of researcher bias when classifying the activities described by the participant. Quantitative numerical data were entered into an SPSS file (e.g., number of network members), along with other relevant data, such as WASI scores and demographic information.

5.3.1.7 Data analysis: Feasibility of recruitment and methods

A threshold of four months was used to assess the feasibility of recruitment. To be feasible, n = 10 (n = 5 women) of the target sample were to be recruited over this time (approximately 80%). Descriptive data on the number of information packs administered, the number of interviews scheduled, and the number of interviews conducted, was used to determine if the method of recruitment was feasible. If participants withdrew from the study, any reasons given were recorded to inform the appraisals of retention. Data on recruitment and retention would be used to determine if amendments would either be required to the recruitment strategy, or the length of time required to recruit participants for the full-scale study.

Using the audio recordings, the time (minutes) taken to conduct the social support network method and the total interview time were recorded for each participant. Descriptive statistics were calculated to identify the average length of time taken and the range of time. Using observations made by the researcher and data in the interview transcripts, factors that contributed to the length of the interview were noted, with transcript quotations used to support any points made.

To be considered feasible, approximately 80% (n = 10) of the participants had to complete the methodology. Additional observations made by the researcher during the data collection process, data from the transcriptions of the interviews and the developed sociograms were used to appraise the feasibility of the proposed methods for use with adults with mild intellectual disabilities. The feasibility appraisal related to the ability to administer the social support network methods, and to identify the types of activities engaged in, identify if these activities were supported by network members, and if the leisure activities would be classified as PA or SB.

5.3.1.8 Piloting proposed data-analysis methods

5.3.1.8.1 Quantitative data analysis

Statistical analyses were conducted on IBM SPSS version 26. Descriptive statistics and frequencies were calculated for the quantitative data. Quantitative data related to the demographic information, network features, (e.g., number of network members, number of members in each ring of closeness, number of connected network members, network member gender and age, and relationship to participant i.e., number of friends). Quantitative data also related to the PA and SB promoted, such as number of participants engaging in an activity and number of network members that promote the activity. This was conducted for male and female participants by splitting the data by gender. To assess gender differences, in network features (e.g., number of network members) and number of PA or SB promoted, independent samples t-tests were to be conducted.

5.3.1.8.2 Qualitative data analysis

The transcripts were analysed using thematic analysis (Braun & Clarke, 2006). Transcription of the interviews were conducted by the PhD student researcher and read multiple times to ensure familiarisation. The transcripts were annotated with codes, and relevant codes were grouped together into initial themes. Following further reading of the transcripts, these themes were refined and reviewed. The data driven semantic themes that emerged related to the participants' perceptions of social support, or any factors that may have influenced participation in PA. This was to be conducted across all transcripts, and for transcripts of men and women, to allow for comparisons to be made between genders in the patterns of themes identified. Qualitative data analysis was conducted by one researcher. However, an Excel spreadsheet of themes, sub-themes, codes, and supported quotes were presented to the researcher's primary supervisor to review, to improve trustworthiness of the findings. This resulted in themes being discussed and refined to ensure they accurately reflected the data.

5.3.2 Results

5.3.2.1 COVID-19 Pandemic

On March 23rd, 2020, the UK government enforced a nationwide lockdown due to COVID-19 pandemic. Prior to this date, social distancing procedures were enforced. All data collection stopped on March 13th, 2020, following University regulations.

5.3.2.2 Participants

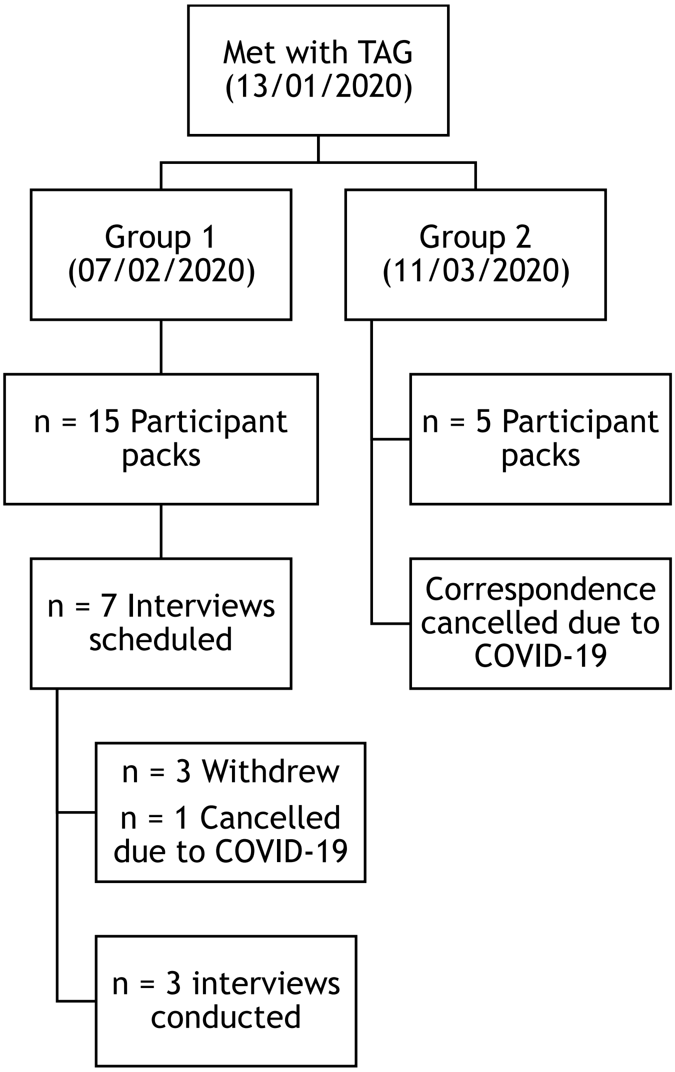
Data were collected from a total of n = 3 (n = 2 males) participants. All participants were from the most deprived areas of Glasgow (SIMD Quintile 1 and 2). One participant lived independently, and two participants lived with family. All participants were over aged 18 years (M = 37.67; SD = 16.07 years) and were White/Caucasian. Participants were identified by gatekeepers as having mild intellectual disabilities, with WASI FSIQ-2 scores ranging from 64 to 78 (M = 70.33; SD = 7.09), indicating mild to borderline intellectual disabilities.

5.3.2.3 Feasibility results

5.3.2.3.1 Recruitment and retention

The recruitment strategy was implemented at the beginning of January 2020, and The Advisory Group (TAG) was the first organisation to respond. A member of TAG was met on 13th January 2020 and offered to forward information to associated groups (Figure 5.3). Two subsidiary groups registered interest in the study through TAG. The researcher met with gatekeepers at the first group on 7th February 2020 to discuss the study and provided a total of fifteen information packs. Through this group, three people registered interest by proxy through a phone call or email from a gatekeeper and four people returned completed reply-sheets.

Figure 5.3 Flow chart of participant information packs and interviews scheduled



Notes: TAG = The Advisory Group; flow-chart displays progress prior to study stopping due to COVID-19

A total of seven interviews were scheduled (n = 5 males/n = 2 = female) and the researcher met with four participants in their homes to conduct the study (n = 3 males/n = 1 = female). All prospective participants requested a support to be present. Of these interviews, three were conducted (n = 2 males/n = 1 female). One participant withdrew just prior to data collection as the idea of the Dictaphone made them uncomfortable and they requested for their words to be written down instead. As this was not possible, the participant decided not to take part. A further two prospective participants (n = 1 male; n = 1 female) were unable to take part due to extenuating circumstances. One interview was cancelled to protect the participant and researcher from COVID-19 infection (n = 1 male).

After initial phone correspondence with the second group contacted through TAG, the organiser requested a digital copy of the easy read information sheet. This was then discussed at a group meeting and based on positive feedback from the group members (10 adults with intellectual disabilities), the researcher was invited to attend the following meeting on 11th March 2020. The researcher described the study and was asked questions by group members. Five group members registered verbal interest in taking part and requested information packs (n = 3 men/n = 2 women). However, it was necessary to halt correspondence with members of this group due to social distancing measures enforced by the government to reduce the spread of COVID-19.

There was also email correspondence with Scottish Disability Sport, however it was decided that recruiting participants through a sports club could potentially introduce bias. One group, Fortune Works (associated with Enable) were contacted and were intending to discuss the study in a staff meeting in March 2020. However, this was cancelled due to the COVID-19 pandemic. Subsequently, it was not possible to make any formal assessments on feasibility or determine if the recruitment strategy was appropriate.

5.3.2.3.2 Duration of proposed methods

The concentric circle social network methodology ranged between 05:47 minutes (Participant 1, Male) to 12:55 minutes (Participant 2, Male). Total interview ranged from 18:39 minutes (Participant 1, Male) to 47:10 minutes (Participant 2, Male; table 5.1). It was observed that the presence of a support contributed to the duration of proposed methods. The support present for Participant 1 did not provide prompts or rephrase any questions. Conversely, the supports present in the interviews of participants 2 and 3 facilitated discussion:

> *"You used to go to the cycling as well down by [Park]" [Participant 2, Support]*

Participant 3 had two supports present, which resulted in discussions between the supports. The visual aids were useful for guiding the conversation back to the interview schedule:

> *"I think we went off subject a wee bit of that, I didn't realise you had those cards." [Participant 3, Support 1]*

Based on limited data, the social support network methodology was feasible, with interview time influenced by the contribution of a support.

Table 5.1 Duration of interviews

	Participant 1	**Participant 2**	**Participant 3**
	Male	**Male**	**Female**
Social network method	05:47 minutes	12:55 minutes	11:56 minutes
Total interview time	18:39 minutes	47:10 minutes	43:59 minutes

5.3.2.3.3 Suitability of the social support network methods

All participants were able to answer the questions relating to their social support networks, which allowed for the development of a sociogram and to identify the basic network features (Diagram 5.1, 5.2 & 5.3; Table 5.2). The social networks of each participant were dense with most network members connected to another, and networks were homogenous, consisting primarily of family members (Table 5.2; Diagrams 5.1, 5.2 & 5.3). Only participant 3, a female, identified people who were "Less important". Interestingly, the two participants with larger social support networks participated in social groups and had a greater proportion of male network members (Diagrams 5.1, 5.2, 5.3).

Diagram 5.1 Participant 1, Male: Sociogram

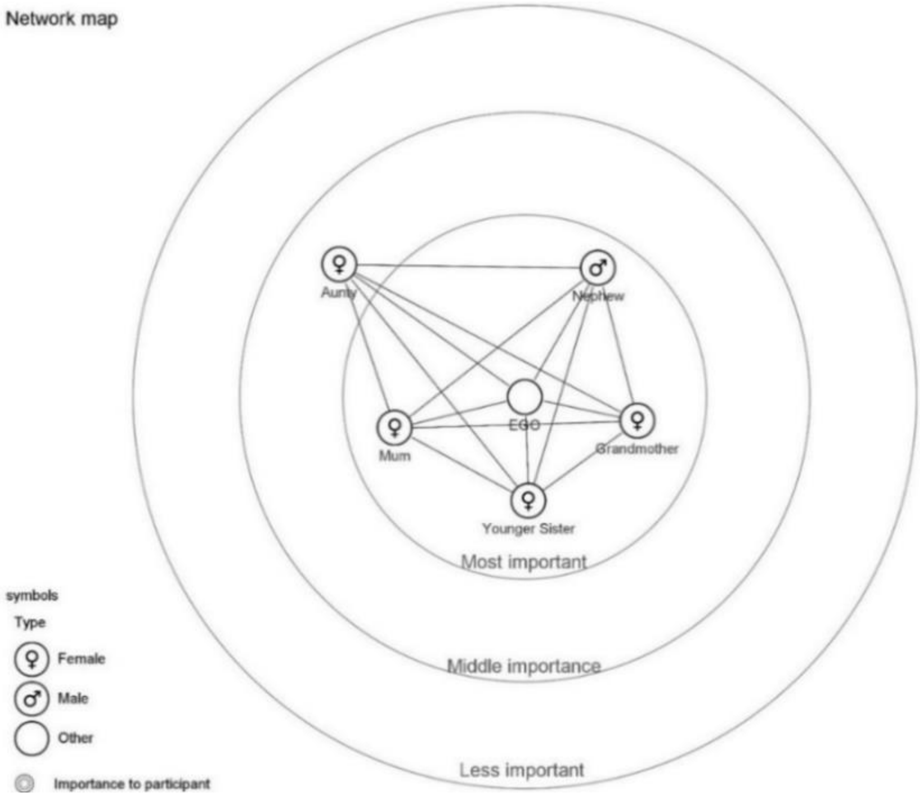


Diagram 5.2 Participant 2, Male: Sociogram

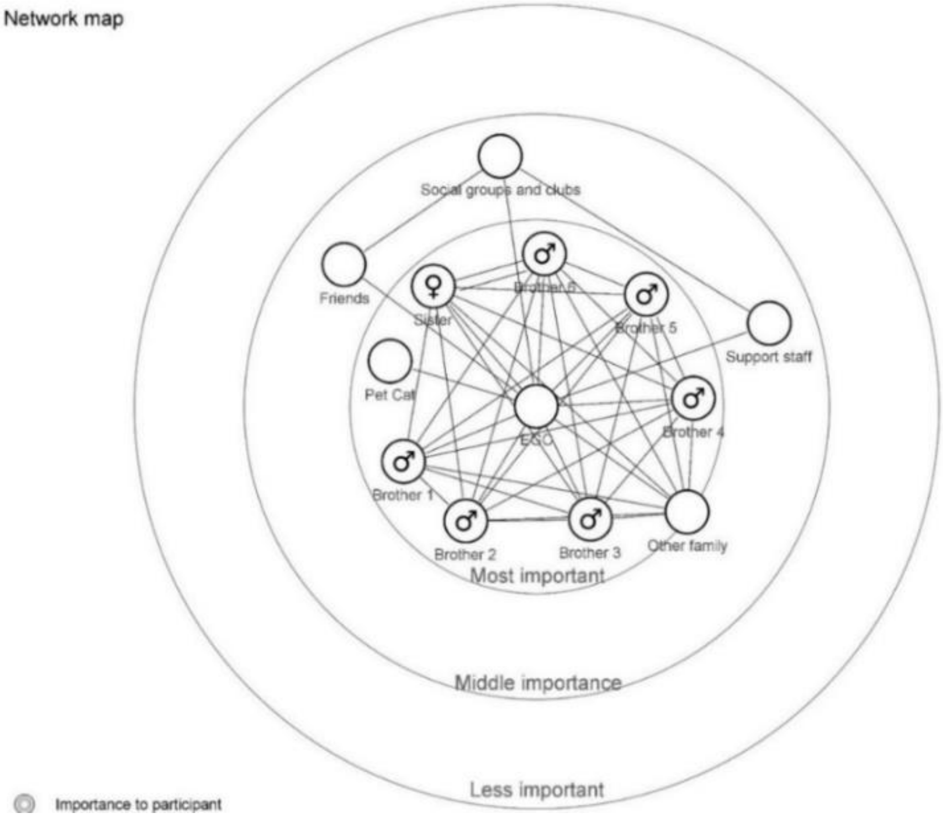


Diagram 5.3 Participant 3, Female: Sociogram

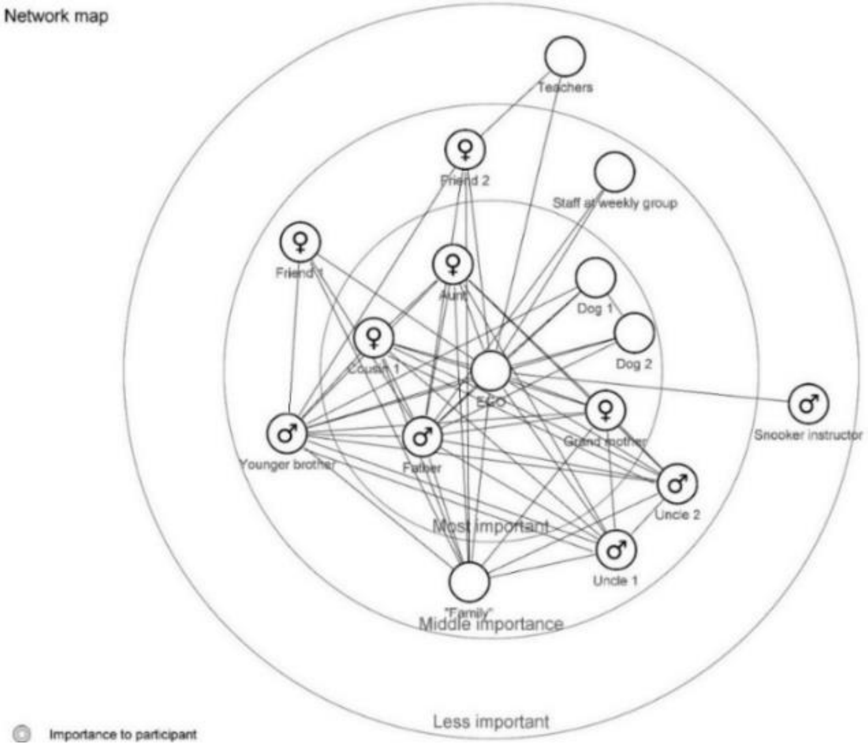


Table 5.2 Social network characteristics

	Participant		
	1	**2**	**3**
	Male	**Male**	**Female**
Network Size	5	[a.] 12	[a.] 15
"Most important"	4	9	6
"Middle importance"	1	3	7
"Less important"	0	0	2
Number of connected network members	5	11	14
Number of female network members	4	1	5
Number of adult network members	4	12	15
Number of family members	5	[a.] 8	[a.] 8
Number of friends	0	[a.] 1	2
[b.] Number of support staff	0	[a.] 2	[a.] 1

Notes: [a.] *contains extra-individual groups of people e.g., "friends";*
[b.] *Includes staff at social groups.*

It was observed that prompts from a support facilitated the social support network development. Supports attending the interview had a knowledge of the participants' support network and were able to prompt the participant:

> *"[Participant 2, Male] receives support from a care provider…would they be people that are important to you?" [Participant 2, Support]*

Participant 1 answered the questions independently without the help from a support and named fewer network members (Table 5.2; Diagram 5.1). Participants also had difficulty recalling specific information, and specific people, resulting in the identification of groups of people:

> *"People I go to clubs wae that I know. I can't remember their names [laughs]" [Participant 2, Male]*

Participants extended the social support network to include pets:

> *"My family's most important to me, so's my cat. He's more important to me as well" [Participant 2, Male].*

The names of network members were written on sticky-notes by the researcher. Participants 1 and 2 instructed the researcher where to place network members:

> *"Most close to me. They're there for me every time" [Participant 2, Male]*

However, Participant 3 independently placed the network members in the rings, and was decisive in placement based on closeness:

> *"We have our moments, but I don't really feel that close to him" [Participant 3, Female]*
>
> *"OK, that's me done that circle" [Participant 3, Female].*

Participants were able to indicate whether other network members knew each other:

> *"[Friend 1, Female] knows most of my, most of my family, so does [Friend 2, Female]" [Participant 3, Female]*

Connections between network members were drawn retrospectively using the interview transcript and VennMaker (Diagrams 5.1, 5.2 & 5.3). Each participant was able to complete the social support networks but were not always able to provide rich detail. Supports with knowledge of the participants lives were able to prompt and guide the participant.

5.3.2.3.4 The activities promoted by the social support network members

Table 5.3 Types of leisure activities engaged in and number of network members the activities were done with

		Participant 1	Participant 2	Participant 3
		Male	Male	Female
Leisure activity	Intensity	Number of network members		
Walking	MPA	0 [a]	1 [a] (r-2)	2 [a] (r-1)
Shopping	LPA	1 (r-1)	2 [a] (r-2)	2 [a] (r-2)
Cycling	MVPA	-	1 [b, c] (r-2)	1 [a, b] (r-2)
Swimming	MVPA	-	-	1 [b] (r-1)
Football	MVPA	-	0 [b, d]	1 [c] (r-2)
Tennis	MVPA	-	1 [b, c] (r-2)	-
Ten Pin Bowling	LPA	-	1 [c] (r-2)	1 [b] (r-1)
Snooker	LPA	-	1 [c] (r-2)	1 [c] (r-3)
Crazy golf	MPA	-	-	1 [b] (r-1)
Basketball	MVPA	0 [b, d]	-	-
Watching TV	SB	4 (r-1) & (r -2)	1 [a] (r-1)	1 (r-1)
Video games	SB	0 [a]	-	1 [c] (r - 2)
Cinema	SB	1 (r - 1)	1 [c] (r - 2)	3 (r - 1) & (r -2)
Going out for food/drink	SB	3 (r-1)	2 [c] (r-2)	1 (r- 2)
Board games	SB	3 (r-1)	-	-

Notes: PA = physical activity; SB = sedentary behaviour; LPA – light intensity PA; MPA = moderate intensity PA; MVPA = moderate to vigorous PA; (r-1) ring 1 - most important network members; (r-2) ring 2 – middle importance network member; (r-3) ring 3 – less important network members.

[a] Activity was reported as being carried out independently.

[b] Activity was reported as being in the past.

[c] Activity supported by social group (included in support network).

[d] Activity was done outside of the support network (e.g., at school)

It was possible to gather data on the types of leisure activities engaged in, identify if these were PA or SB, and determine if they were promoted by social support network members (Table 5.3). For all participants, the SB of watching TV was done with most important network members. Paritcipant 2 & 3 engaged in the most leisure activities, which is also reflected in their larger social networks and attendance at social groups (Diagram 5.2 & 5.3; Table 5.3). Walking was the most common form of PA, with this being conducted with network members and independently (Table 5.3). Many of these activties were described as past behaviours (Table 5.3). Through detail orientated and elaboration probes it was possible to elicit qualitative data relating to opportunities for PA and social support:

> *"…it would be great walking and that with my brothers, and going for a walk with them, no but they're busy, they're working and that kind of thing…" [Participant 2, Male].*

The inclusion of more open ended questions would provide richer data and this should be considered for future research.

5.3.2.4 Piloting the data analysis methods

5.3.2.4.1 Quantitative analysis

It was not possible to calculate gender differences or calculate descriptive statistics or frequencies across participants. Due to the small sample size results are presented for each participant (Table 5.2 & Table 5.3).

5.3.2.4.2 Qualitative analysis: Perceptions of social support

The sample size was too small to assess gender differences in themes, and saturation of themes were not possible. However, preliminary emergent themes across all the participants were recorded (Table 5.4).

Table 5.4 Themes and sub-themes

Themes	Sub-themes
Perceptions of social support from network members	Appraisal support Informational support Instrumental support Barriers to social support
Importance of social groups	Activities at social groups Cost of social groups
The wider social and physical environment	Owning or network member owning a dog Available opportunities for physical activities in local area Weather Negative attitudes of members in the community
Personal influences	Motivation Affective influences Positive perceptions Physical limitations
Past physical activities	"Not been in a while" Played at school Special Olympics when younger

5.3.2.4.2.1 Theme of "General perceptions of social support"

Perceptions of social support related to appraisal support, informational, instrumental support, and perceived barriers to supporting PA. Appraisal support came from feedback from network members to do more activities, and through provision of positive feedback and encouragement:

> *"Em, that I shouldn't em, be stuck in the house watching telly all day. That I should go out and do something fun." [Participant 3, Female]*

> *"I was happy, it was good what he said, and that was good and that what he says "you're doing great [Participant 2]" and that." [Participant 2, Male]*

Informational support came from advice about opportunities to engage in activities or develop the necessary skills to take part, and through being shown how to do specific activities:

> *"You could get lessons." [Participant 2, Support person]*

> *"A bean bag. He shows you, and flings it to you and that kind of thing, and you fling it back to people and that, and that's what he did. He showed me that" [Participant 2, Male]*

Participants also perceived there to be instrumental support, where participants were given tangible aid to participate in PA. This included being driven to facilities, having PA planned by network members, and through necessary equipment being purchased to facilitate engagement in an activity:

> *"…they take me and somebody else to a tennis, before I had my accident and that, he'd take me to a tennis place and that, and there were coaches there to train you and that." [Participant 2, Male]*

> *"Em, well, when I want to visit them, they plan to walk to wherever they are sometimes." [Participant 1, Male]*

> *"Umm, my Nanny buys me my swimming costumes." [Participant 3, Female]*

Barriers to social support were also identified, and this related to the time available to network members to help promote PA, the fear and anxiety network members had regarding supporting certain PA, and the sedentary preferences of network members, as they described watching television all day:

> *"That I like to do, yes but… the honest truth, eh I don't get enough hours to do that as well. They call it hours I get." [Participant 2, Male]*

> *"Yes she was in with me, I had a guy teaching me as well and that, but she, because the guy was doing something else and I was lifting up the weights, said "[Participant 2] don't do that, you're going to hurt yourself doing it."" [Participant 2, Male]*

> *"Yeah, well, we're all guilty of that (sitting in and watching TV all day)" [Participant 3, Support person 2 – relative]*

Overall participants described recieiving social support from network members to participate in PA. However, barriers were observed that were thought to potentially inhibit the faciltiation of PA.

5.3.2.4.2.2 Theme of "The importance of social groups"

Social groups were identified as being necessary for engaging in a variety of activities. Two participants reported social groups within their social networks, and these participants engaged in more diverse activities (Diagram 5.1, 5.2, 5.3; Table 3). One of the participants reported having access to social groups and voluntary groups that supported PA:

> *"Yeah, so [social group] every month send him a list of events that are on throughout the next month and he calls up, and he lets them know the ones he wishes to attend." [Participant 2, Support person]*

> *"You used to go to the cycling as well down by [Park]" [Participant 2, Support] "Yes. Yeah, I used to do that as well. I used to be a volunteer" [Participant 2, Male]*

> *"… the lassie who runs it and that, just let her know if you can take the bike out, and she said "aye" and that" [Participant 2, Male]*

However, attendance at such groups was not guaranteed, as there were financial restrictions reported:

> *"…kind of difficult as most things for people with a learning disability do cost" [Participant 3, Support person 1]*
>
> *"[Participant 3] does not have the budget to go somewhere like that. You know, had it one time but no longer does have" [Participant 3, Support person 1]*

This emphasises that there are infrastructural influences that may prevent effective social support of PA. Although social groups are important for facilitating engagement in activities, these clubs are not always accessible.

5.3.2.4.2.3 Theme of "The wider environment"

The wider physical and social environment directly influenced PA of participants. Participants reported that owning a dog, or having a network member who owned a dog, was both a barrier and facilitator of participation. Needing to walk the dog, for the dog's health benefits, was a facilitator, however having unruly or large dogs was a barrier:

> *"Eh, just me and my dog (on walks)" [Participant 1, Male]*
>
> *"I canny really take them on a big walk 'cause, 'cause of the big collie drags me and drags a wee bit too much and he gives me a sore back, or he, so I take them a block walk or I do try and take them there big, on a big walk, but dad does the big walk." [Participant 3, Female]*

Often, walking for PA was associated with a destination, such as the local shops, and some participants reported the benefits of having local leisure facilities nearby:

> *"had a wee walk myself to the shops" [Participant 3, Female]*

> *“Well we’re fortunate in as much as we’ve got several different decent facilities around about us” [Participant 3, Support person 2, relative]*

It was also observed that closure of local shopping facilities resulted in reduced PA, as participants had to travel further resulting in the use of transportation:

> *“No I don’t go to Tesco anymore, I go to Morrisons. I get a taxi …I changed my shopping because they don’t have a food court anymore.” [Participant 2, Male]*

The most concerning wider social influence was reported by one participant, where discriminatory and prejudiced actions were directed at him by members of the public who held negative attitudes towards people with a disability:

> *“...I was in the gym one time, and I seen someone looking at me and that, I was doing my exercises in there, and they were teasing me and that. It was a long time ago. It doesny matter anymore. It’s been done.” [Participant 2, Male]*

This was described as a one-off incident that happened in the past; however, it does highlight the wider social environment may not be supportive of PA. It is evident that the wider social and physical environment can influence PA of the participants and may contribute to the social support received.

5.3.2.4.2.4 Theme of “Personal influences”

The theme of personal influences related to the intrapersonal factors influencing PA. Participants described variations in their own motivation to be active. Some participants held positive perceptions and were intrinsically motivated to engage in PA, while others described reduced willingness to engage in PA due to “laziness”:

> *“Eh…. I just do… I love walking, and that. That’s all, I love walking. I love to do.” [Participant 2, Male]*
>
> *“Em… too lazy I guess.” [Participant 3, Female]*

The personal influences also extended to affective states. Participants described their mood influencing their decisions to engage in PA:

> *“it depends what kind of mood I am in if I stay out for go for a walk for an hour. Then I go and get the bus back up the road and that. That’s what I do if I am in a good mood. If it’s sort of nice outside I go for a walk” [Participant 2, Male]*

However, participants affective state also related to anxiety or feeling apprehensive outside, which may suggest an interaction between the wider environment and personal influences impacting PA:

> *“cause I don’t always like to go outside and that, so it can be a bit difficult…. ‘cause sometimes I get nervous outside.” [Participant 1, Male]*

Overall, participants held positive perceptions of PA. Participants wanted to be able to participate in sports and to take part:

> *“Yeah, sports. I would like to learn how to do more sports.” [Participant 1, Male]*
>
> *“...I canny swim. I wish I can swim. [laugh] I wish I could.” [Participant 2, Male]*

PA was also associated with perceived social opportunities, as leisure PA provided an opportunity to communicate and interact with family members, potentially providing an opportunity for social connectedness:

> *"…we get to communicate when we are walking." [Participant 1, Male]*

> *"I like hanging about with my wee second cousins and playing with them and chasing them in the pool." [Participant 3, Female]*

PA was also considered to provide an opportunity to be mindful and provide time to reflect:

> *"…sometimes it just gives me some space to think" [Participant 1, Male]*

In addition to these psychosocial factors, the PA participation was also influenced by physical limitations that restricted the PA a person could engage in:

> *"I canny walk that far, 'cause of my hip." [Participant 2, Male]*

> *"I need the special seat, on the cycling because it hurts my thighs." [Participant 3, Female]*

This theme of the "personal influences" when applied to the context of social support for PA emphasises that individual preferences, wants, and abilities are equally as important to consider and may influence receptivity to social support. Nevertheless, all participants held generally positive perceptions about PA, and reported an interest to learn the necessary skills to take part.

5.3.2.4.2.5 Physical activities in the past

One theme that emerged in the data was a description of PA in the past tense, with activities "not been in a while":

> *"I like, em… I like going swimming. But I have not been going swimming for a while."* [Participant 3, Female]

> *"… he hasny done it [tennis] anymore and that."* [Participant 2, Male]

PA was reported as being supported at school; however, all participants were adults and no longer had access to the opportunities provided:

> *"Yeah, I played it with, eh, when I was in primary school and in high school, and we had some Celtic and Rangers players come and visit us, and teach us how to play."* [Participant 3, Female]

> *"Sometimes, eh, in the past my sister would drive me to sports club when I was at school and stuff, she would drive me to there."* [Participant 1, Male]

One participant described being part of the Special Olympics for football; but this was in the past. Continued participation in sports was restricted due to physical limitations, emphasising the need to identify accessible activities, such as walking:

> *"Aye, I used to play football and that. Now I canny do any sports because of my leg and that, I am overweight and that, I canny do nothing, I canny… I can walk. I like walking."* [Participant 2, Male]

Participants described participation in PA and sports, nevertheless these were in the past. Access to school physical education and organisations in youth supported this participation, but these opportunities may not be available once the participant transitioned into adulthood.

5.3.3 Discussion

The feasibility of social support network methods in the context of support for PA for adults with intellectual disabilities was assessed. This was part of a planned wider study to explore gender differences in sources of social support, the types of activities engaged in and perceived social support for PA. Due to the global COVID-19 pandemic it was necessary to halt data collection. As a result, only n = 3 (n = 2 male) participants were recruited out of an intended sample of n = 12 (n = 6 male). It was not possible to meaningfully interpret the results and establish if the methods are viable. However, the initial findings will be discussed, and the implications interpreted with caution.

It was not feasible to recruit the proposed sample size as data collection was halted. One observation was the gender differences in recruitment, with more men than women registering interest in taking part. Past research has indicated similar issues when assessing support for PA (Bossink et al., 2019). This study reported that it was not possible to assess gender difference due to predominantly males with intellectual disabilities being supported by participants (Bossink et al., 2019). This may be reflective of prevalence rates for intellectual disabilities (McKenzie et al., 2016). However, it could also indicate a greater reluctance of women with intellectual disabilities to participate in research. Therefore, to assess gender differences, it may be necessary to develop a recruitment strategy focused more on women.

The observed time to administer the methods was feasible. Past literature has reported a wide range in durations of social network methods with people with intellectual disabilities (15 minutes to 2 hours; Giesbers et al., 2019). Consequently, it is not possible to make any conclusions based on the limited number of participants.

Participants were able to answer questions, but the presence of a support with knowledge of a participant’s social interactions greatly helped data collection. Other research comparing concentric circle social network methods using proxy respondents (caregivers) and adults with intellectual disabilities, found that proxies identified more network members (Roll & Koehly, 2020). This could suggest that caregivers facilitate the network development through additional knowledge of the participants lives.

However, although supports facilitated the methods, prompts can introduce bias and influence the responses given by people with intellectual disabilities (Sigstad & Garrels, 2017).

Participants also had some difficulty identifying specific network members or providing detail on network member characteristics (e.g., age). This has been reported in previous social network research, and it was suggested that rough estimations were appropriate (Giesbers et al., 2019). Participants reported “extra-individual” network members, such as groups of people (e.g., Friends), which reflects the findings of past research (Lunsky & Neely, 2002). However, due to the limited number of participants, it is not possible to generalise these findings.

The data collected highlighted that the networks of all participants were dense with most network members connected to each other. Participants also primarily cited family members as network members, reflecting the social networks generated for people with intellectual disabilities in the extant literature (Harrison et al., 2021). These restricted social networks may limit the access to resources afforded to people with intellectual disabilities (Roll & Koell, 2020). As a result, this impacts opportunities for social capital and social support in general (Berkman, 2000; Borgatti et al., 1998; Crossley et al., 2016), and for PA (Legh-Jones & Moore, 2012).

Attendance at social groups was associated with increased activities and larger social networks. These social groups were not accessible to everyone due to financial restrictions, with participants living in the most deprived areas of Greater Glasgow. Literature has identified financial restrictions as a barrier to PA (Bossink et al., 2017) and as an influence on a person’s social networks (Berkman et al., 2000). It is therefore necessary for researchers and policy makers to consider ways to improve the accessibility of clubs and groups to promote health and wellbeing.

Although walking as PA was cited by all participants and described as an accessible activity, some adults with intellectual disabilities may still require support to engage in walking and deciding routes (Mitchell et al., 2015). Most of the remaining PA was in the past, such as at school. Physical education has been reported by adolescents with intellectual disabilities as a main source of PA (Stevens et al., 2018). During the transition into adulthood, there may be less accessible options for PA and a lack of support for health promotion after leaving school (Young-Southward et al., 2017). This highlights a need to integrate accessible options for PA within the wider community to promote healthy lifestyles of adults with intellectual disabilities.

The qualitative data indicated that participants held positive perceptions of PA, were generally motivated to participate in PA, and reported social support for PA. Although there were a broad range of individual and environmental influences of PA, the most concerning finding was the discrimination experienced by one participant because of his intellectual disabilities. Only one participant reported being made fun of in public while using gym facilities. Nevertheless, this reflects the wider literature where people with intellectual disabilities have experienced negative treatment (Ali et al., 2012).

A lack of community support and acceptance or awareness of intellectual disabilities has been identified as a barrier to PA among people with intellectual disabilities (Bossink et al., 2017). Additionally, parents of children with intellectual disabilities have reported negative attitudes of others towards intellectual disabilities as a barrier to promoting PA (McGarty et al., 2021). These negative attitudes must be combatted to ensure inclusive and supportive environments for people with intellectual disabilities, which would facilitate healthy lifestyles.

5.3.4 Strengths and limitations

The main limitation of this study is that insufficient data was collected to meaningfully analyse the data, interpret the findings, or assess gender differences. This was unavoidable due to the COVID-19 pandemic. The social support networks also did not include additional proxy generate networks for comparison, which can facilitate interpretation with people with intellectual disabilities (Roll & Koell, 2020). Additionally, activities were retrospectively reported, and may have been facilitated with additional forms of data collection, such as activity diaries.

When developing this study and submitting the ethics application the sample size was based on the potential to meet saturation of themes. Due to the nature of the data collected, and the identification of semantic or surface level themes, it is possible that data saturation would occur (Braun & Clarke, 2021). However, this is a contentious decision, and it is recommended that the final sample size should be decided "in-situ" and based on the richness of the data collected (Braun & Clarke, 2021). Future iterations of this study and collection of qualitative data would have benefited from adopting this approach when deciding on the final sample size.

The main strength was that this study employed novel methods to explore gender differences in sources of social support, general perceptions of social support and the leisure activities engaged in and supported. The study also appraised the feasibility and piloted the methods, to determine if the methods were appropriate for use with adults with mild intellectual disabilities, and if the methods collected data relevant to the study aims.

5.3.5 Conclusions

The results indicate that social support network methods could be used with adults with mild intellectual disabilities in the context of PA and SB, while considering the role of gender. This requires further research with a larger sample size. The preliminary findings suggest that the presence of a person to support the participant can help facilitate the development of the social support networks and can provide useful prompts. The initial results also indicate that the social support networks are dense with most network members connected with each other. In addition to this, participants' who identified social groups as part of their support network participated in more PA. The most common type of PA conducted by all participants was walking.

It is important for research to continue to explore social support for health behaviours and identify if there are any gender differences.

5.4 Study two: Remote investigation into social support for PA and SB, and how this has been impacted by the COVID-19 pandemic.

5.4.1 Introduction

On March 11th, 2020, the World Health Organisation declared the outbreak of COVID-19 to be a pandemic (WHO, 2020). The University of Glasgow instructed that all face-to-face research was to be halted indefinitely to protect lives. As a result, the proposed research halted, and it was necessary to adapt research to fit these unprecedented times. This section (section 5.4) presents the proposed amendments to a study that was cancelled. As this was a unique context, it provided the opportunity to consider the context of the COVID-19 pandemic and social distancing measures on PA, SB and the types of activities engaged in. Additionally, the feasibility of remote data collection was unknown. Subsequently, the aims of the amended study were:

1. Evaluate the feasibility of adapting a study to a telephone interview with adults with intellectual disabilities.
2. Describe the PA and SB promoted by the people most important to adults with intellectual disabilities.
3. Explore perceptions of social support for PA.
4. Explore the role of gender in perceptions of social support and types of activities promoted by people most important to adults with intellectual disabilities.
5. Explore participants experiences of social support and PA during the COVID-19 pandemic.

5.4.2 Proposed methods of the amended study

5.4.2.1 Mitigating the impact of COVID-19

The first attempt to mitigate the impact of the pandemic on this PhD was to adapt the previous study for remote working. All data was to be suitable for computer storage using secure University OneDrive accounts, or the University server. For this to be done, certain aspects of the study had to be removed as they would either not be feasible or would have questionable validity when conducted remotely. This resulted in the removal of the WASI FSIQ-2 and the concentric circle methodology. Additionally, the current social context had to be considered and questions were added reflecting the COVID-19 pandemic.

5.4.2.2 Design

Qualitative telephone interview study planned to be conducted in two phases: a pilot study assessing the feasibility of the proposed amendments; and a full-scale study assessing the aims relating to social support for PA, the role of gender and the impact of the COVID-19 pandemic. Data collected were to be analysed using interpretative phenomenological analysis (IPA).

5.4.2.3 Ethical approval

An amendment was sent to MVLS ethics committee, and the alterations to the study and study documents were approved on 30th April 2020 (Appendix 21).

5.4.2.4 Proposed sample

The new purposive sample was to include a total of n = 8 adults (age ≥18 years) with mild intellectual disabilities living in Greater Glasgow. Participants with mild intellectual disabilities would be identified by gatekeepers. An even mix of men and women was sought to compare genders when comparing themes. N = 2 participants were to be included in the pilot study, and n = 6 recruited after methods were established as suitable. It was anticipated that all n = 8 participants would be included in the final sample size. This sample size was considered appropriate for IPA as part of a PhD thesis which requires a smaller sample and deeper qualitative data analysis (Lyons & Coyle, 2016).

5.4.2.5 Proposed recruitment and consent procedures.

A strict timescale was established for recruitment, where at minimum, participants required for the pilot aspect of this study were to be identified before the start of June (one month after start of recruitment). This was to ensure the proposed study would be mitigating the impact of the COVID-19 pandemic on the thesis timeline.

The gatekeeper of the group identified through TAG that were met in March, was to be contacted. Additionally, gatekeepers at organisations and social groups, such as People First and Enable, were be contacted by email. Email was selected as the primary source of contact as during lockdown many people may not have access to their office phones. If groups were able to identify eligible adults, the researcher would email them the amended information sheets (Appendix 22), privacy notices (Appendix 23) and consent forms (in easy read format; Appendix 24) to be forwarded to potential participants. If someone wished to take part, they were advised to send the electronic consent form to the researcher via email.

The easy read consent form was developed to contain electronic check boxes and it was not possible to alter any of the text for the statements for consent. This consent form was included to ensure the participant had read the required documents, and to ensure the participant was happy for their voice to be recorded during the interview. The participant was still able to invite a support person to attend the interview, if they lived together or if the support was legally able to attend the interview. The support could either attend the interview via an additional handset or by having the phone call put on loudspeaker. In this case, information sheets, privacy notices and support electronic consent forms were provided for the support (Appendices 25, 26, 27, respectively). The consent forms of the participant and support were requested to be sent to the researcher in the same email.

If electronic consent form(s) were returned to the researcher, a time to phone the participant to further discuss the study was arranged. This was also to provide prospective participants with the opportunity to ask questions, and for a date and time to be arranged for the interview. This date and time were to be confirmed with the participant either by email or text messages (based on participant preference). On the day of the interview, formal consent procedures were to be followed. The researcher would summarise the study again and assess capacity by asking the participant to describe the study in their own words. The fact the audio of the interview was to be recorded would be reiterated before recording the verbal consent procedures. If a support were wanting to attend the interview, verbal consent would be obtained from the support person.

5.4.2.6 Measures

The demographic questionnaire used in the previous chapter was to be administered at the start of the interview. The semi-structured interview schedule that was developed for the pervious chapter was amended to reflect the new aims (Appendix 28). Previous questions relating to developing a sociogram of the participants social support network were removed. To gather data appropriate for IPA, broader open questions were to be included relating to experiences of social support and PA. Additional questions were also included focused on the impact of the COVID-19 pandemic on social support and PA. All interviews were to be conducted using a mobile phone purchased for the study outlined in the previous chapter. Interviews were to be recorded using an Olympus Digital Voice Recorder with an Olympus TP-8 Telephone Pick-up Microphone purchased to enable audio to be recorded without using loudspeaker.

5.4.2.7 Data analysis

The interview transcripts were to be developed in a pseudonymised format (e.g. Participant 1, Male). The data from the first n = 2 participants was to be analysed to ensure the data was appropriate and to determine if the proposed methods were feasible. If any changes were required, this was to be done before collecting data from the remaining n = 6 participants.

The data from the total sample (n = 8) were to be analysed qualitatively using IPA. IPA explores a person's personal and lived experiences of situations (Lloyns & Coyle, 2016). This method also enables comparisons between participants (Lloyns & Coyle, 2016) permitting differences/similarities between men and women to be established.

5.4.3 Recruitment results and justification for stopping this amended study

Ethical approval for the amendments was granted on 30th April 2020 and recruitment commenced the first full week in May 2020. The group that was met with in March in the previous iteration of the study was contacted first due to interest in the previous iteration of this study. This was followed by four other intellectual disabilities groups and organisations based in Glasgow. Specific contacts were then used for the Glasgow branches of the other organisations; however, these returned no responses.

On 19th May, the organiser of the group met with in March contacted the researcher and expressed interest in helping with recruitment. The organiser described a couple of people that may be interested but identified potential issues as some members of the group did not have access to the internet and would not be able to receive the electronic participant packs. The organiser also described the devastating impact of the COVID-19 pandemic on the group members. It was clear from this phone call that although it may be possible to recruit some participants for the study, data collected at this time would benefit from a focussed analysis of the impact of this pandemic, rather than a proxy exploration using an amended interview schedule.

During a supervision meeting on the 21st of May, the decision was made to stop working on this study and to start working on a second mitigation plan. The decision was made based on the likelihood of recruiting enough participants to allow for a high-quality study. In addition to this, there were concerns about the quality of the newly proposed methods and telephone interviews. The amended study would also fail to explore the complex and far-reaching impact of the COVID-19 pandemic on people with intellectual disabilities, and this would be best addressed with a new study. This would have required a new ethics application and would not have been feasible during this final year of the PhD. It was therefore decided that a secondary data analysis would be a better research project to complete this PhD during the global pandemic.

5.5 General chapter discussion in the context of the COVID-19 pandemic

This chapter presented research conducted during a unique intersection of time, where research was halted, and the future was unclear. The planned research project was cancelled, and it was necessary to adapt for remote working. Amending the study highlighted a reliance on the internet and accessing equipment. It was intended that this study would appraise gender differences in social support, sources of support and the types of activities promoted, however it was not possible to assess this. Although the findings of this chapter cannot be generalised, it is still important to reflect on the studies and the wider potential impact of the COVID-19 pandemic on adults with intellectual disabilities.

The initial findings of this study indicated that participants had small and dense social support networks, with social groups important for participation in leisure activities. However, all face-to-face social groups were shut indefinitely to prevent the spread of the virus, with most social contact also relying on access to technology. Research has indicated that adults with intellectual disabilities have attended online social groups and activities, including PA, during the COVID-19 pandemic (Lake et al., 2021). This online social connection was reported to reduce the sense of isolation and loneliness (Lake et al., 2021). However, using internet requires access to devices, which has been reported as a barrier for people with intellectual disabilities, as equipment like computers are expensive (Chadwick et al., 2013).

It is therefore necessary to consider that the participants recruited for study one came from the most deprived areas of Glasgow, which is reflective of the increased deprivation among adults with intellectual disabilities (Emerson, 2007). This may prevent access to the necessary equipment to meaningfully attend and engage with online social groups. Additionally, during recruitment for study two within this chapter, the lead of one social group reported that not all group members had access to the internet or equipment needed to take part. This could potentially exacerbate inequalities during the COVID-19 pandemic, with research conducted with adults with intellectual disabilities at this time being biased towards people who have access to the necessary resources.

Free online resources were available to the general population in the UK during lockdown, such as free YouTube physical education classes. However, these may not be accessible for people with intellectual disabilities (Theis et al., 2021). A UK based proxy-completed electronic survey reported reduced PA among children and young adults with intellectual disabilities during the COVID-19 restrictions (Theis et al., 2021). This trend could also be reflected among adults with intellectual disabilities. However, the preliminary findings of study one indicates that most PA were past activities, such as sports at school, with the transition from school to adulthood resulting in reduced access to resources and PA (Stevens et al., 2018; Young-Southward et al., 2017). This may then result in adults with intellectual disabilities not having access to the opportunities for PA provided while at school.

Participants recruited in study one of this chapter reported walking to be the main current form of PA. Qualitative research conducted has reported that adults with intellectual disabilities may use walking as a coping mechanism for dealing with the COVID-19 pandemic (Lake et al., 2021). Nevertheless, research has indicated that walking for PA varies depending on the independence of people with intellectual disabilities, with some people relying on caregivers for support and deciding where to walk (Mitchell et al., 2015).

The COVID-19 pandemic has also had a huge impact on the caregivers of people with intellectual disabilities, with carers of adults with intellectual disabilities experiencing increased mental health issues (Willner et al., 2020). Support staff and caregivers experienced an emotional impact due to the COVID-19 pandemic, with fear of contracting COVID-19 and feeling overwhelmed (Embergts et al., 2020). Additionally, care staff experienced increased workload and pressure due to the COVID-19 pandemic, due to issues such as people with intellectual disabilities being unable to attend day care facilities (Embergts et al., 2020). Increased workload and time constraints are barriers to PA and increasing walking for PA for people with intellectual disabilities (Bossink et al., 2017; Mithcell et al., 2016).

The long-term impact of the COVID-19 pandemic is unknown; however, it will exacerbate underlying social and health inequalities. This is displayed in initial findings where people with intellectual disabilities are at increased risk of death from COVID-19 compared to the general population (Henderson et al., 2021). There may also be more pronounced social inequalities, as social groups moved online, with not everyone having access to the necessary equipment and resources to participate. It is not possible to make inferences relating to gender or differences between men and women, as the data is not available, and the pandemic is ongoing. However, it is important to consider the concept of interacting sources of disadvantage and the notion that marginalised women experience the most inequalities (Chapter 1, section 1.6). This will need to be considered in future research and when it is possible to truly understand and explore the impact of the COVID-19 pandemic on adults with intellectual disabilities.

5.6 Conclusions

This chapter presents research that was not feasible during the COVID-19 pandemic. The long-term impact of the COVID-19 pandemic is unknown at the time of writing this thesis. It was not possible to assess gender differences within this study due to the small sample sizes. The preliminary results identified small social support networks and the importance of social groups has important implications. However, the social groups described were not free and accessible to everyone. Social groups have moved online during the pandemic. Accessing these groups therefore requires expensive equipment, such as computers. The COVID-19 pandemic may exacerbate social inequalities and opportunities for healthy lifestyles experienced by adults with intellectual disabilities. Exploration into these issues is not within the scope of this thesis and would require a focused analysis. To progress with this thesis and address the aims of this chapter of gender differences in social influences for PA and the types of leisure activities engaged in, it was necessary to identify data for a secondary analysis.

Chapter Six. Gender differences in the social and environmental correlates of physical activity and sedentary behaviour, and the types of activities engaged in by adults with intellectual impairments

6.1 Overview of this chapter

Chapter five presented a study that was halted due to the COVID-19 pandemic. The study was part of a planned project developed to explore social support for PA, sources of support and the activities promoted for men and women with intellectual disabilities. Attempts to adapt this study for remote working were not possible. This current chapter was developed for remote working to address questions relating to gender differences in social and environmental influences of PA and SB, along with differences in the types of leisure activities engaged in. This was done using a secondary data analysis of the British Cohort Study data set, where it was possible to identify individuals with intellectual impairments that were indicative of potential intellectual disabilities.

6.2 Introduction

Adults with intellectual disabilities are reported to have restricted social networks, with social contact primarily coming from family members and paid support staff (Giesbers et al., 2019; Lippold & Burns, 2009; van Asselt-Goverts et al., 2015). A person's social network provides opportunities for social support and wider social influences of behaviours (Berkman et al., 2000). Having small and homogenous social networks, consisting of people with similar personal characteristics, reduces social capital (Borgattiet al., 1998). Social capital benefits an individual through their social networks and norms of reciprocity (Putnam, 2001), and relates to norms and trust associated with social connections (Putnam, 1994). However, social capital can also describe the actual and personal resources accessed through an individual's social network (Bourdieu, 1986). Therefore, restricted social networks and social contact potentially has a huge influence on the lives of adults with intellectual disabilities, and the opportunities an individual has access to.

This has implications for the prospects people with intellectual disabilities have for activities, as social support is cited as one of the core influences of participation in PA (Chapter 1, section 1.4.7.2). Increased PA has been linked to attendance at social groups, and the associated increased social interaction and opportunities for interpersonal relationships (Wilson et al., 2017). Limited and infrequent social contact with family and friends has contributed to reduced participation in PA, such as sports, for adults with intellectual disabilities (Robertson & Emerson, 2010).

Gender differences have also been reported in social opportunities of people with intellectual disabilities, as men participate in more social activities and interact with friends more than women with intellectual disabilities (Dusselijee et al., 2011). Limited research has explicitly looked at gender differences in the types of activities engaged in. However, one study reported that women engage in less types of PA than men with intellectual disabilities (Draheim et al., 2002). This is reflective of the general population, where gender norms are present about gender appropriate masculine or feminine activities that may influence participation in PA and sports (Chalabev et al., 2013; Plaza et al., 2017; Spencer et al., 2015; Cla et al., 2019), suggesting an influence of the wider social environment.

For adults with intellectual disabilities, the wider environment, including geographical location, accommodation type, financial limitations, and broader societal influences, have been identified as influencing PA and SB (Chapter 1, section 1.4.7). However, it can also influence social interaction, as reported in a Scottish study exploring social exclusion of people with intellectual disabilities, which identified differences based on urban or rural locality (Nicholson & Cooper, 2013). People with intellectual disabilities living in rural areas had greater access to resource centres, whereas a greater number of urban dwelling people with intellectual disabilities lived in the most deprived areas. However, people living in urban areas generally experienced less confrontation and more close relationships (Nicholson & Cooper, 2013). Additionally, research has indicated a potential increased risk of obesity for people with intellectual disabilities living in rural settings (Hsieh et al., 2014), which is a negative health outcome associated with PA and SB (Chapter 1, section 1.4.3). Given that financial resources and social support are core influences of PA in adults with intellectual disabilities (Bossink et al., 2017), it makes the wider environmental setting an interesting factor to consider.

For people with intellectual disabilities, it is evident that social contact and the wider environment play a key role in PA and SB participation. Given that adults with intellectual disabilities have unhealthily low PA and high SB (Chapter 1, section 1.4.5), it is essential for research to reflect upon these social influences and associated environmental factors. Additionally, research has indicated gender differences in social opportunities (Dusselijee et al., 2011), with men with intellectual disabilities also reported to participate in more sports (Draheim et al., 2002), reflecting the gender norms in the general population (Chalabaev et al., 2013).

Very limited research has addressed this or explored the interaction between gender with PA and SB of adults with intellectual disabilities (Chapter 2). Therefore, this study aims to explore gender differences in the social and environmental influences of PA and SB, and determine if there are differences in the types of leisure activities engaged in. This will be done by addressing the following research questions using a secondary data set where it is possible to identify people with intellectual impairments that may indicate intellectual disabilities.

1. Are there gender differences in the PA and SB of adults with intellectual impairments indicative of intellectual disabilities?
2. Are there gender differences in the social and environmental correlates of PA and SB of adults with intellectual impairments indicative of intellectual disabilities?

3. Are there gender differences in the types of activities engaged in by adults with intellectual impairments indicative of intellectual disabilities?

6.3 Methods

6.3.1 Design

A cross-sectional secondary data analysis of the 2016-18/age 46 years sweep of the 1970 British Cohort study (BCS70; University of London, Centre of Longitudinal Studies, 2019, 2020).

6.3.2 Ethical approval

The BSC70 data has ethical approval for the data to be used for non-commercial/scientific purposes, with the anonymised data sets available on the UK Data Service. The UK Data Service hosts a collection of data sets, including cross-sectional surveys, longitudinal studies, and UK government sponsored surveys (https://www.ukdataservice.ac.uk/). It is funded by the Economic and Social Research Council and was developed to benefit individuals, including academic researchers and students. It can be accessed through organisations, such as The University of Glasgow.

6.3.3 Data

The BCS70 includes a cohort of 17,000 people born in Britain in a single week in 1970. Thus far data has been collected from participants at 11 points throughout their lives. In this study, data from the 2016-18/age 46 sweep (n = 8,581) were used. This is the only sweep to have collected objectively measured activity data, specifically accelerometery. Additional data were collected by an interview lasting approximately 50 minutes, a self-completed questionnaire, and nurse measurements (e.g., anthropometric measurements). To determine if participants had a potential intellectual impairment, cognitive tests at age 5 years /1975 (n = 13,135; Butler, Dowling

& Osborn, 2016) and age 10 /1980 (n = 14,875; Butler & Bynner, 2016) sweeps were used.

This data set was selected as the objectively measured PA and SB data using accelerometers is more valid than subjective self-report measurements (Esliger & Tremblay, 2007). The data also included relevant social and environmental data to allow for research questions to be addressed. It was not possible to identify people that had a formal diagnosis of an intellectual disability from the data set based on the criteria described in Chapter 1, section 1.2. Additionally, there were no complete validated measures of intellectual and adaptive functioning. However, BCS70 data has been used previously to identify participants with intellectual impairments that are indicative of intellectual disabilities (Emerson et al., 2018), and past research has also employed standardised scores as a proxy indicator of IQ (Emerson et al., 2014; Emerson et al., 2018; Parsons, 2014). Although not generalisable, the findings of this study can identify important social factors or differences in types of activities conducted between men and women, that could be explored in future research collecting primary data with a sample of people with intellectual disabilities.

6.3.4 Identification of participants with intellectual impairments

To identify participants with potential intellectual impairments that were indicative of a possible intellectual disability, the method outlined by Emerson et al., (2018) was used to calculate a proxy measure for IQ based on scores for cognitive tests at the age 5- and 10-years sweeps. At age 10 years, the Shortened Edinburgh Reading Test (Godfrey Thompson Unit, 1978); the Friendly Maths Test (Parsons, 2014); the Spelling Dictation task (Parsons, 2014); and the Word Definitions, Word Similarities, Recall of Digits and Matrices subscales of the British Ability Scales (BAS; Elliot et al., 1978) were administered. At age 5 years, the cognitive tests included the Copying Designs Test (Rutter et al., 1970); the Human Figure Drawing Test (Harris, 1963); the English Picture Vocabulary Test (Brimmer & Dunn, 1962); the Schonell Reading Test (Schonell, 1971) and the Complete Profile Test (Kalverboer, 1972).

Following the methods of Emerson et al., (2018), at both the age 10 years and age 5 years sweep, multiple imputation was conducted for the cognitive tests producing five data sets. Scores for each imputed data set were averaged to produce an aggregated score for each cognitive test. Principal components analysis (PCA) was conducted for the cognitive tests at age 5 years and age 10 years, the first component was extracted to establish a general cognitive ability factor across the tests as a proxy for IQ (Emerson et al., 2018; Parsons, 2014).

At age 10 years the first extracted component contributed to 59.95% of variance in initial eigenvalues, with all tests loading positively on the component (ranging from 0.56 for the BAS recall, and 0.89 for the Edinburgh reading test). At age 5 years, the first extracted component contributed to 38.83% of variance in the initial eigenvalues, with each test loading positively on the component (ranging from 0.45 for the Schonell reading test, and 0.76 for the copying designs test). The scores generated for the PCA were saved as regression methods, and the standardised score generated used as a proxy for IQ. Standardised scores reflect z-scores that represent standard deviation units, with standardised scores of ≤ -2 representing two standard deviations below the mean (Field, 2018), suggesting an IQ ≤ 70 and an impairment in intellectual functioning (Boat & Wu, 2014).

Using participant identification numbers, a merged data set was created with standardised scores for both age 5 and 10 years. Based on recommendations by Emerson et al. (2018), age 10 years standardised scores were used to indicate people with an intellectual impairment, with the age 5 years standardised score used when the age 10 years score was not available. This method identified a total of n = 457 people with a potential intellectual impairment, which accounted for approximately 2.9% of the total sample with cognitive tests (n = 15,452). These scores and participant identification number were used to identify participants at the 2016-18/age 46 sweep (total sample n = 8,581) that potentially had an intellectual impairment. This resulted in a final sample of n = 132 participants.

6.3.5 Conceptualisation of gender

A dichotomous variable of participant sex was reported in the data sets. This was based on biological sex (male/female). However, the term gender was used in this study, as this is a complex construct that is both biological and social (Chapter 1, section 1.5)

6.3.6 Outcome variable: objectively measured activity data

A thigh-mounted activPAL3 micro triaxial accelerometer (PAL Technologies Ltd., Glasgow, UK) was utilised by the BCS70 study at the 2016-18/age 46 years sweep (University of London, Institute of Education, Centre for Longitudinal Studies, 2020). Participants were asked to wear the accelerometer for seven days, during all hours (including sleeping and when bathing) and were instructed not to remove or re-attach the device. Participants were also asked to complete a diary for appraising the quality of the accelerometer data. This type of accelerometer collects data on body posture (e.g. sitting), transition between postures (e.g. sitting to standing), stepping, and cadence.

Subsequently, calculations of MVPA were based on a cadence threshold of ≥100 steps. There were concerns about the validity of this protocol for use in this study, as people with intellectual disabilities may have gait abnormalities (Almuhtaseb, Oppewal & Hilgenkamp, 2014). Consequently, in this study, daily step counts were used as the PA outcome and sitting time hour/day used as the SB outcome. A total of n = 63 (58.7% male) had accelerometer data, and 50.8% wore the monitor for a minim of 7 days. The mean wear time in waking hours was (M = 15.51 hours/day; SD = 1.64) and ranged between 11.31 hours/day to 20.13 hours/day.

6.3.7 Missing accelerometer data: multiple imputation

Of the final sample of n = 132 participants with potential intellectual impairments, 52% had no accelerometer data even though 75.5% of participants reported being willing to wear the accelerometer. Statisticians at the University of Glasgow Robertson Centre for Biostatistics were consulted on the best way to proceed given the high number of missing data. Multiple imputation methods were followed, as there were concerns that using only the complete case accelerometer would increase risk of bias.

Following the guidance from statisticians, a dichotomous variable of "accelerometer data present yes/no" was developed. This was used to assess significance of difference in potentially relevant variables using independent samples t-tests for continuous variables, and chi square tests were used for categorical variables. This was conducted for both the total sample and the data split by gender. Only two variables reported differences between people with and without accelerometers: self-reported difficulties walking 1-mile (49% of no accelerometer data/27% of accelerometer data present; X^2 (1, 114) = 5.42, $p < .02$); self-reported number of days a week physically active for 30 minutes or more in women [M = 1.79 days (SD = 2.34) no accelerometer/M = 3.58 days (SD = 3.06) accelerometer present; t (46,58) = 2.41, $p < .02$)].

Following this, bivariate correlations were conducted between each potential predictor variable and steps/sit time, with additional demographic, health related, and self-reported PA variables also assessed as these could influence activity, to determine if any were important for the imputation model (Appendix 29). All categorical variables were recoded as dummy variables to allow for correlations to be assessed. Any significant variables were added to the multiple imputation model along with gender and the standardised cognitive test score. Due to the large number of missing data, a total of 50 imputations were conducted.

6.3.8 Social and environmental correlates

Correlates relating to social network data included "Sees family outside of household each week" Yes/No, "Sees friends outside of household each week" Yes/No, "attends meetings, events or activities at any organisations (including gyms and social clubs) each week" Yes/No. The data were originally scored with multiple levels, ranging from three or more times a week (1), to every few months (4), to never (7). For the purposes of this study, it was recoded to the frequency of “each week” to allow for inclusion in the regression model in a way that may have influenced the PA or SB data.

Correlates related to other social issues such as “Whether there are people present who will listen to participants problems (social support proxy)” Yes/No. In the original data this was scored on four levels ranging from “a great deal” (1) to “not at all” (4). “A great deal” was used to indicated “yes” as this was the highest recorded response (68.2% of all participants) and indicated people were present that provided emotional support. All other responses were recoded as “No” (0). Other social variables pertained to “Whether most people can be trusted” Yes/No. The original data this was coded on three levels of “most people can be trusted” (1) to “it depends” (3), with “most people can be trusted” used to indicate “Yes” in the recoded dummy variable. Questions relating to trust can be used as indicators of social capital (Kawachi & Berkman, 2000).

The wider environment was also included based on data reflecting “Whether participant lives in an urban area” Yes/No, which was recoded based on responses to the 2001 Urban/rural indicator. This original measurement had 25 levels and were recoded after looking at frequencies in the participant responses, where 81.1% of all participants lived in Urban areas. From this, values that indicated Urban living were scored as 1, and all else were scored as 0. The frequencies of recoded values were compared to responses in the original variable and were comparable.

The environmental correlates also related to “Whether participants describe themselves as living comfortably” Yes/No, based on a variable of how well participants were managing financially. Scores relating to living comfortably were scored as 1, and all other variables recoded to 0. A dummy variable was also created for accommodation type: lives in private residence (1) vs sheltered housing (0), as these were the two responses reported for the participants within this sample.

Health related variables were also included to determine if this exerted a combined influence when included in a multivariate model: “Whether participant has a health problem that has limited moderate intensity activities” Yes/No (1, 0); “Whether participant has a health problem that has limited social activities in last month” Yes/No. These variables were recoded to Yes = 1, for responses of “Yes, a lot”, and “Yes, a little”. All other responses were recoded to 0.

6.3.9 Self-reported types of physical and sedentary activities

The BCS70 collected self-reported activity data. This comprised of frequencies of leisure activities participated in over a 12-month period, including physical activities, such as sports, but also incorporated activities like gardening and walking. This provided an opportunity to explore gender differences in the types of activities engaged in. The frequencies provided ranged from never to ≥6 times a week, to facilitate data analysis this was recoded as engages in the activity weekly, monthly, or less than monthly/never. Activity related data was also present on PA in the workplace recording whether participants engaged in sitting occupation, standing occupation, physical work, or heavy manual work.

Self-reported activity data was also recorded for household physical activities such as cleaning the house and laundry, with options ranging from none to more than 15 hours. These were recorded as < 3 three hours per day/> 3 hours per day. The hours per day (ranging from none to > 4 hours per day) were also recorded for sedentary activities of watching television, playing video games, time spent on the internet or time spent reading. This was recoded as <4 hours per day vs > 4 hours per day. Note that none of this data were imputed as it were categorical, and data were present for n = 110 participants (43.6% females).

6.3.10 Data analysis

All statistical analyses were conducted using IBM SPSS versions 26 and 27.

Independent samples t-tests were conducted to assess the significance of gender differences in the objectively measured step counts and sitting time to determine if gender differences were present (RQ1). A chi-square test was conducted to determine if there were gender differences in the activities engaged in (RQ3). The data was then split by gender and descriptive statistics were calculated for all the variables.

Bivariate linear regression was conducted between the objectively measured PA and SB and each of the predictor variables. Variables that were significantly associated with objectively measured PA and SB at a significance value of $p < .25$ were included in the multivariate model. For analyses with accelerometer data as an outcome, pooled analyses of the imputed data were conducted using SPSS. Following advice from the Robertson Centre for Biostatistics, the same data analysis methods were conducted with the complete case activity data as a sensitivity analysis (RQ2).

6.4 Results

6.4.1 Participant characteristics

Of the n = 132 participants in the final sample, n = 58 (43.9%) were female and most participants were from a European UK ethnic group (Table 6.1). Most participants lived in private residences and in an urban area. However, many did not describe themselves as living comfortably and were living in deprived areas. Most participants saw family they did not live with each week, however findings for seeing friends were mixed. In addition to this, n = 8 males and n = 4 females reported never seeing friends or not having any friends. Participation in social groups was low, with more males attending social groups than females. Additionally, most participants felt like other people could not be trusted. More women experienced health issues that limited social and moderate intensity activities (social activities: male = 37.9% vs. female = 60.8%; moderate intensity activities: male = 39.7% vs. female = 54.2%).

Table 6.1 Participant characteristics

	Male (n = 74)	**Female** (n = 58)
Residence in the United Kingdom	Valid percentage	
England	87.8%	89.7%
Wales	9.5%	3.4%
Scotland	2.7%	6.9%
Ethnic group		
European UK	84.8%	95.3%
European Other	1.5%	
West Indian	3.0%	4.7%
Indian-Pakistani	6.1%	
African	1.5%	
Not stated	3.0%	
Has a job role (paid/self-employed/voluntary)		
Yes	66.2%	55.7%
No	33.8%	44.2%
Accommodation type		
Sheltered housing	6.8%	3.4%
Private residence	93.2%	96.6%
2015 Index of multiple deprivation rank decile		
Rank 1 = Most deprived	13.5%	27.6%
Rank 2	17.6%	13.8%
Rank 3	12.2%	6.9%
Rank 4	10.8%	12.1%
Rank 5	6.8%	10.3%
Rank 6	8.1%	6.9%
Rank 7	6.8%	8.6%
Rank 8	13.5%	8.6%
Rank 9	6.8%	3.4%
Rank 10 = Least deprived	4.1%	1.7%
Living financially comfortably		
No	67.6%	84.5%
Yes	32.4%	15.5%
Living in an urban setting		
No	16.2%	19%
Yes	83.8%	81%
Sees family not living with every week		
No	32.4%	39.7%
Yes	67.6%	60.3%
Sees friends not living with every week		
No	40.5%	51.7%
Yes	59.5%	48.3%
Attends social groups every week (inc. gyms)		
No	79.7%	93.1%
Yes	20.3%	6.9%
Believes most people can be trusted		
No	77%	74.1%
Yes	23%	25.9%

6.4.2 Gender differences in step counts and sedentary behaviour

Table 6.2 Descriptive statistics for accelerometer data

Imputed pooled date (n = 132)		**Complete case data (n = 63)**	
Males	**Females**	**Males**	**Females**
	Daily step counts		
M = 8438.78	M = 8356.76	M = 8515 .35 (SD = 3808.65)	M = 8678.08 (SD = 3548.23)
Range = 1868-20958	Range = 1868-20958	Range = 1868-20958	Range = 2784 - 16836
	Sitting time (hour/day)		
M = 9.61	M = 8.98	M = 9.46 (SD = 1.96)	M = 9.02 (SD = 2.36)
Range = 4.95-16.17	Range = 4.95-16.17	Range = 4.95-13.31	Range = 5.78-16.17

Notes: M = mean; SD = standard deviation

Table 6.2 presents the descriptive statistics for the pooled imputed data and the complete case data for step counts and SB data. For both the imputed data [steps: t(213, 210.57)=.094, $p > .05$/sitting: t(152, 154.08)=1.092, $p > .05$] and complete case data [steps: t(61, 56.26) = -.172, $p > .05$/sitting time: t(61, 47.4) = .805, $p > .05$] there were no significant gender differences in the objectively measured step counts or SB.

6.4.3 Correlates of daily step-counts

Pooled bivariate analyses were conducted between each variable and daily step counts using the imputed data (Table 6.3). For females, trust of others ($p < .25$) and health limiting moderate activities ($p < .05$) were eligible for inclusion in the final model. For males, living in an urban area ($p < .25$) and health limiting moderate activities ($p < .25$) were included. In the final pooled multiple regression model, health limiting moderate activities was negatively and significantly associated with step counts for females and no variables were significantly associated with step-counts for males (Table 6.4).

Table 6.3 Pooled bivariate analyses of daily step-count data

	Males		**Females**	
Correlates	**B (SE)**	**p-Value**	**B (SE)**	**p-Value**
Weekly visit to family	-266.98(1051.25)	.800	-153.98(1124.21)	.891
Weekly visit to friends	-447.52(1034.02)	.665	436.74(1136.42)	.701
Attends weekly groups	806.32(1224.25)	.510	-712.54(2123.54)	.737
Proxy for emotional support	805.60(1139.93)	.480	5.28(1372.86)	.997
Trust of others	178.81(1297.58)	.890	-1744.20(1364.22)	.202*
Private vs sheltered housing	1203.23(2157.51)	.577	2923.85(3117.11)	.349
Urban living	-2743.29(1400.60)	.051*	-1484.55(1661.04)	.372
Self-reported living comfortably	308.07(1109.30)	.781	266.18(1537.65)	.863
Health limiting social activities	-1157.59(1098.16)	.292	-1116.20(1304.84)	.393
Health limiting moderate activities	-1850.89(1312.34)	.105*	-2721.34(1179.57)	.022**

*Notes: SE = standard error; * p < 0.25; **p<0.05*

Table 6.4 Final regression models for daily step counts with the imputed data

Correlates	B (SE)	p-Value
Males		
Constant	11251.15(1291.28)	.000**
Urban living	-2367.23(1469.96)	.102
Health limiting moderate activities	-1407.39(1184.30)	.189
Females		
Constant	10246.39(929.92)	.000**
Trust of others	-2082.09(1250.99)	.097
Health limiting moderate activities	-2866.55(1211.01)	.019**

*Notes: SE = standard error; B = Beta; **p<0.05*

In the complete case analysis, reflecting the pooled data, urban living ($p < .05$) and health limiting moderate activities ($p < .25$) were associated with step counts in the bivariate analyses for males. For females, trust of others ($p < .25$), health limiting moderate activities ($p < .05$) and private vs sheltered housing ($p < .25$) were eligible for inclusion (Table 6.5). In the final multivariate analysis urban living was significantly and negatively associated with step counts for males, and health limiting moderate activities was significantly and negatively associated with step counts for females (Table 6.6).

Table 6.5 Bivariate analyses for daily step-count data using complete case data

	Males			**Females**		
Correlates	**B (SE)**	**ß**	**p-Value**	**B (SE)**	**ß**	**p-Value**
Weekly visit to family	-103.61(1318.53)	-.132	.436	152.88(1459.49)	.021	.917
Weekly visit to friends	-.599.97(1277.78)	-.079	.642	237.49(1436.73)	.034	.870
Attends weekly groups	1267.67(1413.76)	.150	.376	-1335.51(2206.22)	-.123	.551
Proxy for emotional support	1299.59(1412.93)	.154	.364	971.2(1673.97)	.118	.567
Trust of others	630.99(1425.92)	.075	.661	-2245.1(1534.19)	-.286	.156*
Private vs sheltered housing	572.83(3914.76)	.025	.885	6129.84(3474.69)	.339	.090*
Urban living	-3415.35(1430.47)	-.374	.022**	-308.89(2222.10)	-.028	.891
Self-reported living comfortably	339.69(1328.94)	.043	.800	-665.20(1796.93)	-.075	.714
Health limiting social activities	-1070.1(1391.95)	.131	.447	-1183.03(1465.81)	-.170	.428
Health limiting moderate activities	-1827.97(1363.64)	-.227	.189*	-4422.88(1312.56)	-.583	.003**

*Notes: SE = standard error; B = Beta; * p < 0.25; **p<0.05*

Table 6.6 Complete case final regression model for daily step-counts

Correlates	B (SE)	ß	p-Value
Males			
Constant	11331.77(1297.61)		.000**
Urban living	-3220.67(1513.04)	-.354	.041**
Health limiting moderate activities	-1116.16(1338.51)	-.139	.411
Females			
Constant	6878.65(3110.69)		.039**
Trust of others	-2594.25(1254.35)	-.330	.057
Health limiting moderate activities	-4094.65(1284.35)	-.540	.005**
Private vs sheltered housing	3922.93(3050.94)	.219	.213

*Notes: SE = standard error; B = Beta; **p<0.05*

6.4.4 Correlates of sedentary behaviour

Pooled bivariate analyses were conducted for each variable and the outcome of sitting time hours/day. No variables were eligible for inclusion in the multivariate model for females (*p* >.25) Trust of others had a significance value of *p* < .25 for males, however no other variables were eligible for inclusion (Table 6.7).

Table 6.7 Pooled bivariate analyses for imputed sitting time (hour/day) data

	Male		Female	
Correlates	**B (SE)**	**p-Value**	**B (SE)**	**p-Value**
Weekly visit to family	-.43(.65)	.506	.17(.74)	.824
Weekly visit to friends	-.31(.63)	.619	.63(.71)	.373
Attends weekly groups	-.54 (.75)	.473	1.29(1.31)	.326
Proxy for emotional support	-.57(.67)	.399	-.28(.83)	.735
Trust of others	-1.36(.77)	.079*	.74(.88)	.404
Private vs sheltered housing	-.16(1.38)	.906	-.04(1.94)	.983
Urban living	.64(.81)	.426	.49(1.10)	.654
Self-reported living comfortably	-.29(.65)	.656	-.15(.84)	.573
Health limiting social activities	.68(.69)	.320	-.03(.77)	.967
Health limiting moderate activities	.67(.65)	.307	.36(.72)	.718

*Note: SE = standard error; B = Beta; *p* < 0.25

In the complete case bivariate analyses, weekly visit to family (*p* < .25), trust of others (*p* < .05), health limiting social activities (*p* < .25) and health limiting moderate activities (*p* < .25) were eligible for the multivariate model for males (Table 6.8). For females, weekly visit to friends (*p* < .25) and trust of others (*p* < .25) were included in the multivariate model (Table 6.8). In the final regression model, none of the variables were statistically significantly associated with sitting time in males. However, for females, trust of others was significantly and positively associated with sitting time (Table 6.9).

Table 6.8 Bivariate analyses for accelerometer data using complete case sitting time (hour/day) data

	Male			Female		
Correlates	B (SE)	ß	p-Value	B (SE)	ß	p-Value
Weekly visit to family	-.94 (.67)	-.233	.165*	.35(.97)	.073	.722
Weekly visit to friends	-.65(.65)	.166	.327	1.28(.92)	.273	.176*
Attends weekly groups	-.59(.73)	-.135	.425	1.58(1.44)	.218	.286
Proxy for emotional support	-.74(.73)	-.170	.314	-1.16(1.1)	-.212	.299
Trust of others	-1.89(.66)	-.433	.007**	1.83(.99)	.350	.079*
Private vs sheltered housing	.63(2.01)	.053	.756	.47(2.46)	.039	.850
Urban living	.67(.79)	.143	.398	.62(1.47)	.086	.677
Self-reported living comfortably	-.78(.67)	-.191	.256	.77(1.19)	.132	.521
Health limiting social activities	.98(.70)	.232	.173*	-.59(.89)	-.140	.514
Health limiting moderate activities	1.37(.67)	.333	.051*	.27(1.07)	.054	.802

*Notes: SE = standard error; B = Beta; *p* < 0.25; ***p < 0.05*

Table 6.9 Final multiple regression model with complete case sitting time (hours/day)

Correlates	B (SE)	ß	p-Value
Males			
Constant	9.61(.63)		.000
Weekly visit family	-0.23(.68)	-.056	.737
Trust of others	-1.51(.75)	-.350	.054
Health limiting social activities	.62(.69)	.147	.377
Health limiting moderate activities	.70(.70)	.171	.328
Females			
Constant	7.78(.64)		.000
Weekly visit friends	1.60(.87)	.342	.077
Trust of others	2.13(.96)	.408	.037**

*Notes: SE = standard error; B = Beta; **p < 0.05*

6.4.5 Gender differences in the types of activities engaged in

Table 6.10 shows the frequencies that participants engaged in a range of leisure activities, and the significance of results reported by the Chi square tests. Males were significantly more likely to engage in cycling for pleasure (X^2 (2, 109) = 8.35, $p < .05$), for racing/rough terrain cycling (X^2 (2, 109) = 6.55, $p < .05$), and skills-based activities such as carpentry, or home maintenance (X^2 (2, 110) = 8.93, $p < .05$). Descriptively, males were more likely to engage in sport-based leisure activities than females, with females never participating in most physical leisure activities. However, participation was generally low for all leisure activities in both males and females, even for accessible activities like walking for pleasure (weekly walking: 31.1% of males/34.7% of females). There were no significant gender differences in self-reported sedentary activities (Table 6.11).

Although 66.2% of males had a job role (including voluntary work), only 40.5% had full-time employment, with 14.9% classed as self-employed, 10.8% unemployed and 18.9% on permanent sick or disability. Of the 66.2% of male participants with a job role, 25% were in a sitting occupation, 7.5% in a standing occupation, 45% engaging in physical work, and 22.5% having heavy manual work. For the 55.7% of females with a job role, 19% in full-time employment, 25.9% in part-time employment 3.4% were unemployed, 19% in permanent sick or disability and 22.4% of females were looking after the home or family. Of the female participants with a job role, 9.1% were in a sitting occupation, 27.3% in a standing occupation, 54.5% in a physical role, and 9.1% employed in heavy manual work.

The Chi square indicated that there were no significant gender differences in the activity levels in the job role, X^2 (3, 62) = 7.38, $p > .05$. Descriptively, more males engaged in heavy manual labour than females. When looking at gender differences in participation in physical activities contributing to daily tasks (Table 6.13), females were significantly more likely to participate in over three hours a week of preparing food/cleaning [34.9% of males/59.6% of females ; X^2 (1, 115) = 6.992, $p < .05$], cleaning the house [16% of males /57.7% of females; X^2 (1, 115) = 18.35, $p < .001$], and doing the laundry or ironing [6.3% of males/44.2% of females; X^2 (1, 115) = 22.75, $p < .001$].

Table 6.10 Frequencies attending leisure activities and gender differences

Leisure activity	Males			Females			*P* Value
	Never/Less than monthly	Monthly	Weekly	Never/Less than monthly	Monthly	Weekly	
Competitive swimming	98.3%	1.7%		100%			.374
Leisurely swimming	93.4%	4.9%	1.6%	91.5%	6.4%	2.1%	.929
Backpacking or mountain climbing	98.4%	1.6%		100%			.378
Walking for pleasure	45.9%	23.0%	31.1%	51.0%	14.3%	34.7%	.517
Racing or rough terrain cycling	87.1%	9.7%	3.2%	100%			.038*
Cycling for pleasure	83.9%	12.9%	3.2%	100%			.015*
High impact aerobics or step aerobics	96.8%		3.2%	93.8%		6.3%	.450
Other aerobics	95.2%		4.8%	95.8%		4.2%	.867
Exercise with weights	75.8%	6.5%	17.7%	85.4%	4.2%	10.4%	.456
Conditioning exercises	79.0%	4.8%	16.1%	85.4%	6.3%	8.3%	.466
Floor exercises e.g. Yoga	88.7%		11.3%	83.3%	2.1%	14.6%	.446
Dancing e.g. ballroom or disco	95.2%	4.8%		97.9%	2.1%		.456
Competitive running	98.4%	1.6%		97.9%	2.1%		.855
Jogging	93.5%	3.2%	3.2%	97.9%		2.1%	.421
Tennis or badminton	96.8%		3.2%	100%			.209
Bowling (all varieties)	98.4%		1.6%	100%			.377
Squash	100%			100%			-
Table tennis	96.8%		3.2%	100%			.209
Golf	92.1%	4.8%	3.2%	100%			.142
Football, rugby or hockey (during season)	96.8%	3.2%		100%			.209
Cricket during season	100%			100%			-
Rowing	98.4%	1.6%		100%			.382
Netball, volleyball or basketball	100%			100%			-
Horse riding	100%			100%			-
Snooker, billiards or darts	85.9%	7.8%	6.3%	98.0%		2.0%	.068
Ice skating	100%			100%			-
Sailing, wind-surfing or boating	100%			100%			-
Martial arts, boxing and wrestling	95.3%		4.7%	100%			.125
Fishing	95.2%	4.8%		100%			.122
Mowing lawn - grass cutting season	65.1%	20.6%	14.3%	69.4%.	20.4%	10.2%	.801
Watering the lawn or garden in the summer	66.7%	11.1%	22.2%	62.5%	16.7%	20.8%	.698
Digging, shovelling or chopping wood	79.0%	8.1%	12.9%	85.4%	8.3%	6.3%	.513
Weeding or pruning	57.1%	26.5%	16.3%	64.5%	17.7%	17.7%	.535
Carpentry/home/care maintenance	58.7%	28.6%	12.7%	85.1%	10.6%	4.3%	.012*

Note: **p* < .05

Table 6.11 Frequencies of sedentary activities at weekend and weekday

	Males		**Females**		***P* value**
	≤4 hours day	> 4 hours day	≤4 hours day	> 4 hours day	
Weekends					
Watching television	55.4%	44.6%	62%	38%	.476
Video games	93.8%	6.2%	96.0%	4.0%	.607
Home internet use	84.6%	15.4%	90.2%	9.8%	.593
Reading at home	100%		100%		
Weekdays					
Watching television	75.4%	24.6%	78.4%	21.6%	.700
Video games	96.9%	3.1%	98.0%	2.0%	.707
Home internet use	89.2%	10.8%	92.2%	7.8%	.374
Reading at home	100%		100%		

Table 6.12 Frequencies in daily activities and significance of gender differences

	Males		**Females**		
	≤ 3 hour a week	> 3 hours a week	≤ 3 hours a week	> 3 hours a week	***P* value**
Preparing food, cleaning	65.1%	34.9%	40.4%	59.6%	.008*
Shopping for food	88.9%	11.1%	82.7%	17.3%	.339
Browsing the shops	90.3%	9.7%	86.5%	13.5%	.527
Cleaning the house	81.0%	16.0%	42.3%	57.7%	.000**
Laundry or ironing	93.7%	6.3%	55.8%	44.2%	.000**
Caring for an infant (non - work)	92.2%	7.8%	81.6%	18.4%	.091
Caring for an elderly or disabled person (non-work)	95.2%	4.8%	88.0%	12.0%	.158

Note: *$p < .05$; **$p < .001$

Table 6.13 Economic activity status of participants

Economic activity status	Male	Female
Full-time employment	40.5%	19.0%
Part-time employment	2.7%	25.9%
Full-time self-employment	14.9%	1.7%
Part-time self-employment	2.7%	3.4%
Unemployment	10.8%	3.4%
Temporary sickness/disability	4.1%	1.7%
Permanent sickness/disability	18.9%	19.0%
Looking after home/family	5.4%	22.4%
Retired	-	1.7%
Other	-	1.7%

6.5 Discussion

This study aimed to explore gender differences in the social and environmental influences of PA and SB, and differences in the types of leisure activities engaged in by adults with intellectual impairments indicative of an intellectual disability. The study addressed this aim by exploring if there were any gender differences in PA and SB levels (RQ1); if there were gender differences in the social and environmental influences of PA and SB (RQ2); gender differences in the types of activities engaged in by adults with intellectual impairments indicative of an intellectual disability (RQ3).

No gender differences were observed in the objectively measured PA (daily step counts) and SB (sedentary time hours/per day; RQ1). The lack of gender differences for step counts was unexpected as a recent systematic review and meta-analysis identified males with intellectual disabilities to participate in significantly more steps than females with intellectual disabilities (Chapter 2). This may be linked to the age of participants within this sample (age ≥46 years). In Chapter 3, PA of men was negatively associated with age, along with poor health, potentially leading to less pronounced gender differences in older age groups due to poor health. Nevertheless, within this study, women experienced greater limitations in health impacting moderate and social activities. Additionally, health limiting moderate activities was negatively associated with step counts in women only.

The lack of gender differences in step counts within this study may be due to methodological issues. There were high levels of missing data and only 50.8% of participants with accelerometer data wore the activity monitor for 7 days. This may have impacted the average daily step count data, which ranged considerably between 1,868 to 20,958 steps/day for males and 2784 to 16,836 steps/day for women. This indicates that the step count data has reduced validity, and this may have impacted the ability to assess gender differences in participation rates.

The presence of no gender differences in SB corroborates the findings of the systematic review and meta-analysis (Chapter 2). It is important to note that a limited number of studies within PA and SB intellectual disabilities research assess gender differences and subsequently the meta-analyses included few papers (Chapter 2). It is therefore necessary for research to assess gender differences to fully understand the low PA and high SB of adults with intellectual disabilities.

This study uncovered that there were no social or environmental correlates of objectively measured PA (step counts) or SB (sedentary time) among the participants when using the final data sets using the pooled imputed data (RQ2). The complete case data had a high risk of bias and must be interpreted with caution due to very limited generalisability. The findings of the complete case data suggest that attention should be given to the physical environment, such as urban vs rural areas, and the perceived trust of others, with trust considered an indicator of social capital (Putnam, 1994).

A negative association between urban living and step counts was observed for both genders, however the strength of the association was strongest among men. Walking for PA among adults with intellectual disabilities has been linked to perceived risks associated with urban living, such as needing to avoid busy roads due to safety concerns (Mitchell et al., 2016). The stronger influence of urban living for men could indicate that barriers in the physical environment exert more of an influence over PA. Men may participate in more exercise when the perceived risk is removed or in an environment that supports PA. This also emphasises a need to make urban settings more accessible for people with intellectual disabilities, to help promote PA and reduce SB.

Perceived trust is perhaps the most interesting finding when considering social influences. Descriptively, the perceived trust of others reported by all participants was very low, which may indicate low levels of social capital (Putnam, 1994; Kawachi & Berman, 2000). In the complete case regression model, trust of others was negatively associated with step counts, and positively associated with SB in women. However, it was negatively associated with SB and positively associated with step counts for men. The same direction of the association between trust and step counts and SB was also observed for men and women in the pooled imputed data. In the complete case data, the final model for step counts, believing most people can be trusted and having weekly visits with friends were positively associated with SB for women. This could indicate that women participate in more sedentary activities with friends.

Past literature has reported that women with intellectual disabilities prioritise trust and talking with friends, while men with intellectual disabilities describe doing activities with friends (McVilly et al., 2006), which potentially has implications for PA and SB. Additionally, trust is an indicator of social capital (Putnam, 1994; Kawachi & Berman, 2000), which relates to social support (Song et al., 2016). This suggests that even women with intellectual disabilities with greater social support and social capital may not be supported to participate in more PA. This could indicate gendered support for activities, which has been observed in qualitative literature, with men and adolescent boys with intellectual supported to do “male things”, such as sport, by male caregivers (Wilson et al., 2011).

This concept of gender differences in the activities engaged in was observed in the self-reported leisure activities (RQ3). Females were less likely to engage in any of the activities, and males were significantly more likely to participate in sports, such as cycling. This reflects past literature as men with intellectual disabilities have been reported to participate in more social activities (Dusselijee et al., 2011), and women with intellectual disabilities have been identified as participating in fewer PA and sports than men (Draheim et al., 2002). The higher participation rates in sports among men could reflect the influence of gender on support (Wilson et al, 2011), and the broader impact of gender norms that are described as important in the general population (Chalabaev et al., 2013; Plaza et al., 2017; Spencer et al., 2015; Cla et al., 2019). This concept was further supported, as women were also more likely to participate in household activities, such as cleaning, which reflects the gender norms relating to work and housework reported in the general population (McMunn et al., 2020).

However, the gender differences were outweighed by the very low participation rate in leisure activities across all participants, with walking being the highest rated activity. This reflects the unhealthily low levels of PA reported for adults with intellectual disabilities (Dairo et al., 2016), with walking reported as the most frequently participated activity for both males and females with intellectual disabilities (Draheim et al., 2002). Walking is also a free and accessible form of leisure activity, so it is possible that the lack of participation in other activities relate to broader infrastructural issues. This could relate to financial limitations and accessibility of sports facilities experienced by all adults with intellectual disabilities (Bossink et al., 2017).

Few participants described themselves as living comfortably, indicating financial restrictions, which has been identified as a barrier to PA (Bossink et al., 2017). Reflecting this, limited numbers of participants attended social groups or clubs, such as gyms, which may reduce opportunities to participate in more PA based leisure activities. Additionally, although most participants saw family members that they do not live with, approximately half of participants did not see friends they did not live with on a weekly basis. Furthermore, some participants reported never seeing friends or not having friends.

This reflects the restricted social networks and social contact described in past literature (Lippold & Burns, 2009; Giesbers et al., 2019; van Asselt-Goverts et al., 2015), with social contact with family and friends also linked to participation in leisure activities including sports (Robertson & Emerson, 2010). The reduced social contact and participation in social groups is concerning as social support is a key influence of PA and SB of adults with intellectual disabilities (Chapter 1, section 1.4.7.2). This may also reduce opportunities for social support and social capital, which is also reflected in the low levels of perceived trust reported by all participants (Putnam, 1994; Kawachi & Berkman, 2000). This emphasises that for both genders, there are social inequalities, relating to social inclusion and access to the necessary resources and facilities to engage in PA. This requires urgent attention to ensure adults with intellectual disabilities have access to the necessary opportunities to engage in a healthy lifestyle to improve health and wellbeing.

6.5.1 Strengths and limitations

The core strength of this study was its novelty, as it explored gender-specific social and environmental correlates in adults with intellectual impairments and assessed differences in the types of activities engaged in. The study also identified a lack of participation in leisure activities and attendance at social groups. Although there were potential differences between men and women that need to be further explored, the study emphasises potential issues with social inclusion and accessibility of leisure activities for all people with intellectual impairments.

The core limitations relate to the nature of the data, with a secondary data analysis conducted from the 1970 British Cohort Study. This resulted in the proxy measure of intellectual impairment being used, as there were no standardised measurements to identify people with intellectual disabilities resulting in an inability to generalise the findings. Additionally, the questions administered were not adapted or developed for use with people with intellectual disabilities and may not have been appropriate covering abstract concepts. Research has also indicated the need for population specific accelerometery protocols for people with intellectual disabilities relating to adherence (Leung et al., 2017). This would have contributed to the high levels of missing data and limited wear time for the devices which impacted the validity of the study findings. This highlights a need for researchers to develop reliable and valid measures of PA and SB for adults with intellectual disabilities. It also emphasises a need for caution when interpreting secondary data where the primary study was not developed specifically for people with intellectual disabilities.

Although there were high levels of missing accelerometer data, statisticians were consulted on how to handle this, and it was determined that using the complete case data would increase bias. There were differences in the significance values for the complete case versus the imputed data. However, the variables most strongly associated with the PA and SB and the directions of any associations were similar. The accelerometer data needs to be handled with caution and has limited generalisability. Nevertheless, it does provide a potential direction for future work and emphasises the need for population specific accelerometer protocols.

6.5.2 Recommendations for future research based on this study

Future research should collect primary data recruiting people with reported intellectual disabilities addressing similar research questions. Research should collect primary data exploring the social influences of PA and SB of adults with intellectual disabilities. There is a need for reliable and valid measures of PA and SB to be established for use with adults with intellectual disabilities. It is important to directly explore social contact with friends and family, and attendance at social groups among people with intellectual disabilities and how this relates to PA and SB. Additionally, exploring broader psychosocial factors, such as perceived trust of others and how this relates to PA and SB, should be a priority. The data also highlighted potential differences in leisure activities, so research should explore participation in leisure activities and try to promote attendance in sports and PA based activities.

6.6 Conclusion

This study explored potential gender differences in social and environmental correlates of objectively measured PA and SB, and differences in participation rates in leisure activities, using the BCS70 age 46 years data set. Although there were no clear differences in the correlates and the findings cannot be generalised, the importance of the physical environment and perceived trust should be considered. Gender differences were observed in the leisure activities, with men were more likely to participate in sports, while women spent more time doing light PA in the form of housework, such as cleaning. This could indicate the presence of gender norms relating to sports and leisure activities, which require further attention. Most importantly, however, participation rates in leisure activities were low across all participants, potentially due to financial limitations. Future research should explore similar research questions using primary data and methods developed or adapted for use with people with intellectual disabilities.

Chapter Seven. Reflection on the PhD process

At the start of this PhD in October 2017, my research and life experience included a newly completed MSc. in Health Psychology, a BSc (Hons) in Psychology and part-time employment. I had a solid understanding of research methods, psychological theories, and health behaviours, but limited knowledge of intellectual disabilities. This ultimately shaped the first months of the PhD; my reading and ideas were previously centralised on what was important to PA or SB in the general population. There was little appreciation of the complexity of intellectual disabilities research. I was advised to closely read the extant literature on PA and SB of adults with intellectual disabilities and critically reflect on what the methodological issues or gaps were, rather than focusing on broad and abstract ideas.

It became clear that there were gender differences in obesity and negative health outcomes associated with PA and SB, yet gender differences in PA and SB were overlooked. The existing intellectual disabilities research appeared to generalise findings to all people with intellectual disabilities. There was limited consideration of adults with intellectual disabilities as being a heterogenous group of people, with individual factors such as gender, potentially shaping lifestyle. From this point on, the focus of the PhD had been identified.

It was then necessary to consider how to address the broad and nuanced concept of gender and the PA and SB of adults with intellectual disabilities. This was an important yet under researched area of exploration. The decision was made to inform each new study based on the findings, limitations, or gaps of the previous study. First, gender differences were quantified through a systematic review and meta-analysis, to appraise if there were differences between men and women in PA and SB (Chapter 2). After this, it was necessary to be very critical of the findings: could the gender differences be concluded based on the small number of studies?

Rather than moving towards broad and abstract explorations, such as considering gender norms and PA or SB, this prompted a need for further quantification of gender differences through secondary data analysis. This also allowed for the exploration of gender-specific correlates of PA and SB. Due to the difficulties recruiting participants in intellectual disabilities research, secondary data analysis provided the opportunity to appraise questions relating to gender differences and gender-specific correlates in a time effective manner. However, the secondary data was limited and did not allow for the exploration of one of the most salient influences of PA and SB for adults with intellectual disabilities: social support.

The anticipated final study was developed to appraise gender differences in social support, using a method that could evaluate the sources of support, perceptions of support and the types of activities promoted (allowing consideration of gender norms). There were careful considerations made for the accessibility of the methods: minimising abstract questions; developing easy read material; creating visual aids; inviting supports to attend if the participant wished; and incorporating time to assess feasibility and pilot the methods. An ethics application was submitted in June 2019 but was not approved until October 2019. This was due to the ethical issues surrounding research with adults with intellectual disabilities. After the study was approved, there were further delays to starting data collection due to a need to update a Protecting Vulnerable Groups scheme form to include the University of Glasgow. This resulted in a delay in recruitment commencing until 2020.

The short period of time in 2020 where it was possible to interview adults with intellectual disabilities was deeply rewarding. Being able to learn from the lived experiences and expert knowledge of people with intellectual disabilities was invaluable. This period also provided a greater understanding of the complexities of data collection with adults with intellectual disabilities, and the necessity to consider research methods carefully in this context.

In March 2020 everything stopped, and a clear divide developed in my PhD experience: before and after the COVID-19 pandemic. As outlined in Chapter 5, the COVID-19 pandemic had major implications for the PhD thesis and resulted in quickly developing an entirely new study. This study had to be conducted remotely, be methodologically sound and address relevant research questions (Chapter 6). This was an exceptionally stressful and difficult time in *all* aspects of life. However, it ultimately advanced reflexivity and problem-solving skills that would not have been developed otherwise.

In addition to fostering problem solving skills, this PhD provided a unique understanding of developing accessible methods and encouraged critical thinking. The PhD also developed new skills, including, but not limited to, systematic reviews and meta-analyses; statistical data analysis; ethical considerations and data protection for research involving vulnerable adults; lone working; conducting interviews with adults with intellectual disabilities.

The PhD also provided additional opportunities to conduct lectures, attend conferences for both poster and oral presentations, participate in data collection for a feasibility trial with children with intellectual disabilities, and conduct thematic analysis as a second researcher in a separate project. Additionally, as a result of the skills acquired through the PhD, I was accepted for a research assistant position to work on part-time during the thesis pending period. I was also able to use the new expertise and knowledge base to develop a successful research grant application relating to PA of adults with intellectual disabilities.

Throughout the PhD I have developed a strong understanding of the lifestyles of adults with intellectual disabilities, and how the research area of PA and SB in this context is multifaceted and complex. As a result of this, I now strongly believe that the lived experiences of people, their perceptions, cognition, communication abilities, and language will influence our knowledge and understanding. This has major implications for research with people with intellectual disabilities, as the lived experiences of adults with intellectual disabilities and academic researchers will be very different. I must therefore acknowledge that my own understanding of reality will have been influenced by the fact I am a woman, without a disability, who has limited direct experiences of inequalities, and has received higher education in the field of psychology. Therefore, my own perceptions, experiences, and cognitions will have influenced my interpretation of the data. However, I also consider it possible to use rigorous methods and continued exploration to develop an understanding. This is reflected in the exploratory mixed-methods approach of this thesis, and the goal to develop an initial evidence base to inform understanding of gender differences and gender-specific influences on the PA and SB of adults with intellectual disabilities.

This is also reflective of the philosophical perspective of realism, which would have shaped the methods used and my interpretation of the findings. Realism is an ontological assumption (i.e., assumption about reality) used in psychology, with critical realism arguing that although an independent reality exists it cannot be known for certain (Lyons & Coyle, 2016). This approach is also not specific to qualitative or quantitative methodology (Pawson, 2005). Realism has been described as falling between two philosophical stances of positivism (the real world can be directly understood through observation) and constructivism (reality is shaped and interpreted through human senses and the brain, so cannot be fully understood) (Wong et al., 2013). Realism reasons that knowledge of reality will be “partial and imperfect” as this knowledge is “processed through human senses, brains, language and culture” (Wong et al. 2013, p. 3). Although the real world influences our interpretations, it is possible to build upon our knowledge and understanding of reality (Wong et al. 2013). Throughout this PhD, my experiences and improved knowledge have further reinforced this philosophical position.

This PhD has instilled a passion to understand how to tackle health and social inequalities, and to promote the health and wellbeing of adults with intellectual disabilities. As a result of this PhD, I hope to be able to pursue a career focusing on enhancing awareness of the lifestyles of adults with intellectual disabilities as a modifiable determinant of the health inequalities experienced.

Chapter Eight: General discussion

8.1 Introduction

This PhD thesis provides the first ever exploration into gender differences and gender-specific influences of the PA and SB of adults with intellectual disabilities. At the time of developing the rationale for this thesis, the topic of gender and PA or SB of adults with intellectual disabilities was vastly overlooked. Investigation into this issue was considered essential as there were clear gender differences in negative health outcomes associated with low PA and high SB, with women most at risk (Chapter 1, sections 1.3.1 & 1.4.3). PA and SB were therefore two modifiable lifestyle behaviours that could be targeted by future interventions. However, there was an insufficient evidence base to inform the development of gender-sensitised interventions, which represents a significant gap in the literature that needed to be addressed.

The MRC guidelines for developing complex interventions emphasise that an evidence base must be identified and reviewed before the intervention development stage (Craig et al., 2009). The behavioural epidemiological framework outlines that once a health influencing behaviour has been identified, and a suitable measurement method established, it is necessary to identify influences of the behaviour (Sallis et al., 2000). This thesis aimed to develop an initial evidence base, to inform future research and determine if gender-sensitised interventions were justified. To develop an evidence base, this project was based on sequential studies. Each study informed the research questions of the next, in the hopes of bridging the clear gap in the literature. Overall, the thesis was developed to address two aims:

1. Investigate and quantify gender differences in the PA and SB levels of adults with intellectual disabilities.

2. Identify potential gender-specific influences on the PA and SB of adults with intellectual disabilities.

8.2 Developing an evidence base for physical activity, sedentary behaviour, and gender: summary and implications of the findings

8.2.1 Gender differences in physical activity and sedentary behaviours (Aim 1)

The findings of this thesis indicate that men with intellectual disabilities engage in more PA than women with intellectual disabilities. However, there were no gender differences identified for SB. The systematic review and meta-analysis reported that men engage in significantly more step-counts and MVPA than women with intellectual disabilities (Chapter 2). Findings across the remaining studies reported gender differences in meeting the PAG based on subjective measurements (Chapter 4). Gender differences were reported in engagement in specific PA, with men more likely to participate in sports, such as cycling (Chapter 6). Gender differences were observed in activity related to job roles, with men more likely to engage in manual labour and women in cleaning household activities (Chapter 6). Although gender differences in PA may be present, these were less consistent than in the general population. The most concerning observation was the unhealthily low PA levels for all adults with intellectual disabilities. For example, percentages meeting the PAG were very low for both men and women (men: 8.8%/women: 4.3%; Chapter 4).

The most important implication is that all adults with intellectual disabilities were inactive and participated in high levels of SB. Both low PA and high SB are independently associated with numerous negative health outcomes. This includes reduced life expectancy, cardiovascular disease, and type-2 diabetes (Chapter 1, section 1.4.3). Additionally, increasing PA and engaging in > 60 minutes of moderate PA a day, can reduce the impact of SB (Ekelund et al., 2016). Therefore, the very low levels of PA observed for all adults with intellectual disabilities is concerning, as there is no protective impact of PA on the high SB levels reported. This will exacerbate health risks and contribute to the numerous health inequalities experienced.

The gender differences in PA were not as widespread as those reported in the general population (Chapter 1, section 1.7). However, the lack of consistent gender differences for SB reflects the general population (Chapter 1, section 1.7). This emphasises that these lifestyle behaviours are distinct. It is therefore concerning that the systematic review identified that studies misclassified low PA levels as SB (Chapter 2), which reflects the findings of past systematic reviews (Melville et al. 2017). This emphasises a need for more rigorous research addressing SB.

The finding that men with intellectual disabilities engage in more MVPA, have higher step counts, are more likely to meet PAG and engage in sports is important. This has implications for the increased risk of health inequalities for women with intellectual disabilities (Chapter 1, section 1.3.1). All people with intellectual disabilities experience numerous health inequalities, however, women with intellectual disabilities experience greater disadvantages (Chapter 1, section 1.3). Marginalised women, such as women with intellectual disabilities, experience intersecting sources of disadvantage because of their gender and their disability (Heise et al., 2019). This can then have implications for pathways to health, such as engaging in health behaviours, such as PA (Heise et al., 2019). Therefore, although the PA levels of all adults with intellectual disabilities are unhealthy, women potentially experience greater levels of inactivity. This may then contribute to the gender differences in health inequalities, emphasising the necessity to consider gender when examining PA and SB.

8.2.2 Gender-specific influences on physical activity and sedentary behaviour (Aim 2)

To inform the evidence base, the second thesis aim was to explore gender-specific influences. This included exploration of individual level influences, such as demographic factors or disability related factors, social influences, and wider environmental factors, such as access to PA resources. More gender-specific influences were observed for PA, reflecting the lack of gender differences in SB identified when addressing aim 1.

8.2.2.1 Individual level influences

8.2.2.1.1 Age

Age was an individual level influence that may interact with gender when impacting PA. Older age and health outcomes were correlates of objectively measured MVPA for men only (Chapter 3). Additionally, age was retained in the regression model for men only for subjectively measured PA, with older age associated with reduced odds of engaging in PA (Chapter 4). No gender-specific interactions were observed between age and SB (Chapter 3 & 4).

As adults with intellectual disabilities get older, the impact of health inequalities increase. Older adults are reported to have lower physical fitness, increased risk of cardiovascular risk factors and have very low levels of PA (de Winter et al., 2012; Hermans & Evenhuis, 2014; Hilgenkamp et al., 2012). However, women experience greater risk of obesity, poor health, and mortality (Chapter 1, section 1.3.1). As older age was a potential influence for men only, it suggests that younger men experience fewer barriers to PA than women and the health limiting barriers associated with age are more pervasive.

8.2.2.1.2 Health

An interaction was identified between health, PA, and SB of men and women. For women, this included an association between obesity and mental health issues with increased SB (Chapter 3), and health limiting moderate activities and reduced step counts (Chapter 6). For men, this included an association between physical health and both MVPA and SB (Chapter 3). There was also an association between mental health issues and self-reported PA for men (Chapter 3).

8.2.2.1.2.1 Obesity

Obesity was associated with increased SB in women in the objective accelerometer data (Chapter 3). However, obesity was not a significant correlate for SB of women when using subjectively measured screen time as a proxy measure (Chapter 4). Findings from Chapter 3 are less generalisable than Chapter 4, as it included intervention baseline data with unrepresentatively high obesity rates. However, the objectively measured SB in Chapter 3 has improved validity compared to the proxy measure of screen time. This emphasises the importance of measurement for SB, as it is unclear if obesity is a correlate. The findings however suggest, that for women, SB may be a lifestyle behaviour to target to address the increased risk of obesity.

In Chapters 3 and 4, rates of obesity were higher for women (Chapter 3: 77% women and 54.7% men/Chapter 4: 54.8% women and 31.2% men). This increased risk of obesity among women with intellectual disabilities has been widely reported (Emerson et al., 2005; Melville et al., 2007; Ranjan et al., 2018). The potential association between SB and obesity for women requires more attention. As increased risk of obesity is associated with inactivity and a sedentary lifestyle, these lifestyle behaviours could be targeted by interventions to address the obesity risk for women.

8.2.2.1.2.2 Physical health

Presence of physical health problems were associated with reduced objectively measured MVPA and increased SB of men (Chapter 3). Additionally, in Chapter 5, a man with intellectual disabilities reported high motivation for PA that was prevented due to physical limitations. This may suggest that physical limitations were the core barrier to PA participation. However, for women there may be more complex barriers preventing MVPA.

Nevertheless, health limiting moderate activities was negatively associated with step counts in women only (Chapter 6). Additionally, women reported poorer health limiting both moderate and social activities (male = 39.7%/female = 54.2%; male = 37.9%/female = 60.8%; respectively). This is reflective of the greater risk of health inequalities experienced by women with intellectual disabilities (Chapter 1, 1.3.1). This may suggest that health and mobility issues restrict PA in the form of step counts of women. Subsequently, it is essential to identify methods to improve the accessibility of PA for people with intellectual disabilities experiencing health limitations. This is especially important for women, who are at greater risk of health inequalities (Chapter 1, 1.3.1). This also highlights the importance of considering different types and domains of PA when targeting activity levels of adults with intellectual disabilities.

8.2.2.1.2.3 Mental ill health

Mental health issues were significantly associated with increased SB for women using accelerometer data and linked to decreased self-reported PA for men (Chapter 3 & Chapter 4). Self-reported PA has been identified as being negatively associated with future risk of depression and anxiety in meta-analyses of the general population (Schuh et al., 2018; Schuh et al., 2019). Additionally, SB was associated with increased risk of depression (Huang et al., 2020). This emphasises that the same association with PA and SB may be present for adults with intellectual disabilities. Although more research is required, this suggests that when targeting mental health issues, PA and SB should be targeted for both men and women.

8.2.2.1.3 Problem behaviour

Presence of problem behaviour was identified as a potential gender specific behaviour, associated with increased self-reported PA for men (Chapter 4). Nevertheless, no gender-specific association between problem behaviour and MVPA was observed (Chapter 3). The subjective PA was measured using a large representative sample and findings have improved generalisability. Additionally, eligibility criteria for participation in the study described in Chapter 3 excluded people with severe behaviour problems, while Chapter 4 did not.

In Chapter 4, the association between problem behaviour and PA was linked to aggressive behaviours, which are associated with the male sex hormone testosterone (Batrinos, 2012). Additionally, exercise interventions used to target problem behaviour for adults with intellectual disabilities (Ogg-Groenendaal et al., 2014) may contribute to the gender differences. However, this could also be linked to social support, as problem behaviours in men may be supported by male caregivers.

Research has indicated gendered roles of paid care staff. There are fewer men than women in paid caregiver roles for adults with intellectual disabilities (McConkey et al., 2007). This was linked to caregiving roles being gendered and considered appropriate for women (McConkey et al., 2007). Women in caregiver job roles have described having less trust of men with intellectual disabilities and feeling more at risk (Wilson et al., 2013). This reflects the wider literature, with research focusing on criminality and sexual deviancy of men with intellectual disabilities (Wilson et al., 2010). This may result in men with intellectual disabilities expressing problem or aggressive behaviour being supported by men. This has implications for PA, as supporting sports, such as football or swimming, are seen as “male things” that are supported more by men (Wilson et al., 2013). Additionally, men in the general population have greater self-efficacy for PA (Edwards & Sackett, 2016), and self-efficacy influences social support for PA provided by caregivers of adults with intellectual disabilities (Bains & Turnbull, 2020).

8.2.2.1.4 Intellectual disabilities specific issues

An interaction between PA, SB and intellectual disabilities related issues were identified for both genders. In Chapter 4, reduced odds for participating in PA were observed for men with severe and profound intellectual disabilities. Presence of Down syndrome was associated with increased odds of engaging in PA for women. However, this was potentially linked to level of intellectual disabilities as a higher proportion of women with Down syndrome had mild to moderate intellectual disabilities. For both men and women, decreased odds of SB were reported for profound and severe intellectual disabilities, with increased odds reported for presence of obesity among men. The decreased odds of engaging in SB for adults with profound and severe intellectual disabilities was linked to using “screen time” as a proxy for SB.

In Chapter 3, level of intellectual disabilities was not identified as a final correlate of PA or SB. However, in the bivariate analyses, severe to profound intellectual disabilities were associated with increased SB in women only. It is important to note that the study sample was not representative, and 79.7% of women vs. 89.7% of men had mild to moderate intellectual disabilities. In the large population-based sample of Chapter 4, 64.5% of women and 60.2% of men had mild to moderate intellectual disabilities. Profound and severe intellectual disabilities is a barrier for all adults with intellectual disabilities and is not a gender-specific influence.

Adults with severe to profound intellectual disabilities have greater care and support needs, potentially requiring 24-hour supervision. This may result in greater perception of people with severe and profound intellectual disabilities as being gender neutral by caregivers. Additionally, gender expression may be inhibited by cognitive limitations of people with intellectual disabilities and support provided by caregivers (Wilson et al., 2013). Therefore, although level of intellectual disabilities exerts an important influence over the PA or SB, it may not exert a gender specific impact. Additionally, the influence of gender may be more pronounced among adults with mild to moderate intellectual disabilities. This will require consideration in future research.

8.2.2.1.5 Self-efficacy

Bivariate correlates were conducted between self-efficacy for PA, with MVPA and SB in Chapter 3. Higher self-efficacy was significantly associated with increased MVPA and reduced SB in women only. No associations were observed for men. Self-efficacy for PA is one of the core gender-specific influences in the general population (Edwards & Sackett, 2016). However, it is not possible to make generalisations for adults with intellectual disabilities.

The self-efficacy for PA data had major methodological limitations reducing the ability to accurately interpret the findings (Chapter 3). The scoring provided participants with three options of agreement to a statement (Yes, Maybe, No). The mean scores for participants indicated “maybe” scores had been selected, reducing the ability to interpret the findings. Additionally, researchers collecting the data used in the secondary analysis reported that the measure was potentially too complex for participants (Melville et al., 2015). There were also concerns over assessing this qualitatively due to the abstract nature of potential questions. This is a recurring issue, and there needs to be focused consideration into suitable methods before the impact of self-efficacy can be fully explored.

8.2.2.2 Social influences

8.2.2.2.1 Social support and social capital

Social support is one of the central influences of PA and SB of adults with intellectual disabilities (Chapter 1, section 1.4.7.2). Although the research in Chapter 5 was halted due to the COVID-19 pandemic, data on social influences were collected from participants. The results indicate that adults with intellectual disabilities have small and restricted social networks, consisting primarily of family members. Chapter 6 addressed similar research questions with secondary data. There were no significant correlates in the final regression models. However, variables of interest included trust of others, and a small proportion of men and women believed that other people could be trusted (23% men/25.9% women). Trust of others was associated with increased SB and reduced PA among women, but the reverse was observed for men.

The low levels of perceived trust reported may reflect the high rates of bullying and disablism experienced by people with intellectual disabilities (Emerson, 2010; Green et al., 2010). An English cross-sectional survey explored rates of disablism experienced by adults with intellectual disabilities (Emerson, 2010). It was identified that 50% of participants experienced bullying at school, and 34% had recently experienced overt disablism or discrimination because of their disability. Both exposure to disablism and past bullying at school were associated with significantly increased odds of poor self-reported health (Emerson, 2010).

Within this thesis, a participant experienced discrimination because of their intellectual disabilities from members of the public when using a local gym (Chapter 5). Consequently, disablism may contribute to poor health as a barrier to PA. Importantly, the study by Emerson (2010) observed that increased access to material and social resources reduced the risk of poor self-reported health among people who experienced disablism. This emphasises the necessity to foster social contact for people with intellectual disabilities, and the need for more effective strategies to combat the disablism people experience.

It is therefore also concerning that in Chapter 5, participants had small and dense social support networks, which reflects previous social network studies for adults with intellectual disabilities (Harrison et al., 2021). This indicates that adults with intellectual disabilities may have limited access to resources through social capital (Roll & Koehly, 2020). The reversed association between genders for trust of others, and PA and SB, indicates potential differences in the resources accessed and activities supported. Trust of others is an indicator of social capital, which is a source of social support (Kawachi & Berkman, 2000; Putnam, 1994; Putnam, 2001; Song et al., 2016).

Therefore, women with greater social capital and subsequent social support may not be supported to participate in PA. Caregivers have described men and boys with intellectual disabilities doing “male things, such as swimming” with male caregivers (Wilson et al., 2011, p. 345). However, trust of others was low for all participants, indicating low social capital and social support. Although men with intellectual disabilities engaged in more sports than women, participation was low for all participants. This emphasises that although gender differences may be present, all adults with intellectual disabilities have limited opportunities to participate in PA.

8.2.2.2.2 Impact of gender norms

The gender differences in sports participation and negative association between trust of others and PA of women, may be impacted by gender norms. Gender norms influence the access to resources experienced by men and women (Cislaghi & Heise, 2020). It has been argued that gender norms influence participation and performance in PA, such as sports (Chalabaev et al., 2013). Descriptively men were more likely to participate in more sports and active leisure activities, with significantly higher rates of cycling (Chapter 6). Although participation rates were very low for both men and women, more women participated in no activities compared to men. Additionally, women spent significantly more time in daily activities such as preparing food, ironing, and cleaning. Women also engaged in more shopping and caring responsibilities.

Men and women with intellectual disabilities have reported gender normative perceptions of masculinity and femininity (Fitzgerald & Withers, 2013; Wilton & Fudge-Schormans, 2020; Zierkiewicz & Cytowska, 2019). This may contribute to the observed differences in activities engaged in. However, adults with intellectual disabilities when considering gender, have been reported as having limited autonomy, freedom of choice, and independence (Bjornsdottir et al., 2017; Fitzgerald & Withers, 2013; Wilton & Fudge-Schormans, 2020; Zierkiewicz & Cytowska, 2019). Subsequently, gender norms held by caregivers may exert more of an influence.

Qualitative research has reported that there are gender differences in the activities promoted for adults with intellectual disabilities. In institutional settings, women have been given tasks, such as cleaning, while men are encouraged to have roles in maintenance (Bjornsdottir et al., 2017). Additionally, gendered service delivery has been reported, where gender norms around masculinity influence support for men and boys with intellectual disabilities (Wilson et al., 2013).

Female care staff for adolescent boys and men with intellectual disabilities reported PA and sports as primarily supported by male caregivers (Wilson et al., 2013). This was linked to these activities as being male appropriate activities (Wilson et al., 2013). A participant in this study described playing football with female care staff as “socially not acceptable” (Wilson et al., 2013, p. 344). However, it has also been reported that there are fewer male paid caregivers for adults with intellectual disabilities (McConkey et al., 2007). This may explain the higher participation rates for PA and sports among men with intellectual disabilities, but the overall low participation rates for both genders (Chapter 6). Chapter 5 was intended to assess gender differences in support for PA; however, due to the limited data it was not possible to assess this. It is also not possible to make any meaningful inferences based on past literature, as there is no research explicitly exploring gender and social support for PA.

PA research exploring perspectives of caregivers of adults with intellectual disabilities have recruited primarily female caregivers (e.g., 67% - 86% women; Bains & Turnbull, 2020; Bergstrom & Wihlman, 2011; Bossink et al., 2019; Martin et al., 2011). It was reported the caregivers' perceived behavioural control to support PA (i.e., perceived ability to enact a behaviour) was associated with increased intentions to support PA of adults with intellectual disabilities (Martin et al., 2011). Additionally, receiving training for PA support increases perceived capability to promote PA for adults with intellectual disabilities (Bossink et al., 2019). Increasing knowledge and skills through training was attributed to promoting self-efficacy through mastery of healthy lifestyles (Bains & Turnbull, 2020). This could potentially indicate the importance of targeting confidence and self-efficacy for PA of women caregivers through extra training.

8.2.2.3 Wider environmental influences

8.2.2.3.1 Accessing social groups and physical activity resources

Chapter 5 identified that attending social groups was associated with larger social networks and participating in more leisure activities. Although the sample size was small, these preliminary findings identify social groups as important. Participants reported being motivated to take part in sports. However, it was also reported that most PA leisure activities were in the past and associated with being in school or past attendance at social groups.

Chapter 6 reported that attendance at weekly social groups, including gyms, were low with women having lower attendance (men = 20.3%/women = 6.9%). Additionally, the qualitative data for Chapter 5 indicated experiencing discrimination and stigma at gyms by a man with intellectual disabilities.

This emphasises a need to improve accessibility of social groups and PA resources. The low access to social groups may contribute to the restricted social networks, which may inhibit access to resources and social support (Kawachi & Berkman, 2000; Putnam, 1994; Putnam, 2001; Roll & Koelly, 2020; Song et al., 2016). Additionally, the past access to sports at school reflects the reduced options for PA after leaving school where physical education was promoted (Stevens et al., 2018).

Although access was low for both men and women, participation rates at social groups were higher among men. This reflects the higher participation rates in sports (Chapter 6). It is possible that men are encouraged to participate in clubs (including gyms) and sports due to the influence of gender norms (Chapter 8, section 8.2.2.2.2). The lower participation rates in clubs, such as gyms, and sports, among women compared to men (Chapter 6), suggests more pronounced inequalities for women. This indicates an intersection between gender and disability, and the concept that marginalised women experience greater inequalities and disadvantages (Heise et al., 2019).

In the general population, attending gyms is also influenced by gender norms (Coen et al., 2018). Gyms are potentially less supportive environments for women than men (Coen et al., 2018). Women have been reported to experience micro-aggressions, such as pressure to give way to allow men to access equipment (Coen et al., 2018). Gender norms may also exert an influence over accessing clubs and PA equipment for adults with intellectual disabilities. However, in Chapter 5, one man with intellectual disabilities reported similar aggressive behaviour at the gym, as the participant was teased and made fun of. Although this was a one-off occurrence, it emphasises that facilities are not supportive for adults with intellectual disabilities. This has also been reported in a systematic review, with negative social support, such as discrimination, being an environmental barrier to PA for all people with intellectual disabilities (Bossink et al., 2017).

8.2.2.3.2 Financial limitations

Financial limitations were identified as the main barrier to attending social clubs that promote activities (Chapter 5). Across all the studies in this thesis, most men and women experienced deprivation and financial limitations. However, there was a potential influence of gender, with more women observed as living in the most deprived areas (53.5% - 55% women/43% - 47.9% men; Chapters 3 & 4), or not living financially comfortably (84.5% women/67.6% men; Chapter 6). Additionally, men from the least deprived area of Glasgow had greater odds of engaging in PA than men from most deprived areas of Glasgow (Chapter 4).

Deprivation being an influence of PA for men only, may suggest that men experience greater opportunities for PA when financial resources are available. The increased deprivation observed among women, potentially indicates increased social and financial inequalities compared to men. Both these findings reinforce a potential intersection between presence of disability and gender when considering inequalities. This supports the idea that marginalised women, such as women with intellectual disabilities, experience greater disadvantages and inequalities (Heise et al., 2019). This may further reduce access to groups and facilities for women with intellectual disabilities. This potentially contributes to the higher participation rate in sports observed for men, and the higher attendance at social groups (Chapter 6).

8.2.2.3.3 Physical environment

There was limited data in this thesis relating to a gender specific influence of the physical environment on PA or SB. However, in Chapter 6, living in an urban setting was identified as a variable of interest. Living in an urban setting, versus a rural area, was associated with reduced step counts for both men and women. However, the strength of association was stronger for men. Additionally, in Chapter 5, a man living in the Greater Glasgow area, reported feeling anxious walking outside.

Qualitative interviews from a Glasgow based intervention promoting walking, reported barriers to walking relating to urban living (Mitchell et al., 2016). In this study, participants reported not following the highway code and nearly being knocked down (Mitchell et al., 2016). There were subsequent perceived risks around busy roads (Mitchell et al., 2016). Therefore, rural areas may be perceived as safer for PA participation and result in increased walking. This emphasises a need to make outdoor spaces more accessible for people with intellectual disabilities.

8.2.3 Gender blind research

The critique of intellectual disabilities research as being “gender blind” and the appraisal of adults with intellectual disabilities as being gender neutral was observed in this thesis (O’Shea & Frawley, 2020; Dusseljee et al., 2012; Umb-Carlsson & Sonnader, 2006). Most of the full-text papers were excluded during the systematic review and meta-analysis as these did not consider potential gender differences (Chapter 2). This reflects a failure to consider the individuals, and instead focusing purely on the disability.

There is mounting evidence that health inequalities are more pronounced among women (Chapter 1, section 1.3.1). Additionally, within this thesis, there is evidence that men engage in more PA and have greater participation in active leisure activities. When observing participant characteristics, men were experiencing less financial deprivation and had greater attendance at social groups. Although *all* adults with intellectual disabilities experience inequalities, it appears that women may experience greater risk. This emphasises that lack of attention on gender has the potential to reinforce and broaden existing inequalities.

8.3 Wider implications of thesis findings for all adults with intellectual disabilities

8.3.1 Impact of the COVID-19 pandemic

It is important to consider the potential impact that the COVID-19 pandemic will have on the lives of adults with intellectual disabilities based on the findings of this thesis. Throughout this thesis, it was reported that adults with intellectual disabilities engage in low PA and high SB, which contributes to increased health risks. A systematic review reported that social distancing and “lockdowns” to prevent the spread of COVID-19 pandemic have contributed to an increase in SB and decrease in PA (Stockwell et al., 2021). This has major implications for adults with intellectual disabilities, as the pre-COVID-19 PA and SB levels were already at unhealthy levels. Further reductions in PA and increases in SB could exacerbate the health inequalities experienced by adults with intellectual disabilities. It will therefore be essential to monitor the impact of COVID-19 pandemic restrictions on the lifestyles and health of people with intellectual disabilities.

National social distancing measures were enforced to curb the spread of COVID-19. This resulted in significantly reduced social contact for everyone. However, adults with intellectual disabilities experienced smaller social networks prior to these measures being introduced, and the pandemic will further enforce these social inequalities. It was observed in Chapter 5 that attendance at social groups increased social contact and the number of activities engaged in. Face-to-face social groups closed and moved online, which may have serious implications for people with intellectual disabilities. When attempting to adapt the study in Chapter 5 a group leader advised that many people did not have access to the internet.

The Office of National Statistics has outlined that a higher proportion of adults in the UK without access to the internet have a disability (Seranifo, 2019). Additionally, across the UK, more women than men do not have access to the internet (Seranifo, 2019). This will have implications for adults with intellectual disabilities who may not have the opportunity to access online social groups or use the internet for social interaction. As social support is also integral to PA participation, this may further restrict PA and increase SB.

8.3.2 Developing accessible physical activity groups

Attending social groups may increase the size of social networks (Chapter 5). This will provide opportunities to meet new people and increase access to social support. However, these social groups are impeded by financial limitations, and often club attendance or participation in sports occurred in the past (Chapter 5). Although the motivation may be present to be physically active, the opportunity may not. All adults had low participation in sports, and attendance at social groups (Chapter 6), with PA predominantly described as being in the past (Chapter 5).

Qualitative research on the transition into adulthood has reported fewer sports clubs available for adults compared to children with intellectual disabilities (Young-Southward et al., 2017). This was linked to fewer opportunities for social interaction for young adults with intellectual disabilities (Young-Southward et al., 2017). Sports clubs provided at school for adolescents with intellectual disabilities were described as promoting social connectedness and enjoyment (Stevens et al., 2018). It is therefore necessary to develop accessible clubs and groups for adults with intellectual disabilities to increase PA and sports participation. In addition to increasing the health benefits for PA, it may also expand social networks and opportunities for social support.

The main barrier to these groups reported in Chapter 5 was the associated cost. Sports promotion may not be financially feasible, as there is a need for equipment and spaces to participate. However, it is still important to identify options. Walking was the most frequently reported leisure activity (Chapter 5; Chapter 6), with walking identified as the main form of PA in past literature (Draheim et al., 2002). This could suggest the development and promotion of walking groups to promote PA and social interaction for adults with intellectual disabilities. Additionally, a participant in Chapter 5 reported walking as providing an opportunity to talk and socialise with network members.

Past interventions to promote walking for PA have not been successful in significantly increasing PA and reducing SB for adults with intellectual disabilities (Melville et al., 2015). However, this was not delivered as a walking group, and it was observed that caregivers and participants were disappointed that walking groups were not provided (Matthews et al., 2016). Walking groups were seen by adults with intellectual disabilities as an opportunity to socialise (Matthews et al., 2016). This has been corroborated in qualitative research of other programmes. Adults with intellectual disabilities have reported perceived health benefits of walking, but also the opportunities to interact and socialise with others (Brooker et al., 2015). Participants walking on their own also used this to deal with stress and to relax (Brooker et al., 2015).

There are barriers to walking for PA among adults with intellectual disabilities, such as risk around road safety, and reliance on care givers to identify routes (Mitchell et al., 2016). However, further exploration and consideration into developing accessible PA groups, such as walking clubs, will help address this. In addition to promoting PA and reducing SB, developing accessible sports clubs for adults with intellectual disabilities has the potential to increase social connections. This will also promote access to social support and resources, which can further enhance health and wellbeing. Additionally, women with intellectual disabilities may have social motivators for PA, describing having fun walking with others (Frey et al., 2005). Therefore, improving access to PA groups may help improve the PA levels of women with intellectual disabilities, specifically.

8.3.3 Physical activity and sedentary behaviour guidelines for adults with intellectual disabilities

The percentage of those meeting PAG was very low for all adults with intellectual disabilities, and this was based on guidelines of 150 minutes of weekly MVPA in the general population (Chapter 4). Meeting 150 minutes of MVPA is associated with numerous health benefits (Chapter 1, section 1.4.4). This may reduce the risk of health inequalities of adults with intellectual disabilities, and therefore the low PAG attainment is concerning. However, these guidelines are not population specific, and there are no PA and SB recommendations developed for adults with intellectual disabilities (Chapter 1, section 1.4.4.).

A recent study has also emphasised the health benefits for light intensity PA by linking the 2015 National Death Index records to the 2003-04 and 2005-06 National Health and Nutrition Examination Survey (Cruz et al., 2021). It was observed that participants achieving medium (approx. 280-374 minutes/day) and high (approx. 374-663 minutes/day) amounts of light PA had lower risk of mortality (Cruz et al., 2021). The authors proposed that light PA may be a more accessible form of PA and should be recommended to people that experience barriers to MVPA (Cruz et al., 2021). This has implications for adults with intellectual disabilities, as meeting the PAG was so low. This highlights the potential scope of the benefits to promoting more accessible forms of PA. It may also increase confidence and perceived ability of caregivers to promote PA.

8.4 General strengths and limitations

Influences of PA and SB were framed around the multi-level interacting individual, social and environmental factors, reflecting the socio-ecological model. However, no explicit theoretical frameworks were used, for both the exploration of gender and understanding PA and SB. This was due to an overarching limitation within PA and SB intellectual disabilities research. There are no theoretical frameworks developed that are specific to adults with intellectual disabilities, which outline the empirically tested influences of PA and SB. Instead, it was necessary to identify broad influences. This also has potential implications for gender, with limited research exploring gender in adults with intellectual disabilities.

Broad methodological issues common within intellectual disabilities research limit the ability to measure PA and SB within this population. This spans into more fundamental problems for the measurement of PA and SB. Subjective measurements rely on memory, recall and abstract concepts, such as time, duration, and intensity. Additionally, within this thesis, there were concerns over the use of proxy measures of SB, such as screen time. People with severe to profound intellectual disabilities may have high levels of SB, but low screen time, such as television views (Oppewall et al., 2018). This reduces the accuracy and validity of this proxy measure. In addition to this, it was observed that past researchers misclassified low PA levels as SB (Chapter 2).

There are also concerns over the use of accelerometer protocols, as no population-specific or consistent methods have been developed for adults with intellectual disabilities (Leung et al., 2017). This reduces the reliability of the findings and ability to make cross study comparisons. Some methods for calculation of MVPA used in the general population, such as cadence threshold of ≥100 steps (e.g., BCS70 data), may not be suitable. This is due to gait and walking abnormalities that have been reported in adults with intellectual disabilities (Almuhtaseb et al., 2014). Additionally, adults with intellectual disabilities and caregivers have reported difficulties using and understanding pedometers. It is therefore necessary to fully explore feasible, accessible, and valid measurement methods for PA and SB.

Specific to this thesis, the main limitation was the reliance on primarily secondary data to answer the research questions. This was an unintended consequence of the COVID-19 pandemic and the need to quickly identify a feasible method to address the thesis research question. This also resulted in a reliance on quantitative methods that did not allow for in-depth exploration of the role of gender on PA and SB. The secondary nature of the data used in chapters 3, 4, and 6, meant the variables assessed were not identified or developed specifically for the study meaning key correlates were not included.

As outlined in a previous section, there were methodological concerns over addressing abstract psychosocial influences (section 8.2.2.1.5). Self-efficacy was an intended variable to be explored due to its importance in the general population (Chapter 1, section 1.7). However, there were major concerns over the level of abstraction required to assess this concept. It would require a focused exploration on measurement which was not within the scope of this thesis. This also reflects a strength of this thesis: all studies were designed based on appropriateness of research methods for use with adults with intellectual disabilities.

Throughout this thesis, careful considerations were made to ensure methods were as rigorous as possible. For example, before starting the research for Chapter 5, the intention was first to appraise the feasibility and consider the suitability of methods. Additionally, when there were concerns over data analysis in Chapter 6, statisticians at the Robertson Centre were consulted for the best way to proceed.

At the time of developing the rationale, there was a major gap in the literature, making the thesis focus an essential research area. The thesis was developed to create an initial evidence base around gender differences in PA and SB of adults with intellectual disabilities. Although a lot of the work is preliminary and exploratory, it is an important step towards having a nuanced understanding of these lifestyle behaviours. The findings and recommendations can be used as a basis for future research or the development of interventions. This will then contribute toward addressing the health inequalities experienced by adults with intellectual disabilities.

8.5 Future research

The following recommendations for future research are based on the findings of this thesis, limitations that need to be addressed, and continuing gaps in the evidence base.

- Research should explicitly explore gender norms around the leisure activities engaged in by adults with intellectual disabilities. Caregivers and support people should be included, as social support is a core aspect of PA participation.

- The impact of a caregiver's gender and their appraisal of masculinity and femininity on PA and SB levels of adults with intellectual disabilities should be explored.

- Develop and test valid and accessible measurement methods to assess psychosocial variables.

- Develop population-specific theoretical frameworks to explain behaviour change for adults with intellectual disabilities.

- Further explore measurement methods for PA and SB of adults with intellectual disabilities, to identify suitable methods that are feasible, reliable, and valid.

- There is a need to fully understand PA and SB of adults with intellectual disabilities to develop population-specific recommendations and guidelines for participation rates.

- The long-term impacts of the COVID-19 pandemic on the health, wellbeing, and lifestyle behaviours of adults with intellectual disabilities must be explored.

8.6 Concluding remarks

This thesis was the first to specifically investigate potential gender differences, and gender-specific influences on PA and SB of adults with intellectual disabilities. This was essential as women with intellectual disabilities experience increased health inequalities, which are reflective of low PA and high SB. The PhD thesis was conducted with the goal of adding to the limited evidence base that could be used to inform future interventions targeting PA and SB of men and women with intellectual disabilities. This PhD project was impacted by the COVID-19 pandemic, which resulted in a greater reliance on secondary data. Overall, the findings indicate that men engage in more PA, and more leisure activities, such as sports. However, participation rates were very low for both men and women. There were gender-specific influences observed for PA requiring more focus in future research before conclusions can be drawn. No gender differences were observed in SB. There is a need for research to continue to explore this important area of research to tackle health inequalities by targeting low PA and high SB of adults with intellectual disabilities.

Appendix 1. Chapter 2: Permissions to use published material

Permission was requested and granted to use the following published systematic review and meta-analysis within this thesis:

Westrop, S. C., Melville, C. A., Muirhead, F., & McGarty, A. M. (2019). Gender differences in physical activity and sedentary behaviour in adults with intellectual disabilities: A systematic review and meta-analysis. *Journal of Applied Research in Intellectual Disabilities*, *32*(6), 1359–1374. https://doi.org/10.1111/jar.12648

Details of the permissions request.

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Licensed Content Title: Gender differences in physical activity and sedentary behaviour in adults with intellectual disabilities: A systematic review and meta-analysis

Licensed Content Author: Arlene M. McGarty, Fiona Muirhead, Craig A. Melville, et al

Licensed Content Date: Aug 1, 2019

Licensed Content: Volume 32

Licensed Content Issue: 6

Type of use: Dissertation/Thesis

Requestor type: Author of this Wiley article

Format: Print and electronic

Portion: Full article

Will you be translating? No

Title: An exploration of gender differences and gender-specific influences on the physical activity and sedentary behaviours of adults with intellectual disabilities

Institution name: University of Glasgow

Expected presentation date: Aug 2021

Requestor Location: Miss. Sophie Westrop Gartnavel Royal Hospital Administration Building, 1st floor 1055 Great Western Road Glasgow Glasgow, G12 0XH United Kingdom Attn: Miss. Sophie Westrop

Publisher Tax ID: EU826007151

Total 0.00 USD

Appendix 2. Chapter 2: Example search strategy

The Ovid MEDLINE search is an example search strategy that reflects the terms used within each database. Subtle variations in terms arose from exploded terms as these were database specific, and the formatting varied between databases.

Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946-present

last ran 29/01/2018

1. exp Intellectual Disability/
2. exp Mentally Disabled Persons/
3. (developmental adj2 (disab* or disorder or difficult*)).tw.
4. (mental* adj2 (retard* or defici*)).tw.
5. (cognitiv* adj2 (defici* or impair*)).tw.
6. (learning adj2 (disab* or disorder or impair* or difficult*)).tw.
7. (intellectual* adj2 (disab* or disorder or impair* or difficult*)).tw.
8. exp Physical Exertion/
9. exp Exercise/
10. exp Sports/
11. Sport*.tw.
12. walk*.tw.
13. physical* activ*.tw.
14. exercis*.tw.
15. Leisure activit*.tw.
16. exp Sedentary Lifestyle/
17. (sedentary adj2 (behaviour or behavior or time)).tw.

18. sedentar*.tw.

19. Physical* inactiv*.tw.

20. sitting time.tw.

21. television watching.tw.

22. television viewing.tw.

23. video viewing.tw.

24. electronic game playing.tw.

25. computer gaming.tw.

26. computer time.tw.

27. "computer use”.tw.

28. "PC use".tw.

29. occupational sitting.tw.

30. deskbound.tw.

31. motor* transport.tw.

32. prolonged sitting.tw.

33. 1 or 2 or 3 or 4 or 5 or 6 or 7

34. 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15

35. 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32

36. 34 or 35

37. 33 and 36

38. limit 37 to (full text and humans and "all adult (19 plus years)" and English)

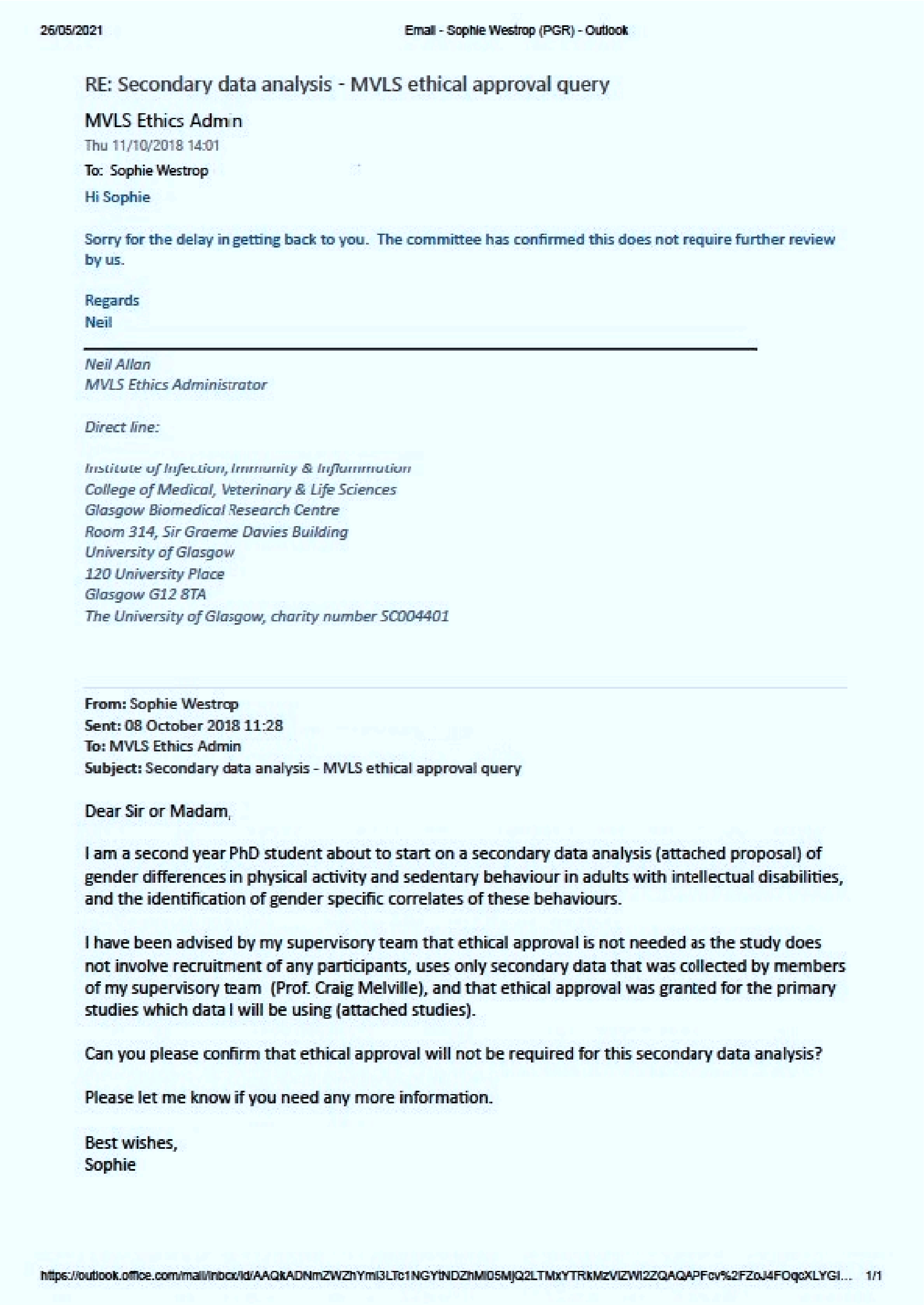
Appendix 3. Chapter 2: Weighted averages example

The table below shows the weighted average calculated for daily MVPA, using the number of males and females within a sample as a weight.

	Sample size		Weight		Daily MVPA		Weighted MVPA	
Study	Males	Females	Males	Females	Males	Females	Males	Females
Nordstorm et al., 2013	33	54	0.212	0.323	35.8	22	7.59	7.106
Oviedo et al., 2017	49	35	0.314	0.21	32.1	29	10.079	6.09
Phillips & Holland. 2011	74	78	0.474	0.467	40.4	30.2	19.15	14.103
Total	156	167	1	1			36.8	27.3

Appendix 4. Chapter 3 & 4: Ethics confirmation on secondary data analysis

Confirmation was sought that ethical approval would not be required to conduct the secondary data-analyses in Chapters 3 & 4.



26/05/2021 Email - Sophie Westrop (PGR) - Outlook

RE: Secondary data analysis - MVLS ethical approval query

MVLS Ethics Admin
Thu 11/10/2018 14:01
To: Sophie Westrop

Hi Sophie

Sorry for the delay in getting back to you. The committee has confirmed this does not require further review by us.

Regards
Neil

Neil Allan
MVLS Ethics Administrator

Direct line:

Institute of Infection, Immunity & Inflammation
College of Medical, Veterinary & Life Sciences
Glasgow Biomedical Research Centre
Room 314, Sir Graeme Davies Building
University of Glasgow
120 University Place
Glasgow G12 8TA
The University of Glasgow, charity number SC004401

From: Sophie Westrop
Sent: 08 October 2018 11:28
To: MVLS Ethics Admin
Subject: Secondary data analysis - MVLS ethical approval query

Dear Sir or Madam,

I am a second year PhD student about to start on a secondary data analysis (attached proposal) of gender differences in physical activity and sedentary behaviour in adults with intellectual disabilities, and the identification of gender specific correlates of these behaviours.

I have been advised by my supervisory team that ethical approval is not needed as the study does not involve recruitment of any participants, uses only secondary data that was collected by members of my supervisory team (Prof. Craig Melville), and that ethical approval was granted for the primary studies which data I will be using (attached studies).

Can you please confirm that ethical approval will not be required for this secondary data analysis?

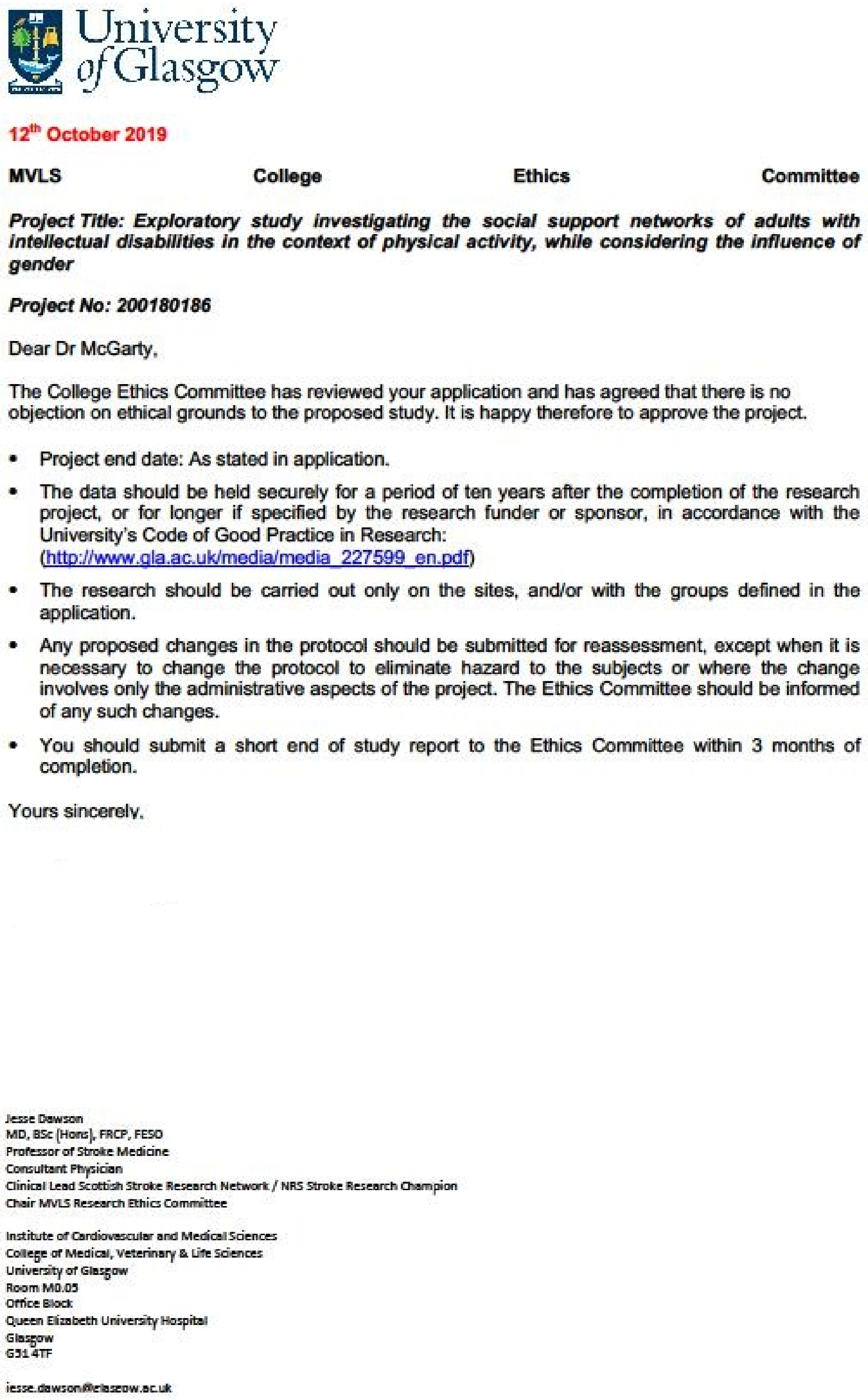
Please let me know if you need any more information.

Best wishes,
Sophie

https://outlook.office.com/mail/inbox/id/AAQkADNmZWZhYmI3LTc1NGYtNDZhMi05MjQ2LTMxYTRkMzViZWI2ZQAQAPFcv%2FZoJ4FOqcXLYGI... 1/1

Appendix 5. Chapter 5: Ethical approval

MVLS ethics committee provided ethical approval for Study 1 in Chapter 5 to be conducted.



University of Glasgow

12th October 2019

MVLS College Ethics Committee

Project Title: Exploratory study investigating the social support networks of adults with intellectual disabilities in the context of physical activity, while considering the influence of gender

Project No: 200180186

Dear Dr McGarty,

The College Ethics Committee has reviewed your application and has agreed that there is no objection on ethical grounds to the proposed study. It is happy therefore to approve the project.

- Project end date: As stated in application.
- The data should be held securely for a period of ten years after the completion of the research project, or for longer if specified by the research funder or sponsor, in accordance with the University's Code of Good Practice in Research: (http://www.gla.ac.uk/media/media_227599_en.pdf)
- The research should be carried out only on the sites, and/or with the groups defined in the application.
- Any proposed changes in the protocol should be submitted for reassessment, except when it is necessary to change the protocol to eliminate hazard to the subjects or where the change involves only the administrative aspects of the project. The Ethics Committee should be informed of any such changes.
- You should submit a short end of study report to the Ethics Committee within 3 months of completion.

Yours sincerely,

Jesse Dawson
MD, BSc (Hons), FRCP, FESO
Professor of Stroke Medicine
Consultant Physician
Clinical Lead Scottish Stroke Research Network / NRS Stroke Research Champion
Chair MVLS Research Ethics Committee

Institute of Cardiovascular and Medical Sciences
College of Medical, Veterinary & Life Sciences
University of Glasgow
Room M0.05
Office Block
Queen Elizabeth University Hospital
Glasgow
G51 4TF

jesse.dawson@glasgow.ac.uk

Appendix 6. Chapter 5: Standard participant information sheet

This the text used in the standard participant information sheets is presented. In the original document, a dated version number was provided which matched the consent form provided (see Appendix 14).

The images were “Easy on the I” copyrighted for Leeds York Partnership NHS Foundation trust (https://www.learningdisabilityservice-leeds.nhs.uk/easy-on-the-i/image-bank/)

University of Glasgow | College of Medical, Veterinary & Life Sciences

Participant Information Sheet

Title: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women.

Please read this information sheet.

You can ask someone you trust for help reading this sheet.

You have been asked to take part in a study.

You need to know what the study is about before saying yes. You need to understand why the study is being done and what you would do. Please read this carefully and talk about it with someone you trust. Please ask me if you need more information.

What is the study for?

This study is part of the researchers degree at the University of Glasgow. The researcher wants to find out how to study the support you get to do activities. The study will find out about the people most important to you. It will look at the activities you do together and support you get for physical activity. It will also see if there are differences between men and women.

Why have I been asked to take part?

You are over 18 years old and you have a mild learning disability. You live in Greater Glasgow.

Do I have to take part?

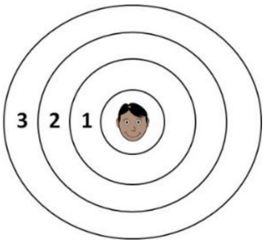
No. You do not have to take part. It is OK to say “no”.

If you say “yes” but change your mind, it is OK. Let me know if you want to stop. You do not have to say why you have changed your mind.

What will happen to me if I take part?

You will meet the researcher for about 1 hour and 15 minutes. This will be in a safe place that you want to meet at. You can ask the researcher anything about the study. You will be asked to explain what you think the study is about. If you still want to take part the researcher will get you to sign a consent form.

You will be asked questions about yourself. You will be asked questions relating to your learning disability. This is to make sure that you should be taking part in the study. You will also be asked about the people you know and the activities you do. You will then be asked about the people you know and those most important to you. These are the people you are most close to.



The names of the people important to you will be written on a picture. This picture has three rings with you in the middle. The rings show how close a person is to you. Ring 1 is for the people you feel most close to. Ring 3 is for important people you are less close to than rings 1 and 2.

You will be asked what activities you do and who you do them with. You will also be asked about the support you get to do physical activities. There will be pictures to help you answer questions. The sound from our voices will be recorded during the interview. This is so the researcher can type what was said for the study report.

You can choose not to answer questions. You can ask the researcher to explain questions that you do not understand. If the interview is taking a long time you can stop and meet another day. You can stop the interview at any time and choose to leave the study.

Can I get someone to help me do this study?

Yes. You can ask an adult that you trust to help you take part. They will need to read the information sheet and agree to come.

What do I have to do?

If you want to take part you will complete the reply sheet. If an adult you trust will be helping you, they will need to fill out a reply sheet. These will be put in a same stamped and addressed envelope and sent to the researcher.

If you still want to take part, the researcher will arrange a time and place to meet. You will then meet the researcher face to face. The researcher will explain the study and ask you to complete a consent form. You will meet the researcher for about 1 hour and 15 minutes and will be asked questions. If you do not like a question you can choose not to answer it. You can also ask the researcher explain any questions that you do not understand.

Will anything bad happen if I take part?

You will have to give up about 1 hour and 15 minutes of your time.

It is unlikely that any anything bad will happen to you because you took part.

Are there any good things about taking part?

There are no direct good things that will happen because you took part.

You may find the study fun and interesting to do.

Will other people find out I took part?

No. You taking part will be kept private.

Your name will not be said in the study. The people most important to you will not be named. It will not be possible for someone else to know you took part.

What will happen to the information I give you?

Reports will be written about what was found for the researchers degree. The reports may be published in academic journals or presented to other researchers. There may be things that you have said in the report. The picture made in the interview may be in the report. Your name will not be in the report. The names of the people important to you will not be in the report. No one will know that you took part.

The researcher will follow the rules made to keep your information safe. All information will be stored safely at the University of Glasgow. This information will be kept for ten years. After ten years the information will be destroyed.

The researcher needs to report any illegal or harmful activities you do. The researcher will need to disclose this to social work and regulatory bodies. This is to keep you safe.

Who is paying for this study?

This study is part of the researchers University degree. It is run by the researcher and her supervisors. It is being paid for by the Scottish Government as they are funding the degree.

Who has checked this study?

The College Ethics Committee of the University of Glasgow has checked this study. They have made sure that it is safe for you to take part.

How can I take part?

Read this information sheet. Fill out the reply sheet and give it to the researcher. You can send this to me using the stamped and addressed envelope.

How can I get someone to help me do this study?

They will need to read the other information sheet. They will need to fill out a reply sheet.

Put this in the same envelope as your reply sheet.

You can contact me to ask questions about the study.

Miss Sophie Westrop

1st floor Admin Building
Mental Health & Wellbeing
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow G12 0XH

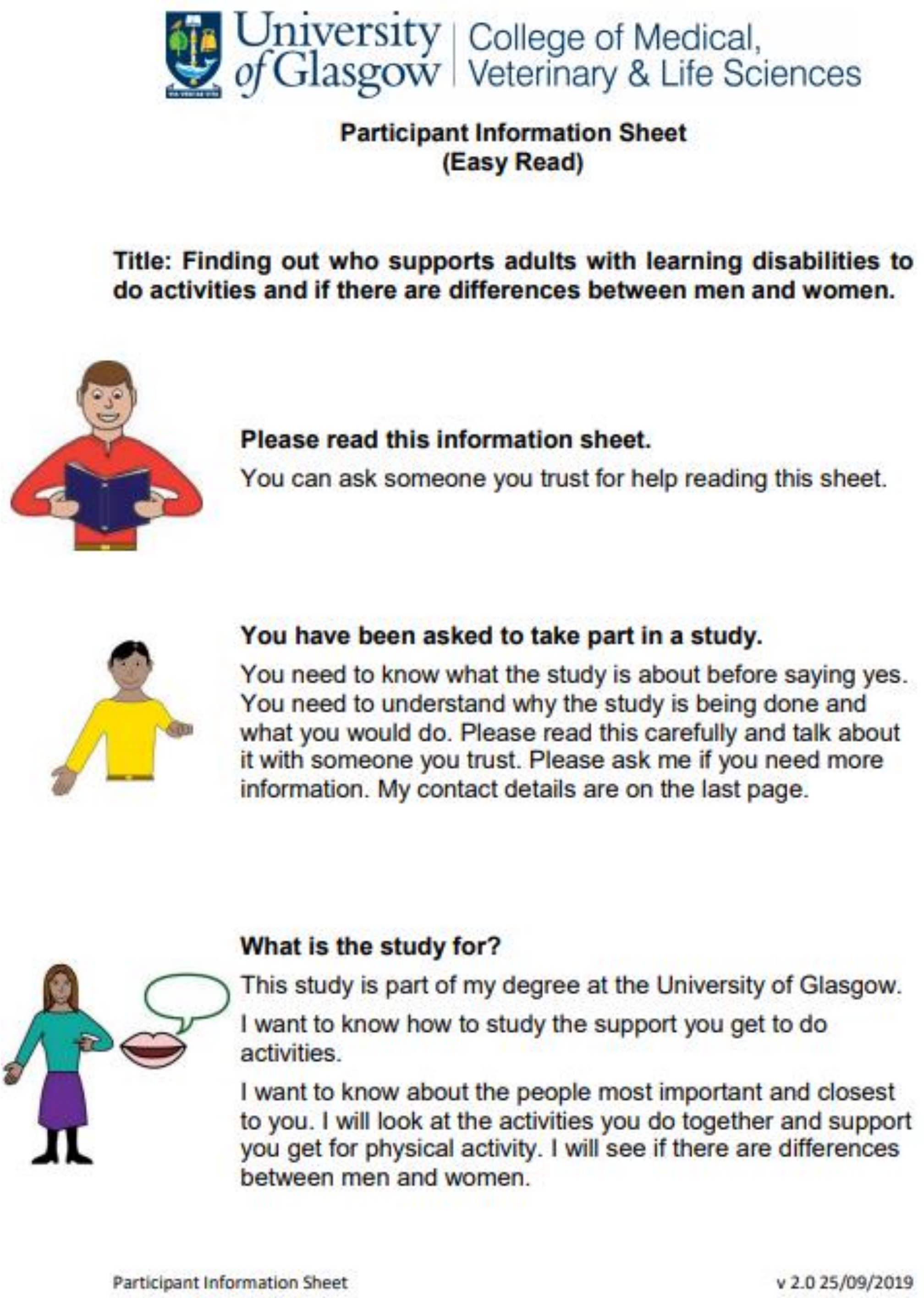
Email:

Mobile:
Work Telephone:

Contactable during office hours (9am to 5pm / Monday to Friday).

Appendix 7. Chapter 5: Easy read information sheet

To avoid formatting issues, the pages have been inserted as an image. Graphics from “Easy on the I” copyrighted for Leeds York Partnership NHS Foundation trust (https://www.learningdisabilityservice-leeds.nhs.uk/easy-on-the-i/image-bank/)



University of Glasgow | College of Medical, Veterinary & Life Sciences

Participant Information Sheet
(Easy Read)

Title: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women.

Please read this information sheet.

You can ask someone you trust for help reading this sheet.

You have been asked to take part in a study.

You need to know what the study is about before saying yes. You need to understand why the study is being done and what you would do. Please read this carefully and talk about it with someone you trust. Please ask me if you need more information. My contact details are on the last page.

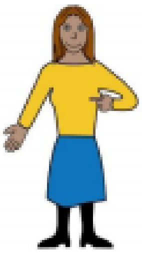
What is the study for?

This study is part of my degree at the University of Glasgow.

I want to know how to study the support you get to do activities.

I want to know about the people most important and closest to you. I will look at the activities you do together and support you get for physical activity. I will see if there are differences between men and women.

Participant Information Sheet v 2.0 25/09/2019



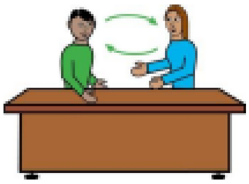
Why have I been asked to take part?

You are an adult and you have a mild learning disability. You also live in Greater Glasgow.

Do I have to take part?

No. You do not have to take part. It is OK to say "no".

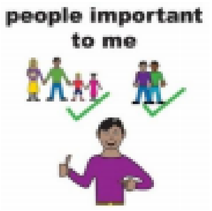
If you say "yes" but change your mind, it is OK. Let me know if you want to stop. You do not have to say why you have changed your mind.



What will happen to me if I take part?

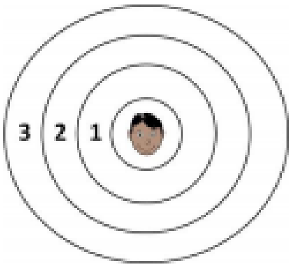
You will meet me for about 1 hour and 15 minutes.

This will be in a safe place that you want to meet at. You can ask me anything about the study. I will ask you to tell me what you think the study is about. I will ask questions about you and your learning disability. This is to make sure that you should be taking part.



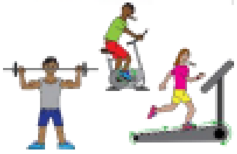
I will then interview you. The sound from our voices will be recorded during the interview. This is so I can type what was said for my study.

You will be asked to answer questions about the people you know and those most important to you.



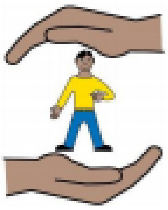
The names of the people important to you will be written on a picture. This picture has three rings with you in the middle. The rings show how close a person is to you. Ring 1 is for the people you feel most close to. Ring 3 is for important people you are less close to than rings 1 and 2.

You will be asked what activities you do and who you do them with.



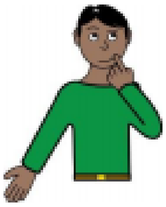
You will be asked about the support you get to do physical activities.

You can choose not to answer questions. You can ask me to explain questions that you do not understand. If the interview is taking a long time we can stop and meet another day. You can stop the interview at any time and choose to leave the study.



Can I get someone to help me do this study?

Yes. You can ask an adult that you trust to help you take part. They will need to read the information sheet and agree to come.

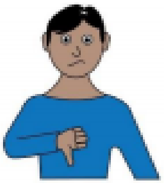


What do I have to do?

If you want to take part you will need to complete the reply sheet. If a trusted adult is coming to help they will need to do this too. This needs to be sent to me using the stamped and addressed envelope.

If you want to take part you will choose when and where to meet me. You will then meet me face to face. I will talk about the study and get you to sign a consent form. You will then be interviewed for 1 hour and 15 minutes.

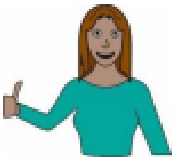
If you do not like a question you can choose not to answer it. You can also ask me to explain any questions that you do not understand.



Will anything bad happen if I take part?

You will have to give up 1 hour and 15 minutes of your time.

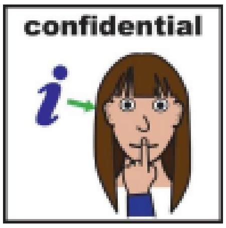
It is unlikely that anything bad will happen to you because you took part.



Are there any good things about taking part?

There are no direct good things that will happen because you took part.

You may find the study fun and interesting to do.



Will other people find out I took part?

No. You taking part will be kept private.

Your name will not be said in the study. The people most important to you will not be named. It will not be possible for someone else to know you took part.

What will happen to the information I give you?

I will write reports about what was found. Other people will be able to read these reports. There may be things that you have said in the report. The picture we made in the interview may be in the report. Your name will not be in the report. The names of the people important to you will not be in the report. No one will know that you took part.

I will follow the rules made to keep your information safe. All information will be stored safely at the University of Glasgow. This information will be kept for ten years. After ten years the information will be destroyed.

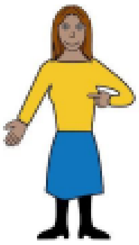
I will have to report any illegal or harmful activities. This information would be passed on to social work and regulatory bodies. This is to keep you safe.

Who is paying for this study?

This study is part of my University degree. It is being paid for by the Scottish Government as they are funding my degree.

Who has checked this study?

The College Ethics Committee of the University of Glasgow has checked this study. They have made sure that it is safe for you to take part.

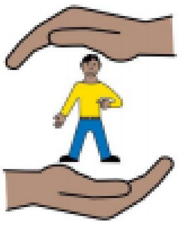


How can I take part?

Read this information sheet.

Fill out the reply sheet.

You can send this to me using the stamped and addressed envelope.

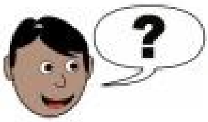


How can I get someone to help me do this study?

They will need to read the other information sheet.

They will need to fill out a reply sheet.

Put this in the same envelope as your and reply sheet.



You can contact me to ask questions about the study.

Miss Sophie Westrop

1st floor Admin Building
Mental Health & Wellbeing
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow G12 0XH

Email:

Mobile:
Telephone:

Contactable during office hours (9am – 5pm / Monday to Friday)

Appendix 8. Chapter 5: Information sheet for trusted adult/support

Text copied from the information sheet provided to the support or “trusted adult” of the participant. In the original document, a dated version number was provided which matched the consent form provided (see Appendix 15).

University of Glasgow | College of Medical, Veterinary & Life Sciences

Support Information Sheet

(Carer / Parent / Support)

Study Title: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women.

The participant has been invited to take part in a research study. Before they decide, it is important they understand why the research is being done and what it will involve. Please ensure they have taken the time to read the information sheet carefully and give the opportunity for them to discuss it with you if they wish. Ask us if there is anything that is not clear or if you would like more information. If they decide to take part in this study, they will be given a copy of this participant information sheet and the signed consent form to keep.

What is the purpose of this study?

This study is conducted as part of the PhD qualification of the researcher and explores the social support networks of adults with learning disabilities in relation to support for leisure activities (e.g. going for walks; going shopping; going to the cinema) and how participants feel they are supported to do physical activities. The study will also see if there are differences between genders. The social support network is made up of the people important to the participant and those they are closest to. This will be used to study sources of social support for leisure activities and the types of activities that are promoted. In order to do this, the study has two main aims.

The first aim is to test the method for researching the social support networks of adults with learning disabilities in relation to the activities promoted. This has never been done before with adults with learning disabilities, so it is important to understand if this technique is possible.

The second aim is to describe the social support networks of adults with learning disabilities (e.g. the number of people in the network; the number of males or females within the network) and the types of activities that are supported to do, along with support for physical activities. Additionally, potential differences between males and females will be assessed.

Why has the person I support been invited to participate?

They have been invited to take part as they are an adult, over the age of 18, with a mild learning disability living in the Greater Glasgow area.

Does the person I support have to take part?

No, it is up to them to decide if they want to participate. If they do decide to take part, they will be given their information sheet to keep. They will be asked to provide their contact details and return the reply sheet. If they decide to take part, they are still free to withdraw at any time, prior to data analysis, without giving a reason.

What will happen to the person I support if they take part?

If they decide to participate they will meet the researcher face to face in a safe location, the researcher will describe the study to them. The researcher will then make sure they understand the purpose of the study by asking them to describe the study in their own words to ensure informed consent. They will then be given a consent form to complete.

The participant will meet the researcher face to face for about 1 hour and 15 minutes. During the first fifteen minutes, the participant will be asked questions to determine their level of learning disability and demographic information. There will then be an interview lasting about one hour. The researcher will ask the participant to name the people they know. They will then be asked to identify the people who are most important to them, along with some basic information about these people (e.g. age and gender). They will be asked to identify the people they feel most close to, and whether any of the people in their network know each other. This information will be recorded on a diagram that consists of three rings that represent how close people in the participant’s network are to them.

The participant will then be asked about the leisure activities they do, and who they do them with. To help them answer this question there will be pictures of possible activities. They will then be asked questions relating to social support for physical activities.

There will be visual aids to help answer the questions. The participant can take their time to answer the questions and ask the researcher to reword or explain any questions that they do not understand. The participant can choose not to answer questions and can ask the researcher to stop the interview at any time. If they get tired, they can also ask to take a break or ask for the interview to be resumed on another day.

The audio of the interview will be recorded using a Dictaphone to allow for transcription

What does the person I support have to do?

If the participant wants to take part they will need to complete a reply sheet. This will need to be sent to the researcher using the provided stamped and addressed envelope. If the participant requests for you to attend, your reply sheet must be posted in the same envelope.

If the participant still wants to take part, the researcher will arrange a time and place to meet. The researcher will then meet the participant face to face, and the researcher will explain the study to them. To ensure capacity for informed consent, the participant will be asked to explain the study in their own words. The participant will then be asked to complete a dated consent form. The participant will then be asked the questions about themselves and the interview will be conducted.

What if the person I support wants me to be there and help?

If the person your support wishes for you to be present, or you feel they will need additional support, you are invited to attend the interview.

What will I have to do if I attend to support the participant?

If you have read this information sheet and wish to attend to support the participant, you will be required to provide your contact details and complete a consent form (labelled as “Carer/Parent/Support”).

If you attend, you will not be asked any interview questions directly. However, you can help the participant respond to any questions that they have difficultly answering or rephrase any questions. You may also assist the development of the social network diagram. The participant can refuse to answer any questions. If you or the participant wishes to stop at any time you are welcome to do so.

What are the possible disadvantages and risks of taking part?

There is unlikely to be any risk involved in taking part. However, the interview can take up to an hour and fifteen minutes to complete and participants or supporters may find the study boring.

What are the possible benefits of taking part?

There are no direct benefits of taking part. However, the data collected will help us to improve methods in exploring social support for leisure and physical activities in adults with learning disabilities. The study will also uncover the types of activities supported and understand the social support networks of adults with learning disabilities. The research will also provide data on potential perceptions of social support for physical activity and potential gender differences.

Will participation be kept confidential?

Yes. All information collected throughout the course of this research will be kept strictly confidential. However, if the participant reports illegal and/or harmful activities, the researcher will need to disclose this. The researcher would be required to break confidentiality and report this to social work and regulatory bodies.

Participants will be referred to by an identification number and gender, this will be used to anonymise transcripts and to cite any quotes when writing up the research (e.g. Participant 3, Male). Electronic versions of the social networks and transcripts will be developed, and the names of members of the social networks will be changed. The network members will only be referred to by their relationship to the participant, their age and gender (e.g. Mother, Older adult, Female). Every effort will be made to ensure that participants and social network members cannot be identified from any published material.

If you assist the participant, your attendance will be kept strictly confidential. You will only be referred to as the supporter (e.g. Participant 3, supporter). It is important that the attendance of the participant and any responses provided by the participant are kept confidential by yourself.

What will happen to the data collected?

The researchers are following laws to ensure all data collected is kept confidential and secure.

We are collecting and storing identifiable information in order to undertake this study. This means that the University is responsible for looking after this information and using it properly. We will not pass this information to a third party without your express permission. If you withdraw from the study, we will keep the information about you that we have already obtained. After the study is finished, data will be stored in archiving facilities in line with the University of Glasgow retention policy for 10 years. All personal information will be collected, stored, and processed in accordance with the General Data Protection Regulation.

The data provided will be used as part of the researcher’s degree thesis. Data relating to demographic information and level of learning disability will be kept anonymous. The data may be used to write reports for publication in academic journals and conference proceedings. The data may also be used by the researcher in the future to answer other questions relating to social support and activities participated in adults with learning disabilities. Within these reports, quotations from transcripts and numerical data will be published. The pseudonymised digital version of the social network diagram may also be included. Participant’s names will be replaced with a participant number and members of the social network will not be identifiable (e.g. Mother, older adult, female). There will be no identifiable information, and participation will be kept confidential.

What will happen to the results of the research study?

The results will be included as part of the researchers degree thesis. The results of this study may inform the development of a larger future study and may be published in an academic journal or conference proceeding. The information provided may be used to report results relating to the use of the methodology and determine if changes or adaptations must be made. The results may also be used to directly describe and explore the social support networks of adults with learning disabilities, or perceptions of social support for physical activities. The data provided may also be used by the researcher in the future to answer different research questions relating to social support for physical activity and gender differences.

Who is organising and funding the research?

This research is being organised by researchers at the University of Glasgow and is funded as part of PhD qualification by the Scottish Government.

Who has reviewed the study?

This study has been reviewed and approved by the Medicine, Veterinary and Life Sciences College Ethics Committee at the University of Glasgow.

Contact for further information?

Miss Sophie Westrop
1st floor Admin Building
Mental Health & Wellbeing
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow G12 0XH

Email:
Mobile :
Telephone:

Contactable during standard office hours (9am – 5pm / Monday to Friday)

Thank you for taking the time to read this information sheet. If you have any questions, please do not hesitate to contact us.

If you wish to attend the interview to support the participant, please fill out your contact details on the reply sheet. Please send this to the researcher in the stamped and addressed envelope provided.

Please use the same provided stamped addressed envelope as the participant.

Appendix 9. Chapter 5: Reply sheets

These are the reply sheets developed for Study 1, Chapter 5. Images from "Easy on the I" copyrighted for Leeds York Partnership NHS Foundation trust (https://www.learningdisabilityservice-leeds.nhs.uk/easy-on-the-i/image-bank/)

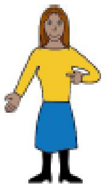
University of Glasgow | College of Medical, Veterinary & Life Sciences

Title: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women.

PARTICIPANT REPLY SHEET

If you want to take part please fill out this reply sheet.
We need this information to contact you.

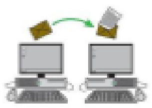
Please write the information inside the box.



What is your name?

What is your address?

What is your telephone number?



What is your email?

Title: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women.

SUPPORT REPLY SHEET
(Carer/Parent/Support)

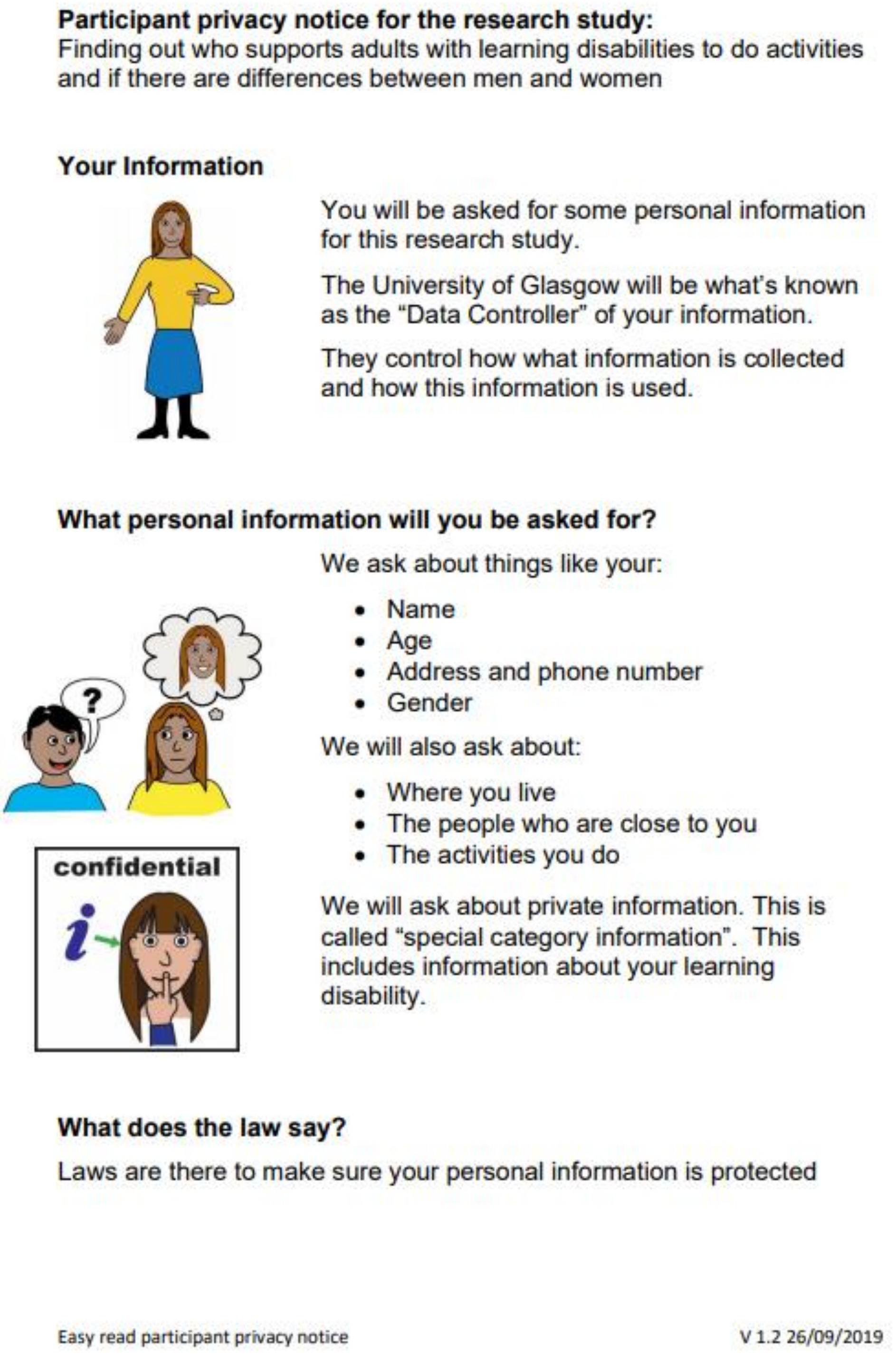
This is to be completed if a trusted adult is coming to support the interview. Can the person coming to support please fill out this sheet.

Please write the information inside the box.

What is your name?	
What is your address?	
What is your telephone number?	
What is your email?	

Appendix 10. Chapter 5: Easy read privacy notice

Graphics were from “Easy on the I” copyrighted for Leeds York Partnership NHS Foundation trust (https://www.learningdisabilityservice-leeds.nhs.uk/easy-on-the-i/image-bank/)



Participant privacy notice for the research study:
Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women

Your Information

You will be asked for some personal information for this research study.

The University of Glasgow will be what’s known as the “Data Controller” of your information.

They control how what information is collected and how this information is used.

What personal information will you be asked for?

We ask about things like your:

- Name
- Age
- Address and phone number
- Gender

We will also ask about:

- Where you live
- The people who are close to you
- The activities you do

We will ask about private information. This is called “special category information”. This includes information about your learning disability.

What does the law say?

Laws are there to make sure your personal information is protected

The laws make sure the researchers have a reason to collect your information.

Your information is being collected for research.

This research may be used to help other people.

The researchers must ask you if they can use your information.

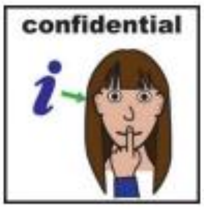
You can say “No” at any time.

You do not have to share information if you don't want to.

What do we do with your information?

All personal information will be used by researchers at University of Glasgow.

All information will be kept private. Paper forms of the information will be locked in cabinets. Other information will be kept on a password protected university computer. All information will be kept safe.



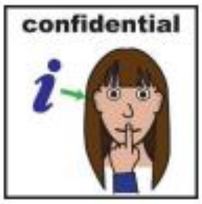
Your name will not be said in the study. The people most important to you will not be named. It will not be possible for someone else to know you took part.

The recorded interview will be typed on the computer. The recorded sound from the interview will be destroyed. A computer copy of the diagram made during the interview will be made.

The information will be used to learn more about support and the activities people do.

Your information will be used to write a report or in a presentation.

Other people will see this report.



Your name, address and telephone number will not be in this report. The names of people close to you will not be in this report.

You will be asked permission before using information that could let people know you took part.

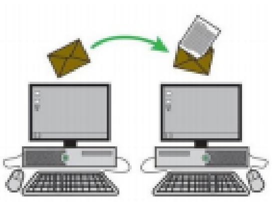
How long do we keep the information?

All information will be stored safely at the University of Glasgow. This information will be kept for ten years. After ten years the information will be destroyed.

What are your rights?

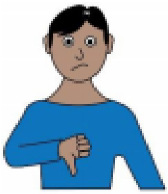
You can ask to see the information about you. You can ask for a copy of this information. You can ask to change wrong information.

You can say “No” if you don’t want to share information.

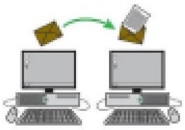


If you want to use your rights:
Go online:
https://www.gla.ac.uk/myglasgow/dpfoioffice/gdpr/gdprrequests/
Email: dp@gla.ac.uk.

What if I have a complaint?



You can complain if you are unhappy with how your information is used. You do this by contacting the University Data Protection Office



Send your complaints by email to:
dataprotectionofficer@glasgow.ac.uk

If you are not happy with how the university responds, you can complain to the Information Commissioner's Office (ICO)

This is accessed online: https://ico.org.uk/

You can contact the researcher if you have any questions.

Miss Sophie Westrop

1st floor Admin Building
Mental Health & Wellbeing
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow G12 0XH

Email:

Mobile:
Work Telephone:

Appendix 11. Chapter 5: Standard participant privacy notice

The text from the participant privacy notice is provided below. In the original document, a dated version number was provided which matched the consent form provided (see Appendix 14).

Participant privacy notice for the research study:
Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women

Your Personal Data

The University of Glasgow will be what's known as the "Data Controller" of your personal data processed in relation to the study: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women. This privacy notice will explain how the University of Glasgow will process your data.

Why we need it

We are collecting data such as your:

- Name
- Contact Details
- Date of birth
- Gender
- Living situation
- Ethnicity
- Postcode
- The people who support you
- Activities

We are also collecting limited special categories such as:

- Disabilities, health conditions, or other impairments
    - We will get data on your level of learning disability

All data, outlined above, will be collected to conduct research and publish findings relating to the study: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women. All outputs will have personal data removed, and it will not be possible to identify you from the data. This will be done prior to publication.

Legal basis for processing your data

We must have a legal basis for processing your data. As this study is academic research, the basic personal data will be processed as a **task carried out in**

public interest. For special category data collected, the data will be processed reflecting data that is **necessary for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes.**

We will also ask for your **consent** to take part to fulfil our ethical requirements. This will not be part of the legal basis for processing your data.

What do we do with it and who we share it with

- All personal data you submit will be processed by staff at the University of Glasgow in the United Kingdom

- All paper forms of data will be stored within a locked filing cabinet. Digital data will be stored on the secure home drive of the researchers password protected and firewalled university computed. Both the filing cabinet and computer are stored within the researchers locked university office. Only the researchers involved in the project will have access to the data.

- Your name and contact details on the consent form and reply will be stored separately from all other data. All other data will use the pseudonym of your participant number, and gender (e.g Participant 1, Male). Names of anyone mentioned in the interview will also change to this format (e.g. Friend, Adult, Male).

- Your data will be analysed by university researchers working on this project. The audio of the interview will be typed up as a transcription (using Microsoft Word). Following this, the audio will be destroyed. The diagram made during the interview of people important to you will be digitally made using computer software (VennMaker).

- Numerical data and demographic data (age; gender; ethnicity; level of intellectual disability) will be put onto the computer to allow statistical analysis to be conducted (using Microsoft Excell and IBM SPSS). This will help understand the data (e.g. average age of participants; number of activities) and will allow for differences between men and women to be calculated.

- Data from the interviews will also be used to understand your social support for physical activity. This will be analysed by identifying themes in the data (recurring patterns). This will be conducted by members of the research team.

- The information you provide will be written as part of the lead researchers PhD thesis, journal publications and presentations. Any published or presented data will be pseudonymised. Every effort will be made to ensure no one can identify you from the data.

How long do we keep it for

Audio from the interview will be deleted immediately following transcription. Following the Code of Good Practice in Research, all other data will be retained by the University for 10 years. After this time, your data will be securely destroyed.

What are your rights?

You have the right to request access to and copies of your personal data. You have the right to ask for amendments or deletion of personal data, and can object to processing. You have the right to limit the processing of your personal data and data portability. You can request access to the information about you that we process.

If at any point you believe that the information we process relating to you is incorrect, you can request to see this information and may in some instances request to have it restricted, corrected or, erased. You may also have the right to object to the processing of data and the right to data portability.

If you wish to exercise any of these rights, please submit your request via the webform or contact dp@gla.ac.uk.

*Please note that the ability to exercise these rights will vary and depend on the legal basis on which the processing is being carried out.

Complaints

If you wish to raise a complaint on how we have handled your personal data, you can contact the University Data Protection Officer who will investigate the matter.

Our Data Protection Officer can be contacted at dataprotectionofficer@glasgow.ac.uk

If you are not satisfied with our response or believe we are not processing your personal data in accordance with the law, you can complain to the Information Commissioner’s Office (ICO) https://ico.org.uk/

Contact details

Sophie Westrop
Mental Health & Wellbeing
1st floor, Admin Building
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow
G12 0XH

Work Telephone:

Mobile:

Email:

Appendix 12. Chapter 5: Privacy notice for trusted adults

Below is the text for the privacy notices provided to the trusted adults invited to support the participant. In the original document, a dated version number was provided which matched the consent form provided (see Appendix 15).

Support privacy notice for the research study:

Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women

Your Personal Data

The University of Glasgow will be what’s known as the “Data Controller” of how personal data is processed in relation to the study: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women. This privacy notice will explain how the University of Glasgow will process your data.

Why we need it

We are collecting data such as your:

- Name
- Contact Details

All data, outlined above, will be collected during consent procedures for this study. You are invited to support the participant.

Legal basis for processing your data

We must have a legal basis for processing your data. As this study is academic research, the basic personal data will be processed as a **task carried out in public interest.**

We will also ask for your **consent** to support the participant during the interview to fulfil our ethical requirements. This will not be part of the legal basis for processing your data.

What do we do with it and who we share it with

- All personal data you submit will be processed by staff at the University of Glasgow in the United Kingdom

- All consent forms of data will be stored within a locked filing cabinet. The filing cabinet is stored within the researchers locked university office. Only the researchers involved in the project will have access to this data.

- Your name and contact details on the consent form and reply will be stored separately from all other data. If you speak during the interview to support the participant, this will be reported in a pseudonymised format e.g. Participant 1, Support.

- The audio of the interview will be typed up as a transcription (using Microsoft Word). Following this, the audio will be destroyed.
- Any information you provide during the interview may be written as part of the lead researchers PhD thesis, journal publications and presentations. Any published or presented data will be pseudonymised. Every effort will be made to ensure no one can identify you from the data.

How long do we keep it for

Audio from the interview will be deleted immediately following transcription. Following the Code of Good Practice in Research, all other data will be retained by the University for 10 years. After this time, your data will be securely destroyed.

What are your rights?

You have the right to request access to and copies of your personal data. You have the right to ask for amendments or deletion of personal data, and can object to processing. You have the right to limit the processing of your personal data and data portability. You can request access to the information about you that we process.

If at any point you believe that the information we process relating to you is incorrect, you can request to see this information and may in some instances request to have it restricted, corrected or, erased. You may also have the right to object to the processing of data and the right to data portability.

If you wish to exercise any of these rights, please submit your request via the webform or contact dp@gla.ac.uk.

*Please note that the ability to exercise these rights will vary and depend on the legal basis on which the processing is being carried out.

Complaints

If you wish to raise a complaint on how we have handled your personal data, you can contact the University Data Protection Officer who will investigate the matter.

Our Data Protection Officer can be contacted at dataprotectionofficer@glasgow.ac.uk

If you are not satisfied with our response or believe we are not processing your personal data in accordance with the law, you can complain to the Information Commissioner’s Office (ICO) https://ico.org.uk/

Contact details

Sophie Westrop

Mental Health & Wellbeing
1st floor, Admin Building
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow
G12 0XH

Work Telephone:

Work Mobile:

Email:

Appendix 13. Chapter 5: Easy read consent form

This was developed after the ethics application was approved, but before data collection started. Approval was granted for the easy read consent forms.

RE: Amendment to Project No: 200180186

MVLS Ethics Admin
Wed 19/02/2020 10:20
To: MVLS Ethics Admin [redacted] Sophie Westrop (student) [redacted]
Cc: Jesse Dawson [redacted]

Hi Sophie

The deputy Chair has approved your amendment. Please treat this email as evidence, and I'll keep a copy on file for reference

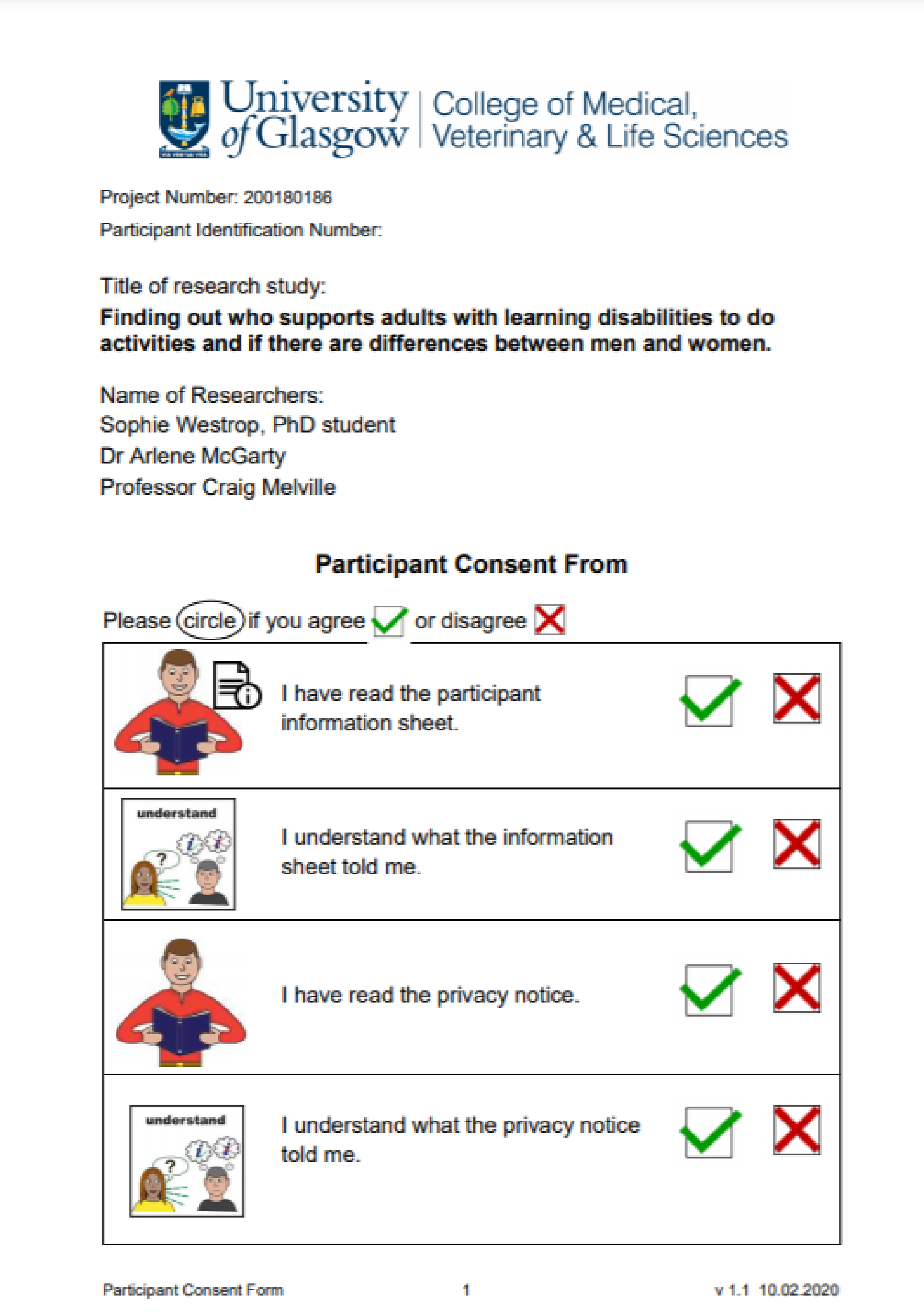
Regards
Neil

Neil Allan
MVLS Ethics Committee Administrator

Direct line: [redacted]

Institute of Infection, Immunity & Inflammation
College of Medical, Veterinary & Life Sciences
Glasgow Biomedical Research Centre
Room 314, Sir Graeme Davies Building
University of Glasgow
120 University Place
Glasgow G12 8TA
The University of Glasgow, charity number SC004401

Graphics from “Easy on the I” copyrighted for Leeds York Partnership NHS Foundation trust (https://www.learningdisabilityservice-leeds.nhs.uk/easy-on-the-i/image-bank/)



University of Glasgow | College of Medical, Veterinary & Life Sciences

Project Number: 200180186

Participant Identification Number:

Title of research study:

Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women.

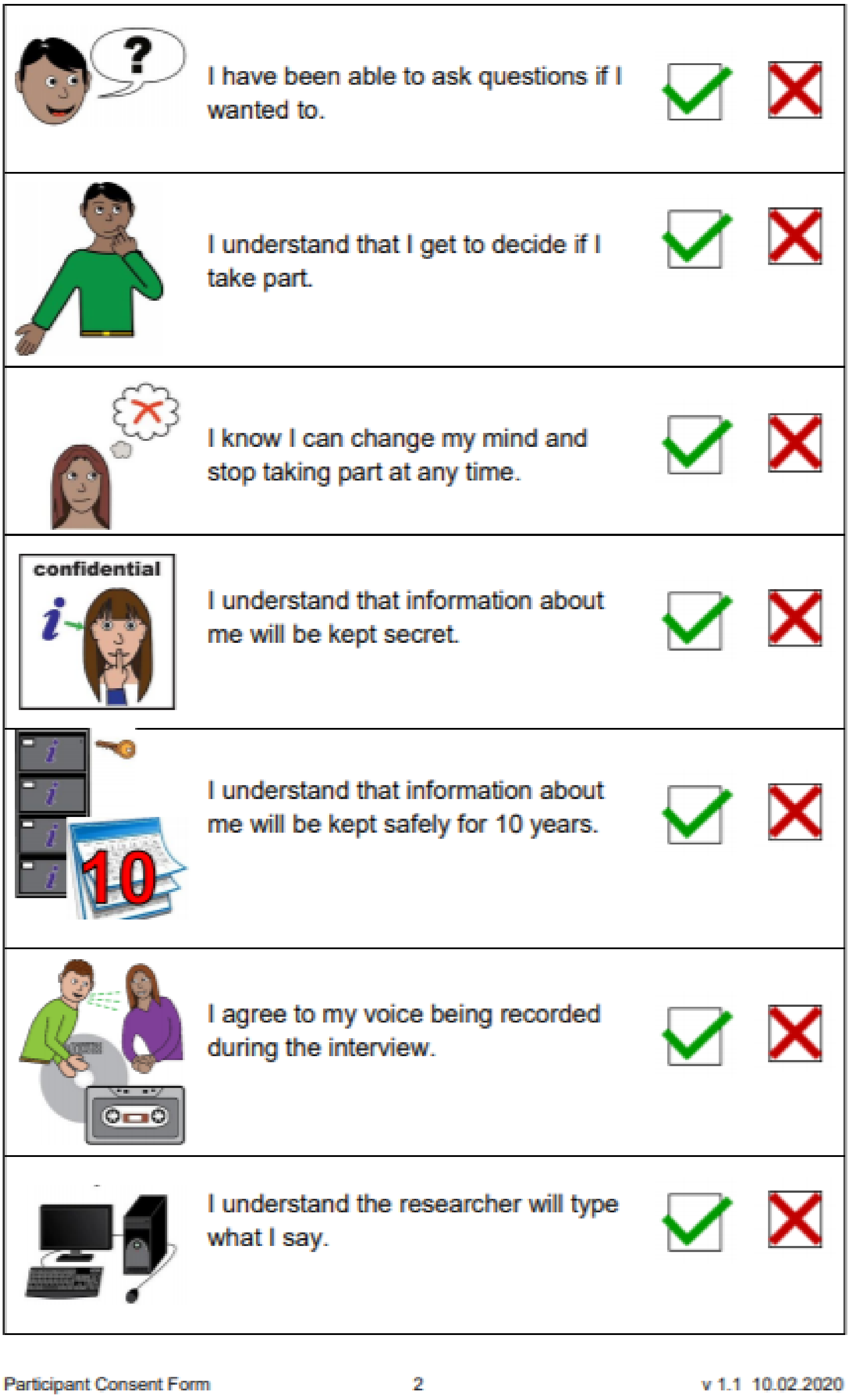
Name of Researchers:
Sophie Westrop, PhD student
Dr Arlene McGarty
Professor Craig Melville

Participant Consent From

Please circle if you agree ✓ or disagree ✗

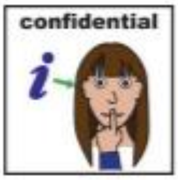
	I have read the participant information sheet.	✓	✗
understand	I understand what the information sheet told me.	✓	✗
	I have read the privacy notice.	✓	✗
understand	I understand what the privacy notice told me.	✓	✗

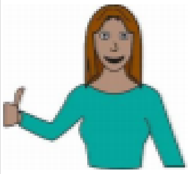
Participant Consent Form 1 v 1.1 10.02.2020



	I have been able to ask questions if I wanted to.	☑	☒
	I understand that I get to decide if I take part.	☑	☒
	I know I can change my mind and stop taking part at any time.	☑	☒
	I understand that information about me will be kept secret.	☑	☒
	I understand that information about me will be kept safely for 10 years.	☑	☒
	I agree to my voice being recorded during the interview.	☑	☒
	I understand the researcher will type what I say.	☑	☒

Participant Consent Form 2 v 1.1 10.02.2020

	I understand that a computer copy of the diagram made in the interview will be made.	☑	☒
	I understand that a report will be written about the study. Other people will see this report. I understand that some of the things I say may be in the report. I understand that the report may have a copy of the diagram made in the interview.	☑	☒
	I know my name will not be in the report. I know the names of people important to me will not be in the report.	☑	☒
	I understand that if I leave the study the information I give will be kept and used.	☑	☒
	I understand that any illegal or harmful activities I do will be reported. This is to keep me safe.	☑	☒



I would like to take part in the study. ☑ ☒

Name of participant Date Signature

Researcher Date Signature

(1 copy for participant; 1 copy for researcher)

Appendix 14. Chapter 5: Standard participant consent form

University of Glasgow | College of Medical, Veterinary & Life Sciences

Centre Number:
Project Number: ***200180186***
Participant Identification Number:

Title of Project: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women.

Name of Researchers:
Sophie Westrop, PhD student
Dr Arlene McGarty
Professor Craig Melville

CONSENT FORM

(Participant)

	Please Initial Box
I confirm that I have read and understood the Participant Information Sheet version 2.0 dated 25/09/2019.	☐
I confirm that I have read and understood the Privacy Notice version 1.2 dated 26/09/2019.	☐
I have had time to think about the information. I have been able to ask questions. I understand the answers given.	☐
I understand that my participation is my choice. I know that I am free to stop at any time, without giving reason, without my legal rights being affected.	☐
I agree that my name, contact details and data described in the information sheet will be kept for this research project.	☐

I agree to my voice being recorded during the interview. I understand that the recorded interview will be typed word by word. ☐

I understand that a computer copy of the picture made in the interview will be made by the researcher. I know that my name will not be recorded on the computer copy. ☐

I confirm that I agree to the information given being stored by the university for up to 10 years. I know that this data will be stored according to rules to keep my information safe. ☐

I understand that my taking part will be kept secret. The information provided will only be seen by the study researchers and those who check their work. ☐

I understand that if I leave from the study any information given up to the time I stopped will be kept and used. ☐

I understand that the data will be used to write reports. I understand that other people will read this report. I know that my name will not be in the report. I know that the names of people important to me will not be in the report. ☐

I understand that any illegal or harmful activities I do will be reported. These will be reported to social work or regulatory bodies. The researcher will be required to break confidentiality.
This is to keep me safe. ☐

I agree to take part in this study.

______________________	__________	______________________
Name of Support Person	Date	Signature
______________________	__________	______________________
Researcher	Date	Signature ☐

(1 copy for participant; 1 copy for researcher)

Appendix 15. Chapter 5: Trusted adult / support consent form

Text from the trusted adult / support consent form is provided below

University of Glasgow | College of Medical, Veterinary & Life Sciences

Centre Number:
Project Number: ***200180186***
Participant Identification Number:

Title of Project: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women.

Name of Researchers:
Sophie Westrop, PhD student
Dr Arlene McGarty
Professor Craig Melville

CONSENT FORM
(PARENT/CARER/SUPPORT)

	Please Initial Box
I confirm that I have read and understood the Participant Information Sheet version 2.0 dated 25/09/2019	☐
I confirm that I have read and understood the Privacy Notice version 1.2 dated 26/09/2019.	☐
I have had the opportunity to think about the information and ask questions, and understand the answers given.	☐
I understand that my participation as a support is voluntary and that I am free to withdraw at any time, without giving reason, without my legal rights being affected.	☐
I agree that my name, contact details and data described in the information sheet will be kept for the purposes of this research project.	☐

I understand that the audio of the interview will be recorded and transcribed word by word. ☐

I understand that pseudonymised digital versions of the network diagrams will be developed. ☐

I confirm that I agree to the way the data will be collected and processed and that the data will be stored for up to 10 years in the University archiving facilities in accordance with relevant Data Protection policies and regulations. ☐

I understand that all data and information I provide will be kept confidential and will be seen only by study researchers and regulators whose job it is to check the work of researchers. ☐

I understand that if I withdraw from the study, my data collected up to that point will be retained and used for the remainder of the study. ☐

I agree to keep all information described by the participant I supported kept strictly confidential and I will not talk about what was said during the interview. ☐

I understand that the data will be used to write reports for the researchers thesis, academic journals and conference proceedings. ☐

I understand that if the participant reports illegal or harmful activities, the researcher is required to break confidentiality and report this to social work or regulatory bodies. ☐

I agree to take part in the study as a support for the participant. ☐

_______________________________ _____________ _______________________

Name of Support Person Date Signature

_______________________________ _____________ _______________________

Researcher Date Signature

(1 copy for participant; 1 copy for researcher)

Appendix 16. Chapter 5: Demographic questionnaire

Participant No:

Participant age: ____________________

What is the participant's gender?	**Male**	☐
	Female	☐
	Other	☐
	Prefer not to say	☐
Where does participant live?	**Parents home**	☐
	Other family carers home	☐
	Lives with someone other than family. Write below: ____________________	☐
	Lives on their own	☐
	Lives in supported living	☐
	Residential care	☐
What is the participant's ethnicity?	**White** (Scottish, other British, Irish or any White background)	☐
	Asian, Asian Scottish or Asian British (Indian, Pakistani, Bangladeshi, Chinese or any other Asian background)	☐
	Black, Black Scottish or Black British (Caribbean, African or any other Black background)	☐
	Mixed (any mixed background)	☐
	Other (any other background) Please specify below: ____________________	☐

Post Code ____________________

SIMD Decile ____________________

Appendix 17. Chapter 5: Interview schedule

Detail oriented probes: who; where; what; when; how

Elaboration probes: “could you tell me more about xxx”

Clarification probes: “what do you mean by xxx”

I want you to think of people you see and talk to, the people you know.

Can you tell me who these people are?

Now, I want you to think about all the people who are important in your life right now.

Can you tell me who these people are?

> Is xx an adult, older adult, child, teenager?
>
> How do you know xxx – are they your friend, are they in your family, do they work with you, are they your caregiver?
>
> Is xxx a man or woman?
>
> *visual aids*
>
> Record above information for subsequent people mentioned

Show diagram – these circles will be filled to include the people who are important to you in your life right now. Each ring shows how close or important someone is to you.

I want you to tell me / show me, the people you feel so close to that it is hard to imagine life without them. (People most important to you / people you love the most)

I want you to tell me / show me the people who you do not feel as close to but who are still very important to you. (Still really like or love, but not as much as first circle)

I want you to tell me / show me the people you haven’t named / selected yet but who are still close and important to you. They are still close enough and important enough to be in your circle. (People you still really love or like, but not quite as much as the inner circle)

Detail oriented probe: Who are the people you see the most / spend the most time with?

Do any of the people important to you know each other?

Activities

show images

Do you enjoy doing any of these activities?

Detail oriented probes e.g. **who with**; where do you do it; what do you like about it / what do you do; when; how does it make you feel

Have you done any of these activities recently (in last month)?

Detail oriented probe: What do you do the most?

Any other leisure activities you do / Any that you don't do but would like to.

Perceived social support for physical activity

Detailed oriented probes: WHO; WHERE; WHAT; WHEN; HOW

(Who with; where do you do it; what do you do / what is said; how does that make you feel)

Elaboration probes: "Could you tell me more about xxx"

Clarification probes: "What do you mean by xxx"

I am going to ask you about physical activities. Physical activities can include activities like walking or running, but can also include other activities like sports like swimming or playing football.

Do any of the people important to you remind you to do physical activities?

Do any of the people important to you do physical activities with you?

Do any of the people important to you plan physical activities when you spend time with them?

Do any of the people important to you anyone show you how to do physical activities?

Do any of the people important to you anyone tell you that you are good at physical activities?

Do any of the people important to you pay for you to do physical activities somewhere or buy you things that you need to do physical activities?

Do any of the people important to you drive you somewhere to do physical activities when you need them to?

Do any of the people important to you tell you not to do physical activities?

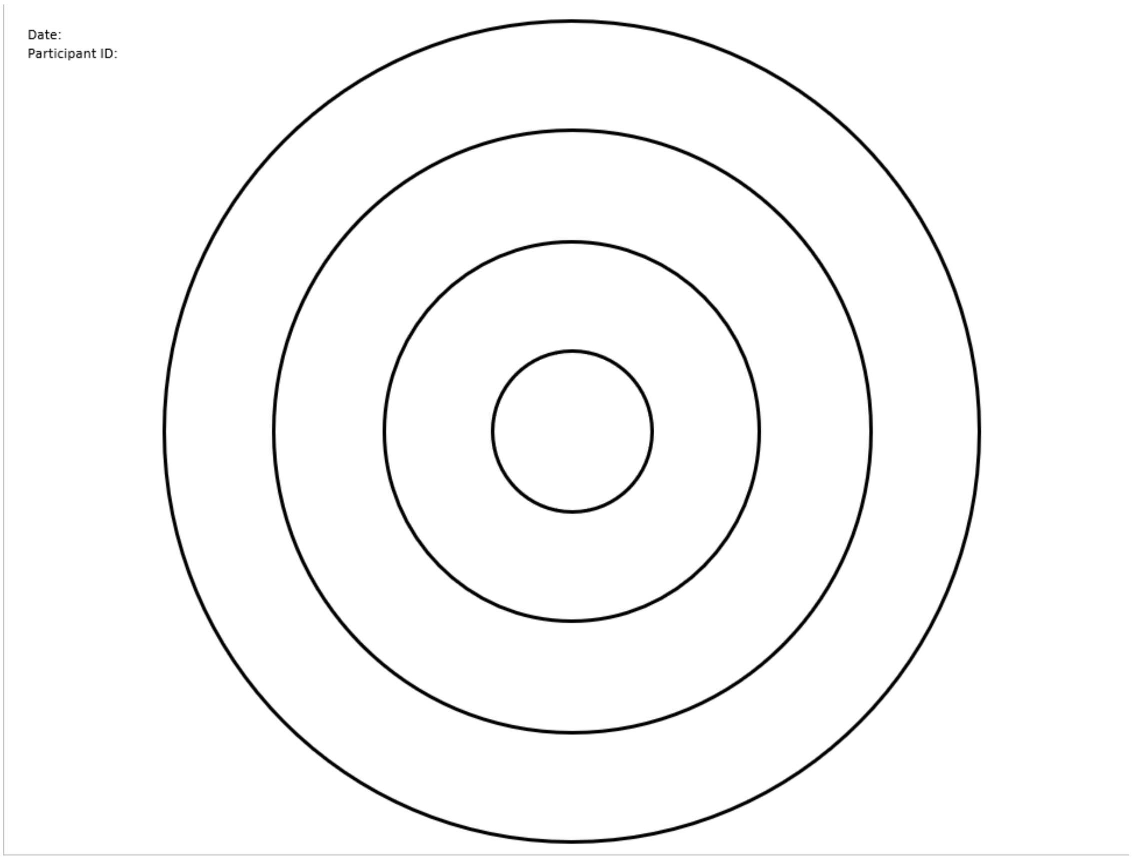
Do any of the people important to you tell you that physical activities will hurt you?

Do any of the people important to you tell you that you are bothering them when you do physical activities?

Do any of the people important to you ever tease or make fun of you when you do physical activities?

Appendix 18. Chapter 5: Concentric circles

Presented on A3 sheet paper.

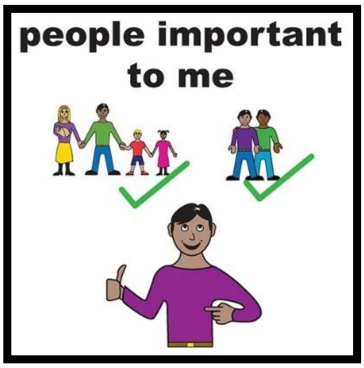


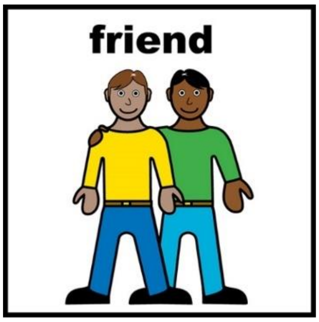
Date:
Participant ID:

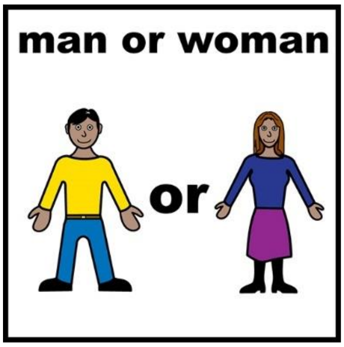
Appendix 19. Chapter 5: Example of the visual aids used during the interview

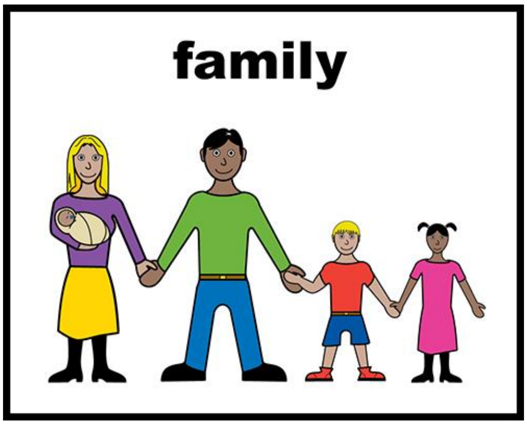
Visual aids for the social network analysis.

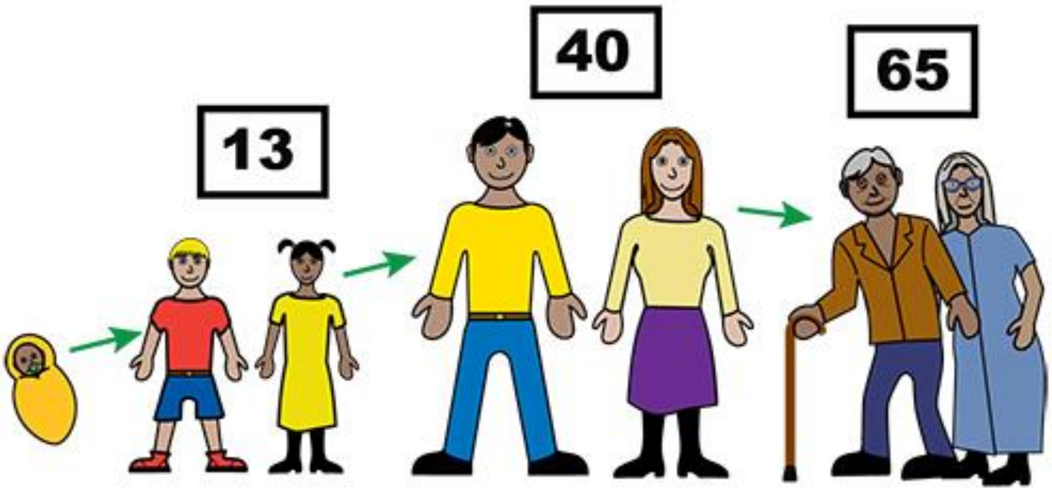
These will be the size of quarter of an A4 page and laminated. Graphics from “Easy on the I” copyrighted for Leeds York Partnership NHS Foundation trust (https://www.learningdisabilityservice-leeds.nhs.uk/easy-on-the-i/image-bank/)











Appendix 20. Chapter 5: Example of the visual aids used for activities.

These are examples of the visual aids of activities. The images were cut into cards and laminated.

We go for a walk

We go swimming

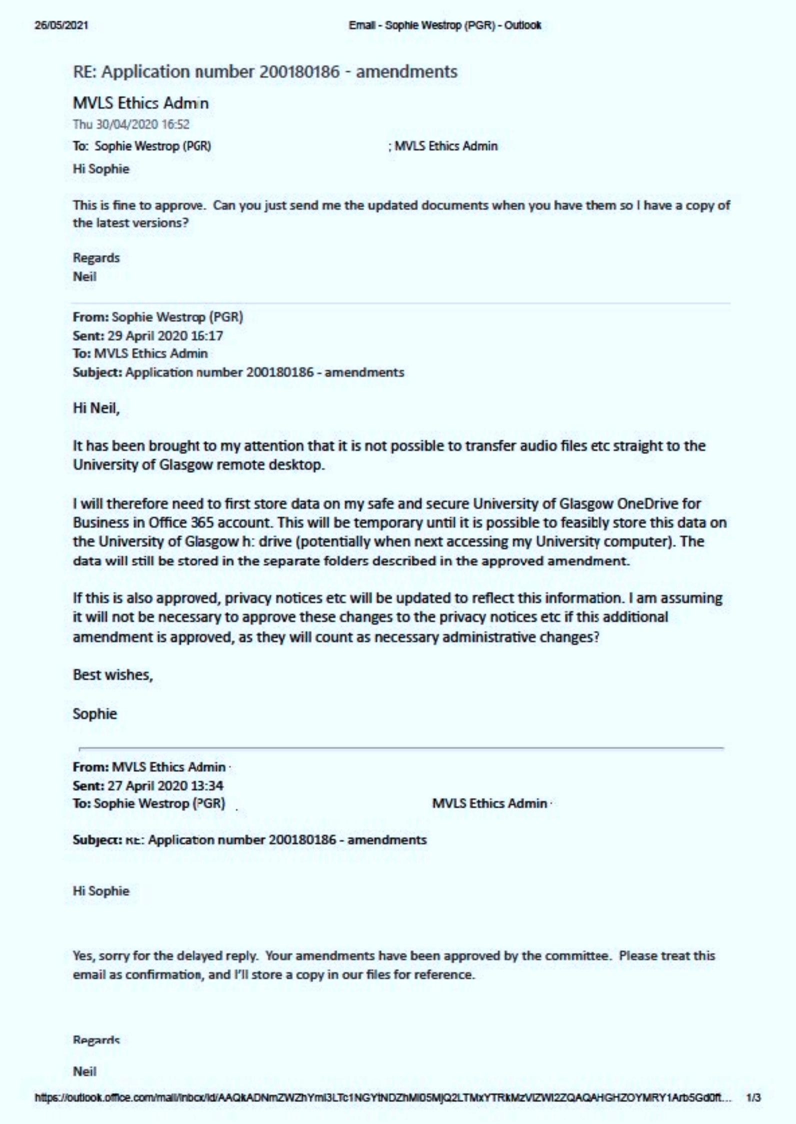
We go for a run

We go to the gym

We go for a cycle

We play football

Appendix 21. Chapter 5 (study 2): Approval to amended study



26/05/2021 Email - Sophie Westrop (PGR) - Outlook

RE: Application number 200180186 - amendments

MVLS Ethics Admin
Thu 30/04/2020 16:52
To: Sophie Westrop (PGR) ; MVLS Ethics Admin

Hi Sophie

This is fine to approve. Can you just send me the updated documents when you have them so I have a copy of the latest versions?

Regards
Neil

From: Sophie Westrop (PGR)
Sent: 29 April 2020 16:17
To: MVLS Ethics Admin
Subject: Application number 200180186 - amendments

Hi Neil,

It has been brought to my attention that it is not possible to transfer audio files etc straight to the University of Glasgow remote desktop.

I will therefore need to first store data on my safe and secure University of Glasgow OneDrive for Business in Office 365 account. This will be temporary until it is possible to feasibly store this data on the University of Glasgow h: drive (potentially when next accessing my University computer). The data will still be stored in the separate folders described in the approved amendment.

If this is also approved, privacy notices etc will be updated to reflect this information. I am assuming it will not be necessary to approve these changes to the privacy notices etc if this additional amendment is approved, as they will count as necessary administrative changes?

Best wishes,

Sophie

From: MVLS Ethics Admin
Sent: 27 April 2020 13:34
To: Sophie Westrop (PGR) MVLS Ethics Admin

Subject: RE: Application number 200180186 - amendments

Hi Sophie

Yes, sorry for the delayed reply. Your amendments have been approved by the committee. Please treat this email as confirmation, and I'll store a copy in our files for reference.

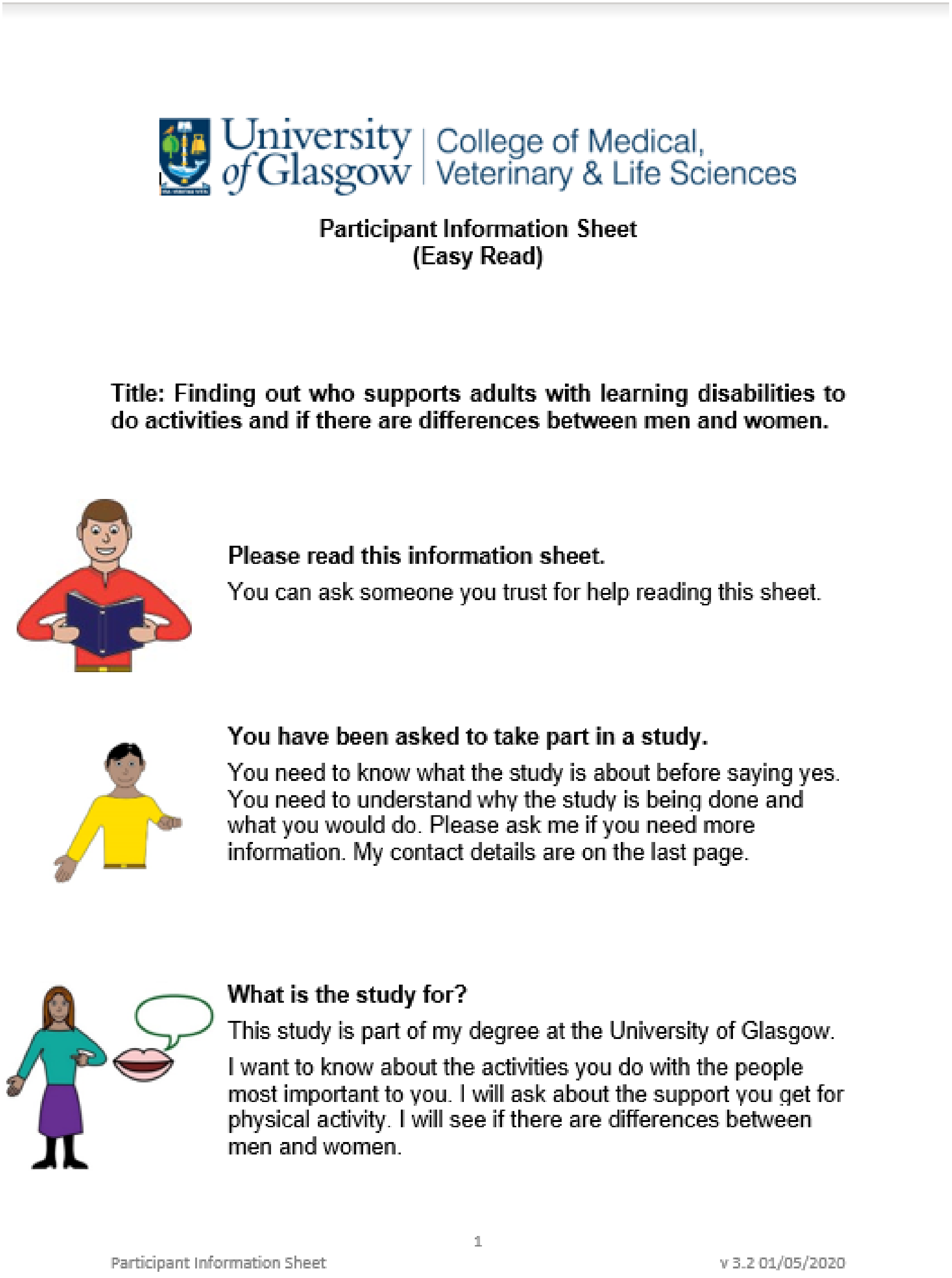
Regards

Neil

https://outlook.office.com/mail/inbox/id/AAQkADNmZWZhYmI3LTc1NGYtNDZhMi05MjQ2LTMxYTRkMzVlZWI2ZQAQAHGHZOYMRY1Arb5Gd0ft... 1/3

Appendix 22. Chapter 5 (study 2): Amended study information sheet

Graphics from “Easy on the I” copyrighted for Leeds York Partnership NHS Foundation trust (https://www.learningdisabilityservice-leeds.nhs.uk/easy-on-the-i/image-bank/)



University of Glasgow | College of Medical, Veterinary & Life Sciences

Participant Information Sheet
(Easy Read)

Title: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women.

Please read this information sheet.

You can ask someone you trust for help reading this sheet.

You have been asked to take part in a study.

You need to know what the study is about before saying yes. You need to understand why the study is being done and what you would do. Please ask me if you need more information. My contact details are on the last page.

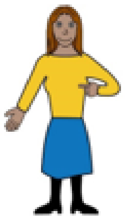
What is the study for?

This study is part of my degree at the University of Glasgow.

I want to know about the activities you do with the people most important to you. I will ask about the support you get for physical activity. I will see if there are differences between men and women.

1

Participant Information Sheet v 3.2 01/05/2020



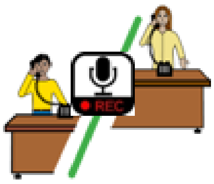
Why have I been asked to take part?

You are an adult and you have a mild learning disability. You also live in Greater Glasgow.

Do I have to take part?

No. You do not have to take part. It is OK to say “no”.

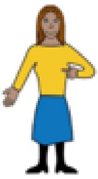
It is OK to say “yes” but change your mind, it is OK. Let me know if you want to stop. You do not have to say why you have changed your mind.



What will happen to me if I take part?

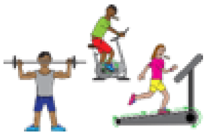
We will have a phone call lasting about 1 hour.

This will be at a time that is best for you. I will ask you to tell me what you think the study is about. I will then interview you. The sound from our voices will be recorded during the interview. This is so I can type what was said for my study.



I will ask questions about you. There will be questions about your age, gender, ethnicity and where you live.

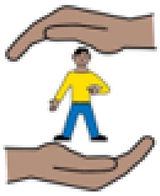
You will be asked what activities you do and who you do them with.



You will be asked about the support you get to do physical activities.

You will be asked questions about the support you get now that it is important to stay at home. I will ask about your experience of this.

You can choose not to answer questions. You can ask me to explain questions that you do not understand. You can stop the interview at any time and choose to leave the study.

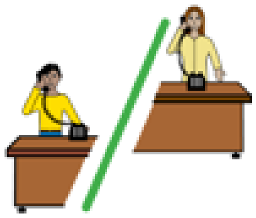


Can I get someone to help me do this study?

Yes. You can ask an adult that you trust to help you take part in the phone call. They will need to read an information sheet and privacy notice. They will need to complete a consent form.

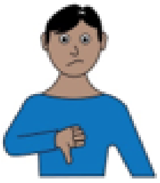
What would I have to do?

If you want to take part you will need to complete the consent form. This can be done on the computer. If a trusted adult is will help during the interview they will need to do one too. This needs to be sent to my email address.



I will then ask you to phone me. We will talk about the study and you can ask questions. You will choose when the phone interview will be. I will send you a text or an email to remind you of the date and time of the interview. Before the interview I will make sure you agree to take part. You will then be interviewed for about 1 hour.

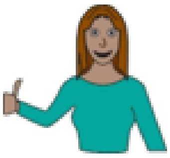
If you do not like a question you can choose not to answer it. You can also ask me to explain any questions that you do not understand.



Will anything bad happen if I take part?

You will have to give up 1 hour of your time.

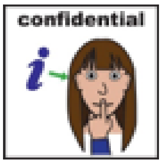
It is unlikely that anything bad will happen to you because you took part.



Are there any good things about taking part?

There are no direct good things that will happen because you took part.

You may find the study fun and interesting to do.



Will other people find out I took part?

No. You taking part will be kept private.

Your name will not be said in the study. It will not be possible for someone else to know you took part.

What will happen to the information I give you?

I will write reports about what was found. Other people will be able to read these reports. There may be things that you have said in the report. Your name will not be in the report. No one will know that you took part.

I will follow the rules made to keep your information safe. All information will be stored safely on the University of Glasgow computer server and OneDrive. Information will be kept for ten years. After ten years the information will be destroyed.

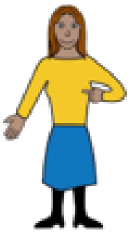
I will have to report any illegal or harmful activities. This information would be passed on to social work and regulatory bodies. This is to keep you safe.

Who is paying for this study?

This study is part of my University degree. It is being paid for by the Scottish Government as they are funding my degree.

Who has checked this study?

The College Ethics Committee of the University of Glasgow has checked this study. They have made sure that it is safe for you to take part.

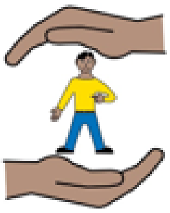


How can I take part?

Read this information sheet and the privacy notice.

Fill out the consent form. Send the consent form to me by email. My email is on the last page.

I will then ask you to call me to decide a date for the interview.

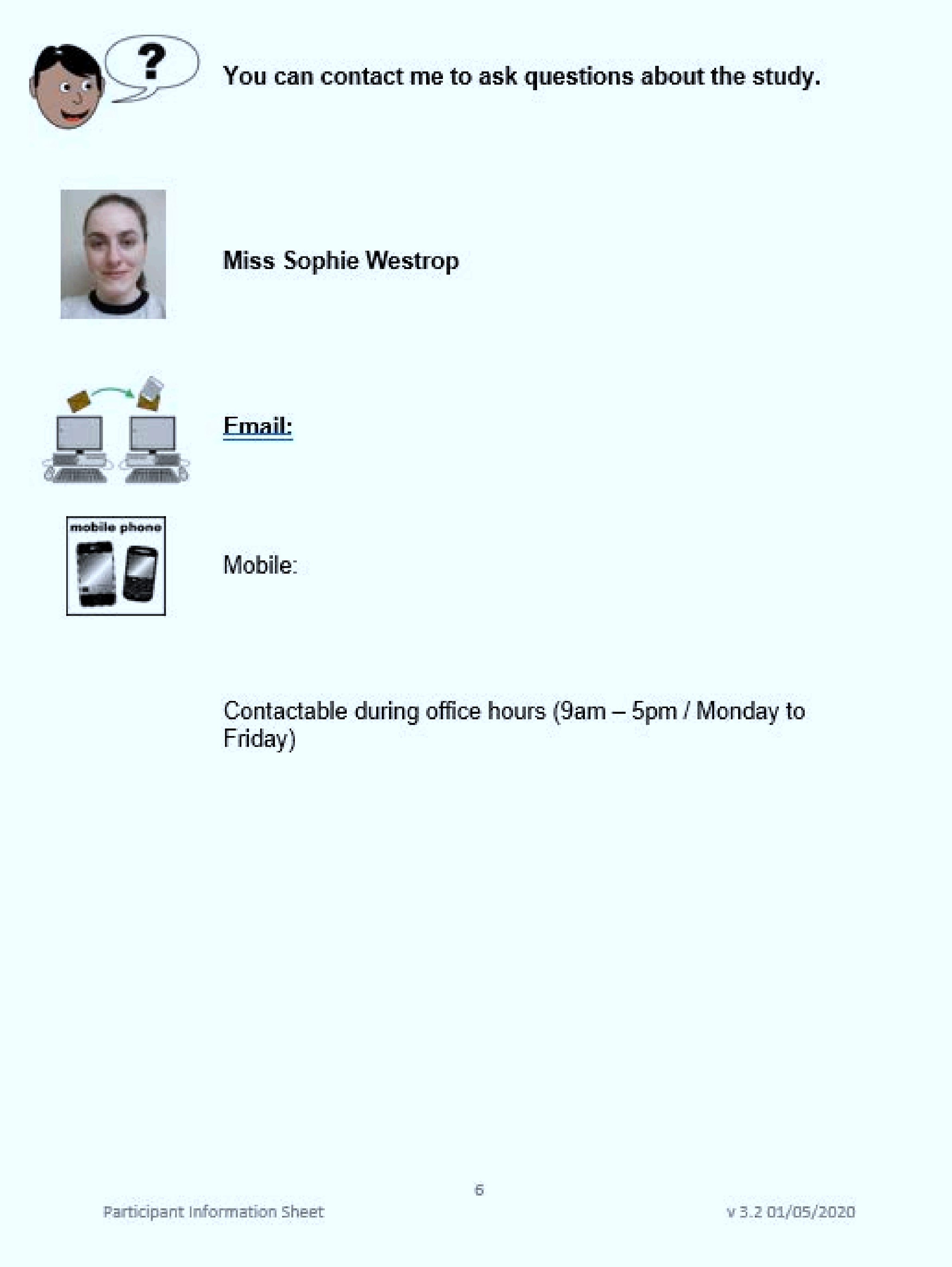


How can I get someone to help me do this study?

They will need to read the other information sheet and privacy notice.

They will need to fill out a consent form.

Put this in the same email as your consent form.



You can contact me to ask questions about the study.

Miss Sophie Westrop

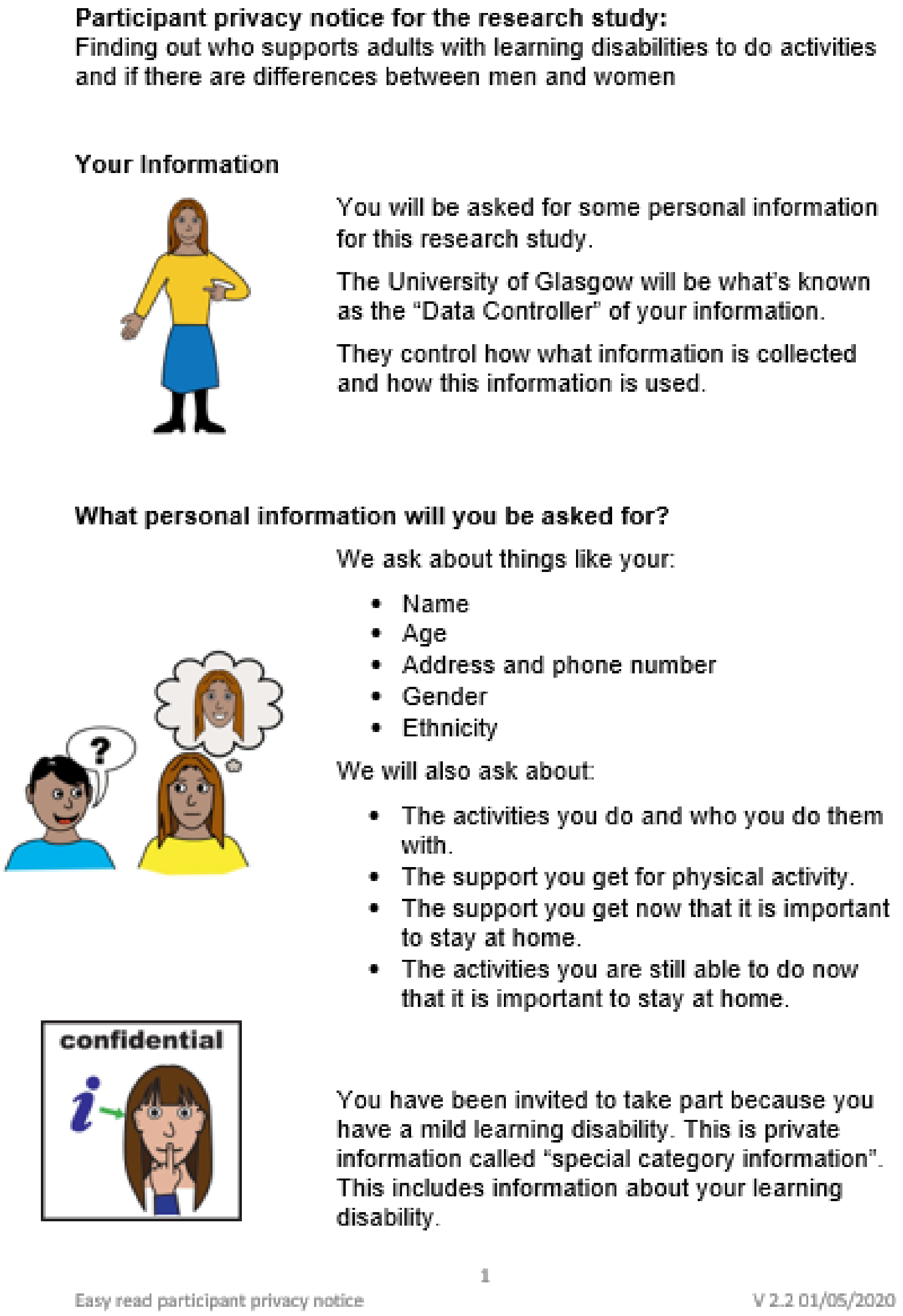
Email:

Mobile:

Contactable during office hours (9am – 5pm / Monday to Friday)

Appendix 23. Chapter 5 (study 2): Amended study privacy notices

Graphics from “Easy on the I” copyrighted for Leeds York Partnership NHS Foundation trust (https://www.learningdisabilityservice-leeds.nhs.uk/easy-on-the-i/image-bank/)



Participant privacy notice for the research study:
Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women

Your Information

You will be asked for some personal information for this research study.

The University of Glasgow will be what’s known as the “Data Controller” of your information.

They control how what information is collected and how this information is used.

What personal information will you be asked for?

We ask about things like your:

- Name
- Age
- Address and phone number
- Gender
- Ethnicity

We will also ask about:

- The activities you do and who you do them with.
- The support you get for physical activity.
- The support you get now that it is important to stay at home.
- The activities you are still able to do now that it is important to stay at home.

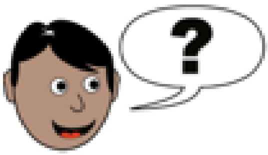
You have been invited to take part because you have a mild learning disability. This is private information called “special category information”. This includes information about your learning disability.

1

Easy read participant privacy notice V 2.2 01/05/2020

What does the law say?

Laws are there to make sure your personal information is protected

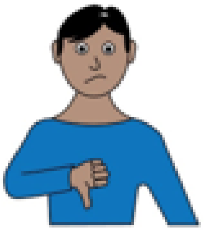


The laws make sure the researchers have a reason to collect your information.

Your information is being collected for research.

This research may be used to help other people.

The researchers must ask you if they can use your information.



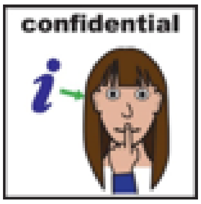
You can say "No" at any time.

You do not have to share information if you don't want to.

What do we do with your information?

All personal information will be used by researchers at University of Glasgow.

All information will be kept private. Information will be kept on a password protected university computer server and university OneDrive. All information will be kept safe.

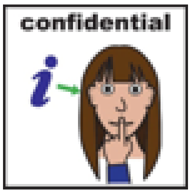


Your name will not be said in the study. The recorded interview will be typed on the computer. The recorded sound from the interview will be destroyed.

The information will be used to learn more about social support and the activities people do.

Your information will be used to write a report or in a presentation.

Other people will see this report.



Your name, address and telephone number will not be in this report.

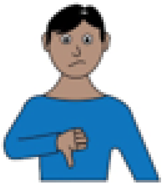
You will be asked permission before using information that could let people know you took part.

How long do we keep the information?

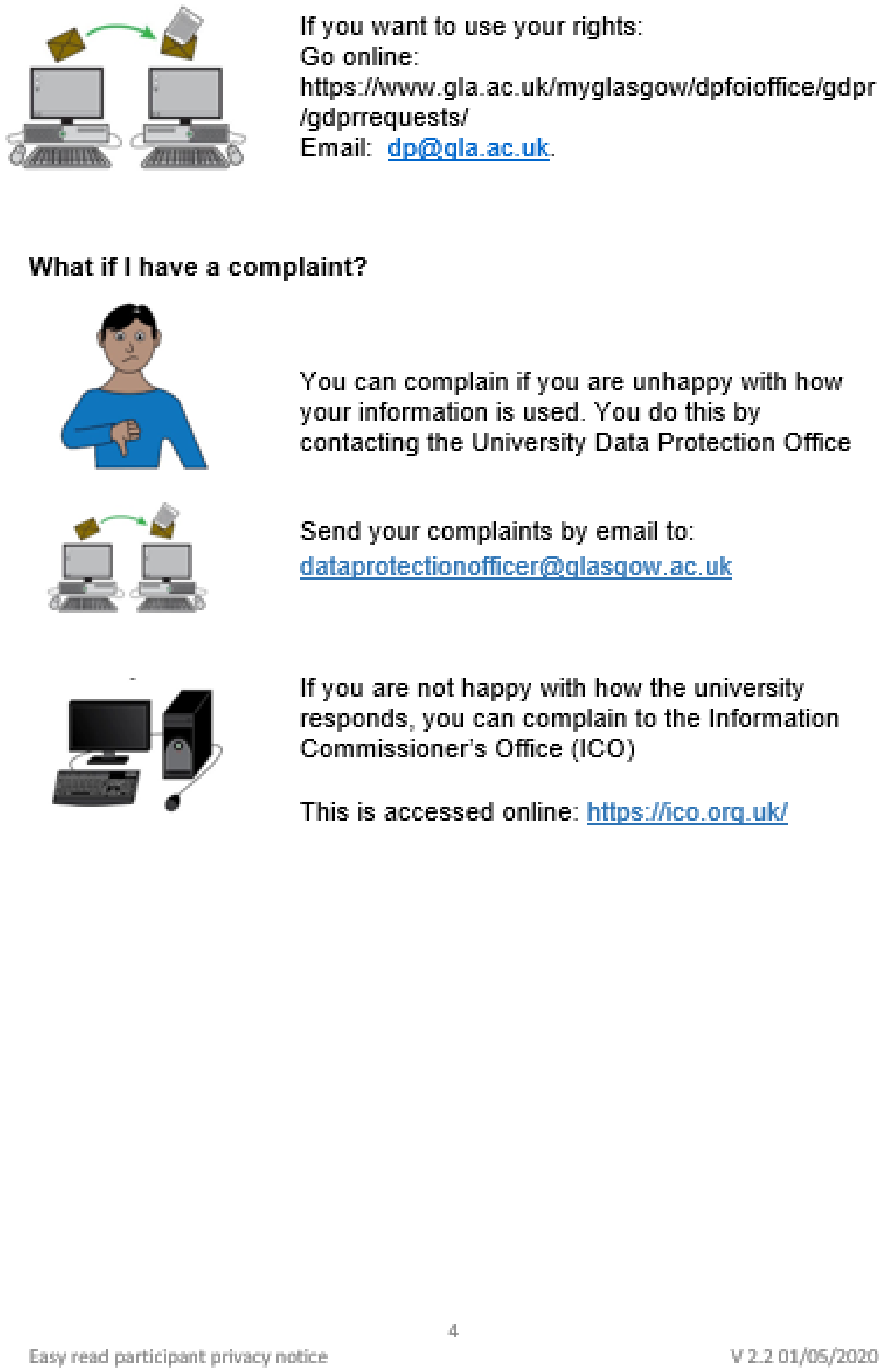
All information will be stored safely at the University of Glasgow. This information will be kept for ten years. After ten years the information will be destroyed.

What are your rights?

You can ask to see the information about you. You can ask for a copy of this information. You can ask to change wrong information.



You can say "No" if you don't want to share information.



If you want to use your rights:
Go online:
https://www.gla.ac.uk/myglasgow/dpfoioffice/gdpr/gdprrequests/
Email: dp@gla.ac.uk.

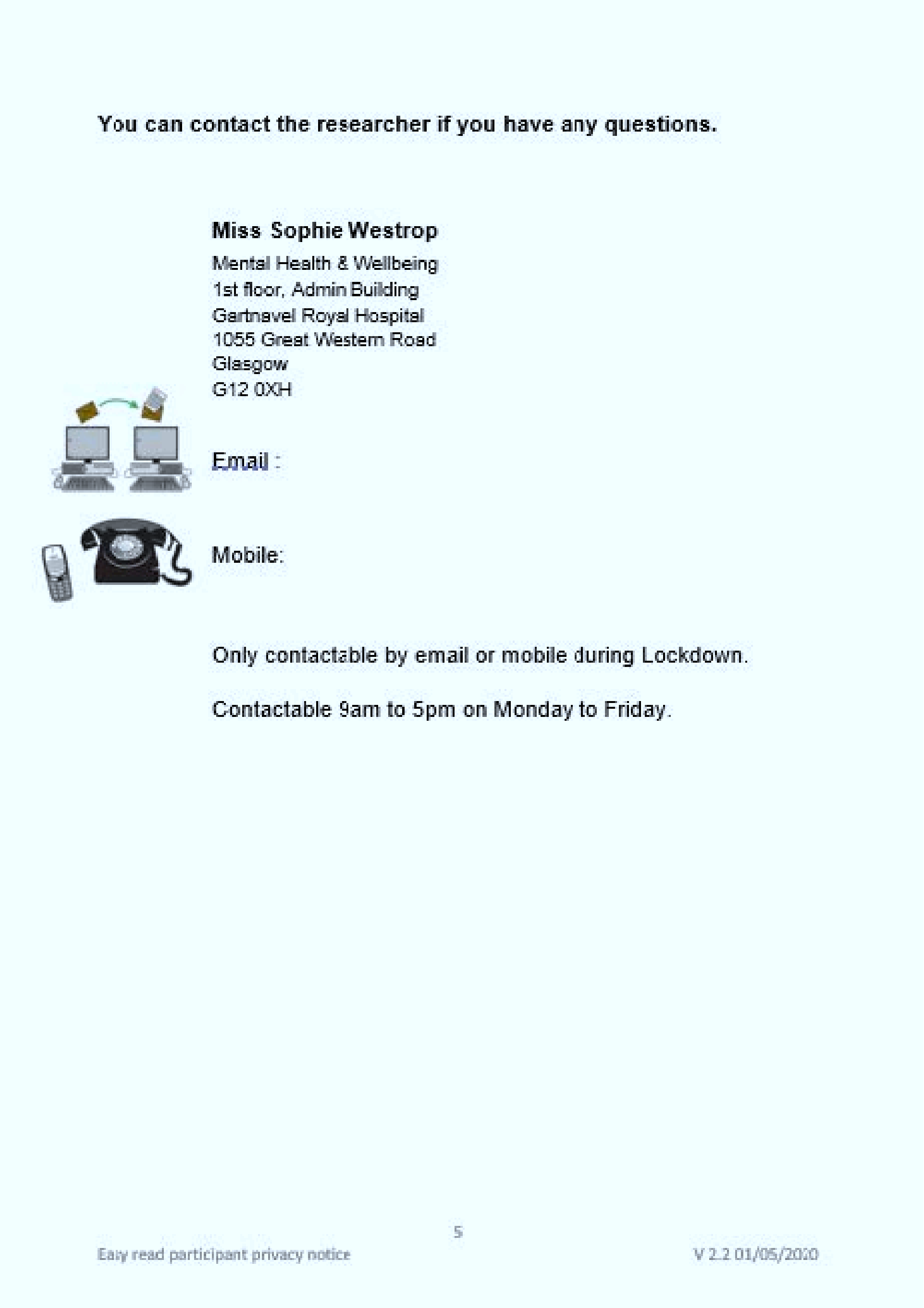
What if I have a complaint?

You can complain if you are unhappy with how your information is used. You do this by contacting the University Data Protection Office

Send your complaints by email to:
dataprotectionofficer@glasgow.ac.uk

If you are not happy with how the university responds, you can complain to the Information Commissioner's Office (ICO)

This is accessed online: https://ico.org.uk/



You can contact the researcher if you have any questions.

Miss Sophie Westrop
Mental Health & Wellbeing
1st floor, Admin Building
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow
G12 0XH

Email :

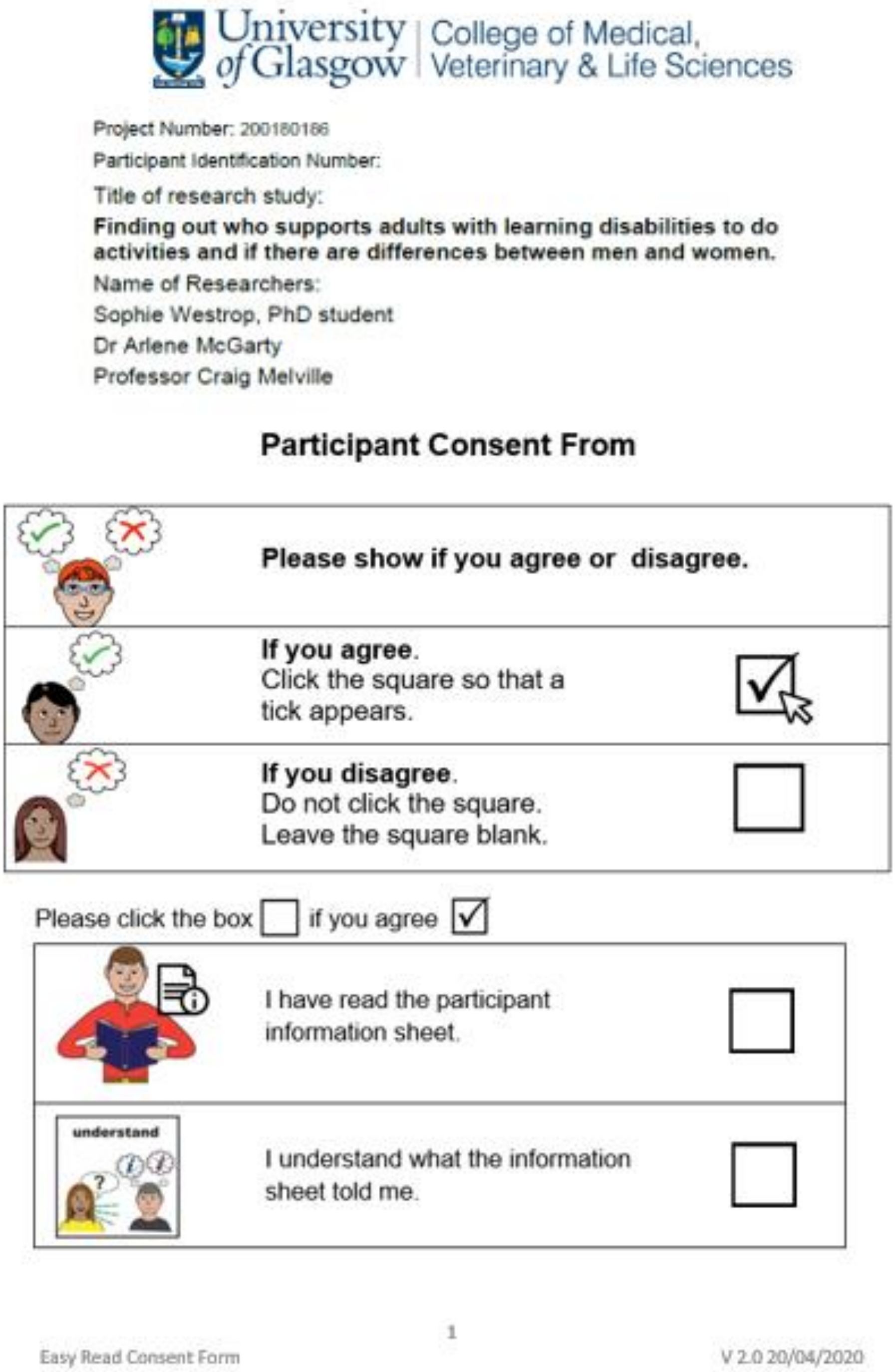
Mobile:

Only contactable by email or mobile during Lockdown.

Contactable 9am to 5pm on Monday to Friday.

Appendix 24. Chapter 5 (study 2): Electronic easy read consent form

Graphics from “Easy on the I” copyrighted for Leeds York Partnership NHS Foundation trust (https://www.learningdisabilityservice-leeds.nhs.uk/easy-on-the-i/image-bank/)



University of Glasgow | College of Medical, Veterinary & Life Sciences

Project Number: 200180186
Participant Identification Number:
Title of research study:
Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women.
Name of Researchers:
Sophie Westrop, PhD student
Dr Arlene McGarty
Professor Craig Melville

Participant Consent From

	Please show if you agree or disagree.	
	If you agree. Click the square so that a tick appears.	☑
	If you disagree. Do not click the square. Leave the square blank.	☐

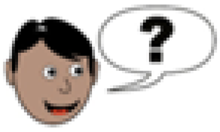
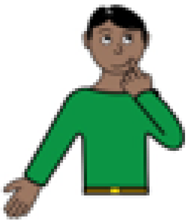
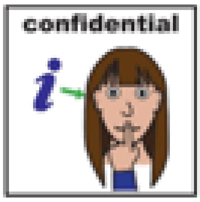
Please click the box ☐ if you agree ☑

	I have read the participant information sheet.	☐
understand	I understand what the information sheet told me.	☐

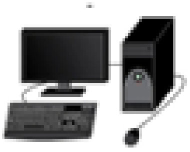
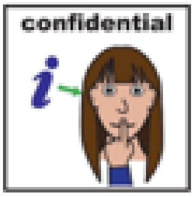
1

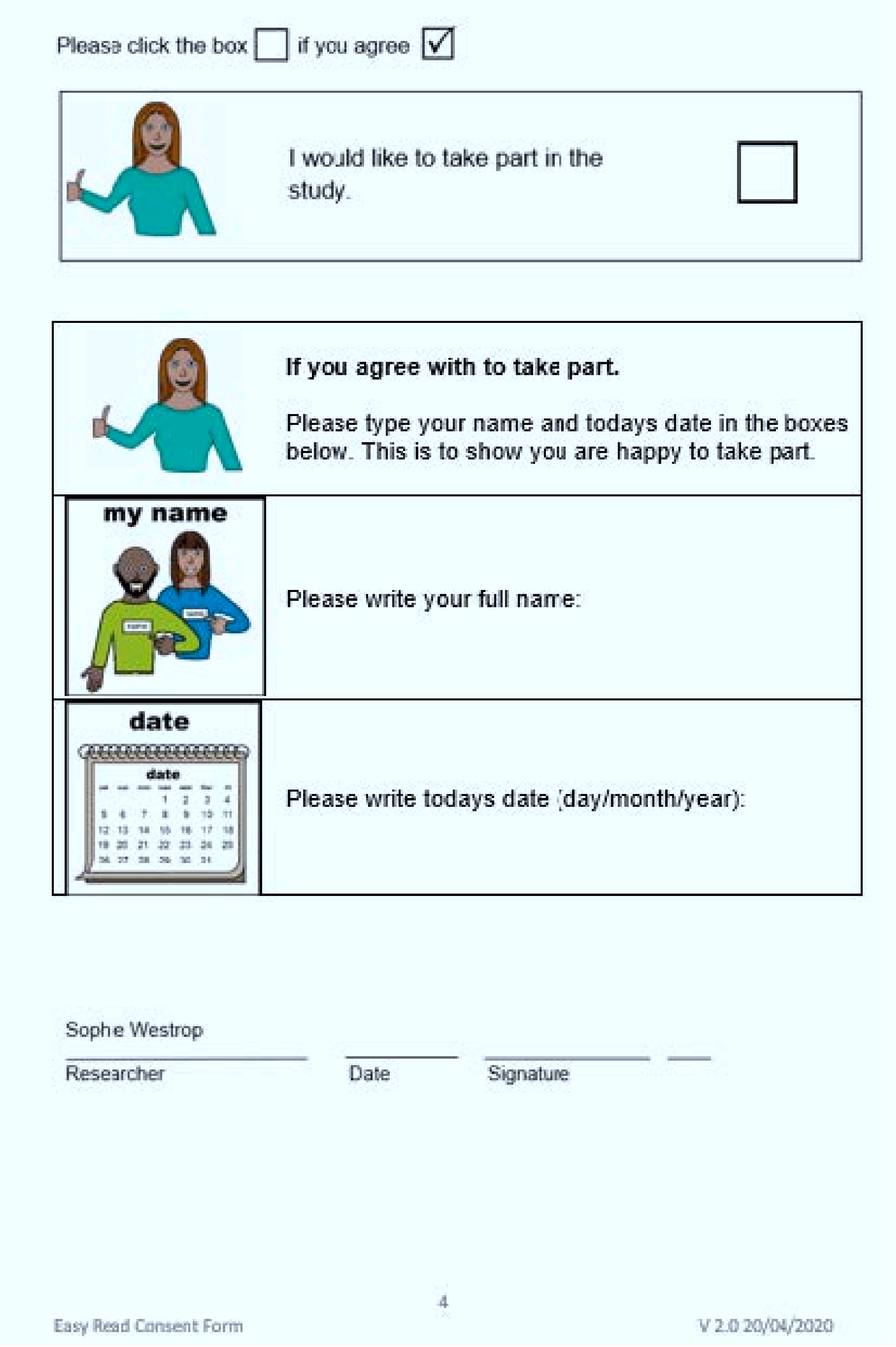
Easy Read Consent Form V 2.0 20/04/2020

Please click the box ☐ if you agree ☑

	I have read the privacy notice.	☐
	I understand what the privacy notice told me.	☐
	I have been able to ask questions if I wanted to.	☐
	I understand that I get to decide if I take part.	☐
	I know I can change my mind and stop taking part at any time.	☐
	I understand that information about me will be kept secret.	☐
	I understand that information about me will be kept safely for 10 years.	☐

Please click the box ☐ if you agree ☑

	I agree to my voice being recorded during the telephone interview.	☐
	I understand the researcher will type what I say.	☐
	I understand that a report will be written about the study. Other people will see this report. I understand that some of the things I say may be in the report.	☐
	I know my name will not be in the report.	☐
	I understand that if I leave the study the information I give will be kept and used.	☐
	I understand that any illegal or harmful activities I do will be reported. This is to keep me safe.	☐



Please click the box ☐ if you agree ☑

	I would like to take part in the study.	☐

If you agree with to take part.

Please type your name and todays date in the boxes below. This is to show you are happy to take part.

my name	Please write your full name:
date	Please write todays date (day/month/year):

Sophe Westrop

Researcher Date Signature

Appendix 25. Chapter 5 (study 2): Electronic trusted adult information sheet

The text developed for the trusted adult / support information sheet is presented below. In the original document, a dated version number was provided which matched the consent form provided (see Appendix 26).

University of Glasgow | College of Medical, Veterinary & Life Sciences

Support Information Sheet

(Carer / Parent / Support)

Study Title: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women.

The participant has been invited to take part in a research study. The participant has requested that you attend as their support. Please read this information sheet and privacy notice provided. If anything is unclear, or if you would like more information, please do not hesitate to contact the researcher using the contact details on the end of this information sheet.

What is the purpose of this study?

This study is conducted as part of the PhD qualification of the researcher and explores the social support from the people most important to adults with learning disabilities in relation to support for leisure activities (when it was safe to do so) and how participants feel they are supported to do physical activities. This study aims to describe the leisure activities promoted by the people most important to adults with learning disabilities, explore perceptions of social support for physical activity and find out if there are differences between men and women. This study will also explore participants experiences of social support and physical activity during the current social distancing measures.

Why has the person I support been invited to participate?

They have been invited to take part as they are an adult, over the age of 18, with a mild learning disability living in the Greater Glasgow area.

Does the person I support have to take part?

No, it is up to them to decide if they want to participate. Participation is voluntary, and the study can be stopped at any time.

What will happen to the person I support if they take part?

If they decide to participate, there will be an initial phone call to discuss the study and for the researcher to answer any questions. A date and time will then be arranged to conduct a telephone interview. The researcher will then make sure the participant understands the purpose of the study by asking the participant to describe the study in their own words. They will then be asked if they agree to the study methods and if they consent to taking part.

The telephone interview will last approximately one hour. After providing informed consent, the researcher will ask questions to gather demographic information. The participant will then be asked about the leisure activities they do, and who they do them with. They will then be asked questions relating to social support for physical activities. The researcher will also ask questions relating to social support and physical activity during the current social distancing measures.

The participant can take their time to answer the questions and ask the researcher to reword or explain any questions that they do not understand. The participant can choose not to answer questions and can ask the researcher to stop the interview at any time. If they get tired, they can ask for the interview to be resumed on another day.

The audio of the interview will be recorded using a Dictaphone to allow for transcription

What does the person I support have to do?

If the participant wants to take part they will need to complete a the consent form. This will need to be sent to the researchers email address. If the participant requests for you to attend, your consent form must be sent in the same email.

The researcher will then contact the participant and request for the participant to call them to arrange a date and time for the interview. During the interview phone call, the participant will be asked to explain the study in their own words. The participant will then be asked if they agree to the study methods and if they consent to taking part. The participant will then be asked the questions about themselves and the interview will be conducted.

What if the person I support wants me to be there and help?

If the person you support wishes for you to be present, or you feel they will need additional support, you are invited to attend the interview. You can attend the interview by having the participant to set the phone call on loudspeaker (mobile phone) or using another handset (landline).

What will I have to do if I attend to support the participant?

If you have read this information sheet and privacy notice, and wish to attend to support the participant, you will be asked to complete a consent form (labelled as "Carer/Parent/Support").

If you attend the phone interview, you will be asked if you agree to the study methods and if you agree to taking part. You will not be asked any interview questions directly. However, you can help the participant respond to any questions that they have difficultly answering or rephrase any questions. The participant can refuse to answer any questions. If you or the participant wishes to stop at any time you are welcome to do so.

What are the possible disadvantages and risks of taking part?

There is unlikely to be any risk involved in taking part. However, the interview can take up to an hour to complete and participants or supporters may find the study boring.

What are the possible benefits of taking part?

There are no direct benefits of taking part. However, the data collected will uncover the types of activities supported and understand social support experienced by adults with learning disabilities. The research will also provide data on perceptions of social support for physical activity and potential gender differences. The research will also examine social support and opportunities for physical activity experience by adults with learning disabilities during the social distancing.

Will participation be kept confidential?

Yes. All information collected throughout the course of this research will be kept strictly confidential. However, if the participant reports illegal and/or harmful activities, the researcher will need to disclose this. The researcher would be required to break confidentiality and report this to social work and regulatory bodies.

Participants will be referred to by an identification number and gender, this will be used to anonymise transcripts and to cite any quotes when writing up the research (e.g. Participant 3, Male). If you assist the participant, your attendance will be kept strictly confidential. You will only be referred to as the supporter (e.g. Participant 3, supporter). It is important that the attendance of the participant and any responses provided by the participant are kept confidential by yourself.

What will happen to the data collected?

The researchers are following laws to ensure all data collected is kept confidential and secure.

We are collecting and storing identifiable information in order to undertake this study. This means that the University is responsible for looking after this information and using it properly. We will not pass this information to a third party without your express permission. If you withdraw from the study, we will keep the information about you that we have already obtained. After the study is finished, data will be stored in archiving facilities in line with the University of Glasgow retention policy for 10 years. All personal information will be collected, stored, and processed in accordance with the General Data Protection Regulation.

The data provided will be used as part of the researcher's degree thesis. Data relating to demographic information and level of learning disability will be kept anonymous. The data may be used to write reports for publication in academic journals and conference proceedings. The data may also be used by the researcher in the future to answer other questions relating to social support and activities participated in adults with learning disabilities. Within these reports, quotations from transcripts and numerical data will be published. Participant's names will be replaced with a participant number. There will be no identifiable information, and participation will be kept confidential.

What will happen to the results of the research study?

The results will be included as part of the researcher's degree thesis. The results of this study may inform the development of a larger future study and may be published in an academic journal or conference proceeding. The information provided may be used to report results relating to the use of the methodology and determine if changes or adaptations must be made. The results may also be used to directly describe and explore perceptions of social support for physical activities. The data provided may also be used by the researcher in the future to answer different research questions relating to social support for physical activity and gender differences.

Who is organising and funding the research?

This research is being organised by researchers at the University of Glasgow and is funded as part of PhD qualification by the Scottish Government.

Who has reviewed the study?

This study has been reviewed and approved by the Medicine, Veterinary and Life Sciences College Ethics Committee at the University of Glasgow.

Contact for further information?

Miss Sophie Westrop

Email:
Mobile :

Contactable during standard office hours (9am – 5pm / Monday to Friday)

Thank you for taking the time to read this information sheet. If you have any questions, please do not hesitate to contact us.

If you wish to attend the interview to support the participant, please fill out your consent form. Please send this to the researcher by email.

If possible, please use the same email as the participant.

Appendix 26 Chapter 5 (study 2): Trusted adult privacy notices

Text developed for the trusted adult / support privacy sheet is presented below.

Support privacy notice for the research study:

Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women

Your Personal Data

The University of Glasgow will be what's known as the "Data Controller" of how personal data is processed in relation to the study: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women. This privacy notice will explain how the University of Glasgow will process your data.

Why we need it

We are collecting data such as your:

- Name
- Contact Details

All data, outlined above, will be collected during consent procedures for this study. You are invited to support the participant.

Legal basis for processing your data

We must have a legal basis for processing your data. As this study is academic research, the basic personal data will be processed as a **task carried out in public interest.**

We will also ask for your **consent** to support the participant during the interview to fulfil our ethical requirements. This will not be part of the legal basis for processing your data.

What do we do with it and who we share it with

- All personal data you submit will be processed by staff at the University of Glasgow in the United Kingdom

- All data will be stored securely on the University of Glasgow server and University OneDrive. Only the researchers involved in the project will have access to this data.

- The consent form and audio of the verbal consent form will be stored separately from all other data. If you speak during the interview to support the participant, this will be reported in a pseudonymised format e.g. Participant 1, Support.

- The audio of the interview will be typed up as a transcription (using Microsoft Word). Following this, the audio will be destroyed.

- Any information you provide during the interview may be written as part of the lead researchers PhD thesis, journal publications and presentations. Any published or presented data will be pseudonymised. Every effort will be made to ensure no one can identify you from the data.

How long do we keep it for?

Audio from the interview will be deleted immediately following transcription. Following the Code of Good Practice in Research, all other data including consent forms and audio, will be retained by the University for 10 years. After this time, your data will be securely destroyed.

What are your rights?

You have the right to request access to and copies of your personal data. You have the right to ask for amendments or deletion of personal data, and can object to processing. You have the right to limit the processing of your personal data and data portability. You can request access to the information about you that we process.

If at any point you believe that the information we process relating to you is incorrect, you can request to see this information and may in some instances request to have it restricted, corrected or, erased. You may also have the right to object to the processing of data and the right to data portability.

If you wish to exercise any of these rights, please submit your request via the webform or contact dp@gla.ac.uk.

*Please note that the ability to exercise these rights will vary and depend on the legal basis on which the processing is being carried out.

Complaints

If you wish to raise a complaint on how we have handled your personal data, you can contact the University Data Protection Officer who will investigate the matter.

Our Data Protection Officer can be contacted at dataprotectionofficer@glasgow.ac.uk

If you are not satisfied with our response or believe we are not processing your personal data in accordance with the law, you can complain to the Information Commissioner's Office (ICO) https://ico.org.uk/

Contact details

Sophie Westrop
Mental Health & Wellbeing
1st floor, Admin Building
Gartnavel Royal Hospital
1055 Great Western Road

Glasgow
G12 0XH

Work Mobile:

Email:

Only contactable by mobile or email during Lockdown.

Contactable Monday to Friday between 9am to 5pm.

Appendix 27. Chapter 5 (study 2): Trusted adult consent forms

University of Glasgow | College of Medical, Veterinary & Life Sciences

Project Number: *200180186*
Participant Identification Number:

Title of Project: Finding out who supports adults with learning disabilities to do activities and if there are differences between men and women.

Name of Researchers:
Sophie Westrop, PhD student
Dr Arlene McGarty
Professor Craig Melville

CONSENT FORM

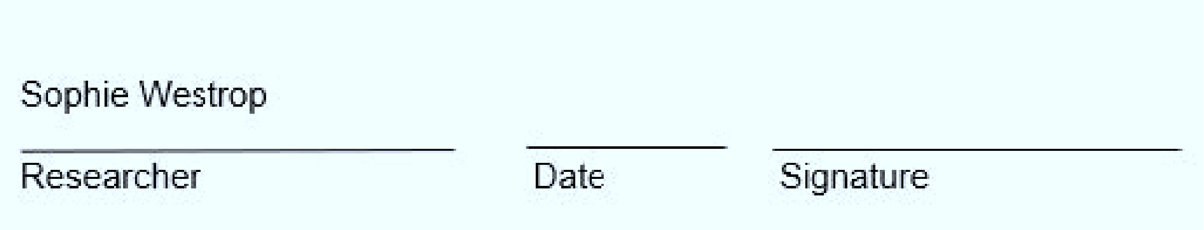
(PARENT/CARER/SUPPORT)

	Please Initial Box if you agree
I confirm that I have read and understood the Participant Information Sheet version 3.0 dated 20/04/2020	<Initials if you agree>
I confirm that I have read and understood the Privacy Notice version 2.2 dated 01/05/2020.	<Initials if you agree>
I have had the opportunity to think about the information and ask questions, and understand the answers given.	<Initials if you agree>
I understand that my participation as a support is voluntary and that I am free to withdraw at any time, without giving reason, without my legal rights being affected.	<Initials if you agree>
I agree that my name, contact details and data described in the information sheet will be kept for the purposes of this research project.	<Initials if you agree>
I understand that the audio of the interview will be recorded and transcribed word by word.	<Initials if you agree>

I confirm that I agree to the way the data will be collected and processed and that the data will be stored for up to 10 years in the University archiving facilities in accordance with relevant Data Protection policies and regulations.	<Initials if you agree>
I understand that all data and information I provide will be kept confidential and will be seen only by study researchers and regulators whose job it is to check the work of researchers.	<Initials if you agree>
I understand that if I withdraw from the study, my data collected up to that point will be retained and used for the remainder of the study.	<Initials if you agree>
I agree to keep all information described by the participant I supported kept strictly confidential and I will not talk about what was said during the interview.	<Initials if you agree>
I understand that the data will be used to write reports for the researcher's thesis, academic journals and conference proceedings.	<Initials if you agree>
I understand that if the participant reports illegal or harmful activities, the researcher is required to break confidentiality and report this to social work or regulatory bodies.	<Initials if you agree>
I agree to take part in the study as a support for the participant.	<Initials if you agree>

______________________________ ____________ ______________________

Name of Support Person Date Signature (or name again)



Sophie Westrop

Researcher Date Signature

Appendix 28. Chapter 5 (study 2): Amended study interview schedule

Semi structured interview schedule (after demographic questions)

Follow up questions and probes (e.g. below) will be asked to elicit qualitative data relevant to the study aims.
Detail oriented probes: who; where; what; when; how
Elaboration probes: "could you tell me more about xxx"
Clarification probes: "what do you mean by xxx"

Activities
I want you to think about the people who are important to you in your life right now. This can be family, friends, support staff or the people at groups who you are close to.

When you are with close [family / friends / support staff / group members] what do you do together?
What other activities do you like to do in your free time?
Prompts: sports (basketball / tennis / football etc); going for walks; going to social clubs (ask about what is done at these clubs); watching television; playing video games etc
Are there any activities that you haven't done before but would like to do?

Perceived social support for physical activity
I am going to ask you about physical activities. Physical activities can include activities like walking or running, but can also include other activities like sports like swimming or playing football.

Tell me about the physical activities you do.
Tell me about the support (or help) you get (from others) to do physical activities.

When you can spend time with the people important to you…
Do any of the people important to you remind you to do physical activities?
Do any of the people important to you do physical activities with you?
Do any of the people important to you plan physical activities when you spend time with them?
Do any of the people important to you anyone show you how to do physical activities?
Do any of the people important to you anyone tell you that you are good at physical activities?
Do any of the people important to you pay for you to do physical activities somewhere or buy you things that you need to do physical activities?
Do any of the people important to you drive you somewhere to do physical activities when you need them to?

LOCKDOWN COVID-19 QUESTIONS
Now that it is important to stay inside and to not see other people who you do not live with…
How often do you talk to the people important to you?

What activities are you able to do right now?
How often are you able to do physical activities / exercise right now?
What are you most looking forward to doing once the lockdown is over?

Appendix 29. Chapter 6: Pearson correlations with step counts and sitting time to identify additional variables for multiple imputation

	Step counts per week			Sit time hours/day		
	All	Male	Female	All	Male	Female
Demographic non-variables						
Sex	0.022			-0.103		
Standardised IQ score	-0.169	-0.218	-0.088	0.025	-0.186	0.28
Ethnicity	0.044	-0.292	-.503*	0.124	0.021	0.331
Health non-variables						
SF-36 Physical functioning	.280*	0.166	.474*	-0.201	-0.247	-0.173
SF-35 Role limitation Physical health	.390**	0.293	.547**	-0.169	-0.171	-0.154
SF-36 Role limitation Emotional problems	0.248	0.193	0.361	-0.032	-0.147	-0.176
SF-36 Energy/fatigue	0.193	0.122	0.356	-.253*	-.391*	-0.161
SF-36 Emotional Well-Being	0.200	0.205	0.202	-0.162	-0.243	-0.088
SF-36 Social functioning score	0.237	0.281	0.201	-0.132	-0.243	-0.061
SF-36 Pain Score	.319*	.424**	0.162	-0.093	-0.295	0.136
SF-36 General health score	0.277*	0.267	0.33	-.282*	-.398*	-0.205
SF-36 Reported health transition	0.101	0.091	0.127	0.11	-0.093	-0.307
Limitations walking 1 mile	-0.235	-0.206	-0.291	0.093	0.172	0.043
Limitations walking 1/2 mile	-0.234	-0.19	-0.309	0.117	0.166	0.093
Limitations walking 100 yards	-0.228	-0.142	-0.359	0.109	0.19	0.034
Objectively measured BMI	-0.144	-0.171	-0.152	0.072	-0.053	0.203
Included variables						
Sees friends weekly	-0.037	-0.079	0.034	0.048	-0.166	0.273
Sees family weekly	-0.072	-0.132	0.021	-0.087	-0.233	0.073
Attends groups weekly	0.057	0.15	-0.123	0.017	-0.135	0.218
Someone willing to listen to problems	0.141	0.154	0.118	-0.191	-0.17	-0.212
Other people can be trusted	-0.068	0.075	-0.286	-0.074	-0.433**	0.35
Lives in private residence vs own home	0.16	0.025	0.399	0.049	0.053	0.039
Is living comfortably	-0.002	0.043	-0.075	-0.039	-0.191	0.132
Index of multiple deprivation	-.053	-.043	-0.063	-.215	-0.161	0.151
Urban/rural	-0.252*	-.374*	-0.028	0.103	0.143	0.086
health limits social	-0.126	-0.131	-0.17	0.025	0.232	-0.14
health limits moderate	-.366**	-0.227	-0.583*	0.206	0.333	0.054
Subjective						
Self-reported PA	.299*	0.419*	0.139	-0.071	-.368*	0.257
TV weekend	-0.093	-0.171	0.026	0.043	-0.026	0.129
TV weekday	-0.197	-0.236	-0.137	0.187	0.141	0.245

*Notes: data displayed are the r values; * p < 0.05; ** p < 0.001; SF-36 – short form 36 questionnaire subscales indicating health related quality of life relating to the specified domains; BMI = body mass index; TV = television; all categorical variables scored as dummy variables 0,1 / no, yes.*

References

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