A MIXED-METHODS EXAMINATION OF PHYSICAL ACTIVITY AND SEDENTARY TIME AMONG SOUTH ASIAN WOMEN IN THE UNITED KINGDOM

BY

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I dedicate this thesis to my parents,

Emin and Kathleen Babakus.

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ABBREVIATIONS

ANOVA	Analysis of Variance
BMI	Body Mass Index
CASP	Critical Skills Appraisal Programme
CPM	Counts Per Minute
CVD	Cardiovascular disease
GP	General practitioner
HSE	Health Survey for England
IMD	Index of Multiple Deprivation
IPAQ	International Physical Activity Questionnaire
IPAQ-SF	International Physical Activity Questionnaire-Short Form
JLT	Janice L. Thompson
LTPA	Leisure-time physical activity
MET	Metabolic equivalent task
METmin/wk	Metabolic equivalent task minutes per week
MVPA	Moderate-to-vigorous physical activity
PA	Physical activity
SA	South Asian
SD	Standard deviation
SDT	Self determination theory
SES	Socio-economic status
ST	Sedentary time
UK	United Kingdom
US	United States
WHO	World Health Organisation
WSB	Whitney S. Babakus

ABSTRACT

Physical activity (PA) and sedentary time (ST) are important influences on the development of chronic diseases such as cardiovascular disease (CVD) and type 2 diabetes, and subsequent morbidity and mortality from these diseases, disproportionately affect vulnerable groups such as women and ethnic minorities [59]. This has been identified as contributing to health inequalities between majority populations and ethnic minority groups [17, 59]. PA and ST behaviours are known to be associated with low education levels, low literacy skills, high rates of poverty and unemployment, social exclusion, and racial discrimination [45, 48].

South Asian (SA) women in the United Kingdom (UK) are a group that is known to be disproportionately affected by all of these factors [67]. However, there is limited published research documenting PA and ST among SA women, limited data on the validity of methods of assessing PA and ST in this group, and limited understanding of the factors contributing to relatively low rates of PA and high rates of ST among SA women in the UK. The purpose of this PhD research is to employ a mixed methods design to quantify PA/ST among SA women in the UK, assess the validity of common methods of PA/ST data collection (a self-report questionnaire and objective measurement with accelerometers), and to provide a better understanding of the factors that may influence PA/ST in this group.

This research was conducted in three phases: 1) a mixed-methods systematic review of the literature on PA and ST among SA women; 2) a study on the comparability of the International Physical Activity Questionnaire (IPAQ) with objective accelerometry measurement; and 3) semi-structured interviews to contextualise conditions under which physical and sedentary activity-related behaviours occur in SA ethnic minority women.

140 SA women wore an accelerometer and 36% (n=50) of the sample also completed the International Physical Activity Questionnaire (IPAQ). 17% (n=24) of the sample also participated in semi-structured interviews. Results indicate that SA women are engaging in similar amounts of PA and ST throughout the day as the general population, and on average the majority (66%) do not meet current recommendations for PA. Self-report measures of PA and ST were found to underestimate PA and ST when compared to objective measurement data and there were no significant correlations between the measurements of the two methods. SA women had difficulty understanding the terminology, content and context of self-report questionnaires, and difficulty recalling their ST. SA women's perceived levels of PA and ST were different from their objectively measured levels of PA and ST. It is recommended that objective measurement of PA and ST be more widely used in this and other comparable populations. Where this is not possible, a more culturally relevant and contextualised self-report tool should be developed to more accurately measure PA and ST among SA women.

Findings from this thesis suggest that SA women may benefit from culturally tailored health promotion campaigns and interventions to increase PA and reduce ST. Future efforts should focus on utilising the resources available within SA communities and working within cultural norms to make changes to SA women's activity levels. This study is significant in the fields of Ageing, Public Health, Exercise Science, and the Social Sciences specifically in the area of PA for health and well-being. The results will provide a more comprehensive elucidation of the intricacies and interrelated factors that contribute to PA and ST in SA women in the UK. The results from this research will provide unique and innovative findings that can be used to accurately measure PA/ST, design and implement effective lifestyle interventions to increase PA levels, and reduce time spent sedentary, with a view to reducing chronic diseases among ethnic minority women and improve health and well-being across the lifespan. Policy makers, practitioners and scholars may use the results from this study to apply processes, methods and techniques to other similar groups, settings and situations as appropriate.

CHAPTER 1

INTRODUCTION

1.1 Background

Research indicates that South Asian (SA) women, women of Bangladeshi, Pakistani, Sri Lankan and Indian descent, may not engage in recommended levels of physical activity (PA) and may be highly sedentary, putting them at 3-6 fold increased risk for developing chronic diseases such as type 2 diabetes and 50% more likely to develop cardiovascular disease (CVD) than their white European counterparts [63, 80]. This thesis implemented a mixed methods design to investigate what is known about SA women's PA and ST, to compare two of the most common methods of assessing PA and sedentary time (ST) in this group, and to explore SA women's experiences and understanding of PA and ST.

For the purposes of this research, Bangladeshi and Pakistani groups were targeted for several important reasons. Bangladeshi and Pakistani groups make up a significant portion of the SA population (nearly 1 million born outside of the United Kingdom (UK) but now living in the UK), with Indian being the only other major SA group living in the UK. UK Bangladeshis and Pakistanis have been reported to be religiously homogenous, with 92% identifying themselves as Muslim in the 2011 Census[9].Additionally, these two groups of SAs have been reported to be the most deprived of the SA groups and one of the most deprived populations in the UK, having high rates of unemployment and low rates of education [4].

Bangladesh and Pakistan havea history of immigration with the UK, with communities of Bangladeshi and Pakistani people in the UK being one of the largest outside of the home countries [34]. Much research has been dedicated to understanding how to improve the health of SA people in the UK. Although the majority of research amongst Bangladeshis has concentrated on the Tower Hamlets region of London, limiting the amount of knowledge on those communities living

outside of the London area [18]. The majority of research on Pakistanis in the UK has been in the Manchester and Bradford areas [35, 112, 113, 136]. Findings from these studies may have limited generalisabilityto other communities in the UK; therefore more research is needed to expand our understanding of these minority ethnic groups and how to improve their health and well-being throughout the UK. This research project was conducted with communities in Cardiff, Wales. Cardiff has approximately 25 distinct ethnic minorities making up over 10% of its population [101]. In 2011 it was estimated that those of SA descent made up 4% of the population and there were nearly 4,838 Bangladeshis and 2,637 Pakistanis living in Cardiff [101]. While there was a great deal of migration to the UK from Bangladesh and Pakistan from 1950-1980, there is now an increasing number who were either born in the UK or moved to the UK at a young age rather than as adults [18, 72]. Bangladeshi and Pakistanis in the UK are relatively young, with 62,500 over the age of 65 as compared to 347,500 of the White population un the UK older than 65, based on the 2011 census data [9]. These large and comparativelyyoung ethnic minority groups in the UK are known to have poor health outcomes, and engaging them in this research offers a unique opportunity to understand how PA/ST plays a role in their health and well-being.

1.2 Aims and Objectives

The purpose of this research is to use a mixed methods design to quantify PA and ST among SA women in the UK, assess the validity of common methods of PA/ST data collection (a self-report questionnaire and objective measurement with accelerometers), and to provide a better understanding of the factors that may influence PA/ST in this group. A mixed methods design was used to: 1) assess and synthesise all available studies on SA women's PA and ST; 2) quantify their levels of PA and ST; 3) assess the comparability of self-report and objective measurements and 4) identify the key determinants that influence activity-related behaviours which will provide critical insights into how best to design and implement effective lifestyle interventions to increase levels of PA and decrease ST among SA and other comparable groups of ethnic minority women throughout their lifecourse. This thesis is not hypothesis driven due to the limited amount of research currently available in this area (Chapter 3). Long-term objectives of this research include:

- Development of improved methods for assessing PA levels and ST in low literacy and hard to reach groups.
- Provide a better understanding of the factors affecting the ability of ethnic minority communities to change PA and ST patterns and improve health.

1.3Research Questions

RQ1. What is currently known about the levels and determinants of PA and ST among SA women?

RQ2. How much and what types of PA do UK Bangladeshi and Pakistani women participate in?

RQ3. Are self-report methods comparable to objective methods of measuring PA and ST?

RQ4. What conditions promote participation in PA, and what are the key barriers to increasing PA and reducing ST?

RQ5. What strategies can be used to increase PA and decrease ST in this population?

RQ6. In what ways can policy makers and public health professionals engage with culturally diverse groups to increase PA and decrease ST in an effort to reduce health inequalities?

CHAPTER 2

LITERATURE REVIEW

This chapter provides a review of the literature supporting the key components of the research conducted during this PhD. A brief summary providing a rationale for the research concludes this chapter.

2.1 Health Inequalities

Good health for all members of society has become an international goal but despite substantial advances in health and social care in recent decades, there is an increasing gap in the health outcomes between ethnic minority groups and majority populations, especially in areas such as chronic disease morbidity and mortality [57]. Health gains have not benefited everyone equally, as the rates of improvement in vulnerable groups do not match those of groups who are economically and socially well off [57, 98]. These health inequalities can be defined as the measurable systematic difference in morbidity, mortality and health care among groups of unequal social position in society [48, 98, 123]. Differences can be observed between groups according to socioeconomic status, gender, and ethnicity [48]. The World Health Organization (WHO) attributes these inequalities to the skewed distribution of health determinants between socioeconomic groups [144]. These determinants include the social, economic, and cultural circumstances in which people live, work, access health care and experience ageing, in addition to the choices individuals make about their own health [4, 144]. Since South Asian (SA) women are disproportionately suffering from chronic diseases when compared to the general population of the United Kingdom (UK), this group can be said to be suffering from health inequalities.

The following sections will discuss the relevant determinants of health inequalities in relation to the physical activity (PA) and sedentary time (ST) of SA women in the United Kingdom (UK).

2.1.1 Socioeconomic Status

Previous research has focused on the bio-medical factors and negative lifestyle choices of those with poor outcomes [79], but increasingly it is recognized that in order to gain a more comprehensive understanding of health inequalities it is necessary to examine the full range of determinants of inequalities [129, 136]. While genetics and behavioural choices may have an influence on health inequalities, factors such as socioeconomic status (SES) must also be examined [136]. The term SES is used as a means to combine social status or class and economic status. SES is commonly measured by household income, level of education, or occupation and is seen as a contributor to health inequalities [28]. A major factor that may influence health outcomes is the unequal distribution of social and economic resources available to a population, since there is considerable evidence that those classified as being of lower SES or high deprivation have high levels of poor health outcomes [136]. Emile Durkheim, the father of modern sociology, explained that people in a society have much power exerted on them by their social interactions and ability to work and move within a society [51]. When there are marked health inequalities, those who are socio-economically disadvantaged may lack the resources of the mainstream society, have movement within that society restricted, and therefore may suffer poorer health outcomes of that society [143]. Grossman's seminal work on health and health economics pointed to education and income as major contributors to health outcomes [68]. Bartley (2004) has developed what he calls the '4 causal approaches to inequality' with socioeconomic status encompassing two stages in this approach [12]. According to the WHO's Commission on Social Determinants of Health, the social and economic circumstances in which individuals and communities find themselves have substantial influence on health and health inequalities [63].

One theory of why health inequalities affect lower SES groups is that money can be an indicator of where a person is in the power structure of a community or society, and therefore can limit the opportunities one might have to improve health outcomes [12]. Though individuals of higher SES groups may not specifically advocate for opportunities that improve health outcomes, these opportunities may result from the resources available to higher status groups [112]. Therefore it may be the resources of

the individual and the community that can have a positive or negative effect on health [112].

Increased rates of obesity, heart attack, illness and disability are also closely tied to SES [76]. Moving from Bangladesh and Pakistan to a more westernized country is generally done by those who have access to funds to pay for the costs of such a move [58]. When they arrive in the United Kingdom (UK) however, they are more likely to have a SES that places them at the bottom of the socioeconomic ladder [64]. Furthermore, ethnic minorities in the UK often live in deprived urban areas [20], and UK South Asians (SA)s are among such groups [64].

When compared to other SA groups in the UK such as people from India, Bangladeshis and Pakistanis are the most socioeconomically disadvantaged, poorly housed and educated, with high unemployment rates and a low number of women in the labour force [4, 15, 51, 128]. UK SA women are less likely to be in full time employment with unemployment rates at 20%-24% for Bangladeshi women and 19%-24% for Pakistani women [107, 128]. Those women who are employed are the lowest paid in the work force. Approximately 50-65% of Bangladeshis and Pakistanis in the UK as a whole live below the poverty line [4]. Studies suggest a link between low SES and CVD, type 2 diabetes morbidity and mortality, and increased risks for overweight and obesity [28]. A higher SES may be somewhat protective when considering chronic diseases and their risk factors [101]. Those from higher income groups have been observed to more regularly participate in health behaviours such as PA [67, 80]. A large proportion of the UK Bangladeshi and Pakistani populations is on the lowest end of the socioeconomic scale with low literacy rates and increased poverty, which may negatively influence PA levels [24, 128].

In the UK, deprivation, known as limited resources and opportunities, is used as a measure of SES. The Index of Multiple Deprivation (IMD) is the official measurement tool of deprivation in the UK [138]. The IMD uses several criteria to rank the deprivation of small geographical areas. These criteria include income,

housing, employment, access to services, education, health, community safety, and the physical environment. Areas are ranked based on their aggregate scores of these criteria [138]. The IMD rank for an area can be found by looking up the postcode in the IMD tables found on local authority or national government websites [138].

While it is not within the scope of this PhD thesis to include a detailed review of the SES and IMD literature here, the evidence above demonstrates the need to take these into account when designing and implementing health research such that found in this thesis.

2.1.2 Ethnicity and Gender

Although poverty can adversely affect health because of a lack of economic means and low social position, the variety of other physical and social characteristics that affect the lives of individuals must also be considered [123]. Sen points out that even if everyone's incomes were equal, health inequalities would still exist due to issues around gender or ethnicity. In order to understand health inequality more fully, it must be understood from more than just an assessment of SES [123].

Ethnicity has been defined as a group that an individual belongs to that may have common ancestry, language, religion, culture, and practices [2, 89, 91]. In 2000 the UK cabinet office recognized ethnicity as contributing to inequality over gender and social class [3]. It is now generally accepted that the burden of disease morbidity and mortality is not shared across all ethnic groups [7] and that ethnic minority groups experience higher levels of a range of chronic diseases [65, 103]. Self-reported poor health among ethnic minorities in the UK is highest among Bangladeshi and Pakistani women when compared across ethnicities [107]. Findings from the National Survey of Ethnic Minorities indicate that health inequalities among ethnic groups in the UK increase with age and become more pronounced after age 30 [103].

It has been suggested that studying ethnic groups with immigrant backgrounds can offer advantages for understanding the origins of inequalities and ethnicity [77]. Health inequalities have an inherent link to immigrant groups since ethnicity and ethnic identities are frequently based on the country of origin of the immigrant or their ancestors [77]. Ethnic group members often find themselves in a subordinate position in a host society or with little power, resulting in vulnerability to socioeconomic deprivation and health inequalities [98]. The region in which ethnic groups live may also have an effect on the health and well-being in that the resources of the community may influence health outcomes [123].

Immigrants are becoming a larger percentage of the total population in many countries. Data from 2010 show 109 million or 3.1% of the population of the world were living outside of their birth country and accounted for one in ten people [133]. It is estimated that over 200 million people are living outside their country of birth, and rates of immigration from less developed nations to developed nations continue to increase [15]. In the UK in 2010 there were an estimated 6.5 million international migrants in the UK [28]. Of those, 46% of them were of SA origin, the largest ethnic group in the UK [51, 60]. Figures from the most recent census conducted in 2011 show 2.39 million SAs living in the UK, a figure that is on the rise [106]. Recently more attention is being paid to female migration around the world. Between 1965-1990 female immigration increased by 63% to 57 million and now makes up half of all international immigrants [80]. Not surprisingly, subsequent generations of SAs are now being born and raised in countries to which their parents immigrated.

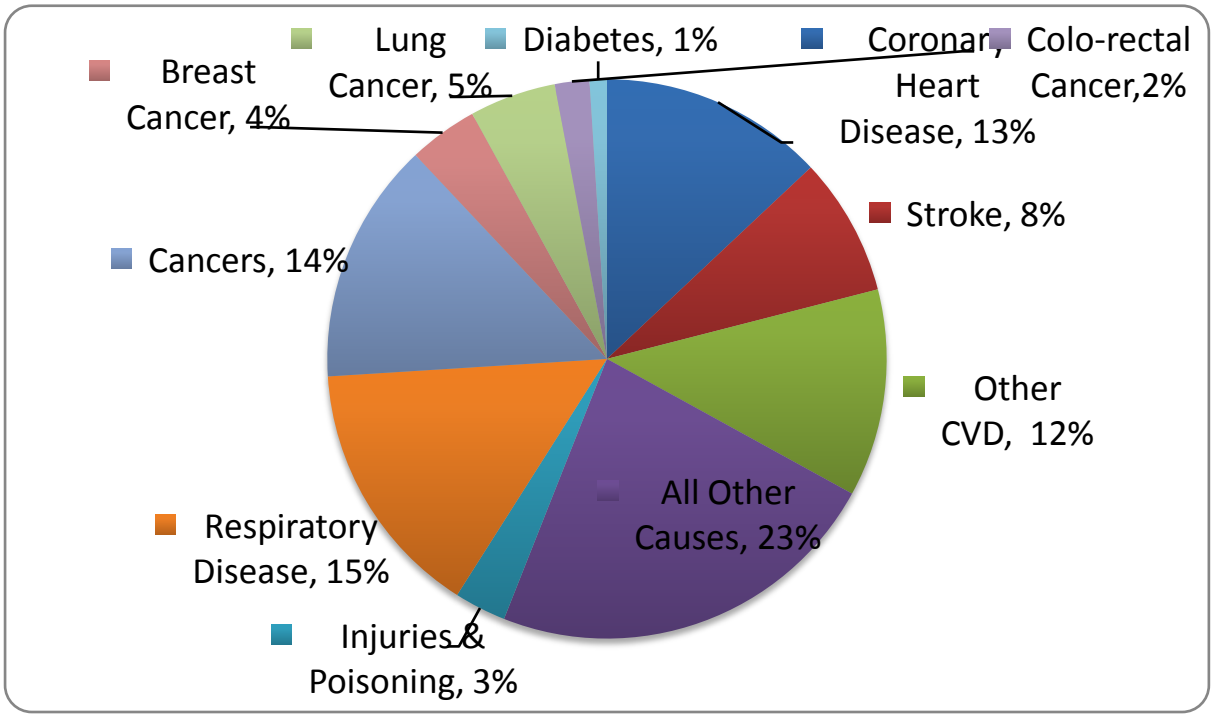
Health inequalities are known to be highest among women of ethnic minority groups, many of who are from an immigrant background; therefore it is important to consider gender when investigating factors affecting health inequalities. Gender organizes most of the social interaction and relationships that humans perform, but is often ignored [97, 126]. In fact, the systematic disparities in health that men and women experience in different cultures cannot easily be blamed solely on income and resources [123]. The expectations and roles that gender can place on men and women may contribute to its role in poor health outcomes [123]. Gender is intertwined with

social class, ethnicity and power structures in societies, indicating that it must be considered when investigating health inequalities [98, 123].

2.2 Cardiovascular Diseases

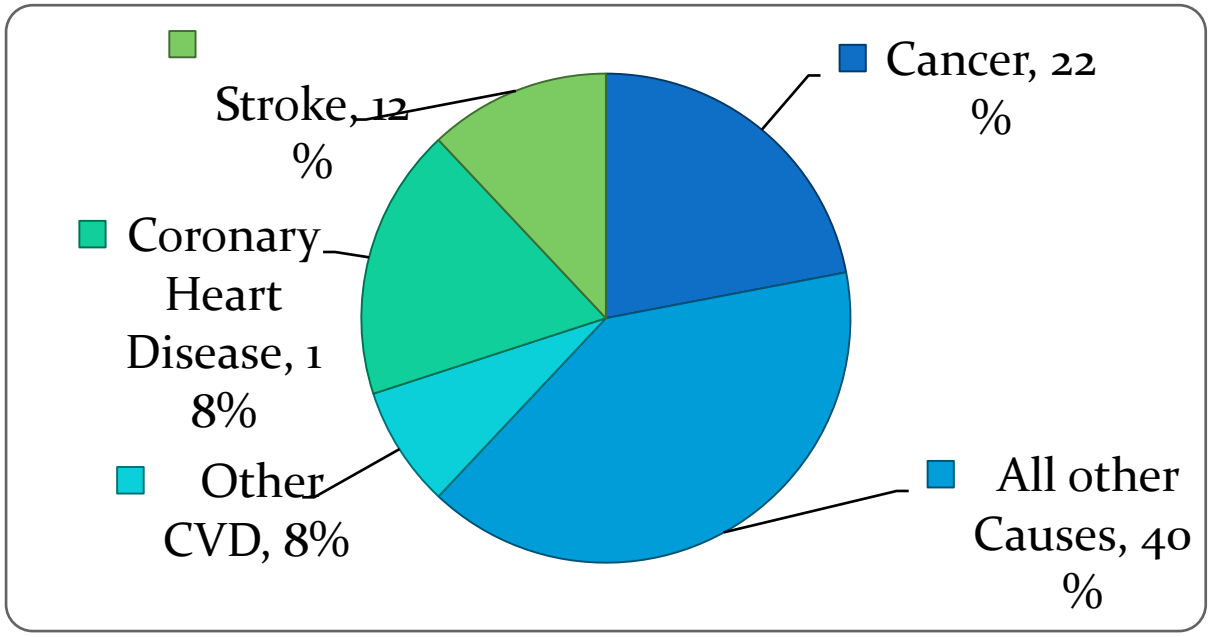
Cardiovascular disease (CVD), which includes heart attack and stroke, has emerged as a major area of concern for those experiencing health inequalities, with 16.7 million deaths globally each year [25, 28]. CVD is the leading cause of death in the UK and nearly half of all deaths in Europe are caused by CVD [18]. The UK has one of the highest rates of CVD in the world, with more than 190,000 deaths in 2008 [18]. Figure 2.1 shows that CVD is the leading cause of death in women in England and Wales in 2008, with CVD causing 33% of mortality [18]. Ethnic minorities in the UK are disproportionately affected by the burden of this disease [46, 49, 51]. Within ethnic groups, women and those of lower SES are known to have higher morbidity and mortality from CVD and other chronic diseases [57, 71, 73].

Figure 2.1: Leading cause of death in women in England and Wales in 2008 [18]



Studies have shown that SAs in the UK have between a 3-6 fold increased risk of death from CVD when compared to the general population and are often diagnosed before the age of 40 [40, 51, 61]. Though much of the academic literature defines and studies SAs as a collective group, it is actually those of Bangladeshi and Pakistani origin living in the UK who bear the greatest burden of CVD [51, 74]. This group is the most prone to premature death from CVD with the highest morbidity and mortality from CVD among SAs compared to the general population [30, 74]. UK Bangladeshis are 50% more likely to develop CVD than their white European counterparts and 1 in 10 Pakistani women will die from CVD [69, 110]. Moreover, women of SA origin in the UK are at the greatest risk. Figure 2.2 shows proportion of mortality by cause in UK SA women in 2008. 38% of all mortality in SA women in 2008 was caused by CVD, 5% higher than for all women [18].

Figure 1.2: Proportion of Deaths by Cause in SA Women in England and Wales, 2008 [18].



Moreover since the global elderly population is estimated to increase by over 80% in the next 25 years, this longevity prolongs exposure to risk factors for CVD resulting in increased morbidity and mortality from the disease [122]. UK national census data

have estimated that the over-65 population in the UK has more than quadrupled since 1951 [17]. It is projected that the over-65 population will continue to rise by over 60% in the next 20 years [28] and those over age 85 will double in number by the year 2033 [38]. These rising numbers highlight the necessity to identify those who are at risk for CVD and to modify risk factors to reduce the incidence of CVD in a growing, ageing population [17]. The facilitation and maintenance of health during the ageing process will aid in maintaining physical function, independence and quality of life over the life course [28,69]. This increase in the ageing population will also affect UK SA groups. The 1970's and 1980's saw large-scale immigration of SA women and children to the UK [19]. The next two decades will see these women reach retirement age along with an increase of new generations born in the UK, and further increased risk for CVD in a group already susceptible to this and other chronic diseases [19, 22].

2.2.1 CVD Risk Factors

Public health advocates, governmental agencies and health professionals worldwide now acknowledge that CVD is one of the most preventable causes of death [25]. CVD is a disease for which there is much prominent and well-established evidence of risk factors that have foundations in socio-economic determinants of health, behavioural risk factors, and genetic factors [37, 127]. The WHO lists 5 major risk factors for the development of non-communicable diseases such as CVD. These include high blood pressure, high blood glucose, obesity, tobacco use, and increased physical inactivity [37, 51]. It has been estimated that 80% of CVD could be prevented by eliminating these major risk factors [37]. The following section will discuss the risk factors that are believed to be the most relevant to the SA population in the UK.

High Blood Glucose

High blood glucose is one major factor in the development of CVD and can result in type 2 diabetes. This can happen as a result of the body not making enough insulin or when the body's cells do not respond to insulin. This failure to respond to insulin is called insulin resistance [104]. If just one parent has this disease, children will have a

15% increased risk to develop it. If both parents have type 2 diabetes that risk increases to 75% [42].

It is estimated that 347 million people worldwide currently have type 2 diabetes and that by 2030, it will be the 7th leading cause of death [145]. In the general UK population the prevalence in 2005 was 4.6% [43]. As an independent risk factor for CVD, type 2 diabetes substantially increases the risk of CVD and harmful effects of other factors including obesity [71]. The role of type 2 diabetes in CVD must be emphasized since 80% of deaths in people with diabetes can be attributed to CVD [5]. If not properly controlled type 2 diabetes can result in severe complications such as CVD, ischemic heart disease, stroke, and amputation [5, 69].

Ethnic minority groups in the UK have a higher prevalence of type 2 diabetes and higher mortality rates than the general population [31] and ethnic differences in mortality from CVD may be greater when one has type 2 diabetes [31, 140]. The prevalence of type 2 diabetes among UK SAs is quite high and they are two times as likely to die from CVD as the general population [25, 65, 101]. It is known that 1 in 5 older SAs in the UK have type 2 diabetes and that the rates are 3-6 fold higher than in the general population [31, 51, 55, 69]. Estimates show that 20% of UK SAs over age 65 are affected in many communities [69]. First generation SAs in the UK have higher rates of the disease, and their daughters may be 3 times more at risk than their white counterparts [61]. Additionally they may present with the disease 10 years earlier and at lower levels of obesity than white European groups in the UK [30, 55]. There is also some evidence that type 2 diabetes progresses more quickly in UK SAs than the general population [30].

Among UK SA groups, those of Bangladeshi and Pakistani descent have a higher prevalence of type 2 diabetes than the aggregate group [16, 74, 140]. Studies indicate that women of SA descent living in the UK are 3 times more likely to have type 2 diabetes than white women and that risk increases with age [71] and Pakistani women are up to 5 times more likely [41]. This may be especially important since SAs are the

fastest growing and youngest ethnic minority group in the UK, and as they age will bear an even heavier burden of disease [58].

Obesity

Obesity is an independent risk factor for CVD, type 2 diabetes, stroke, hypercholesterolemia, and hypertension [65, 83]. It has reached epidemic levels in developed nations such as the UK [115]. Estimates indicate that globally around 1.6 billion adults are overweight and 400 million are obese [83]. In the UK in 1993 29% of people over the age of 16 were categorized as obese and of those 16% were women. Those numbers drastically increased by 2011 to 50% of people age 16 and over categorized as obese with 26% of those being women [105]. Research indicates that obese women may lose at least 2 years of life due to obesity [86].

Obesity increases the risk of morbidity and mortality from CVD and several other chronic diseases such as type 2 diabetes [115]. In fact, Dhawan et al. (1994) found central obesity to be a powerful predictor of CVD in SA populations [40]. In SA women in the UK obesity has been endemic for a generation [84, 89]. Body mass index (BMI) is traditionally used to categorise a person as obese. Evidence indicates that SA populations develop chronic diseases such as CVD or diabetes as a lower BMI than white European populations [29, 44]. Traditionally one is categorised as obese at a BMI over 30 kg/m^2 [44]. Recently though, the WHO has adjusted the criteria for obesity in Asian populations to reflect greater risk for obesity-related diseases at a lower BMI [30]. The newly defined parameters for overweight and obesity are >23kg/m^2 and >25 kg/m^2, respectively [30]. This propensity toward increased risk for diseases such as CVD and type 2 diabetes at a lower BMI highlights the need to research how to prevent and treat obesity in this high-risk population as well as emphasises the great influence that obesity has on developing CVD.

2.3 Physical Activity and Sedentary Time

Of the 5 major risk factors identified by the WHO, physical activity (PA) is one that can have great influence on most of the other major risk factors [115]. The positive relationship between PA and health has been well established over the past 50 years [131]. It has been shown to reduce risks for chronic disease morbidity and mortality

[124]. Physical inactivity is associated with increased risk of developing CVD, type 2 diabetes and obesity [1, 73, 90] and people who are physically active have 50% lower risk of developing CVD [72, 139]. This may be due to weight loss or maintenance of a lower body weight, increased insulin sensitivity, improved lipid metabolism, reduced hypertension, improved vascular function and reduced inflammation [40, 61]. Research spanning the past five decades has concluded that virtually all individuals will benefit from regular PA [72, 131]. Other benefits include the prevention or delay of osteoporosis, increased joint range of motion, and functional independence throughout life [72, 131].

PA can also have a significantly positive influence on prevention and treatment of type 2 diabetes and obesity [40]. PA may improve insulin sensitivity for those who are already most susceptible such as the UK SA population [61]. Despite a genetic predisposition for insulin sensitivity and type 2 diabetes, PA is a major and overriding factor in the development of the disease [72]. Studies consistently show that any PA is better than none in the prevention of type 2 diabetes, but moderate intensity PA will achieve better results [135]. Low PA and cardiorespiratory fitness levels are also strongly related to obesity, and a sedentary lifestyle is a major factor in obesity [61]. Higher levels of PA attenuate the health risks associated with obesity [30, 51].

Many studies confirm that women and older adults have lower reported levels of PA [5, 6, 90]. Ethnic minority populations are also reported to have lower self-reported levels of PA [6, 46]. In 2011the British Heart Foundation reported that just 11% of Bangladeshi and 14% of Pakistani women in the UK reported activity levels that met PA recommendations, while the general population reported participation rates of 33% [130].

The current guidelines for PA are 30 minutes of moderate intensity PA at least 5 days a week or 20 minutes of vigorous PA at least 3 times per week [61, 90]. It has been shown that 45 minutes of brisk walking is associated with a 50% reduction in the risk for heart attack [131]. Tremblay et al (2006)found evidence to support increasing PA

beyond the 30 minutes a day minimum, as they may significantly reduce incidence of CVD and insulin resistance in many groups [131].

While the importance and benefits of PA have been well known for over five decades, it is only in the past few years that sedentary time (ST) has emerged as a significant independent risk factor for chronic disease and disability [142]. Being physically inactive is not synonymous with being sedentary; one can meet or exceed current physical activity guidelines and spend a considerable amount of time each day in sedentary behaviours. ST can be defined as energy expenditure below 1.5 metabolic equivalent units or simply any behaviour that results in low energy expenditure [142]. High levels of ST have been associated with a 147% increase in the risk of CVD, 90% increased risk in CVD mortality, and a 112% increase in risk of diabetes [142]. A recent prospective study reported that ST was a predictor of weight gain even when adjusting for energy intake and PA [109]. Although the majority of evidence is based on cross-sectional and other observational research, it highlights the growing concern that ST may have important negative health consequences in addition to those caused by low levels of PA. Although both PA and ST are independent risk factors for ill health, both were investigated in this thesis because they share many determinants, mediators, and moderators [131, 142].

Common ST behaviours include sitting and standing and can be performed during a wide variety of tasks. A recent systematic review of ST in adults has shown that there is limited high quality data on ST or its related behaviours, and that the majority of research has predominantly focused on children and television viewing behaviours [142]. In addition to television viewing, relatively high levels of ST associated with occupation, leisure time, and transport have been identified as areas of concern [32]. The specific sedentary behaviours being engaged in during these times are currently poorly understood. It has been shown though, that adults may spend up to 50-90% of their day in ST [109, 142]. This is especially true of women and ethnic minority groups [109]. There are currently no national or international guidelines for the recommended amount of ST, but it is now commonly recognised that breaking up prolonged periods of ST may have health benefits [109].

2.3.1 Determinants of Physical Activity and Sedentary Time

The determinants of PA and ST mirror many of the same determinants of health inequalities. These determinants include demographic, biological, psychological, emotional, behavioural, social, cultural, and environmental factors [80, 94]. The complex interactions of these factors on individuals and within communities can create barriers to increasing activity or alternatively may facilitate participation in PA [57, 114].

Demographic Factors

It has long been established that women, older adults, and ethnic minorities have lower rates of PA and more recently it has been suggested that these groups also have high rates of ST [2, 37, 90]. Gender and ethnicity are the major demographic factors that appear to be determinants of PA behaviours. Other demographic factors that have also been linked to low levels of PA and high rates of ST are income, education, and marital status [101]. Studies on SA women support the identification of these factors as determinants of PA since older, married SA women with low levels of income and education have reported lower levels of PA [114]. Biological factors that can influence PA include genetic variations. It is estimated that 10-50% of the variance in physical fitness can be attributed to heritable factors [61]. While genetics plays a role in PA, it is likely that other determinants such as psychological/emotional, behavioural, social/cultural, and environmental factors also play an important role [25, 101].

Psychological/Emotional Factors

It is well documented that psychological stress can trigger physiological responses that may result in poor health and negative health behaviours [37, 136]. Psychological stress can be defined as life disturbances and chronic tension that challenge an individual's capacity to cope [134]. Examples of this include increased heart rate, blood pressure and hormone secretions that may affect one's health as well as an increase in negative health behaviours such at poor diet, smoking and decreased PA/increased ST [36]. Various explanations can be found in the literature to explain what may cause high stress levels in ethnic minority groups such as SA women. One

generally accepted explanation is the negative influences of racism and discrimination. These are known to take the form of interpersonal or institutional racism or discrimination [81].

Interpersonal racism or discrimination can come in the form of the fear of or actual experience of racist attacks, sexual harassment, or exclusion from social groups based on race or ethnicity [4, 27, 64]. Racial and religious discrimination have also emerged as determinants of health behaviour [90, 124]. Ethnic minorities and those of the Muslim faith in the UK are often differentiated by race, social class, and immigration status, any of which could lead to social bias and discrimination [90]. The SA community in the UK is a marginalized group who is known to have a 4.2% greater risk of being subject to a race crime that the general population [65]. SA women often report fear of sexual and physical attack as a reason for not leaving the home [27, 64]. These experiences and fear for safety contribute greatly to limiting SA females' movement within UK society [4, 62, 64]. These social inequalities and exclusion are associated with both chronic disease risk and less healthful lifestyle behaviours [15, 28, 89]. On an institutional level ethnic minority groups may experience discrimination through policies or practices that are part of the organizational structures in which they live and work [81]. For newly immigrated minority groups, additional stressors may include the loss of support from family and friends from their homeland and the adoption of a new way of life in a new country [96]. Furthermore, PA itself can also be seen as a stressor if it becomes overwhelming to a person who is already trying to manage other stressors [92].

An individual's motivation to engage in PA will also affect levels of PA and ST. Self Determination Theory (SDT) has been used to describe PA motivation in individualistic populations as well as across cultures that can be seen as collectivist, such as the Bangladeshi and Pakistani cultures [120]. SDT categorizes motivation along a continuum from extrinsic motivation (motivation to engage in an activity in order to gain reward) to intrinsic motivation (motivation to engage in an activity for enjoyment, not external rewards) [120]. One key concept of SDT is that those individuals with intrinsic motivation to participate in PA will be more likely to be

active and continue to participate in PA over time [120]. Those who have external motivation to participate in PA may not do so out of enjoyment, but only due to reward and are subsequently less likely to engage in the activity for the long term [120]. Those who feel as though they have more control over their decisions and lives are more likely to feel intrinsically motivated [120]. Women of low SES groups or minority groups such as SA women in the UK are often viewed as having little control over their personal decisions and life choices, indicating that they may have low intrinsic motivation to pursue PA and are more likely to be sedentary [97]. Although there is some literature that suggests that an individual's agency, or ability to exert control over aspects of life, should not be dismissed, it is important to note that this agency exists within the social and cultural structures in which people live and can therefore be limited by those structures [10, 39, 97].

Social Factors

Social support has been shown to be an important factor in the health of ethnic minority populations. It has been defined as the help, care and companionship that others provide [119]. This support can be in the form of instrumental support (direct support in the form of time, money or assistance), informational support (support in the form of advice, information gathering and sharing) and emotional support (support in the form of empathy and understanding) [119, 134]. It is widely accepted that social support can provide individuals with a sense of well-being and may encourage positive health behaviours [126]. It is thought that social support offers protection against psychological stress and increases personal control [134]. Literature suggests that lack of social support influences the way ethnic minorities perceive their health and may contribute to them performing fewer health promoting behaviours such as PA [24, 80]. Evenson et al. (2004) found that social support is one of the most consistent correlates of PA regardless of ethnicity and may be equally as important as age and gender in determining PA behaviour [53]. Bartley (2004) notes that those in a more advantaged social position may receive more social support particularly from outside the family [12]. More recently Reed et al. (2011) suggested that friends may be a highly influential force on PA [116]. This is of particular importance in the case of SA women, who due to their lower social position and

higher risk for social isolation in UK society may not receive the social support needed to encourage PA [8, 116].

Just as social support has an influence on PA and ST, the social networks in which this support takes place can have a positive or negative effect on activity. Stephens et al. (2011) found that social networks and social support explained 15% of the variance in physical health outcomes [126]. Social networks are characterized by links between an individual and others in the immediate community and those outside of the community [134]. Individuals make decisions within the context of the social networks to which they belong [14, 97]. It has been found that SA people immigrating to the UK were more likely to do so because they had family and/or friends living there, and upon arrival they came to live in predominantly SA neighbourhoods [125]. The immigration history of SAs to the UK is significant in highlighting the potentially closed social networks this group and subsequent generations may be limited to [99, 108]. When a social network becomes ethnic-specific, the advantages that initially made the network strong such as a sense of support from familiar peers, may become limiting in that information or support from the wider society may not infiltrate the network [121]. A high quality social network, such as one which extends beyond the immediate family and community, can influence health through dissemination of health knowledge, increases in healthy lifestyle activities and influence of social norms that promote health [126, 147]. It may be the case with SA women in the UK that they have more closed or weaker social networks that do not promote PA [121, 126].

Additionally, the culture of members of a social network will often dictate what is acceptable behaviour for its members. Culture can be defined as the beliefs, abilities and customs that one acquires as a member of society [26]. Noted scholars such as Mead (1953), Berry (1974), and Kleinman (1978) have, for years, stressed the importance of culture in regard to health and well-being. While this literature review cannot fully examine the wealth of knowledge in this area, this section will discuss the main points in relation to health, well-being and PA/ST.Aspects of culture can include language, diet, religious beliefs, attitudes, and trends [80]. Studies have

identified that SA cultures may place a higher value on women staying in the home, dressing modestly, and promoting a sense of family and community over an individualistic ideal [11, 47, 62]. Faith and religion are also critical components of SA culture. In fact, 92.4% of Bangladeshis and Pakistanis living in the UK are Muslim and account for 17% of the Muslim community in the UK [4]. Research suggests that SAs view their religion as a large part of their identity construction [26, 52]. While the Muslim faith encourages healthy lifestyles and family taking a central role in achieving those healthy lifestyles, economic and social disenfranchisement may contribute to the burden of chronic diseases [62, 88]. In a study by Grace et al (2008) on the influence of culture on health, they found that religious leaders supported and encouraged healthy lifestyle habits such as increased vegetable intake and PA, though a woman's duty to take care of the family was prioritised higher than taking care of personal needs [62]. Moreover, researchers have consistently found that exercise for health and fitness has little cultural meaning to SAs and activities such as sport are not usually performed by adults [28]. Interestingly, there is not a term for PA in the Sylheti language, the dominant first language of most UK Bangladeshis [64]. There may also be social barriers to PA [65]. One example is social sanction or gossip about a SA woman if she participates in PA or sports since it is not commonly accepted in this culture [62].

While social support and networks may enhance an individual's likelihood of participating in PA, social exclusion may affect those who are isolated or discriminated against. Large proportions of Bangladeshi and Pakistani women do not work outside the home and therefore may be at a disadvantage for learning the language skills needed to integrate fully into the larger UK society, affecting their ability to create strong social networks [27]. Moreover, Bangladeshi and Pakistani women, like many other ethnic minorities, may be spatially isolated, living in ethnic enclaves with limited interaction with other communities [108]. The older generations also tend to be more segregated from society at large, putting them at greater social disadvantage [60]. It has been suggested that UK SA women are often isolated from the extensive support networks that exist in their home country [4].

Environmental Factors

It is increasingly recognized that the physical environment in which an individual lives and works can promote or limit PA and ST [137]. The physical environment can be defined as including those things that can be heard, touched, seen, smelled and tasted that an individual is exposed to in their lives [53]. Environmental factors have come to the forefront of PA research in recent years because it has been recognized that while individuals have agency and can choose to be active or not, they often times cannot choose the environment in which that activity occurs [10, 95]. Among ethnic minority groups the main environmental factors affecting PA and ST are access to recreational facilities, safety in neighbourhoods, urban design that limits outdoor activity, and high crime rates [33, 108]. Studies have shown that SA women worry about their personal safety when outside the home and do not view their neighbourhoods as acceptable places to engage in PA [62, 64].

Acculturation as an Additional Determinant of PA

Since SA women in the UK are a relatively recent group to arrive in the UK, it is important to identify additional factors affecting their PA and ST that may be unique to the experiences of re-settlement of the first generation of women and the experiences of subsequent generations. Acculturation has long been seen as a factor in the development of negative health behaviours in groups with a history of immigration from developing nations to westernized nations [56, 60, 78]. Acculturation has been defined as a transfer of culture from one group to another or adaptation to a new culture [24, 45, 53]. It may include adoption of some or all of the norms, values and behaviours of the new culture and may require social, psychological and emotional adjustments by the person adapting to the new culture [78]. Acculturation is often measured by language proficiency, place of birth and residence in a new country [53]. Various theories have been posited to explain the extent to which an individual may acculturate. The most notable of these include Segmented Assimilation Theory [1]. This theory acknowledges that migrants and subsequent generations to a new society will acculturate at different levels depending on personal characteristics, social and cultural norms of their home country, and the context of the situations in which they interact with others [1, 83, 148].

Acculturation has been used to explain the poor health outcomes and low levels of PA of ethnic minorities in the UK [78]. It is often associated with the adoption of negative 'western' health behaviours such as low PA and the more acculturated a person becomes, the steeper the decline in PA [56, 60]. This can be attributed to the changes in lifestyle that occur when adjusting to a new society [67]. Not surprisingly subsequent generations continue the trend of low levels of PA, though the pathways to this inactivity remain unclear [67]. Greenhalgh (1998) argued that ethnic minority groups with a history of immigration simultaneously hold on the traditional practices but will also adopt new practices from the host culture [64]. Many SA women in the UK have largely retained practices that include traditional cooking and consumption of high-fat foods, but have adopted a less active lifestyle [89].

2.4 Measurement of Physical Activity and Sedentary Time

An important aspect of understanding levels of PA and ST in any group is the way in which these levels are measured. Validity, reliability, ease of use, and cost are just a few concerns when choosing a method of measurement. There are 7 main methods of measurement traditionally used: 1) doubly labelled water; 2) accelerometry; 3) heart rate monitoring; 4) combined heart rate and accelerometer; 5) pedometry; 6) direct observation; and 7) self-report. Doubly labelled water is generally seen as the "gold standard" in measuring activity, but is very expensive, it provides information only on energy expenditure over a defined period of time (commonly two weeks), and does not provide information on the type, duration or frequency of activity [113]. Heart rate monitoring and pedometry are sometimes useful but are prone to error and can only be used in certain circumstances such as during aerobic activities (heart rate monitoring) and walking (pedometry) [23]. Direct observation can provide a large amount of data on activity as well as the context in which activity occurs, but is time consuming, can be expensive and prone to bias [23]. Due to the disadvantages of these methods of measuring activity, accelerometry and self-report measures have become the most commonly used methods [113].

Self-report is the most commonly used method of measuring PA and ST. This most often involves using questionnaires to report frequency, intensity and duration of activity as well as time spent being sedentary [113]. This method has the advantages

of being inexpensive, easy to collect and analyse data, and can be used with most populations [23, 113]. This method is prone to biases such as recall bias and desirability bias and is known to have validity and reliability issues [23, 113]. Accelerometry consists of using an accelerometer, a device that measures bodily movement, to objectively measure PA and ST. The device can be worn around the waist or other sites on the body. It can be used with child and adult populations and is non-invasive [102]. Additional strengths of this measurement tool include the ability to measure frequency, intensity and duration of activity, capacity to measure time spent being sedentary, and relatively easy data manipulation [23, 102]. Limitations of this method include relatively expensive devices, the strong potential to miss out on capturing upper body movements, and complex data analyses [23, 102].

2.5 Conceptual Framework Guiding the Research

This section describes the conceptual framework employed to guide the research.

Phenomenological Approach

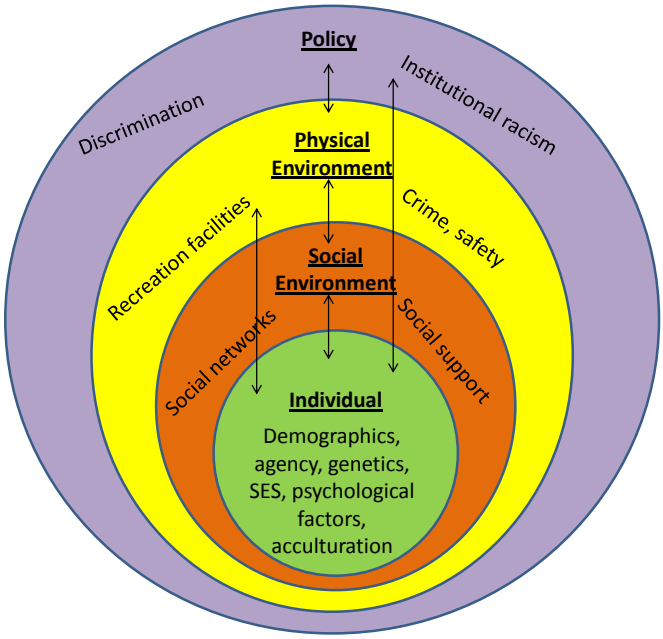
It has been said that phenomenological research "lies somewhere on a continuum between qualitative and quantitative research" [34]. It is therefore appropriate that this mixed-methods study is based upon a phenomenological approach with a view to focus on quantifying and qualitatively describing PA and ST among SA women in the UK. Phenomenological research aims to describe, "what participants have in common as they experience a phenomenon" [34]. This includes *WHAT* they experience as well as *HOW* they experience it. The phenomenon to be explored within this research is that of being a SA woman in the UK in relation to engaging in PA and ST. The important assumption in this approach is that being a SA woman in the UK shapes behaviours and experiences. It is therefore important to gain a clear understanding of the shared experiences of this group in order to better understand their PA/ST patterns and their experiences around the behaviours that contribute to PA and ST.

Ecological Model

Within the larger phenomenological approach taken in this research, an ecological model of PA/ST has been used as a basis for understanding internal and external influences on PA/ST. It is clear from the current research on the determinants of PA

and ST that these behaviours are the result of complex interactions between personal characteristics and social and environmental contexts in which individuals live [10, 68]. Ecological models recognise that health behaviours such as PA and ST are influenced by these interrelated mediators [21, 146]. Figure 2.3 illustrates an ecological model of determinants and acculturation that may be relevant to SA women's PA and ST. This model suggests that these determinants exert their influence through multiple levels and pathways to influence activity patterns [85]. Each level may have an influence on the individual and vice versa [85]. This conceptual framework acknowledges the factors outside an individual that have influence over the decision to be physically active or sedentary. This framework is appropriate for understanding and organising research conducted with ethnic minority women due to its recognition of the reciprocal relationships between determinants and the individual [85].

Figure 2.3: Ecological Model of Determinants of PA and ST Among UK South Asian Women.



2.6 Current Physical Activity Policy and Practice

Over the past three decades policy makers and health practitioners have recognised the need for improved policy guidelines to encourage increased participation in PA and more recently to decrease ST. Guidelines have been established in many western nations such as the United States (US) and the UK that make recommendations to the general public on PA. These guidelines however, may not lead to an uptake of PA by those who are not physically active. There is limited evidence as to why this is the case, but it may be attributed to a lack of culturally tailored messages and low level of understanding of how to engage with communities [22].

PA guidelines in the UK have evolved over the years with the most recent update published in 2011. The 2011 guidelines recommend 150 minutes of moderate intensity PA per week or 75 minutes of vigorous intensity PA per week to achieve health benefits [132]. These guidelines are updated from the 2004 recommendations of 60 minutes of moderate PA per day in an effort to give recommendations on PA for health benefits as well as making PA goals more easily attainable [132]. Another notable change is the recommendation of minimising time spent sedentary. Recommendations do not give specific guidelines other than a generic suggestion to reduce time spend being sedentary. Primary care is a key location used to promote these PA guidelines, and many interventions based in primary care have been implemented over the past 20 years. A recent systematic review looked at the effectiveness of primary care exercise referral schemes to increase the proportion of those who meet PA guidelines [111]. The researchers found that there was no significant difference between exercise referral schemes and usual care in increasing PA levels, no significant difference between exercise referral schemes and alternative PA interventions, and no difference between exercise referral schemes and exercise referral schemes plus behaviour change interventions [111].

Although PA policy and guidelines to increase PA have been updated with a view to be more easily attained by most, and primary care settings are being used to disseminate these messages, rates of PA are not improving in the general population

or in ethnic minority groups such as SAs [18]. It is evident that there is a gap between the policy and implementation of interventions to increase PA; this is a gap that is increasingly evident among ethnic minority groups [18].

2.7 Rationale for the Research

Many social science theorists maintain that the most powerful justification for reducing health inequalities is on the basis of social justice [143]. The unjust distribution of the socioeconomic determinants of health is unfair when poor health outcomes are the result [82, 143]. While some might argue that an improvement in the overall health of a population that does not reduce the gap between socioeconomic groups is acceptable, Woodward &Kawachi (2000) argue that this approach would be 'intrinsically problematic' and would not promote fairness in society [143]. Sen also disputes the idea of simply improving the average population health and asserts that equality may demand specialised approaches that require unequal treatment in favour of the most disadvantaged groups [123]. The ethical principle of fairness should drive society to ensure that the opportunity to be healthy is a right and not a privilege attainable by only the most well off in society [92]. This PhD research focuses on UK SA women, a group that can be seen as a vulnerable population due to their SES, social status, relative isolation and high rates of poor health, with a view to create specialised approaches to reducing health inequalities through increasing PA and decreasing ST.

This research includes the broad benefits of contributing to closing existing gaps in the academic literature related to health inequalities and PA, examining validity of existing methods for working with ethnic minorities, and informing culturally tailored lifestyle interventions and policies aimed at high-risk populations. It is evident from the existing health inequalities literature that CVD and other chronic diseases disproportionately affect vulnerable groups such as ethnic minorities, and that PA and ST are important influences on the development of these diseases. While this relationship is generally accepted by the research community, there remains a gap in existing knowledge in relation to objectively measured PA and ST, and how to most effectively intervene to increase PA levels and reduce ST in diverse populations. The

current methods used to objectively assess PA and ST must be modified to provide a more accurate picture of PA/ST participation among ethnic minorities with limited literacy and cultural norms that promote an inactive and sedentary lifestyle. Additionally this study proposes a qualitative component that helps to refine objective PA/ST measurement and gain insights into how to culturally tailor lifestyle interventions and policies directed at these and other similar groups. The proposed study builds upon past research and methods to offer an original contribution to the academic literature that can be used as a step toward reducing health inequalities.

Scholars such as Raj Bhopal and Colin Fischbacher among others have noted the limitations of conventional data collection methods with ethnic minority groups, supporting the need for this type of research study to improve upon objective PA/ST methods [16, 55]. These limitations include the use of self-report forms of data collection that may result in inaccuracies due to recall bias, linguistic and language barriers, and cultural barriers. Finally, the results from this study may be used by policy makers and practitioners to improve policies and interventions aimed at improving the health of these groups. Policy makers, practitioners and scholars may use the results from this study to apply processes, methods and techniques to other similar groups, settings and situations as appropriate. Moreover the SA community will benefit from increased awareness about the importance of increasing PA and reducing ST and how these behaviours benefit their health, in addition to engaging in the development of culturally compatible strategies to promote increased levels of PA and reduced levels of ST within their families and community.

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CHAPTER 3

PHYSICAL ACTIVITY AMONG SOUTH ASIAN WOMEN: A SYSTEMATIC, MIXED METHODS REVIEW

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3.1 Abstract

Introduction:Theobjectiveofthissystematicmixed-methodsreviewistoassesswhatiscurrentlyknownabout thelevelsofphysical activity (PA)andsedentary time (ST)andtocontextualizethesebehavioursamongSouthAsian womenwithanimmigrantbackground.**Methods**: Asystematicsearchof theliteraturewasconducted usingcombinationsofthekeywordsPA,ST,South Asian (SA),andimmigrant.Amixed-methodsapproachwasusedtoanalyseandsynthesizeallevidence,both quantitativeandqualitative.Twenty-sixquantitativeandtwelvequalitativestudieswereidentifiedasmeetingthe inclusioncriteria.

Results:StudiesquantifyingPAandSTamongSAwomenshowedlowlevelsofPAcompared withSAmenandwithwhiteEuropeancomparisonpopulations. Howevermaking validcomparisonsbetween studies waschallengingduetoalackofstandardizedPAmeasurement.Themajorityof studiesindicatedthatSAwomendidnotmeetrecommended amountsof PAforhealthbenefits.FewstudiesassessedST.Themes emerging fromqualitativestudiesincludedculturalandstructuralbarrierstoPA,faithandeducationasfacilitators,andalack of understandingoftherecommended amountsofPAanditsbenefitsamongSAwomen.**Conclusions**:Quantitativeandqualitati

veevidenceindicatethatSAwomendonotperformthe recommended levelof PAforhealthbenefits.Bothtypesof studiessufferfromlimitationsduetomethodsofdata collection.Moreresearchshouldbededicatedtostandardizingobjective PAmeasurement andtounderstanding howtoutilizetheresourcesof theindividualsandcommunitiestoincreasePAlevelsandoverallhealthofSAwomen.

3.2 Background

Low levels of PA(defined as movement of the body requiring energy expenditure) and increased ST (no energy expenditure above that required at rest) are major independent risk factors in the development of cardiovascular disease, and are recognized as key contributors to other chronic conditions such as type 2 diabetes and obesity [13]. As such, PA and ST are potentially modifiable health behaviours that can be changed to reduce risks for morbidity and premature mortality resulting from various chronic diseases [10, 17, 62]. It has been shown that those who are physically active can reduce their risk of developing cardiovascular disease (CVD) by up to 50% [10]. The WHO, US Department of Health and Human Services and the UK Department of Health agree that 150 minutes of moderate intensity PA or 75 minutes of vigorous activity per week are recommended to achieve health benefits [56, 57, 64].

SA are disproportionately affected by chronic diseases [8-10] and large cross-national surveys of many western nations such as the UK, Australia and the US have consistently reported that SAs report lower levels of PA than their white counterparts [20,24]. Cardiovascular disease (CVD), which includes heart attack and stroke, accounts for 16.7 million deaths globally each year [2]. CVD is the leading cause of death in the United Kingdom (UK) and nearly half of all deaths in Europe are caused by CVD [2]. The UK has one of the highest rates of CVD in the world, with more than 190,000 deaths in 2008 [2]. In the UK 33% of all mortality in SA women and 25% in men 2008 was caused by cardiovascular disease [2]. As insufficient PA is recognized as a significant, independent risk factor for CVD and other chronic diseases, it is important to gain a better understanding of the PA levels of SA and the

factors influencing PA among this population to help inform the development and delivery of culturally appropriate interventions and policy [1].

Researchers have recently focused on quantifying and contextualizing PA and ST among groups such as SAs living in industrialized countries who are at the greatest risk for cardiovascular and other chronic diseases such as type 2 diabetes and hypercholesterolemia when compared to the general populations of those countries [3]. The objective of this systematic mixed-methods review is to assess what is currently known about levels of PA and ST in SA. Research questions are: 1) What is known about the volume, intensity, duration and type of PA/ST that SAs engage in, 2) What is known about the context in which these behaviours occur in SA, and 3) What is the quality of the evidence on PA/ST in SAs?

3.3 Methods

After careful consideration of the methods that would be most appropriate for answering the research questions, a combination of the EPPI-Centre mixed-methods systematic review and an integrative review were used. This review uses the EPPI-Centre methods for systematically searching the literature, rigorously assessing thequality of studies, and synthesizing quantitative and qualitative studies into one report. As in the integrative method, many types of studies were considered for inclusion in order to meet the objective of the review [55]. These included randomized and non-randomized controlled trials, observational studies and qualitative studies. The adaptation of the mixed-methods review and integrative review allowed for a systematized and rigorous review while including the appropriate studies to fully answer the research questions.

Search strategy

A search was performed in online databases (MEDLINE, The Cochrane Library, EMBASE, PsychInfo, CINAHL, AnthroSource and Sociological Abstracts from 1980 to July 2012), grey literature, hand searches of journals over the previous twelve

months (MSSE, Journal of Physical Activity & Health, Journal of Aging and Physical Activity), and reference lists of articles to identify studies. Search terms included combinations of PA, ST, physical exercise, physical fitness, exercise, sport, physical training, physical training, recreation activity, moderate-to-vigorous physical activity (MVPA), leisure-time physical activity (LTPA), leisure activities, physical inactivity, sedentary behaviour and SA/immigrant. Inclusion criteria were:Randomized and non-randomized controlled studies, observational and qualitative studies; studies that include data on PA and/ or ST; studies on SA; studies published from 1980 on to obtain the most current data; studies with data on adult women aged 18 and older; studies published in English. Exclusion criteria included: Studies without adult data and studies focusing on migrant groups instead of permanent immigrants, and studies on children.

Quality of studies was assessed using validated checklists developed from the Critical Appraisal Skills Programme (CASP) [5,43]. The checklist for quantitative studies was used to assess quality of study design including methods selection, identification of biases, appropriate use of statistical methods, and clarity of reporting [5]. Studies were accepted for inclusion if they addressed each of these through justification of choices made in each quality category. The checklist for qualitative studies assessed strength of studies for inclusion, ranking studies on a continuum from weak to strong [43]. Consideration was given to rigor (thorough and appropriate key research methods), credibility (findings well presented and meaningful), and relevance (how useful are the findings) [43]. Qualitative studies were acceptable for inclusion if they were categorized as at least of moderate quality. Two researchers confirmed study eligibility and quality assessment and data extraction were performed by the principal investigator (WSB) and confirmed by a senior researcher (JLT).

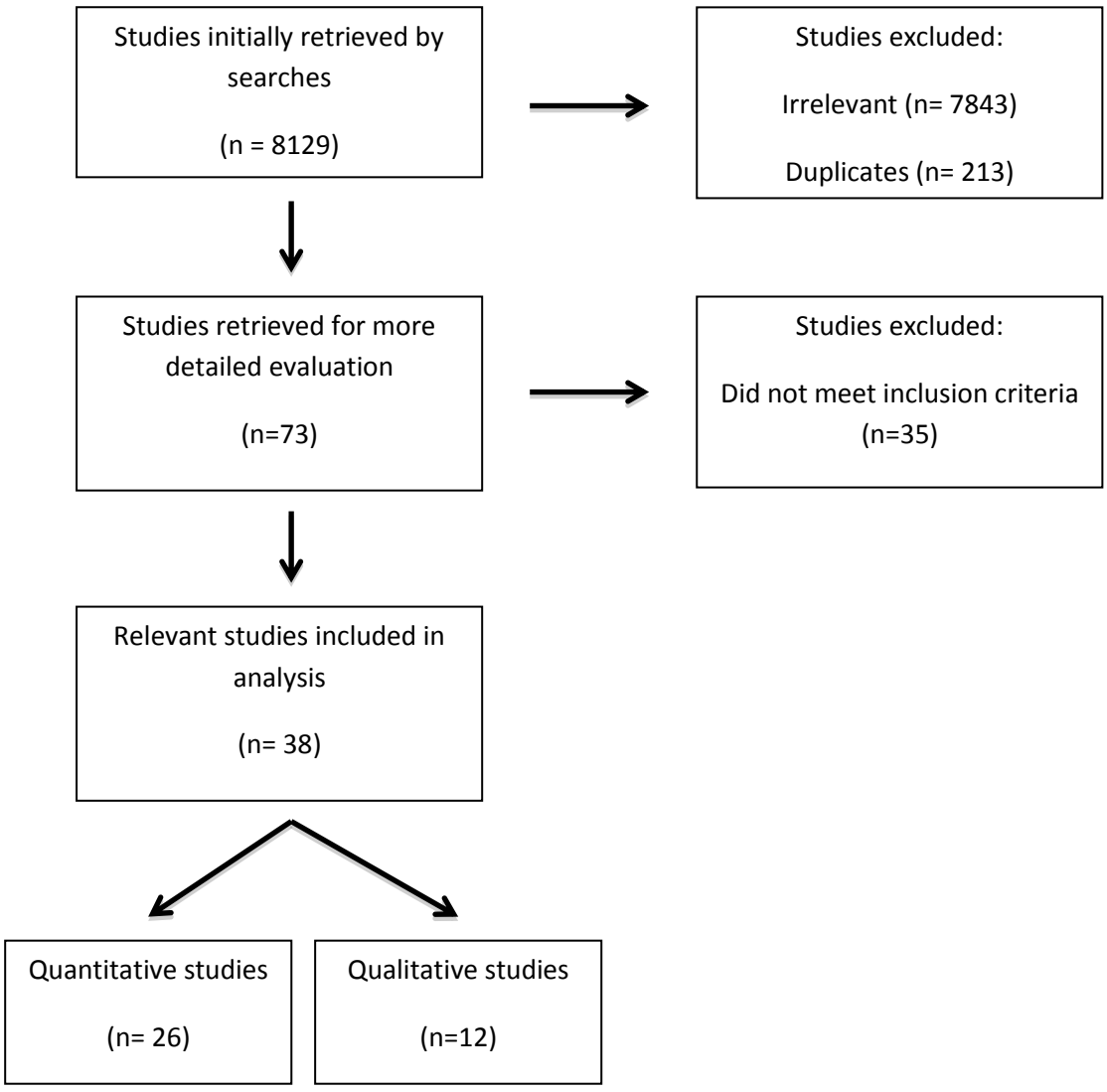
Findings from quantitative studies are described numerically and textually to provide a summary of evidence on PA and ST performed by SA since heterogeneity of methods and measures of PA and ST precludes the use of meta-analysis. Qualitative data was synthesized and analysed thematically using NVIVO in three stages: 1) lineby- line coding of primary studies; 2) organising codes into themes; and 3)

development of analytical themes [55]. The final integrated synthesis consists of narrative commentary, combining the results of quantitative and qualitative syntheses.

3.4 Results

Figure 3.1 shows the identification and inclusion of studies for the final synthesis. A total of 8,123 studies were initially retrieved and seventy-three studies were identified by title and abstract for more detailed evaluation. Thirty-eight studies (quantitative n = 26, qualitative n = 12) were included in the final synthesis and analysis.

Figure 3.1- Identification and inclusion of relevant studies for review



3.4.2 Quantitative synthesis

One study was observational longitudinal [62] and 25 were cross-sectional designs [8, 20-22, 26, 29, 30, 32, 33, 34, 36, 37, 39, 40-42, 45, 47, 51, 61, 64-67] (Table 3.1). Fifteen studies were conducted in the UK [20-22, 31, 32, 34, 42, 45, 47, 48, 60-62, 65, 66], six in the US [26, 36, 37, 39, 41, 67], two in Canada [8,40], one in New Zealand [29], one in Australia/ India [33], and one in Guadeloupe [51]. Eight studies obtained samples from large-scale population studies [20, 39, 40, 45, 61, 65-67], five recruited from community centres [26, 29, 36, 37, 42], five from census/birth records or electoral registers [22, 31, 47, 48, 60], three from general practice lists [24, 34, 51], two did not state recruitment strategy [8,35], two recruited based on postcode [21, 62] and one recruited from a university campus [41]. Five studies were limited to women [22, 31, 32, 41, 45,], while the remaining included both women and men. Five studies conducted their analyses on men and women as one group [20, 26, 39, 61]; sixteen provided analyses by gender [8, 21, 29, 33, 35, 36, 40, 42, 45, 48, 51, 60, 62, 65, 66]. Four studies conducted subgroup analyses by country oforigin [20, 21, 22, 62]. All but two [29, 42] studies assessed PA or ST through self-report survey. These were through pedometer (New Lifestyles NL200) to calculate steps and through accelerometer (Caltrac) used in conjunction with a heart rate monitor to calculate energy expenditure [29, 32]. Four studies [26, 29, 34, 45] examined PA among SA over 40 years of age while all other studies examined adults ranging in age from 16 yr to 90+ yr.

Table 3.1: Summary of quantitative studies focusing on South Asian women and physical activity.

Author & Publication Date	Location of Fieldwork	Participants & Sample Recruitment	Design	Physical Activity Measures	Translation	Response Rate	Main Findings
Dogra et al., 2010	Canada	N=347,229 N(male White)=10729 N(female White)=114,965 N(male SA*)=1,708 N(female SA)= 1,576 SA-Canadian Community Health Survey cycles 1.1, 2.1 and 3.1	Cross-sectional	Self-report: 3 month recall of PA (metabolic equivalent calculation based on Canadian Fitness and Lifestyle Research Institute cut-offs	NA**	NA	SA less likely than Whites to engage in walking, endurance, recreation, and sport activities (SA: walking=56.7%, endurance=29.7%, recreation=38.3%, sports=24.3%; Whites: walking=68.3%, endurance=34.6%, recreation=60.0%, sports=28.8%). SA report more inactivity: 18.7%, Whites=10.5%

Health Education Authority, 2000	UK	N= 4,444 N(Indian)= 1,111 N(Pakistani)= 1,111 N(Bangladeshi= 1,111 N(Afro-Caribbean)= 1,111 National Survey of Ethnic Minorities	Cross-sectional	Self-report: survey piloted and revised for clarity	Translated into 7 languages	72%	% reporting taking 'regular exercise: Indian= 71% Pakistani= 63% Bangladeshi= 65% % females reporting 'very active': Indian=17% Pakistani= 18% Bangladeshi= 17%
Hine et al., 1995	UK	N=547 (women only) N(Pakistani)= 79 N(Indian)=52 N(Bangladeshi)=21 Identified from Family Health Services Authority and Electoral	Cross-sectional	Self-report	Translated into 7 languages	71%	% currently doing exercise to keep healthy: Pakistani: 1%, Indian: 6%, Bangladeshi: 12.5%

		Register					
Jonnalagadda& Diwan, 2002	US	N=237 Asian Indian men and women Identified from 10 community organizations	Cross-sectional	Self-report: survey based on Kriska et al, 1997	NA	65%	% reporting engaging in 1 or more of the 3 activities from PA index: South Indian=70% North Indian=56% West Indian= 65%
Kolt et al., 2007	New Zealand	N=112 N(Asian Indian men)=50 N(Asian Indian women)=62 Identified from Auckland-based Asian Indian community organizations	Cross-sectional	Objective measurement: New Lifestyles NL2000 pedometer	NA	NA	48% of total sample classified at sedentary (<5000 steps/day) 33% classified as active (>10,000 steps/day)
Lean et al., 2001	UK	N=259 N(Scotland general population)=50 N(immigrant SA)= 63	Cross-sectional	Self-report	NA	76%	18% of Migrant SA performed sport and exercise 30% of British-born SA performed sport and exercise

		N(UK-born SA)=56 N(immigrant Italians)=39 N(UK-born Italians)= 51 Identified from Registrar General's records of birth					
Lip et al., 1996	UK	N=232 (women only) N(White)= 84 N(SA)= 72 N(Afro-Caribbean)= 76 Recruited from City Hospital, Birmingham	Cross-sectional	Self-report of regular exercise	Translated into 3 languages	NA	Lower proportion of exercisers among South Asians (X^2=22.34, df=2, p<0.001)

Mahajan&Bermingham, 2004	Australia/India	N=250 N(SA Indians in Australia)= 125 N(familial relatives in India)=125 Recruited from Indian community centres in Sydney and referred familial relatives in India	Cross-sectional	Self-report: Based on the National Heart Foundation Risk Factor Survey	NA	63%	Total exercise hours/week: Men in Australia:17.3+/-25.5 Men in India: 18.9+/-29.4 Women in Australia: 17.1+/-20.6 Women in India: 33.5+/-36.9 (P<0.001 referring to country of residence stratified by gender)
McKeigue et al., 1992	UK	N=3,399 N(European men)=1,506 N(SA men)= 1,360 N(European women)=245 N(SA women)=288 Recruited from general practitioner's lists and industrial workforces in	Cross-sectional	Self-report	Completed questionnaire checked by bilingual fieldworker	NA	Age-adjusted mean leisure time: SA: 3.0MJ/week European: 4.2MJ/week P<0.001

		West London					
Misra et al., 2005	US	N=56 SA Indian immigrants N=31 men N=25 women Recruited via general practitioner's offices, community centres and media releases	Cross-sectional	Self-report: Minnesota LTPA*** questionnaire	NA	80%	Total activity mean in min/week Men: 124.5+/-107.8 Women: 50.2+/-62.3
Misra, 2004	US	N=261 Gujarati Asian Indian immigrants N(men)=180 N(women)=81 Recruited through National Gujarati Association of the US	Cross-sectional	Self-report: revised Health Promotion Lifestyle Profile II	NA		53.3% Follow exercise regime 56.4.% of men 52.5% of women Significant difference between men and women (X^2=14.1, p=0.001)
Mohanty et al., 2005	US	N=(White) 87,846 N(SA Indian)= 555 National Health Interview Survey years	Cross-sectional	Self-report: any vigorous activity 10-20min at least once per week	NA	80.4% in1997, 73.9% in 1998, 69.6% in 1999, 72.1% in 2000	% reporting never being active or active less than once/week: White= 59.3% Asian Indian= 67%

		1997-2000					(p=.004)
O'Laughlin et al., 2007	Canada	N= 2033 (42.2% male), N(French Canadian)=575 N(Portuguese)=294 N(Italian)=122 N(Eastern European)=51 N(SA)=42 Data available from adult parents of children participating in an intervention in Montreal	Cross-sectional	Self-report: ≥20 min. LTPA at least twice/week for 4 months	NA	NA	% inactive (95%Confidence Interval) French Canadian=71.5% (67.6-75.1) Portuguese= 80.5%(75.5-84.9) Italian= 78.3%(69.9-85.3) Eastern European= 58%(43.2-71.8) SA= 76.2%(60.6-88.0)
Palaniappan et al., 2002	US	N= 210 N(Caucasian 0= 67 N(African American)= 69 N(SA Indian)= 70 Recruited from a major	Cross-sectional	Self-report	NA	71.40%	Years of regular exercise Caucasian: 6.2+/-4.0 African American: 4.0+/-4.2 SA Indian: 4.2+/-4.3 P=0.0013

		university student body via fliers					
Patel et al., 2006	UK/India	N= 537 total N(SA Indian men in UK)= 119 N(SA Indian men in India)=139 N(SA Indian women in UK)=123 N(SA Indian women in India)=155 Recruited from community directories and local primary care registries in UK, from electoral roll from India	Cross-sectional	Objective Measurement: Caltrac accelerometers	Bilingual fieldworkers conducted measurements	67% in Sandwell, 65% in Navsari	Measured physical activity in Kcal/day (95% CI): Men in India:1820(1630-2000) Men in UK: 2350(2200-2490) Women in India: 1680(1540-1810) Women in UK: 1750(1640-1870)
Pomerleau et	UK	N=839 (women only)	Cross-	Self-report	Bilingual fieldworkers	NA	SA women walked least for transport compared to

al., 1999		N(European)=246 N(SA)=291 N(Afro- Caribbean)=303 Data from 2 large cross-sectional studies, Southall and Brent surveys	sectional		collected data and translated during interview		European and Afro-Caribbean: 22% vs 44% and 40%, respectively. 1% of SA women participated in sport and none cycled
Riste et al., 2001	UK	N=919 N(European)= 471 N(Pakistani)= 132 N(Afro- Caribbean)=316 Sampled from registers from local health centres	Cross-sectional	Self-report: validated questionnaire(Washburn et al, 1990), PA reported over the past week	Punjabi and Urdu interviewers available	65%	% physically active defined as 3X20min/week (95% CI): Pakistani men= 6.8%(0-13) Pakistani women= 5.2%(0-11) European men=37.8%(23-53) European women=29.4%(13-46)
Rudat, 1994	UK	N=2,619 N(SA Indian)= 1017 N(Pakistani)= 935	Cross-sectional	Self-report		Indian=77%, Pakistani=80%, Bangladeshi=91 % successful as % of screened	% reporting any activity: Indian=46%, Pakistani=41%, Bangladeshi=37%

		N(Bangladeshi)= 667 Sample available from 1981 census				eligible respondents	
Sinnapah et al., 2009	Guadeloupe	N= 122 N(general population men)=25 N(SA Indian men)=27 N(general population women)=32 N(SA women)=30 Sampled from those workers who came in to attend annual medical check-up	Cross-sectional	Self-report: 24-hour recall	NA	93%	Energy expenditure in Kcal +/- SD: SA Indian men: 2615+/-417 SA women: 2264+/-465 Controls men: 2921+/-608 Controls women: 2481+/-627
Williams et al., 2010	UK	N=15,413 N(White)= 13,293 N(SA Indian)=1,244 N(Pakistani/Bangladeshi)=876 Data available from	Observational longitudinal	Self-report: 4 week recall	Questions translated into 5 languages	69-76%	% reporting no weekly physical activity(unadjusted): White=28.1% Indian=37.1% Pakistani/Bangladeshi=56.7% ($p<0.001$)

		Health Survey for England years 1999 and 2004					
Williams et al., 2010a	UK	N=1,948 N(White)= 818 N(SA)=1130 Recruited from London Life Sciences Prospective Population(LOLIPOP) study	Cross-sectional	Self-report: Based on IPAQ****	Questionnaire available in English and Punjabi	83%	% reporting more than 3hours sedentary/day: SA= 45.6% White= 47.5% % reporting some physical activity: SA=73.2% White= 79.4%
Williams et al., 1994	UK	N= 173 SA N by sex unspecified Sampled from electoral and valuation rolls in Glasgow	Cross-sectional	Self-report	Bilingual interviewer and questionnaire available in 4 languages	80.5%	% reporting ever taking vigorous exercise: SA Males= 46%, Male general population= 59% SA females= 38%, Female general population= 44% SA less likely to report ever taking vigorous exercise, difference statistically

							significant in men ($p<0.05$)
Yates et al., 2010	UK	N= 5,474 N(White men)= 2033 N(SA men)=604 N(White women)=2277 N(SA women)=560 European -baseline data from ADDITION-Leicester study	Cross-sectional	Self-report: Short version of last-seven-day self-administered format of IPAQ	English only	92% of white European, 69% of SA	% in activity level category: White Men: Low= 22%, Moderate= 28%, High= 50% SA Men: Low= 37%, Moderate= 25%, High= 38% White Women: Low= 27%, Moderate= 33%, High= 32% SA Women: Low= 40%, Moderate= 28%, High= 32% (all significant at $p<0.01$)
Yates et al., 2012	UK	N=505 N(White European Men)= 220 N(White European Women)=188 N(South Asian Men)= 52 N(South Asian Women)= 45	Cross-sectional	Self-report: Short version of last-seven-day self-administered format of IPAQ	English only	NA	Total hours sitting time (hours/day): Men= 6.0(4.0-8.8) Women= 5.0(4.0-7.0) *p*for difference between genders <0.01 Total MVPA+ (MET-hours/week: Men= 46(17-108)

		From subsample of the ADDITION-Leicester study from 2004-2007					Women= 34(17-106) *p*for difference between genders <0.01
Ye et al., 2009	US	N=77,267 N(White)= 74,424 N(SA Indian)=534 N(Other Asian)=1,117 Aggregated data from the National Health Interview Survey 2003 to 2005	Cross-sectional	Self-report	NA	NA	% reporting physical inactivity(unadjusted): White=37.2%, Asian Indian=41.8%, Other Asian=41.0% (X^2=16.27, p=0.04)

***South Asian, **Information not available in article, *** Leisure time physical activity, ****International Physical Activity Questionnaire, +Moderate-to-vigorous physical activity**

Sixteen studies focused on PA prevalence [8, 20, 21, 26, 29, 31, 32, 36, 39, 40, 45, 47, 60, 63, 66, 67]. Two studies used a questionnaire to estimate both PA and ST among male and female SAs in the UK [61, 67]. Fourteen focused on the prevalence of PA among SAs in comparison to the white or general population of the host country. Kolt et al. (2007) did not make this comparison [29]. Methods of assessing PA prevalence varied greatly between studies. Four studies measured prevalence of PA in the week prior to completion of the survey [20, 39, 47, 67], two asked respondents broadly if they participated in PA but did not specify a timeframe [26, 31], two assessed the prevalence of participating in regular PA [32, 40], one dichotomized PA by asking respondents if they were either active or inactive [62], one assessed prevalence of PA based on the number of kilometres walked or cycled per hour/week [45], one assessed the prevalence of evertaking vigorous PA [60], one used a scale (highly to 'never-routinely') [37], one study assessed the prevalence of performing PA by number of times/week [8], one assessed the prevalence of physical inactivity only [67], and one assessed PA using pedometer steps per minute measured over 7 consecutive days [29]. All studies that assessed prevalence of PA in comparison to the white or general population found that SAs performed significantly less PA than the comparison group [8, 20, 31, 32, 39, 45, 46, 60, 62, 67, 62].

Three studies assessed duration of PA [33, 36, 41]. Misra et al. (2005) report total PA duration in mean minutes per week [36]. SA Indian men performed an average of 45 (+/− 44) minutes while women performed 16 (+/− 48) minutes of PA, less than half of the minutes of PA that the men did per week [36]. Majahan et al. (2004) reported total exercise in hours over a two week period [33]. This study compared SA Indian women living in Australia or India, and found that women in Australia were performing just over half of the hrs/2 weeks of PA (4.8 +/5.3, $p < .003$) than the women in India (9.2+/− 9.1, $p < .003$) [33]. Palaniappan et al. (2002) reported regular exercise in number of minutes per week [41], and found that SA Indian women performed nearly 5 minutes less regular exercise overall than their white counterparts (42 +/− 20.7 vs. 46.5 +/− 21.5) though this result was not significant. Two studies assessed PA in terms of energy expenditure with both finding that SA expended less energy in PA than their white and SA male counterparts [34, 51]. The one study that measured both PA and ST reported that on average, 70% of SAs in the study did some

PA and that an average of 50% of participants were sedentary for more than 3 hours per day [61].

Eighteen studies assessed LTPA [8, 20, 21, 22, 26, 32-34, 36, 37, 39, 40, 41, 45, 47, 31, 48, 59], three assessed home, work and leisure physical activity combined [62, 65, 66], two assessed active commuting [8,36], two did not specify mode of activity but instead measured energy expenditure [42, 51], one assessed occupational physical activity [45], one study did not specify mode of activity but focused on intensity of the activity [60], one study assessed steps but did not specify the mode of activity [29], and one study looked solely at physical inactivity with no mode specified [67]. In studies that assessed LTPA in both SA and white European groups, SA consistently reported less LTPA than their white European counterparts [8,20, 31-34, 39, 40, 41, 45, 47, 48, 62]. In the study by Dogra et al., 55.8% of SA respondents reported actively commuting to work versus 53.1% of the white European respondents (not significant) [8]. Misra et al. (2005) report that 12.5% of SA men reported actively commuting to work while no women reported doing so [36]. Pomerleau et al. (1999) indicate that 62.5% of SA and 49.0% of white Europeans reported walking more than sitting at work ($p < 0.01$) [45].

3.4.4 Qualitative synthesis

Eleven of the twelve qualitative studies included in this review investigated LTPA [7, 16, 18, 23, 27, 30, 38, 50, 52,58], and one investigated the feasibility of using accelerometers and questionnaires to assess PA among SA [44]. Seven conducted individual interviews [7, 16, 29, 36, 42, 49, 54], three conducted focus groups [12, 27, 50], and two used both methods to address various research questions pertaining to PA; none of these studies explored behaviours related to ST [18, 23]. Eight studies were conducted in the UK [7, 14, 18, 23, 30, 44, 50, 52], and one each in Canada [16], Australia [38], the US [27], and Norway [58]. Participants from five studies were recruited from general medical practices [7, 14, 16, 30, 38, 50], three from community centres/sports clubs [44, 50, 58], one via media release [38], one recruited participants by identifying people from participant observations [23], one from a larger cross

sectional study [27] and one did not describe participant recruitment [18]. Nine studies included male and female participants [7, 14, 16, 18, 23, 27, 30, 38, 50] and three were restricted to women [44, 52, 58]. Ages of participants in all studies ranged from 30 yr to 70+ yr. One study restricted age to 16– 25 yr [58] and one did not specify age, but has been included in this review because the authors stated it focused on adults [27]. Table 3.2 summarizes the main findings of the qualitative studies. A broad range of themes emerged including knowledge of PA and its benefits as well as barriers and facilitators to participation among SA. All but one study discussed some aspect of these themes [44]. The study by Pollard &Guell explored the feasibility of using accelerometers with SA women and how well they were able to recall PA from the previous week in order to determinethe appropriateness of using questionnaires with the group [44].

Table 3.2: Summary of qualitative studies focusing on South Asian women and physical activity.

Author, Publication Date& Quality Rating	**Country**	**Aim**	**Methods**	**Sample**	**Main Themes**
Darr et al., 2008 -Strong+	UK	To examine and compare illness beliefs of South Asian and European patients with CHD about lifestyle changes	In-depth interviews	N(Pakistani/Muslim men)=10 N(Pakistani/Muslim women)=10 N(Indian/Sikh men)=7 N(Indian/Sikh women)= 5 N(Indian/Hindu men)= 9 N(Indian/Hindu women)=4 N(European men)= 10 N(European women)=10	<u>Perceptions:</u> Vigorous PA* seen as unnecessary, just keep mobile to achieve adequate PA levels <u>Barriers:</u> Lack of time and uncomfortable walking alone

				Age range: 40-83	
Galadas et al., 2012 - Strong	Canada	To describe Punkabi Sikh patients' perceived barriers to engaging in physical exercise following myocardial infarction (MI)	Semi-structured interviews	N(Punjab men)= 10 N(Punjab women)= 5 Age range: 48-80	<u>Perceptions:</u> Difficulty determining safe PA levels Informal exercise versus structured PA in a gym would be better Social networks disrupted after migrating to Canada and therefore difficult to make friends with whom to do PA with <u>Barriers:</u> Fatigue and weakness

					after MI
Grace et al., 2008 -Strong	UK	To understand lay beliefs and attitudes, religious teachings, and professional perceptions in relation to diabetes prevention in the Bangladeshi community	Focus groups for lay SA religious leaders	N(lay SA men)=37 N(lay SA women)=43 N(Religious leader men)=14 N(lay religious leader women)=15 Mean age: 35 +/-2 standard deviations	<u>Perceptions:</u> 'Namaz' is term used to refer to exercise PA is seen as way to care for the body and for controlling weight Walking best form of activity to maintain modesty PA central to Muslim way of life
Horne et al., 2009 -Weak/moderate	UK	To identify salient beliefs that influence uptake and adherence to exercise for fall prevention among community dwelling Caucasian and SA 60-70 years old	Ethnographic participant observation, focus groups, and semi-structured interviews	FG: N(White men)=14 N(White women)=44 N(SA men)=16	<u>Perceptions:</u> PA not considered necessary if a person is healthy <u>Barriers:</u> Limited knowledge of PA and

				N(SA women)=13 Interviews: N(White men)=9 N(White women)=14 N(SA men)=7 N(SA women)=10 Mean age range: 65.2-66.1	its benefits Unaware of benefits of PA such as balance and improved mobility Fear of injury if participate in PA Lack of confidence to do PA
Kalra et al., 2004 -Strong/moderate	US	To gather information on the perceptions of cardiovascular risk within the Asian Indian community and to identify opportunities to design health promotion and intervention programs	Focus groups	N= 57 Asian Indian men and women FG size and sex unspecified Ages unspecified	<u>Perceptions:</u> Urban dwellers more likely to want to do PA in a gym Rural dwellers knew to walk and caretaking was PA
Lawton et al., 2006	UK	To explore perceptions and experiences of undertaking physical activity as part of diabetes care	In-depth interviews	N(SA)=32 N(Pakistani men)=11	<u>Perceptions:</u> Should do PA Encouraged by

-Strong				N(Pakistani women)=11 N(SA Indian men)=4 N(SA Indian women)=5 Age range:40s-70s	health professional to walk Barriers: Lack of time, fear to go out alone, no culturally sensitive facilities, domestic duties take priority over PA
Mohan et al., 2008 - Moderate	Australia	To report lifestyle factors of Asian Indians in Australia in relation to CHD and explore factors that could inform health education and cardiac rehabilitation programs in achieving lifestyle behavior changes	Semi-structured interviews	N=8 N(SA Indian men)=5 N(SA Indian women)=3 6 born in India, 2 born in Fiji Age range: 41-80	Barriers: Family is a higher priority than PA; loneliness and lack of support after migration
Pollard &Guell,	UK	To explore the facility and confidence with which women were able to recall information	Semi-structured interviews, 24-hour	N= 22 (British Pakistani	Recall of PA:

2011 -Moderate		on PA, as required by questionnaires	PA recall and accelerometry	women only) Age range: 24-61	Women unlikely to accurately quantify time or intensities of daily PA Commonly used questionnaires unlikely to accurately capture PA levels
Sriskantharajah& Kai,2006 -Strong	UK	To explore influences on, and attitudes towards, physical activity among SA women with CHD and diabetes to inform secondary prevention strategies	Semi-structured interviews	N=15 (women only) N(SA Indian)=5 N(Pakistani)=4 N(Bangladeshi)=1 N(East African Asian)=2 N(Sri Lankan)=3 Age range:26-+70	<u>Barriers:</u> Uncertainty of what activities to do Selfish to take PA Language difficulties Modesty an issue
Walseth, 2008 -Moderate	Norway	To explore social network dimension of social capital, and whether participation in sport leads to accumulation of social capital for young women with an immigrant background	In-depth interviews	N=15 (women only from Pakistan, Turkey, Morocco, Iran, Syria, Gambia, and Kosovo)	<u>Perceptions:</u> Sport clubs strengthened established friendships

				Age range: 16-25	Focus on similarities among each other rather than differences

+Quality rating from checklist from Critical Skills Appraisal Programme(8) in which the assessor ranks a series of questions from weak to strong based on their assessment of rigor, credibility and relevance of the study to answering each question. *Physical activity; **South Asian; *** Focus group

3.4.6 Knowledge of physical activity and its benefits

Nine studies highlighted participants' knowledge of PA and its benefits [7, 14, 18, 23, 27, 30, 38, 48, 52]. In three studies respondents reported awareness that they should be participating in regular PA and that it has some general health benefits [14, 27, 30]. In the study by Horne et al. (2009), participants reported not being aware of the health benefits of PA [23]. Although there was a general awareness, five studies reported that there was confusion as to what types and how much PA to perform as well as confusionabout specific health benefits [7, 14, 18, 23, 52].

3.4.7 Barriers to participating in physical activity

Nine studies reported barriers to PA participation among SA[7, 14, 18, 23, 27, 30, 38, 50, 52]. Major barriers were those due to cultural differences with the dominant society and structural barriers. Five studies reported that SA as well as their families and communities would view taking time out to participate in PA as a selfish act [14, 18, 30, 38, 52]. Women reported that in SA culture, woman' s focus is meant to be on the family and she should perform domestic duties over all other activities [30, 52]. Those women who participated in PA or wanted to, were concerned about the stigma that might come from others in their community [14, 18, 30]. Moreover they reported that caretaking duties left them with no time for PA [7, 14, 30]. Five studies cited culturally inappropriate facilities as a barrier to PA participation in this population [7, 14, 18, 50, 52]. Examples included mixed-sex facilities such as swimming pools that do not consider the women' s requirement for modesty, and the use of male instructors [14, 18, 30]. Four studies found that women were less likely to participate in PA outside their home if they had difficulties speaking English, the language of the wider society [18, 30, 50 52]. The concept of fatalism or the idea that health is Allah' s will was expressed in two studies [18, 23].

Structural barriers such as fear for personal safety were cited in five studies [7, 23, 30, 50, 52]. Many women were worried for their safety if they were to go out into the neighbourhood unaccompanied [7, 30], while others were fearful of exacerbating an illness or disability by doing too much PA or becoming too tired while out in the

neighbourhood alone [7, 23, 52]. Three studies cited poor weather as the main barrier for low PA participation [7,30, 50]. Finally, lack of time [7, 14, 30], money [18], and access to open spaces [7] were additional structural barriers noted.

3.4.8 Facilitators to participating in physical activity

Facilitators to PA participation emerged in four studies [18, 23, 30, 52]. A common facilitator seen in all studies was motivation to participate in PA as a way to care for the health of the body and to prevent or alleviate illness and disease [18, 23, 30, 52]. Two studies offered solutions to lack of PA motivation in SA [18, 30]. Having exercise equipment in the home was seen as one way to motivate people to be physically active and eliminate several barriers to participation [30]. Education about Muslim faith was also seen as a way to motivate the SA community since PA was seen as central to the Muslim way of life [18].

3.5 Final synthesis & discussion

The quantitative studies included in this review broadly indicate that SA' s PA levels are lower than the general or white population of their host countries, though SA Indian women generally had higher levels when compared to other SA women (Bangladeshi and Pakistani women) of the host countries [20, 21, 22, 48, 62]. There were no randomised controlled trials available for inclusion in this review, which may indicate that there is not enough high quality evidence on PA or ST in this population from which to draw conclusions. Self-report surveys were used to measure PA participation in all but two studies [29, 42]; it is recognised these measures have limitations such as recall bias and misinterpretation of questions [3, 19]. Eight studies reported using questions on PAfrom a validated questionnaire, though these have beenvalidated on white populations, not SA populations[33, 36, 37, 47, 60, 61, 65, 67]. The study that used an accelerometerto measure PA levels chose to use a device thatis often used in conjunction with a heart rate monitorand is typically used to measure the energy expenditure(in kcals) of PA [42]. The findings that women of SA originperform little PA based on their energy expenditureare similar to other studies that have used the Caltracto assess PA in other ethnic minority women such asAfrican

American women in the United States (US) [28].

This device is known to overestimate energy expenditureof activities such as walking and running and thereforemay not be the best choice of accelerometer [54].Other accelerometers that are commonly used are theActigraph and the ActivePAL [46]. These can be wornwithout the use of a heart rate monitor and are widelyused to measure the intensity and duration of PA [46].More high quality studies with rigorous study designsand methods are needed to assess levels of PA and ST inthis population.

Heterogeneity within SA groups based on country oforigin/birth and diversity of SES,religious beliefs and cultural practices make insightsfrom these studies difficult to generalize and should beinterpreted with caution [4, 11]. Of the 26 quantitativestudies reviewed only 13 included any information onSES and a range of markers of socio-economic status (SES) were measuredacross studies [8, 21, 22, 26, 37, 39, 40, 45, 47, 60-62, 66, 67]. Measuresof SES included household income [8, 26, 47, 60-62], education level [8, 21, 22, 37, 40, 45, 62], and deprivationindexes such as Index of Multiple Deprivation (IMD) scores[65] and the Townsend Deprivation Index [62]. Otherpotential mediating or confounding factors such as employmentstatus [55, 37], disease status [29, 42, 48, 62, 66, 67 62], religion [21, 61], stress levels [61] and racial discrimination[22, 61] were reported and controlled for inphysical activity analyses, although these were not collectedin all studies.

Conclusions from these studies are based on the limitedand often missing information on sampling, methodsand findings obtained from papers. Most studiesgave minimal or no information on the translation ofsurveys into the appropriate languages. As the qualitativestudies reviewed here have indicated, English languageskills are limited in this group and efforts should be made by researchers to make the translation and interview process more transparent. Measurement and definition of PA varied widely, making it difficult to quantify activity across all studies. Moreover terms such as PA, vigorous, moderate, exercise, etc. have different meanings in the English language, making them challenging to understand by those whose first language is not English

[15]. As evidenced by this review, ST is largelyoverlooked within the current research on SA. Only twostudies reported ST and this was self-reported data[61, 66]. Based on the evidence indicating low levels ofPA, this population is likely to have high rates of ST andsedentary behaviours. Future research is needed to assesslevels of ST and contextualise sedentary behaviours sincethese have been identified as important independent riskfactors for CVD. Additionally, it is difficult to comparePA across studies since the domain of PA measured, andthe methods used to assess PA, varied across studies.The majority of quantitative studies measured LTPA. Itmay be the case that SA women do not engage in LTPAbut do engage in more household or occupational activities.There may be considerable amounts of PA that arenot being captured by the currently published studies,therefore more investigation is needed into the type ofPA that SA women currently engage in.

The qualitative studies reviewed for this paper variedby methods, sample size, and research focus. While moststudies reported that they chose themes or interviewquestions a priori, there was little description of howthese were chosen. Mays & Pope (2003) recommendusing the presence of a theoretical framework as one aspectof assessing quality of qualitative studies [58]. Howeveronly three studies in this review [16, 38, 58]identified and reported the theoretical framework thatunderpinned the study.

Knowledge of PA and its benefits was found to be lacking among SA. Horne et al. (2009) found that there was disagreement on the understanding of the difference between exercise and PA [23]. This misunderstanding can be compounded by health practitioners or health promotion professionals giving only general recommendations, and failing to provide detail on what activities should be performed, at what intensity and for what duration [52]. Awareness of specific health benefits of PA such as falls prevention, cardiovascular health, and stress relief was low among many SA [14, 23, 30, 50]. Of those respondents who knew about the benefits of PA and had knowledge of which activities to participate in, few reported that they were successful in actually performing any activity [7, 14, 23, 30] or did not believe that they needed PA for their own health [7, 14, 23, 50]. In contrast, Kalra et al. (2004) found that most respondents

(who were all of SA Indian descent) did do some PA [27].

While the majority of the qualitative studies addressed barriers and facilitator to PA, there was little agreement in the findings. There are several possible reasons for this. The term SA is used to group together people from the India, Pakistan, Bangladesh, and Sri Lanka, but this grouping is one of convenience and fails to address the differences that may be found between these diverse countries and cultures. The studies were also guided by different research goals. For example, some focused on PA in SA with type 2 diabetes [18, 30] or heart disease [14, 16, 38, 50, 52], and others on falls prevention for older SA [23]. Finally, the method of data collection, i.e. individual interviews vs. focus groups, may provide information on individual' s thoughts and perceptions (interviews) or reveal the thoughts and perceptions of the collective (focus groups) [11]. Some common themes across these two methods were identified. These included barriers to PA due to differences of the host culture and the SA culture, structural barriers such as neighbourhood safety, and facilitators such as the use of faith and education to encourage activity.

Put in the context of global PA and ST among ethnic minority groups, the findings from this review are consistent with those of many previous studies on other ethnic minority groups. Examples include studies on African Americans and Hispanics in the US where researchers have found similar barriers to those of the SA reviewed here, including cultural barriers such as proper dress for PA and lack of time, money and facilities for PA [12, 13, 63]. Studies on Muslim minority groups have also found comparable results to these, referring to an incongruence of the minority culture and the host population as a main barrier to PA behaviours [53]. Future research should focus on improved methods of working within minority cultures to reduce barriers to PA and discourage ST. While there are similarities in the barriers to PA, the solutions to low PA among these groups may be varied due to the specific characteristics of individuals and communities. These should therefore be explored further and employed to promote increased levels of PA and reduce ST among SA.

This review has built a detailed description of all the evidence published since 1980

on SA and PA from both quantitative and qualitative sources. This method of synthesizing both types of studies has some limitations. There is currently no standardized way of extracting data or assessing the quality of both types of studies [11], therefore more than one method was used. This analysis suffers from a lack of detail from some papers on the sample, methods, and findings. Publication and researcher bias are also a consideration, although efforts were made to procure all studies, published or unpublished, and to use multiple researchers in the identification of studies, data extraction and assessment of quality. Finally, due to a lack of randomized controlled trials and significant heterogeneity between studies, a meta-analysis of results was not possible.

Although not a traditional systematic review, this review has closely followed the rigorous standards of conducting systematic reviews. The strengths of this review include transparent methodology and the inclusion of all types of research to produce the most comprehensive narrative evidence on PA and SA. This review updates and improves upon previous work through integration of study types to provide the most comprehensive picture of existing evidence in this area [6, 15]. This systematic synthesis of studies also allows for the development of more informed recommendations for future research needs and intervention strategies.

3.6 Implications

These findings have implications for researchers, policy specialists and health practitioners. It is clear from the findings of this review that there is little standardisation of PA measurement or terminology used to describe SA groups across studies. This reduces the ability to compare findings across studies and to make any useful generalisations. It is recommended that researchers use objective measures of PA (e.g., accelerometers) more widely among ethnic minority groups. Only two of the26 quantitative studies [22, 29] in this review used objective measurements and only one of those used accelerometers [42].

While there are other objective measurements that might be considered to be the gold standard, accelerometers offer the ability to accurately and consistently monitor PA and avoid recall bias, translation issues, andhave a high degree of reliability over time [21, 39]. The wider use of this technology will help to standardise PA measures and allow for better comparisons across studies.While objective measurement is recommended, it is not always a practical option. Therefore when self-report methods must be used in lieu of objective measurement,it is recommended that researchers used the International Physical Activity Questionnaire (IPAQ) in order to standardise measurement across studies [25]. The IPAQ can be translated into a range of languages and dialects and used for a wide variety of participants, [19, 25, 66]. Additionally, this review illustrates the need for more theory-based research to better understand the social, structural, economic, and cultural factors contributing to the PA and ST in this group. Moreover, there is currently not enough data to ascertain whether there is a consistent difference between women of various SA subgroups, and if there is, what that difference might be.

Policy specialists should consider the alarmingly low rates of PA among SA and press for more evidence-based interventions and programs aimed at this population. The results reported here suggest that healthcare and health promotion practitioners need to provide more detailed guidance on the type, frequency and duration of PA for their patients and clients in this population. There is also concern among SA that participating in PA will aggravate current disease or illness and practitioners should promote education on the benefits of PA even for those with disease. The use of translators and leaders in the faith communities may assist in disseminating these messages.

3.7 Conclusions

This review has identified the quantitative and qualitative studies on PA among SA. All quantitative studies showed a trend toward low activity levels in this group, though outcome measures varied widely. Although findings were limited, they suggest that barriers to PA may be overcome by working within cultural norms and

toprovide more education on the safety and benefit of PA. The evidence base for these conclusions is limited and it is recommended that more research be done in this areato close gaps in knowledge and provide the information needed to develop and disseminate culturally appropriate interventions that increase PA and reduce ST in this population.

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CHAPTER 4

COMPARABILITY OF ACCELEROMETER-AND IPAQ-DERIVED PHYSICAL ACTIVITY AND SEDENTARY TIME IN SOUTH ASIAN WOMEN

NOTE: This paper has been submitted to the International Journal of Behavioral Nutrition and Physical Activity, and is currently under review.

4.1 Abstract

Introduction: Accurate measurement of physical activity (PA) and sedentary time (ST) is essential in developing and evaluating effective intervention strategies to improve health outcomes. No generally accepted standardized method of assessing PA and ST currently exists, although self-report questionnaires and objective methods (e.g., accelerometry) are widely used. There is limited research documenting objectively measured PA/ST in South Asian (SA) women, with no published evidence of the validity of self-report methods of PA/ST assessment of SA in the United Kingdom (UK). The purposes of the study were to: 1) assess the comparability of accelerometer and International Physical Activity Questionnaire(IPAQ) derived PA/ST measures among SA women in the UK via mixed methods; and 2) to provide a description of their understanding of the terminology, content and context of the IPAQ. **Methods:** 140 SA women wore an ActiGraph accelerometer for 7 consecutive days; a sub-sample (n=50) completed the IPAQ-Short form (IPAQ-SF) and participated in a brief structured interview to determine ease of use, understanding of terms used in the IPAQ-SF, and cultural contextualisations of PA/ST in daily life. **Results:** Mean age and Body Mass Index (BMI) for the full sample were 46.3+/-

15.12 yr and 27.8+/-5.5 kg/m^2, respectively. Accelerometer derived MET(metabolic equivalent task)minutes/week moderate-to-vigorous physical activity (MVPA) for the full and subsamples were 793.94(+/-519.44) and 738.41(+/-393.07) and mean accelerometer derived ST/week for full and sub-sample was 530.20(+/-81.76) and 496.42(+/-72.58) respectively (p>.05). IPAQ-SF derived MVPA (METmin/wk) was 636.80(+/-2113.56) and mean ST/wk was 315.31(+/-266.98). Pearson correlations between accelerometer- and IPAQ-SF-assessed mean METmin/wk for MVPA (r=-.119, p=.579), or ST (r=-.140, p=.229) were not significant. Major themes from the interview included: 1) lack of cultural context and terminology for participation in leisure-based PA; 2) inability of participants to equate their own PA with examples of intensity levels from the IPAQ-SF; 3) inability of participants to recall sitting time; and 4) limited general knowledge of real-life examples of activities that are of moderate or vigorous intensity**. Discussion:** Results indicate that the IPAQ-SF may not accurately measure PA/ST in UK SA women. These findings are supported by qualitative evidence indicating several issues with interpretation and recall of PA/ST as assessed via this questionnaire.

4.2 Background

The health benefits of PA have been well documented and the negative consequences of increased ST are also being recognized [4, 10]. Major health organisations are in agreement that 150 minutes of moderate intensity PA or 75 minutes of vigorous activity per week are needed to reduce risks for chronic disease morbidities and premature mortality [22, 23, 28]. There are currently no guidelines for ST; however it is agreed that reducing ST as much as possible and breaking up bouts of ST are important strategies to promote health [23, 28]. Evidence indicates that those who are physically active can reduce their risk for cardiovascular disease (CVD) by up to 50% [6, 26], and reducing ST may improve the metabolic profiles of adults with type 2 diabetes [3].

Self-report data from the Health Survey for England (HSE) indicate that Bangladeshi and Pakistani women in the UK are less likely to meet PA guidelines than their white

counterparts [11].Limited data suggest that SA women are also more sedentary than the general population [1].As such, increasing PA and reducing ST in this population are important public health priorities, as these health behaviours can be modified to reduce risks for morbidity and premature mortality resulting from various chronic diseases [6, 10, 26]. It is important to accurately assess PA and ST in all populations in order to enhance surveillance and examine trends, and to develop and evaluate appropriate and effective prevention and intervention strategies to increase PA and reduce ST. [17]. There is currently no generally accepted standardised method of accurately assessing PA and ST, although self-report questionnaires and objective methods such as accelerometry are now widely used [15]. A recent mixed-methods systematic review examining PA and ST among SA women (aged 16 to 90yrs) found that there is limited published research documenting objectively measured PA and ST levels in SA women. Further, this review revealed that there is no published evidence of the validity of self-report methods of PA assessment in this group, and indicated that the quantitative and qualitative research that has been published on PA/ST in SA women is of relatively low quality [1]. From the limited data available, the authors of this review confirmed that studies indicate low levels of PA in SA women as compared to SA men and white adults using a wide variety self-report tools [1] Moreover, only two studies used objective measurements of PA and only two studies assessed self-reported ST [1].

Accelerometry is a popular method of objectively measuring PA and ST due to the small size of devices and ease of use [17]. These devices are lightweight motion sensors that record frequency, intensity and duration of PA and can detect ST [18]. Accelerometers can monitor activity in a free-living environment and are practical for measuring PA/ST in large groups [18]. However, due to their relatively high cost as compared to pedometers, accelerometers are not always an option for large-scale studies. Therefore questionnaires are commonly used to assess PA and ST [15]. There are over 85 self-administered PA questionnaires available to measure PA and ST for adults, children and the elderly [17]. Among these, the IPAQ has become the most widely used self-report tool to assess PA and ST [17]. The IPAQ is designed to provide data on PA and ST that can be compared nationally and internationally and validated using accelerometry[12]. This questionnaire is intended to be translated and

culturally adapted as needed, although to date, there appear to be no published studies examining how this method may need to be adapted for use within groups with low English literacy (such as SA women living in the UK).

To our knowledge, no studies have explored the validity of using the IPAQ to assess PA and ST in SA women [1, 15]. Thus, the aims of this mixed-method study were to: 1) assess the comparability of accelerometer and IPAQ derived PA and ST in SA women (specifically Bangladeshi and Pakistani) in the UK, a group with limited English language skills and at high risk for low PA, high ST, and CVD and other chronic diseases [11]; and 2) provide a description of SA women's understanding of the terminology, content and context of the IPAQ-SF using brief structured interviews.

4.3 Methods

Participants

A convenience sample of Bangladeshi and Pakistani women aged 18-72 years living in Cardiff, Wales were recruited to participate in this study from January 2012 through March 2013. Recruitment was initiated with contacts from a previous study conducted within the Bangladeshi community [20], with additional recruitment conducted via referral from those contacts, as well as through various community groups in the Cardiff area. Women were eligible to participate if they were 18 years or older, born in Bangladesh or Pakistan and now living in the UK, or born in the UK with Bangladeshi or Pakistani parents, healthy enough to participate, and able to give full informed consent. Translators fluent in Punjabi, Urdu, Bengali and Sylheti were available during all phases of recruitment and data collection for women who were not fully fluent in English. All participants were invited to wear an accelerometer and have demographic and anthropometric measurements taken. On the day of measurement, a sub-sample of women across the age range and levels of English literacy was invited to complete the IPAQ-Short Form (IPAQ- SF). A total of 140 participants provided objective PA and ST data, with 50 (36% of total sample) providing self-report PA and ST data. Written and verbal consent was obtained from

participants; ethical approval was granted by the University Ethical Review Committee of the University of Birmingham (reference # ERN_12-1316).

Descriptive Characteristics

Descriptive data included height measured to the nearest mm with a SECA Leicester Stadiometer, weight measured to the nearest 0.1 kg using a SECA 899 digital scale, and waist circumference measured to the nearest cm using standard protocols. Age, current health/disease status, medications, place of birth and years in the UK were self-reported. Body fat percentage was estimated using bioelectrical impedance (BodyStatQuadscan 4000 unit, BodyStat Ltd, Douglas, Isle of Man, British Isles) and an equation validated among SA women [14], and was reported to the nearest 0.1%. Body mass index (BMI) was calculated by dividing weight in kilograms by the square of height in meters.

IPAQ-Short Form

The IPAQ-SF is a 7-question self-report tool that documents PA and ST performed over the previous 7 days [12]. The tool is intended to be translated, culturally adapted, and self-administered, and as such was considered to be an appropriate self-report tool to use within the current sample. The English literacy levels of participants in the current study were as follows: 1) 38.6% were fully fluent in written and spoken English, and completed the English version of the IPAQ-SF in the presence of a researcher (WSB); 2) 34.2% had some written and spoken English literacy, but preferred to complete the IPAQ-SF in the presence of the researcher and a trained translator in their native language; and 3) 26.3% had little or no English literacy skills and thus completed the IPAQ-SF in the presence of the researcher and a trained translator in their native language.

Data were converted into MET-minutes per week based on the IPAQ scoring protocol [12]. One MET (Metabolic Equivalent) is equivalent to resting energy expenditure. Total minutes over the 7 days spent in moderate- and vigorous-intensity PA were multiplied by 4.0 and 8.0, respectively, to obtain a MET score for each intensity level. Moderate and vigorous intensity scores were then summed to estimate overall PA [17]. These MET values were chosen based on the scoring protocol of the IPAQ-SF [12].

Accelerometer

The Actigraph GT1M and GT3X were used to collect objective measures of PA and ST. These models are widely employed and data obtained from them are reported to be valid and reliable in adults, children and the elderly [17]. A recent study [24] comparing the GT1M and the GT3X models found no significant difference in measurement of PA and ST between the models, and therefore no additional calibration or validation between the two models was undertaken in the present study. Participants were instructed to wear the accelerometer around their waist for 7 consecutive days during waking hours, and to remove it for sleeping, swimming, or bathing.

A pilot study was conducted in 12 women across the range of English literacy levels prior to collecting accelerometry data in the full sample. A picture diary was developed to accompany the accelerometer and participants were instructed to complete the diary each day of wearing the accelerometer. Results from the pilot study indicated that the picture diary was more useful for PA/ST tracking and compliance than the traditional written PA diary with all women. This was the case even in those with full English literacy. Other adaptations made to the accelerometry methods based on the pilot study included gaining the cooperation of female family members in the home to assist in translating instructions and filling out the diary to assist those participants with limited or no English literacy, and the use of text messaging with participants (and female family members for those participants with limited English literacy) as a compliance reminder.

4.3.1 Data Reduction

Accelerometer data were downloaded using the Actilife 6 data analysis software (Actigraph, LLC, Pensacola, Florida). Based on limited existing literature, participants were not expected to exhibit short bursts of higher intensity activities, and thus the epoch or time interval selected for analysis was 60 seconds [5]. A valid day of accelerometry measurement was defined as a recording of at least 600 minutes of registered time [5]. The time period for measurement should reflect usual activity and fluctuations in activity, therefore participants with a minimum of 3 valid days of activity that included one weekend day were included in this analysis [9]. Non-wear time was defined as more than 60 successive minutes of zero counts. Data were reduced using Kinesoft software (v3.3.75; Kinesoft, Saskatchewan, Canada) to provide counts per minute (CPM) of activity, minutes of MVPA, and minutes spent in ST. Cut points used to determine minutes spent at intensity levels were: sedentary = <50counts/min.; light activity = 51-500 counts/min.; moderate activity = 501-1400 counts/min; vigorous activity = 1401-2300/min; and very vigorous activity = 2301- ∞ /min [8]. Nonparametric data were log transformed for statistical analyses.

4.3.2 Comparison Variable

The IPAQ-SF calculates and reports PA in MET minutes per week (METmin.WK). For comparison purposes, accelerometer data were converted into METmin.WK. Moderate-to-vigorous PA is calculated as (8 x minutes of vigorous PA + 4 x minutes of moderate activity) [8]. ST is reported as mean minutes per week (ST/wk) for both accelerometer and IPAQ-SF data.

4.3.3 Brief Structured Interview

Following the administration of the IPAQ-SF, participants were invited to participate in a brief interview to determine ease of use, understanding of terms used in the IPAQ-SF, and cultural contextualisations of PA/ST in daily life. The interview consisted of 12 questions based on a review of the literature and guided by the

research aims of the study. A trained translator was available for women with limited or no fluency in English. Interviews were audio recorded and transcribed verbatim.

4.4 Data Analysis

Descriptive statistics (means, (standard deviations (SDs), percentages) for all variables were calculated (Table 4.1). T-tests were conducted to determine whether there were any significant differences between the full and sub-sample for age, BMI, or accelerometer and IPAQ-SF derived MVPA and ST. Pearson correlations were determined to examine the relationship between accelerometer and IPAQ-SF by PA intensity level. Additionally, a Bland-Altman plot was used to explore the differences in the two methods of measurement. All statistical analyses were conducted using PASW 18.0 (Quarry Bay, Hong Kong). The qualitative transcripts from the brief interviews were coded independently by two researchers (WSB and JLT). Data from the interview transcripts were coded using directed content analysis [7, 19].

Table 4.1: Participant Characteristics

	All (n=123)	**Subsample (n=50)**	**P value**
Age (yrs)	46.3±15.12	40.1±10.5	*p*=.236
BMI kg/m^2 *	27.8±5.5	28.2±5.3	*p*=.458
% Underweight <18.5	0.80%	0.50%	
% Normal Weight 18.5-23	10.60%	14.70%	
% Overweight 23.1-25.5	22.90%	22.10%	
% Obese >25.5	65.70%	62.70%	
% Body fat	53.9±3.9	50.6±4.1	*p*= .212
Waist circumference (cm)	92.4±9.3	91.9±6.3	*p=.602*

***BMI Categories as defined for South Asians by WHO [24]**

4.5 Results

Out of a total of 167 participants recruited into the study, 140 (84%) had a minimum of 3-days of valid accelerometry data and were included in the analyses. A sub-sample of 50 participants (36% of the 140 with valid accelerometer data) provided complete self-reported data from the IPAQ-SF. As reported in Table 4.1, the mean age and BMI for the full sample were 46.3+/-15.12 yr and 27.8+/-5.5 kg/m^2, respectively and 22.9% and 65.7% were categorised as overweight and obese respectively according to the World Health Organisation's (WHO's) definition for SA BMI [27] (Table 4.1). Only 0.9% were considered non-obese according to body composition. Mean age and BMI for the sub-sample were 45.76+/-13.6 and 28.0+/-6.3 kg/m^2 respectively and 22.1% and 65.7% were categorized as overweight and obese respectively (Table 4.1), and 1% were considered non-obese according to body composition.

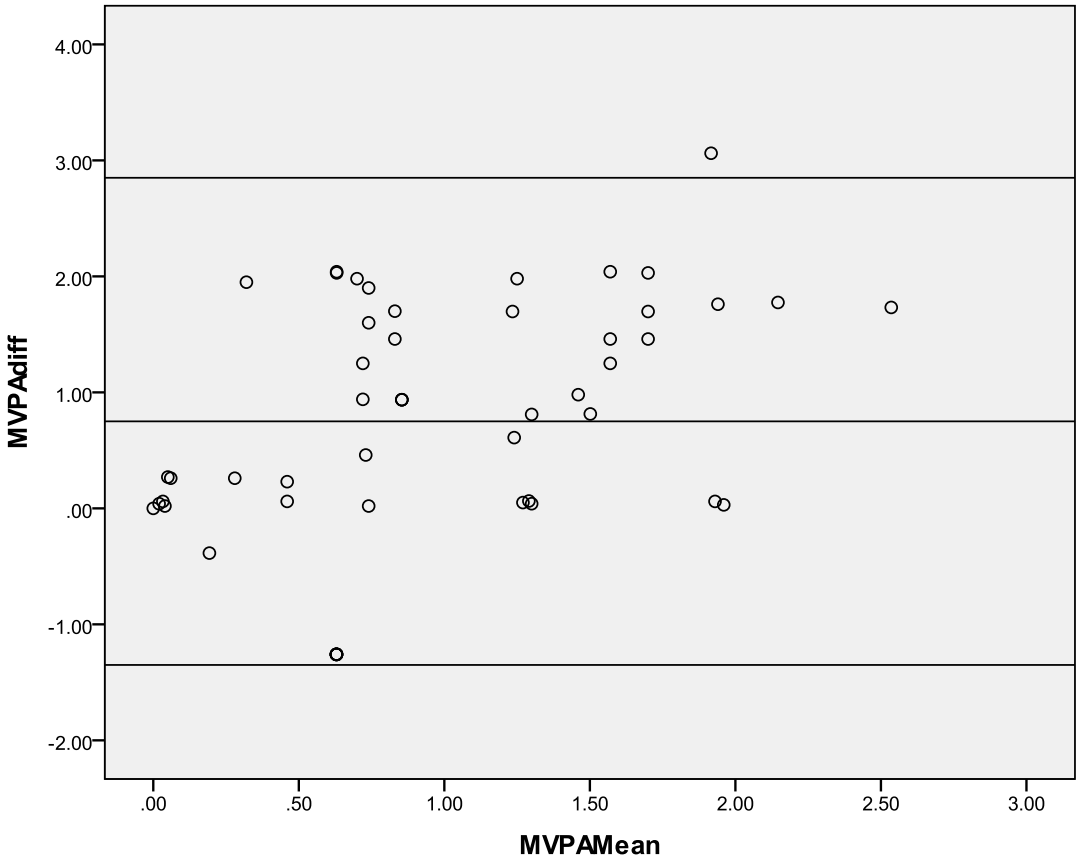
Accelerometer-derived mean CPM was 313.43+/-118.38 and mean MPVA was 34.66+/-21.52 for the full sample. Accelerometer derived METmin/wk MVPA for the full and subsamples were 793.94(+/-519.44) and 738.41(+/-393.07) and mean accelerometer derived ST (min/day) for full and sub-sample was 530.20(+/-81.76) and 496.42(+/-72.58) respectively. IPAQ-SF derived MVPA (METmin/wk) was 636.80(+/-2113.55) and mean ST (min/day) was 315.31(+/-266.98) (Table 4.2). T-tests indicate no significant difference ($p>0.05$) between the full and sub-sample in age, BMI, waist circumference or accelerometer derived MVPA and ST. As all PA data were non-normally distributed, log transformed values were used for these analyses.

Table 4.2: Summary Variables

	All (n=140)	Sub-sample (n=50)	P value (Group)	P value (Accel v IPAQ)
Accel MVPA (min/day)	34.66±21.52	30.9±21.0	*p=.169*	
Accel ST (min/day)	530.20±81.76	496.0±72.6	*p*=.251	
AccelMETmin/d MVPA	113.42±74.21	105.5±51.2	*p=.159*	
IPAQ METmin/d MVPA		90.97±301.94		*P<.001*
IPAQ ST (min/day)		315.31±266.98		*p<.001*

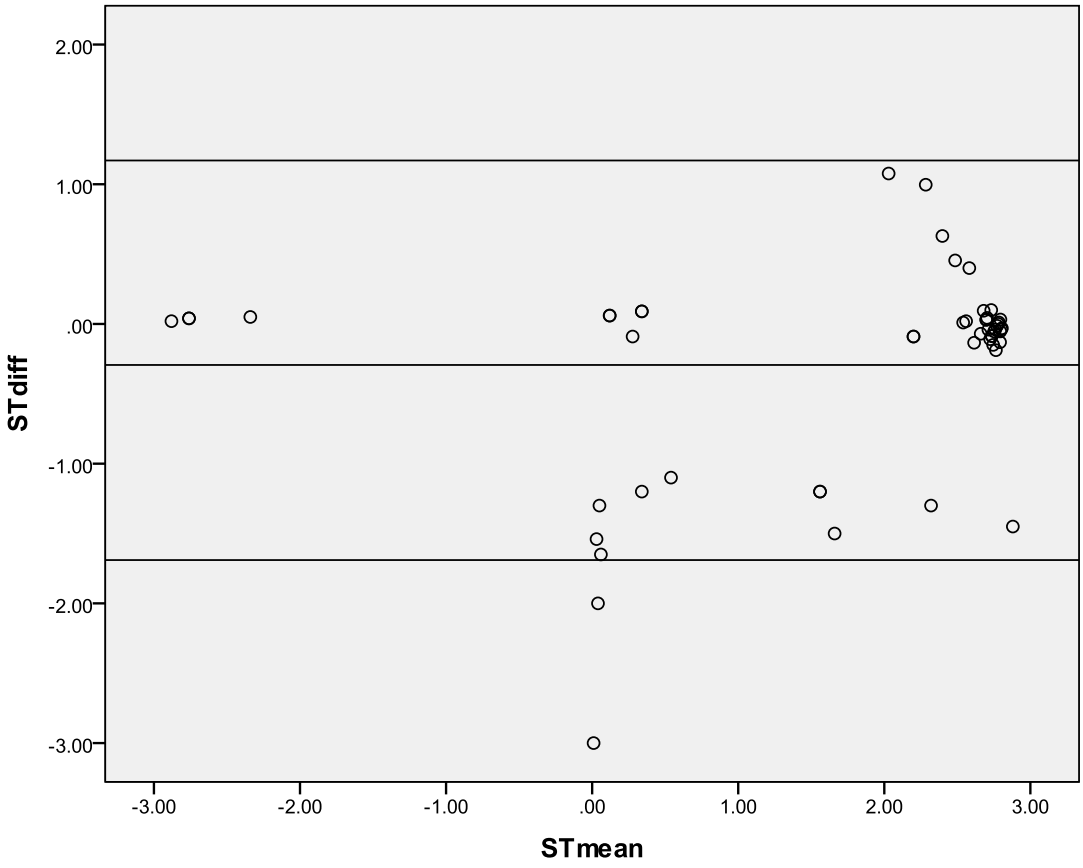
There was a significant difference seen between accelerometer METmin/wk MVPA and IPAQ-SF METmin/wk MVPA (p<.001) and between accelerometer ST (min/day) and IPAQ-SF ST (min/day) (p<.001), with the values lower for the IPAQ-SF in both instances. Pearson correlations indicated no significant associations between accelerometer- and IPAQ-SF-derived METmin/wk for MVPA (r=-.119, p=.579), or ST (r=-.140, p=.229). The Bland-Altman plot of the differences in two methods of measurement of MVPA (Figure 4.1) indicates that the mean of the differences between the two methods of measuring PA is not close to zero; therefore the two methods are producing different results. Figure 4.2 shows a Bland-Altman plot for differences in ST as measured by the two methods. Based on the differences that plotted near zero, the accelerometer and IPAQ-SF methods may be more likely to measure ST similarly. Caution should still be used when interpreting these results however, since many of the differences also plotted below zero. This suggests that there are instances where the two methods do not measure ST similarly.

Figure 4.1: Bland-Altman plot of differences between accelerometer and IPAQ-SF derived MVPA



(MVPAdiff= difference between accelerometer and IPAQ-SF scores; MVPAmean= mean of accelerometer and IPAQ-SF scores)

Figure 4.2: Bland-Altman plot of differences between accelerometer and IPAQ-SF derived sedentary time



(STdiff= difference between accelerometer and IPAQ-SF scores; ST mean= mean of accelerometer and IPAQ-SF scores)

Major themes emerging from the women's responses to the brief structured interview included: (1) lack of cultural context and terminology for participation in leisure-based PA; (2) inability of participants to equate their own PA with examples of intensity levels from the IPAQ-SF; (3) inability of participants to recall sitting time; and (4) limited general knowledge of real-life examples of activities that are of moderate or vigorous intensity. Table 4.3 provides exemplar quotes for each major theme. These themes were identified as the most salient issues affecting participants' ability to self-report PA and ST among this sample, with theme (1) reported in 68% of interviews, theme (2) in reported in 53% of interviews, theme (3) reported in 83% of interviews, and theme (4) reported in 57% of interviews.

Table 4.3: Major themes from brief structured interviews

Major Theme	Participant Quotes
(1) Lack of Cultural Context and Terminology	“I don’t know this word very well, vigorous. I work hard to make my home. Is this the same?” * 59 year old Bangladeshi woman "Vigorous is not easy to understand for me. I need explanation and examples." * 62 year old Pakistani woman
(2) Inability to equate own PA with IPAQ-SF examples	“ During the questions I don’t understand, you see, what is this moderate level. I do carry loads like washing but I never do tennis or bicycle. So I don’t do any of this moderate [physical activity]?” * 47 year old Pakistani woman "Is it [moderate physical activity] when I sweat a lot or only just like walking?" * 32 year old Bangladeshi woman
(3) Inability to recall sitting time	“ I don’t think I do sit much. I get up and pray, make the breakfast, and food for the day. I think I sit sometimes but for how long I don’t know this.” * 64 year old Pakistani woman

	"I don't really keep time of how much sitting. I sit after cooking and taking tea but for how long I don't know." * 53 year old Bangladeshi woman
(4) Limited general knowledge of real-life examples of PA intensity	"I do my prayer during the day and this is, I think this moderate [physical activity]. It is enough." * 72 year old Pakistani woman "I do walking sometimes so this is vigorous, isn't it? I'm not sure." * 35 year old Bangladeshi woman

4.6 Discussion & Conclusions

This study assessed the comparability of objectively measured PA and ST using accelerometry with self-reported PA and ST using the IPAQ-SF in a sample of UK-residing SA women. Results of our analyses indicate that the IPAQ-SF may not accurately measure PA/ST in women of Bangladeshi and Pakistani descent. There were no significant correlations between accelerometer derived PA/ST and IPAQ-SF derived PA/ST; in fact, the correlation between accelerometer- and IPAQ-SF-derived PA was negative, indicating that those with higher objectively measured PA tended to report lower PA levels within the IPAQ-SF. In both the measurement of PA and ST, the IPAQ-SF underestimated the level of activity of the participants when compared to accelerometer-derived data. These findings are supported by the Bland-Altman plot showing the mean of the differences to be above zero, and qualitative evidence indicating several issues with interpretation and recall of PA/ST in this sample of SA women. Specifically the underestimation of MVPA may have been affected by the lack of cultural context and terminology of leisure-based PA, the inability of participants to relate PA examples given in the IPAQ-SF to their own PA, as well as their difficulty in recalling sitting time. These results are consistent with those from similar studies conducted with predominantly white participants and indicate an inherent recall bias [10]. Recall bias may be compounded by the respondents' lack of knowledge and cultural contextualisations related to participating in PA for leisure, and to defining and describing their own PA and ST.

A recent systematic review highlights the difficulties in comparing levels the PA and ST among SA due to the lack of standardised measurement, though some comparisons can be made with studies using the IPAQ and accelerometer data [1]. Using the IPAQ, Williams et al. (2010) found that 45.6% of SA men and women in the study were sedentary (using the benchmark of more than 3 hours/day of sedentary time) [25] and Yates et al. (2010) found 40% of SA women were sedentary (according to IPAQ-SF data) [29]. Our study found a much higher percentage of participants to be sedentary according to the IPAQ-SF (86%). A possible explanation for this difference may be, as the qualitative interviews identify, an inability for participants' to accurately recall sitting time. Kolt et al. (2007), in one of only 2

published studies reporting PA from accelerometer data in SA, and the only one to report ST, reported 48% of SA men and women were sedentary when measured by accelerometer [13]. Similarly, accelerometer-derived data from our study showed 47.7% of our sample to be sedentary.

The HSE (2008) has not yet published data for objectively measured PA and ST by ethnic group, but reports 33% of women sampled in the HSE 2008 as being sedentary for 6 or more hours per day and 71% as not meeting PA recommendations [21]. In the 2008 HSE, PA and ST were measured by accelerometer for the first time. The HSE reports all women as having an average of 584 minutes/day of ST and 24 minutes/day of MVPA [2]. Our results show accelerometer ST as 530.20(+/-81.76) and 496.42(+/-72.58) minutes/day for the full and sub-samples, respectively, and MVPA as 34.66(+/-21.52) and 30.9(+/-21.0) minutes/day for the full and sub-samples, respectively. These findings suggest that SA women in the current sample may be less sedentary and slightly more active than the general population of women in the UK.

There are some limitations to this study. Firstly, the study sample is a relatively small convenience sample, and is not representative of all SA women living in the UK. It is possible that the participants in this study are more active and less sedentary than the general population of SA women in Cardiff and the UK. Strengths of this study included the recruitment of individuals who are traditionally defined as "hard-to-reach", inclusion of SA women across the range of age, activity levels, and English literacy levels, the use of objective measures to quantify PA and ST, and triangulation of quantitative data with qualitative interview data.

To our knowledge, there have been no other studies published to date that have assessed the comparability of accelerometer- and IPAQ-SF-derived PA and ST among SA women in the UK. Our data suggest that further validation of the IPAQ-SF with a larger sample of SA women is needed to determine its suitability within this

population. The current results strengthen the argument for the development of a more culturally tailored and contextualised self-report tools for the assessment of PA and ST among SA women, and emphasise the need for the wider use of accelerometers to objectively measure PA and ST in multi-cultural populations. Moreover, the amount of ST and daily patterns of sedentary behaviours among SA should be explored further, as our accelerometer data indicate a less sedentary group that might have been expected based on published self-report data.

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CHAPTER 5

PATTERNS OFOBJECTIVELY MEASURED PHYSICAL ACTIVITY AND SEDENTARY TIME IN SOUTH ASIAN WOMEN

NOTE: This paper has been submitted to the Journal of Physical Activity & Health and is currently under review.

5.1 Abstract

Introduction: South Asian **(**SA) women in the United Kingdom (UK) are known to be at high risk for the development of chronic diseases such as cardiovascular health disease (CVD) and type 2 diabetes, and are known to have low levels of physical activity (PA) based predominantly on self-report questionnaires. Increasing levels of PA and reducing sedentary time (ST) are recognised as factors to target in an effort to curb chronic disease morbidity and mortality. There is limited evidence documenting objectively measured PA and ST and their correlates in SA women. Therefore the aim of this study was to objectively measure and report patterns of PA and ST among SA women in the UK and examine potential socio-demographic correlates of PA and ST in this group. **Methods:** 140 SA women from Cardiff, Wales wore an ActiGraph accelerometer for 7 consecutive days, along with anthropometric measurements and self-reported socio-demographic information. **Results:** Mean daily moderate-to-vigorous PA (MVPA) was 34.66±21.52 minutes and mean daily ST was 530.20±81.76 minutes, with an inverse correlation (r=-.270, N=140, p<.001). Independent *t*-tests indicated a significant difference in MVPA between older and younger women (18-64.9 ys and ≥65 yrs), with older women failing to meet PA guidelines (t=3.101, p<0.05). Women who were overweight or obese had higher levels of MVPA and ST (p<.001). Multiple linear regression analyses resulted in 19% of the variance in MVPA explained by the model including age and waist circumference (F(2,138)= 6.84, p<0.002). 34.7% of the sample met PA recommendations when calculated using consecutive 10-minute bouts. There was a

significant difference (p<.001) between daily mean ST and moderate-to-vigorous physical activity (MVPA) on weekdays and weekend days with more MVPA on weekdays and more ST on weekends. **Discussion:** Results indicate that older SA women perform less MVPA than younger and those classified as overweight or obese engage in more MVPA and ST than normal weight women. Differences in weekday and weekend activity have important implications for timing of the implementation of PA interventions.

5.2 Background

Low levels of PA and increased ST are recognised as key independent risk factors in the development of CVD and are significant contributors to other chronic conditions such as type 2 diabetes and obesity [10, 17]. CVD, which includes heart attack and stroke, accounts for nearly 17 million deaths around the world each year [2] and is the leading cause of death in the UK. The UK has one of the highest rates of CVD in the world, with more than 190,000 deaths in 2008 [2]. Ethnic minority groups in the UK are known to be disproportionately affected by chronic diseases [12]. Within these ethnic minority groups, women and those of lower socioeconomic status are known to have higher morbidity and premature mortality from CVD [26] and other chronic diseases than white European populations [26, 27]. SA women in the UK are a group that is known to be affected by all of these factors [5, 10]. In the UK, 33% of all mortality in SA in 2008 was caused by cardiovascular disease [7].

Major health organisations currently recommend engaging in 150 minutes of moderate intensity PA or 75 minutes of vigorous activity per week to achieve health benefits [20, 21, 25]. It has been shown that those who are physically active can reduce their risk of developing CVD by nearly 50% [7], and emerging evidence suggests that decreasing ST may also decrease risk for CVD [4]. Self-report data from the Health Survey for England (HSE) indicate that Bangladeshi and Pakistani women in the UK are less likely to meet PA recommendations than their white counterparts [12]. Therefore, PA and ST are potentially modifiable health behaviours that can be

targeted for behaviour change to reduce risks for morbidity and premature mortality resulting from various chronic diseases.

Accurate measurement of PA and ST is essential to developing prevention and intervention strategies in those in greatest need [3]. A recent systematic review examining the validity of the IPAQ found only small correlations between total PA level as measured by the IPAQ and objectively measured PA [15]. The five studies included in this review reported moderate correlations (p=.40-.49). One study found that most IPAQ studies over-reported PA, identifying this as the major limitation of self-reported measurement of PA. This has been attributed to recall bias common in self-report measures [15]. There was no examination of the validity of the IPAQ in measuring ST.

To date, there is limited published research reporting objectively measured PA and ST levels in SA women and few studies investigating activity levels of older SA women, a group that may be at risk for low activity levels and high ST [1, 13]. A mixed-methods systematic review investigating PA and ST among SA women (aged 16 to 90+yrs) found that the existing published evidence is of relatively low quality, with only two studies that have objectively measured PA in this population [1]. No studies objectively measured ST, with only 2 studies examining ST using self-report measures [23, 24]. This review highlighted that self-report data indicate low levels of PA in SA women when compared to SA men and white adults using a broad range of self-report tools [1].

Accelerometers are a common method of objectively measuring PA and ST due to their convenience and durability in the field [22]. They are small motion sensors worn on a waist belt that record frequency, intensity and duration of PA and can detect ST [8]. Accelerometers can detect activity in a free-living environment and are practical for measuring large groups [22]. There is some evidence that accelerometers can be used to collect PA and ST data on groups who may have limited English language

skills and/or low literacy levels, as may be the case amongst some SA women in the UK [9, 17].

Thus, the aim of this cross-sectional study is to report the amount and patterns of PA and ST among SA women in the UK, examine potential socio-demographic correlates of PA and ST in this group, and to make recommendations for future research in this area.

5.3 Methods

Study Population

The study sample consisted of Bangladeshi and Pakistani women aged 18-72 years from Cardiff, Wales. Recruitment took place from January 2012 through January 2013, and built upon a sample initially recruited from another study conducted in Cardiff [19]. The full convenience sample was obtained through referrals and contacts with community groups in the local areas. Participants were eligible to participate if they were a woman 18 years or older, either born in Bangladesh or Pakistan and currently residing in the UK or being born in the UK to Pakistani or Bangladeshi parents and currently residing in the UK, ambulatory, had no medical reason that prohibited participation, and were able to give informed consent. Translators fluent in Punjabi, Urdu, and Sylheti were available to assist with translation for those women who were not fluent in English. Those meeting all inclusion criteria were asked to wear an accelerometer and have all anthropometric measurements and socio-demographic information taken. Written and verbal consent were obtained from respondents. The ethical review committee of the University of Birmingham approved this study (reference # ERN_12-1316).

Measures

Descriptive data included height measured to the nearest mm with a SECA Leicester Stadiometer, weight measured to the nearest 0.1 kg using a SECA 899 digital scale,

waist circumference measured to the nearest cm, and percentage body fat percentage measured using the BodystatQuadscan 4000 (BodyStat Ltd, Douglas, Isle of Man, British Isles) which was estimated to the nearest 0.1% using an equation validated with SA adults [13]. Age, current health/disease status, medications, place of birth, current residential postcode in the UK, self-reported English language fluency, and years in the UK were self-reported by questionnaire. Body Mass Index (BMI) was calculated by dividing weight in kilograms by the square of height in meters. The Welsh Index of Multiple Deprivation (IMD) was used as a socioeconomic indicator and was determined based on residential postcodes. The same trained researcher using standardised protocols took all measurements and collected demographic data.

PA and ST was assessed using the ActiGraph GT1M and GT3X accelerometers (ActiGraph, Pensacola,FL). It has been reported that there is no significant difference in measurement between the two accelerometer models [13]. Therefore no additional calibration or validation studies were done to compare the data derived from the GT1M and GT3X models. The devices were programed to record activity data in 60-second epochs. Participants were asked to wear the monitor during waking hours for 7 consecutive days, removing it to sleep or for water-based activities such as bathing or swimming. Participants were also asked to complete a picture diary indicating when they put on and removed the accelerometer, and any reason for removing the device for more than 20 minutes during the day was recorded. Female family members agreed to assist women with low literacy skills in completing the picture diary in the home. A pilot study conducted prior to this study indicated a picture diary and the cooperation of female family members in the home was the most helpful method for maintaining compliance in wearing the accelerometer. A more detailed description of this pilot is reported elsewhere (Chapter 4).

Data Reduction and Statistical Analyses

Accelerometer data were downloaded using the Actilife 6 data analysis software (Actigraph, LLC, Pensacola, Florida). A valid day of measurement was defined as at least 600 minutes of registered wear time [3]. The time period for measurement

should reflect routine activity and variations in activity, therefore participants with at least 3 valid days of activity that included one weekend day were included in this analysis [3]. Non-wear time was defined as more than 60 successive minutes of zero counts. Data were reduced using Kinesoft software (v3.3.75; Kinesoft, Saskatchewan, Canada) to derive counts per minute (CPM), minutes of MVPA and minutes spent in ST. Cut points used to determine minutes spent at intensity levels were sedentary: <50counts/min., light activity: 51-500 counts/min., moderate activity: 501-1400counts/min, vigorous activity: 1401-2300/min, and very vigorous activity: 2301-∞ /min [8]. Nonparametric data were log transformed for statistical analyses.

Descriptive statistics (means, SDs, percentages) for all variables were calculated. PA data were nonparametric and therefore log transformed for analysis. Independent t-tests or one-way analysis of variance (ANOVA) using covariance were conducted to determine differences in PA and ST between age, BMI, body fat %, language ability, waist circumference, and IMD rank. Bonferroni's post hoc test was used to control for Type I error. The independent effects of potential sociodemographic predictors of PA and ST were explored using multiple linear regression analysis in which all key variables were entered using the enter method. All statistical analyses were conducted using PASW 18.0 (Quarry Bay, Hong Kong).

5.4 RESULTS

Of the 167 SA women recruited to this study, 27 (16%) were excluded due to health reasons (n=3), dropping out of the study (n=7), or had incomplete data (n=17). 140 women with complete demographic, anthropometric, and accelerometer data were included in the final sample.

Participant Characteristics

Age, BMI, waist circumference, body fat percentage, IMD quintile, and self-reported language ability of participants are shown in Table 5.1. Over three quarters of the sample was between 18-64.9 years of age. Over 90% (n=127) of the sample was

classified as overweight or obese based on WHO guidelines for BMI categories for SA adults [25], with 67.9% having a waist circumference greater than 80 cm. Most of the sample (80.7%) were categorized as being in the two most socio-economically deprived quintiles based on the Welsh IMD ranking [16]. In regards to levels of English literacy, 69.3% (n=97) of women reported that they were fluent in English. Approximately 66.5% (n=93) of participants reported having been diagnosed with a chronic medical condition such as type 2 diabetes, high cholesterol or high blood pressure; 90% (n=84) of those women who reported having a chronic medical condition were currently receiving medical treatment (e.g., medication).

TABLE 5.1: Participant Characteristics

Age (mean±SD),yr	46.5±14.3
Age categories, *n* (%)	
18-64.9 yr	106(75.7)
≥65 yr	34(24.3)
BMI (mean±SD), kg/m^2	27.8±5.5
BMI categories*, *n* (%)	
Underweight (<18.5)	1(.8)
Normal weight (18.5-23)	12(8.6)
Overweight (23.1-27.5)	24(17.1)
Obese (>27.5)	103(73.5)
Waist circumference (mean±SD), cm	91.6±14.7
Waist Category, *n* (%)	
Healthy (≤79.9cm)	45(32.1)
Unhealthy (≥80com)	95(67.9)
Body fat(mean±SD)	41.7±23.1
IMD Quintiles**, *n* (5%)	
1 (most deprived)	52(37.1)
2	61(43.6)
3	27(19.3)
4	0(0)
5 (least deprived)	0(0)
Literacy Level, *n* (%)	
Self-reported fluency in English	97(69.3)
Self-reported non-fluency in English	43(30.7)

*BMI Categories as defined for South Asians by the WHO [25],

**Based on Index of Multiple Deprivation ranks for Wales [16]

Physical Activity Levels

The mean CPM per day for this sample was 313.43±118.38, mean ST per day was 530.20±81.76, and mean MVPA per day was 34.66±21.52. Pearson's correlation showed a negative relationship between MVPA and ST (r=-.270, N=140, p<.001).

52.5% (n=74) of the sample met current recommendations for PA of accruing at least 30 minutes of MVPA per day. When MVPA data were examined to determine those meeting PA recommendations of accruing at least 30 minutes per day in consecutive 10-minute bouts, the percentage of those meeting recommendations fell to 34.7% (n=48). 63.8% (n=89) of the sample spent 5 or more hours of their day being sedentary.

Table 5.2 shows that independent t-tests indicate a significant difference in the amount of daily MVPA time between women in the younger age group (18-64.9 yrs) and older age group (≥65 yrs) (t=3.101, p<0.05). On average, women aged 65 years or older did not meet the daily PA recommendation of 30 minutes or more of MVPA most days (23.30±4.07 minutes per day), while women aged 18-64.9 years met the PA recommendation (39.63±2.87 minutes per day). There were no significant differences between age groups for CPM or ST.

BMI effects were seen for ST and MVPA when controlling for age (Table 5.2). Mean daily ST was significantly (p<.001) different between normal weight, overweight and obese BMI categories, and underweight and overweight and obese categories (Table 5.2). There were no significant differences in mean daily ST between participants in the underweight and normal weight categories. The same BMI effect was seen for mean daily MVPA. Those women classified in the normal weight category performed the highest mean daily MVPA (52.89±9.09 minutes).

TABLE 5.2: Comparisons of physical activity and sedentary time by age, language ability, BMI category and waist circumference category

	mean (SD)		
Age group	**CPM***	**ST (mean min/day)***	**MVPA (mean min/day)***
18-64.9prs (n=106)	367.01(17.13)	521.94(12.81)	39.63(2.87)***a***
≥65 yrs (n=34)	264.97(24.31)	549.33(14.73)	23.30(4.07)
Language ability			
Self-reported fluency in English	333.16(16.10)	531.76(11.16)	36.39(2.79)
Self-reported non-fluency in English	317.61(37.37)	522.82(24.11)	28.61(5.52)
BMI			
Underweight	476.37(53.13)	445.82(45.51)***b***	43.30(13.32)***b***
Normal weight	485.41(68.16)	406.23(37.05)***c***	52.89(9.09)***c***
Overweight	338.66(26.01)	555.78(17.49)***c***	38.38(4.72)***c***
Obese	311.29(16.83***)***	533.67(11.50)***c***	31.90(2.95)***c***
ANCOVA(corrected model)	F=3.562, *P*<.05	F=4.078, *P*=.769	F=2.845, *P*=<.05
Waist circumference			
Healthy (≤79.9cm)	374.81(64.77)	504.21(38.11)	42.23(9.69)
Unhealthy (≥80cm)	324.71(14.75)	533.03(10.38)	33.95(2.55)

IMD Quintile				
	1	324.99(22.56)	525.71(17.34)	33.20(3.7)
	2	337.55(22.59)	523.11(14.33)	36.45(3.8)
	3	317.39(46.18)	561.60(24.27)	32.16(2.7)
	4			
	5			

*log-transformed data, untransformed means included for all activity data for ease of understanding

a significantly ($p<0.05$) different from ≥65 yr are group;***b***significantly ($p<.001$) different from overweight and obese groups;***c*** significantly

($p<.001$) different from all weight groups excluding underweight

Multiple linear regression analysis using socio-demographic predictor variables resulted in no significant models for ST (Table 5.3). Five significant models emerged for MVPA (Table 5.4). In model 1, age, BMI, IMD rank, Body fat %, waist circumference and language ability explained 14% of the variance in MVPA and was significant ($F(6,134)= 2.42$, $p<0.04$). Model 2, in which body fat % was removed, explained 16% of the variance ($F(5,135)= 2.92$, $p<0.02$). In model 3, age, IMD rank, waist circumference and language ability were included, explaining an additional 1% of the variance. Age, IMD rank and waist circumference were included in model 4, explaining 18% of the variance. Model 5 included age and waist circumference. This model explained the highest percentage of MVPA variance (Adjusted $R^2= 0.19$) and was significant ($F(2,138)= 6.84$, $p<0.002$). Finally, model 6 explained just 17% of the variance in MVPA and included age as a predictor variable ($F(1,139)=11.43$, $p<0.001$).

Table 5.3: Multiple regression models for sedentary time

Model	Variable	B	SE(B)	β	t	Adjusted R^2	Sig.(*p*)*
1	Age	0	0.001	0.039	0.197	-0.01	0.47
	BMI	0.00	0.00	0.11	0.63		
	IMD Rank	0.00	0.00	0.02	0.11		
	Body Fat %	-0.01	0.00	-0.35	-1.97		
	Waist Circumference	0.00	0.00	0.25	1.04		
	Language+	-0.02	0.03	-0.12	-0.74		
2	Age	0.00	0.00	0.04	0.22	0.02	0.34
	BMI	0.00	0.00	0.11	0.63		
	Body Fat %	-0.01	0.00	-0.35	-2.00		
	Waist Circumference	0.00	0.00	0.25	1.10		
	Language+	-0.02	0.03	-0.12	-0.77		
3	BMI	0.00	0.00	0.10	0.60	0.04	0.23
	Body Fat %	-0.01	0.00	-0.36	-2.17		
	Waist Circumference	0.00	0.00	0.28	1.53		
	Language+	-0.02	0.03	-0.11	-0.76		

4	Body Fat %	-0.01	0.00	-0.36	-2.16	0.05	0.15
	Waist Circumference	0.00	0.00	0.33	1.97		
	Language+	-0.02	0.03	-0.11	-0.78		
5	Body Fat %	-0.01	0.00	-0.33	-2.06	0.06	0.09
	Waist Circumference	0.00	0.00	0.30	1.86		

+ Language category (Fluent in English or not fluent in English; *Significance level set at $p < 0.05$

Table 5.4: Multiple regression models for MVPA

Model	Variable	B	SE(B)	β	t	Adjusted R^2	Sig.(*p*)*
1	Age	-0.01	0.01	-0.37	-2.01	0.14	0.04
	BMI	0.01	0.01	0.84	0.53		
	IMD Rank	0.00	0.00	-0.09	-0.66		
	Body Fat %	-0.01	0.02	-0.07	-0.42		
	Waist Circumference	-0.01	0.01	-0.17	-0.77		
	Language+	0.07	0.13	0.55	0.55		
2	Age	-0.01	0.04	-0.35	-1.99	0.16	0.02
	BMI	0.01	0.01	0.09	0.56		
	IMD Rank	0.00	0.00	-0.09	-0.65		
	Waist Circumference	-0.01	0.01	-0.22	-1.20		
	Language+	0.08	0.13	0.09	0.58		
3	Age	0.01	0.00	-0.37	-2.27	0.17	0.01
	IMD Rank	0.00	0.00	-0.10	-0.69		
	Waist Circumference	-0.01	0.00	-0.16	-1.08		
	Language+	0.09	0.13	0.10	0.65		

4	Age	-0.01	0.00	-0.32	-2.24	0.18	0.006
	IMD Rank	0.00	0.00	-0.11	-0.81		
	Waist Circumference	-0.01	0.00	-0.17	-1.13		
5	Age	-0.01	0.00	-0.34	-2.36	**0.19**	0.002
	Waist Circumference	-0.01	0.00	-0.20	-1.42		
6	Age	-0.01	0.00	-0.43	-3.38	0.17	0.001

+ Language category (Fluent in English or not fluent in English; *Significance level set at p <.05

Table 5.5 shows activity data when investigated by weekdays and weekend days. Mean values for CPM, daily ST and daily MVPA were all significantly different ($p<.001$ for all). On weekdays participants accrued higher CPM (318.53±135.36) and more MVPA (36.12±12.53) than on weekend days. On weekend days women accrued more ST than on weekdays.

Table 5.5: Weekday vs. weekend physical activity and sedentary time

mean(SD)	**Weekdays**	**Weekend days**
CPM	318.53(135.36) ***a***	311.40(137.72)
Sedentary time (min/day)	517.77(67.86)***a***	560.31(146.93)
MVPA(min/day)	36.12(12.53)***a***	27.43(14.24)

Note: One-sample t-tests for log transformed data. Actual means included for clarity of interpretation.

a significantly different from weekend days ($p<.001$)

Figure 5.1 shows daily patterns of MVPA and ST during waking hours. As can been seen in Figure 5.1a, a higher percentage of each hour during weekdays is spent in ST for the total sample while little is spent in MPVA. MVPA peaked during the hours of 1pm-4pm. On the weekend the percentage of MVPA each hour increased, with peaks during 10-11am, 3-4pm, and 9-10pm (Figure 5.1b). Six women spent the hours of 3am-4am participating in MVPA (data not shown). When activity patterns were explored by age group, younger women appeared to participate in more MVPA on weekdays than older women, although patterns were similar from 3pm-9pm in both age groups (Figure 5.1c). Younger women spent a lower percentage of time in ST between 2pm-9pm on weekdays. Conversely, both age groups spent a similar percentage of time in ST on the weekend and showed a similar pattern of ST across the day (Figure 5.1d). Older women increased time spend in MPVA on the weekend, especially between the hours of 9am-11am and 1pm-5pm (Figure 5.1d).

Figure 5.1a-d: Weekly physical activity and sedentary time patterns

(a) Hourly MVPA (bar) and ST (line) patterns (% of measured time) for weekdays, (b)Hourly MVPA (bar) and ST (line) patterns (% of measured time) for weekend, (c) comparison of younger (n=106) and older (n=34) age groups on MVPA (bar) and ST (line) on weekdays, (d) comparison of younger (n=10) and older (n=34) age groups on MVPA (bar) and ST (line) on weekend.

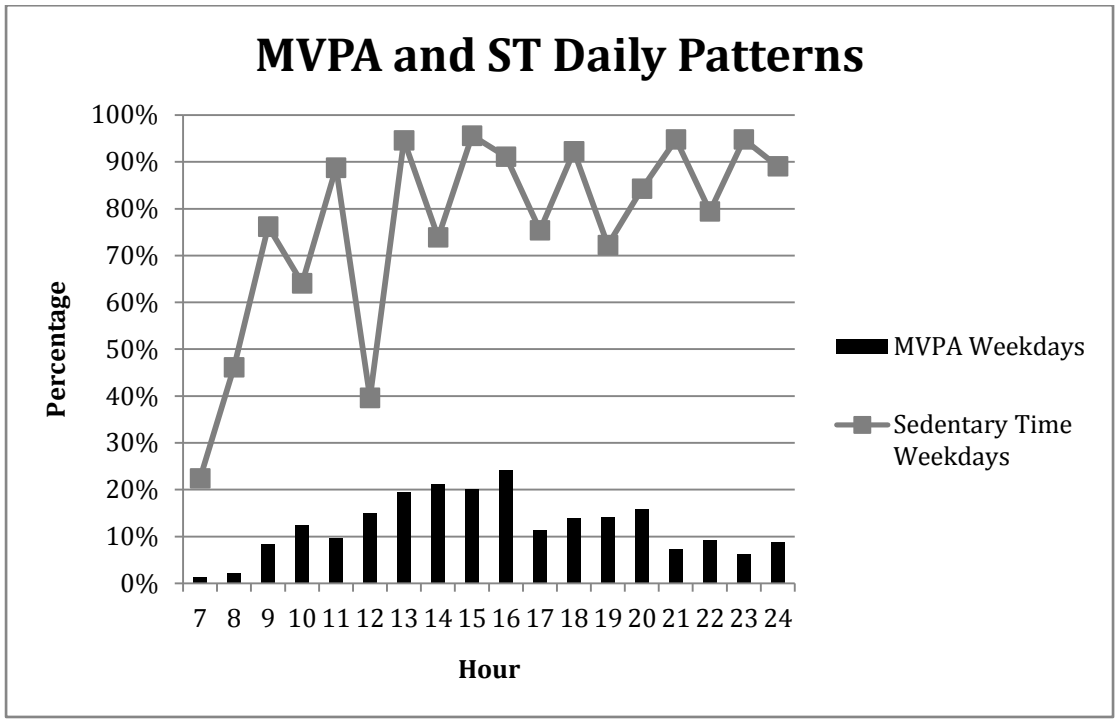

Figure 1a

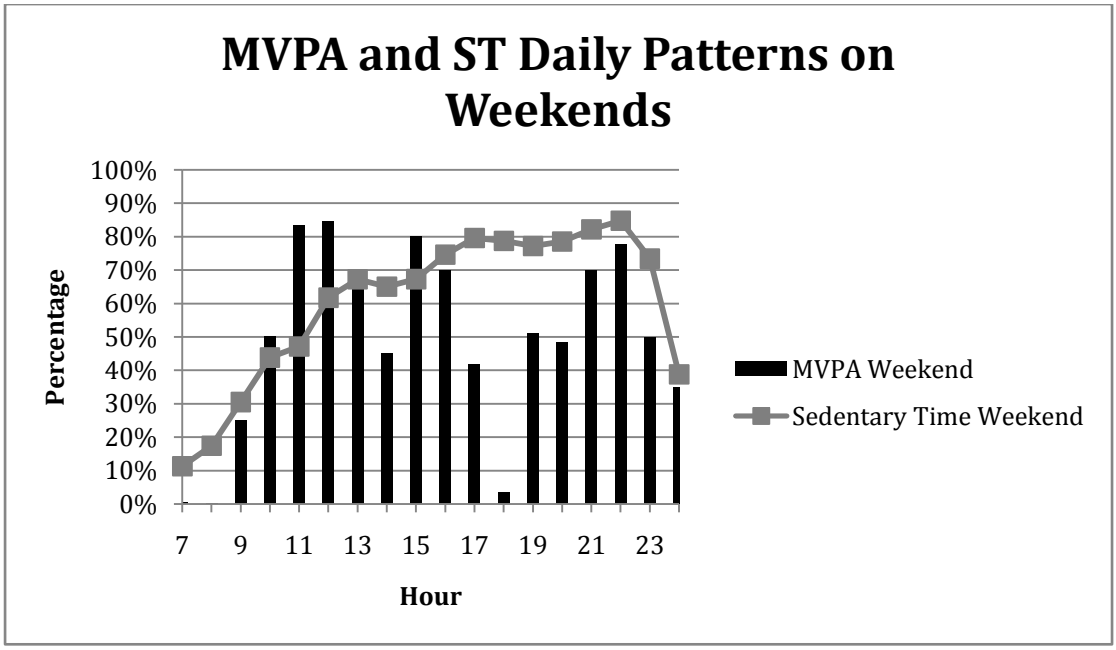

Figure 1b

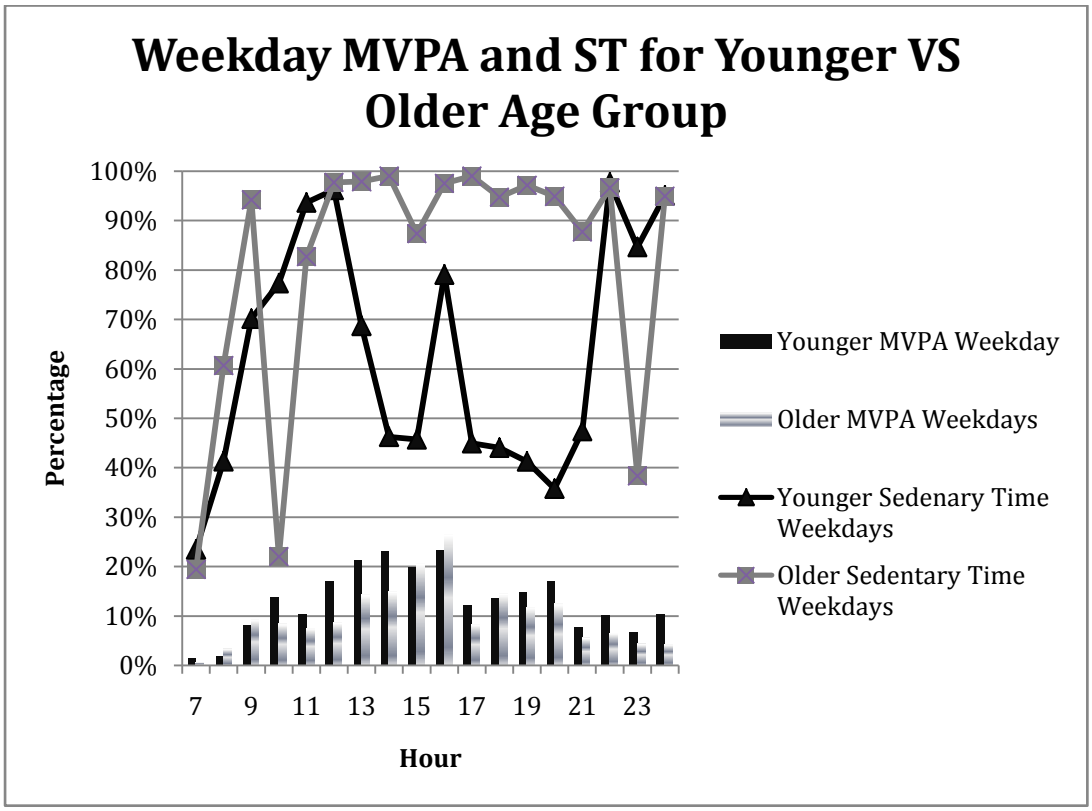

Figure 1c

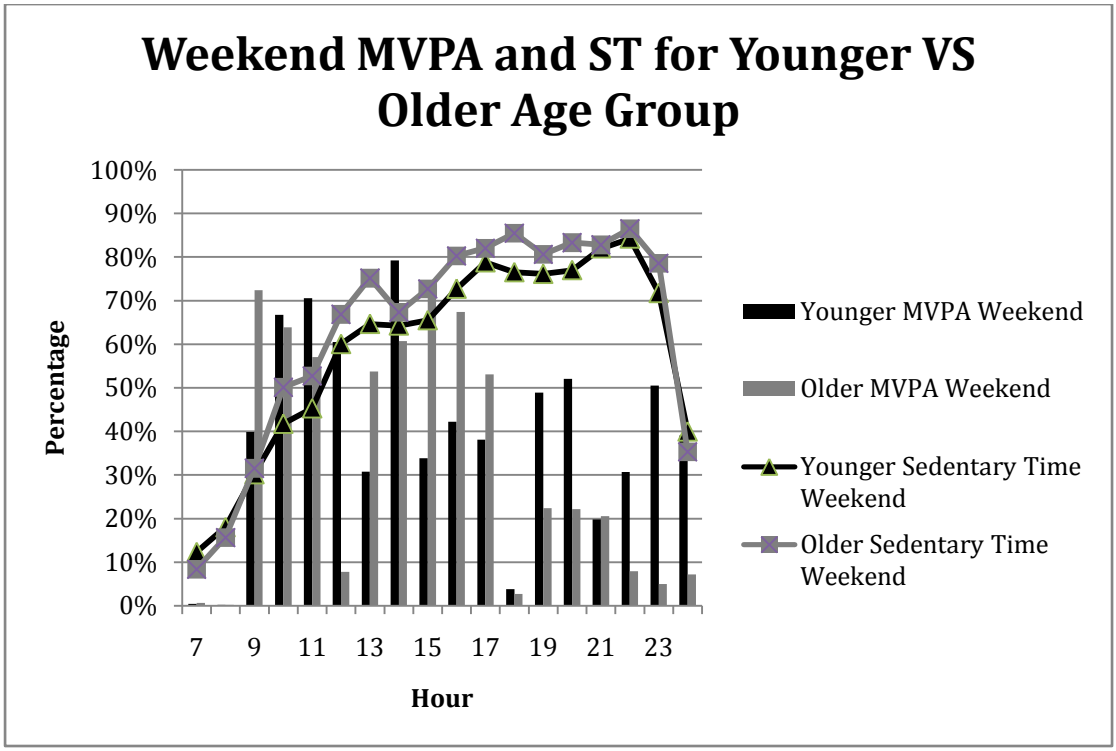

Figure 1d

5.5 Discussion

This study has reported the patterns of PA and ST and explored the socio-demographic predictors among SA women in the UK. In our sample the majority (90%) of women were classified as overweight or obese, ranked as being highly socioeconomically deprived (80.7%), and over half have been diagnosed with a chronic health problem (66.5%). Based on previous studies on SA women these results are to be expected and support the need for healthy lifestyle interventions among this group [12, 24]. While the mean daily MVPA for the total sample was 34.66±21.52 minutes, when activity was separated by age group, a significant difference was seen in mean daily MVPA, with older SA women engaging in an average of 16 minutes less MVPA than 18-64 year old women. The same age effect was not seen for ST, suggesting that age may not be an influencing factor on ST of SA women. In addition to an age effect, there was a BMI effect when controlling for age. Women who were normal weight engaged in significantly ($p<.001$) more MVPA than overweight and obese women and significantly less ST ($p<.001$). It is important to emphasise that only 12 (or 8.6%) of the total sample had a BMI value within the

normal range. The same BMI effect has been seen in other studies of SA women as well as in white European groups [6, 12]. In this study there was only one underweight woman. Her MVPA was significantly higher than the overweight and obese groups, although interpretation of this finding is not possible because of only one woman having a BMI value in the underweight category. The significant multiple regression models indicate that age and waist circumference were the strongest predictors of MPVA in this sample. The higher the age and waist circumference, the lower the MVPA. This model accounted for only 19% of the variability in MVPA and can be considered weak [3]. No significant regression models for ST may indicate a lack of pertinent predictor variables as measured in this study. In future studies it is recommended that psychosocial, environmental and cultural factors are measured and included for modelling.

It may appear from these results that SA women in the UK are particularly active, but when the PA data are examined in bouts of 10 minutes (recommended for health benefits), only 34.7% of the sample still met PA recommendations [11]. The only two other studies to objectively measure PA among SA women found similar rates of PA, although measurement was taken with other devices [13, 18]. These results are also similar to the general UK population of women. The HSE found that 71% of the general population of women in the UK did not meet PA recommendation [3]. These results indicate that the ethnic minority group of SA women in the UK do not differ greatly from other groups of women in the amount of PA they engage in. Conversely, a difference from the general population of UK women can be seen when looking at ST. In our sample women engaged in an average of 530 daily minutes of ST, while the HSE found that the general population of UK women engaged in584 minutes/day of sedentary time [3]. It may be the case that this sample of SA women is particularly less sedentary than other groups. A larger, random and representative sample needs to be measured to determine if this is the case.

Investigation of PA and ST patterns on weekdays and weekend days revealed statistically different daily averages for both measures. On weekdays participants engaged in an average of 8.5 more minutes of MVPA than on weekend days. On

weekends women accrued an average of 42.5 more minutes of ST per day than weekdays. This change in weekend and weekday activity has been shown in other accelerometer studies on adults [6] although these studies have not investigated ethnic minority PA/ST weekly patterns. Hourly patterns of MVPA indicate that SA women are engaging in higher levels of MVPA before and after meal times during the day. When not engaging in MVPA women are either sedentary or engaging in light intensity activities. Older and younger women engaged in a similar percentage of ST on the weekends, while during the week younger women were less sedentary. This may indicate that younger women have more barriers, fewer reasons or less motivation to engage in PA on weekends. These data also indicate that some these participants are active during less common times of day; this likely reflects their extended waking hours, which allow them to accommodate the diverse work schedules of their husbands or other male family members. More research is needed to investigate the reasons for such a drastic change in activity level between weekdays and weekend days, and to provide a more in-depth exploration of patterns of activity throughout a 24-hour period.

This study offers valuable insights into PA and ST patterns in SA women in the UK, but there are several limitations. Firstly, the cross-sectional and non-randomized design of this study limits generalisability. Many determinants, moderators and mediators of PA and ST such as psychosocial, environmental and cultural factors were not assessed. These may be critical to understanding and predicting PA and ST patterns among SA women. The non-randomised nature of this study may have resulted in a sample that is especially active and less sedentary than the general population of SA women in the UK. Additionally, a more diverse sample of socio-economic backgrounds may yield different results. This study benefits from several valuable strengths. Although it included a relatively small convenience sample, it is the largest sample to date that has objectively measured PA and ST among SA women, a traditionally hard-to-reach ethnic minority group. The use of accelerometry to quantify PA and ST is especially important since self-report measures have been found to be problematic when used with culturally and linguistically diverse groups [14, 22].

5.6 Conclusion

This study provides objectively measured PA and ST data and patterns in a cross-sectional sample of SA women in the UK. Data show that overall only 34.7% of participants met PA recommendations when MVPA was accumulated in bouts of 10 minutes. This has important implications for future interventions aimed that this group. These interventions will need to stress the importance of accumulating MVPA in bouts of 10 minutes or more to obtain health benefits. This sample of SA women appears to be less sedentary than UK women in general. Future research with larger, representative samples is needed in order to gain a clearer picture of ST among SA women and the behaviours that they may be engaging in during that time. The addition of psychosocial, environmental and cultural factors would increase our understanding of the influences on PA and ST in this group of ethnic minority women. Finally, this study explored daily patterns of PA and ST by weekday and weekend days. Understanding of these patterns of activity is important to implementing interventions and health promotion strategies among SA women in the UK.

5.7 References

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CHAPTER 6

A QUALITATIVE EXAMINATION OF PHYSICAL ACTIVITY AND SEDENTARY TIME AMONG SOUTH ASIAN WOMEN IN THE UK

6.1 Abstract

Introduction: Limited previous research has found that many South Asian (SA) women in the United Kingdom (UK) are not participating in recommended levels of physical activity (PA) and may be highly sedentary. However there is very little published research on SA women's understanding and experiences of PA and sedentary time (ST), and the context and conditions in which they occur. Therefore the aim of this study is to use semi-structured interviews to explore the shared experiences of SA women in the UK in relation to PA and ST, and compare their perceived levels to objectively measured data. **Methods:** Twenty-four SA women from a larger PA study (Chapters 4 &5) were purposively sampled based on BMI category, English language ability, PA, level and ST level, to participate in a semi-structured interview. Demographic, anthropometric, and objectively measured PA/ST data were collected from this sample during the larger study. Interviews were transcribed verbatim and analysed using directed content analysis. **Results:**The mean age of the sample was 52.8±10.1 years, mean Body Mass Index (BMI) was 28.44±6.1 kg/m^2, mean objectively measured moderate-to-vigorous- PA (MVPA) was 34.66±21.52 minutes per day and mean objectively measured ST was 553.2±59.4 minutes per day. The most notable themes identified in the analysis were the conceptualisation of PA as "keeping busy" or "being healthy", conceptualisation of ST as "lazy" or "resting on old age", limited time and information from health professionals on PA/ST as a barrier,few women reporting being sedentary and most women believing they were physically active because they were busy doing household activities. A comparison of perceived PA/ST and objectively measured PA/ST revealed that many women were not as active as they perceived and many were unable to recall duration of ST, making comparisons with objective data difficult. **Discussion:** Findings from this study indicate that SA women may

conceptualise PA as keeping busy in their everyday lives. This indicates that they may not see a benefit or need for any further PA. Health promotion and interventions might focus on increasing intensity levels of current activity (e.g., housework). These findings also support those from previous work in this thesis (Chapter 4) that self-report methods of measuring PA and ST may no be accurate as accurate as objectively measured PA/ST.

6.2 Background

It has been established in the literature (Chapters 2&3) and the findings of the previous studies in this research project (Chapters 4&5) that the majority SA women in the UK do not engage in the recommended level of PAfor health benefits and that they spend a majority of their day in ST. Despite the growing number of studies examining self-reported activity levels of this group, very little is known about SA women's understanding and experience of PA and ST, and the context and conditions in which they occur [1].

The systematic review in Chapter 3 highlighted that there were only 12 qualitative studies that investigated PA among SA women and none investigated ST [1]. The major themes emerging from the systematic review were knowledge of PA and its benefits, barriers to PA participation, and facilitators to PA participation. None of these studies focused on the understanding and experiences that SA woman had of PA and ST, and very few investigated their perceived levels of PA and ST. In fact, the limited knowledge that is available on SA women in this area is based upon studies providing little information on translation and the interview process, minimal information on how themes and codes were chosen for the analyses, and only three studies reporting using a theoretical framework to underpin their studies [1]. Moreover, these qualitative studies have produced seemingly contradictory evidence on SA women's activity. For example, it was reported in four studies in which participants were asked if they are able to participate in PA that they were not able to participate [7,10,16,19]. In contrast, one study reported that most participants reported engaging in some PA [18]. The lack of information about recruitment, methods, and analyses makes it difficult to put these findings into context.

It is apparent from the limited and inconclusive current evidence on SA women's PA and ST there is little knowledge about the levels of PA and ST among SA women, and that further efforts must be made to understand their experiences and subsequently to use this information in the development of tailored interventions to increase PA and decrease ST. Therefore, the aim of this study is to use semi-structured interviews to explore the shared experiences of SA women in the UK in relation to PA and ST. This study will answer the following research questions (Chapter 1):

RQ2. How much and what types of PA do UK Bangladeshi and Pakistani women participate in?

RQ3. Are self-report methods comparable to objective methods of measuring PA and ST?

RQ4. What conditions promote participation in PA, and what are the key barriers to increasing PA and reducing ST?

RQ5. What strategies can be used to increase PA and decrease ST in this population?

RQ6. In what ways can policy makers and public health professionals engage with culturally diverse groups to increase PA and decrease ST in an effort to reduce health inequalities?

6.3 Theoretical Framework

A phenomenological approach was used to conceptualise, develop, and implement all stages of this study. This approach focuses on the shared experiences of a group and asks the researcher to interpret the meanings of those shared experiences [6]. The shared experience of being a SA woman in the UK was the phenomenon explored in relation to PA and ST. Within this approach an ecological model of PA and ST has been applied as the starting point to organise and understand the internal and external

influences on PA and ST (Chapter 2, Figure 2.3). This ecological model recognises that determinants of PA and ST behaviours are the result of interactions between personal experiences as well as the social and environmental contexts in which people live [3,13]. This model, in addition to the literature review and aims of the research, helped to inform the development of the semi-structured interview questions.

6.4 Methods

This section describes the methods employed in the qualitative phase of the research.

Participants and Recruitment

Participants were recruited from a larger study conducted in Cardiff, Wales (Chapters 4&5) on PA and ST among SA women in the UK. 24 women were purposively sampled from 140 women in the larger study based on BMI category (normal, overweight, and obese), English language ability (fluent/not fluent), PA level (low, medium and high) and ST level (low and high). Demographic and anthropometric data were collected from this sub-sample of women from the first phase of the study (Chapter 3). This included height, weight, waist circumference, body fat percentage, and postcode to determine Index of Multiple Deprivation (IMD) ranking. Accelerometer data for objective measures of PA and ST were also collected at that time. There was overlap in the various categories into which the women fit. For example, most of the sample was obese, therefore many obese women were also chosen based on their activity levels, ST level and language ability.

Instrument

Interview questions were developed based on the aims of the research, a literature review, and the theoretical framework. The interview guide consisted of 15 questions, with 6 of those having additional probing questions. The interview guide was in English but was orally translated as needed by trained community worker interpreters

into Sylheti, Bangla, Urdu, or Punjabi. To verify accuracy of translation, interpreters back translated 5 interviews from recordings.

Data Collection

Interviews were conducted in participants' homes or community centres based on their personal preference. While in private homes, the interviewer (WSB) and a translator, if needed, were the only people present other than the respondent to ensure privacy. While in community centres, a private room was used and the researcher and interpreter were the only individuals present with the participant. Respondents were asked whether they were comfortable participating in the interview in English or another language (e.g. Sylheti, Bangla, Urdu, Punjabi). If necessary an interpreter was available for translation during the interviews. Some women expressed worry that while they were fluent speaking English, they might not understand all the questions. An interpreter was present during these interviews and assisted when a participant needed clarification at any time. Participants gave verbal and written informed consent. All interviews were audio recorded with permission from the participants. Ethical approval for this study was obtained from the University Ethical Review Committee of the University of Birmingham (reference # ERN_12-1316).

Data Analysis

Data handling and analysis of objective data were discussed in Chapters 4&5. All audio recordings of interviews were transcribed verbatim for analysis by a researcher (WSB) and then checked for accuracy by a research assistant. Direct content analysis was used as a systematic method of analysing the interview transcripts. This method of qualitative data analysis is used when there is some existing prior research on a phenomenon [17]. In this case there is previous research in determinants of PA/ST and some research on beliefs and attitudes of PA/ST among SA women [1,4,26]. Existing research has helped to focus the research questions, design the study, create the interview guide, as well as choose the method of analysis. Key concepts and themes were identified when developing the interview guide and these were used to create initial coding categories for analysis. Data from all interview transcripts were

coded using initial categories by WSB. A second researcher (JLT) coded 25% (n=6) to check for agreement in coding. Any data that could not be coded using the original coding categories were identified and analysed to determine if they were to be classified as a new category. A final coding matrix was then developed and all data reviewed again and coded based on the final categories and subcategories (Tables 6.1-6.9).

Table 6.1: Categorisation Matrix-Category 1 - How do SA women conceptualise and contextualise ST?

	Resting	Being Lazy	Sitting a lot	Do not know what ST is	Duties as a housewife	ST Not healthy
How do SA women conceptualise and contextualise ST?	• Taking it easy • Mostly in evening when feel deserve a rest after long day	• Being a "lady of leisure" • Not keeping busy • Not doing one's own housework • Becoming a grandmother by age 40 and then having daughters serve them • A lot of this in the community	• Not moving around much • Sitting and eating • Get too tired and having to sit	• Asked for explanation of what ST is	• Little time for sitting • Want to relax after long day of housework	• Increases diseases such as diabetes • Makes you fat or obese • Leads to depression • Causes limb pain

Table 6.2: Categorisation Matrix-Category 2 - How do SA women conceptualise and contextualise PA/exercise?

	PA is…	Exercise is…	Healthy	Helps Maintain independence	How much is recommended
How do SA women conceptualise and contextualise PA/exercise?	• Walking • Keeping busy • Housework • Daily activities • Do not have to go to the gym • Move around • Exercise • Doing aerobics • Going to the gym • Yoga	• Walking • Swimming • Means working harder than during PA • Must follow a routine • Going to the gym • Doing aerobics • Extra effort • Yoga • Housework • Keeping busy	• Keeps illness away • Helps with depression • Helps to lose weight • Promotes healthy joints • Helps one to relax and relieve stress	• Enjoy life without depending on others for help • Do what you want without experiencing pain • Keeps body from being stiff	• Do not know how much to do • Must do at least 1 hour per day • Walk until too tired and then sit down

Table 6.3: Categorisation Matrix-Category 3 - What do SA women experience as barriers to PA/exercise?

	Barriers Ascribed to Oneself	Barriers Ascribed to Others

What do SA women experience as barriers to PA/exercise?	• Individual
	  ○ Health problems, illness, injury
	  ○ Lack of motivation, depression
	  ○ Laziness
	  ○ Think they can't do it
	  ○ Do not like PA
	  ○ Do not want to do PA
	  ○ Poor English skills
	  ○ Can't drive or do not have bus pass
	• Social
	  ○ Become mother-in-law and stop moving as much
	  ○ Lack of money for activities
	  ○ Want to do PA with other women
	  ○ Need encouragement of others
	• Environmental
	  ○ No equipment at home
		• Social
		  ○ Family caring responsibilities
		  ○ Only mixed sex classes on offer
		  ○ Must rely on others for transport
		  ○ Family pressure to prioritise housework over PA
		  ○ Swimming times conflict with prayer times
		  ○ Daughters do everything for mums
		• Environmental
		  ○ Poor weather conditions
		  ○ No activities available in neighbourhood
		• Policy
		  ○ Gyms are expensive
		  ○ Classes too far away or too crowded
		  ○ No guidance from GP
		  ○ Swimming times conflict with prayer times

Table 6.4: Categorisation Matrix-Category 4 - What do SA women experience as enablers to PA/exercise?

	Enablers Ascribed to Oneself	Enablers Ascribed to Others

What do SA women experience as enablers to PA/exercise?	• Individual
	  ○ Prefer walking
	  ○ Having money
	  ○ Being independent
	  ○ Knowing where activities are
	  ○ Must be fun
	  ○ Learning/speaking English
	  ○ Gradually learning and trying activities
	  ○ Doing short bouts of activity
	  ○ Ability to drive
	• Social
	  ○ Want to engage in social activity
	  ○ Need/receive encouragement for motivation
	  ○ Walk to meet friends or run errands
	  ○ Model their own behaviour after another in the community
	  ○ Like to get away from the house
	  ○ Tell daughters to let them do more
	  ○ Have more free time on weekends
	• Environmental
		• Social
		  ○ Walk w/ family member (often daughter)
		  ○ Friends make getting out better and more fun
		  ○ Younger people educate older ladies to be more active
		  ○ Get children active early
		  ○ Word of mouth best for getting information out
		• Environmental
		  ○ Parks and gyms close by
		  ○ Nice weather
		• Policy
		  ○ Gym discounts
		  ○ Ladies only swimming and activity classes
		  ○ GPs to give more advice and longer consultations
		  ○ Offer more activity groups
		  ○ Provide incentive such as money or trip away for activity
		  ○ Government should give

	○ Like to exercise in the house	more money for groups ○ Conduct health checks at community centres

Table 6.5: Categorisation Matrix-Category 5 - What do SA women experience as barriers to ST?

	Barriers Ascribed to Oneself	Barriers Ascribed to Others
What do SA women experience as barriers to ST?	• Motivation to be healthier • Guilt for sitting and not doing housework • No time for ST	• Family obligations keep women housebound • Judgment from others in the community

Table 6.6: Categorisation Matrix-Category 6 - What do SA women experience as enablers to ST?

	Enablers Ascribed to Oneself	Enablers Ascribed to Others
What do SA women experience as enablers to ST?	• Too tired • Watching TV • Reading • Wake up very early in morning • Health problems or injuries • Bored in the evenings • They have done their job and can now relax as getting older • Habit • A means to enjoy life	• Family obligation • Hours spent sitting and praying or reading Holy Koran • Winter • Visit w/ friends/family • Daughter-in-laws help promote being sedentary and waited upon

Table 6.7: Categorisation Matrix-Category 7 - What knowledge and awareness do SA women have about the benefits of PA and exercise?

	PA only	Exercise only	No distinction
What knowledge and awareness do SA women have about the benefits of PA and exercise?	• Helps with weight loss • Maintains independence • Good for mental and emotional health	• Leads to fewer health problems • Relaxing • Good for joints • Makes you feel less tired	• Good for health ○ Diabetes, cholesterol, blood pressure • Makes you feel better • Walking is the best for health

Table 6.8: Categorisation Matrix-Category 8 - What knowledge and awareness do SA women have about the risk of being inactive and sedentary?

	Inactive	Being sedentary
What knowledge and awareness do SA women have about the risk of being inactive and sedentary?	• None	• Bad for health • Leads to obesity • Leads to illness and disease • Makes you tired • Causes stiffness or pain • Leads to depression

Table 6.9: Categorisation Matrix-Category 9 - How do SA women recall their own PA (or recall PA nostalgically)?

	Current PA	Previous PA
How do SA women recall their own PA (or recall PA nostalgically)?	• Want to be active • Try to walk and take classes • Swimming	• Stopped being active due to injury or illness • Gym too expensive • No classes available so had to stop • Currently too busy to be physically active • More active in the summertime than winter • Many times would state they are active, but when queried further admitted that they USED to be active but are not currently engaging in physical activity or exercise

6.5 Results

The individual characteristics of interviewees and results from the interviews are reported in this section.

Sample Characteristics

Demographic, anthropometric and objectively measured PA and ST data for each participant are reported in Table 6.10. The mean age of the total sample was 52.8±10.1 years, the mean BMI was 28.44±6.1 kg/m^2, the mean body fat percentage was 49.3±17.7%, and the mean waist circumference was 98.8±13.0 cm. This sample of women engaged in an average of 553.2±59.4 minutes of ST per day and 34.66±21.52 of MVPA per day. 20.8% (n=5) of the sample reported themselves as not fluent in English, and only 8% (n=2) were found to have a BMI value that could be categorised as normal BMI based on the World Health Organisation (WHO) cut points for SAs [25]. All women in this study were highest two IMD quintiles based on the Welsh IMD rankings, indicating relatively high levels of deprivation [20].

Table 6.10: Sample Characteristics for 24 Bangladeshi and Pakistani women who participated in in-depth interviews.

[1]Ethnicity, Age	BMI Category[*]	Body Fat %	Waist Circumference[+]	IMD Quintile[++]	Language Ability[+++]	Mean MVPA/Day[#]	Mean ST/Day[#]
(A) Pakistani, 56	Obese	61.06	Unhealthy	1	1	20.07	567.11
(B) Pakistani, 38	Obese	49.64	Unhealthy	2	1	12.45	678.9
(C) Bangladeshi, 52	Obese	53.45	Unhealthy	2	1	64.43	487.36
(D) Pakistani, 54	Obese	51.31	Unhealthy	2	1	16.86	603.27
(E) Bangladeshi, 55	Obese	51.63	Unhealthy	2	1	14.32	605.36
(F) Pakistani, 55	Obese	56.7	Unhealthy	1	2	11.50	565.6
(G) Bangladeshi, 63	Overweight	49.48	Unhealthy	2	1	46.42	437.43
(H) Pakistani, 56	Obese	58.08	Unhealthy	2	1	30.90	467.39
(I) Pakistani, 66	Obese	53	Unhealthy	2	1	32.96	531.52
(J) Bangladeshi, 67	Obese	61.5	Unhealthy	2	1	7.87	468.00
(K) Pakistani, 58	Overweight	49.51	Unhealthy	2	1	6.80	475.21
(L) Pakistani, 60	Obese	56.93	Unhealthy	2	1	37.00	483.2
(M) Pakistani, 58	Obese	55.76	Unhealthy	1	1	32.54	499.51
(N) Bangladeshi, 46	Obese	56.66	Unhealthy	1	2	6.32	643.26
(O) Bangladeshi, 38	Obese	54.54	Unhealthy	2	1	6.50	616.08
(P) Pakistani, 52	Obese	55.23	Unhealthy	1	1	26.45	557.34
(Q) Bangladeshi, 62	Obese	57.29	Unhealthy	1	1	17.11	492.34
(R) Pakistani, 61	Overweight	48.61	Unhealthy	2	1	25.32	567.83

(S) Bangladeshi, 36	Obese	57.06	Unhealthy	1	1	9.93	642.27
(T) Bangladeshi, 61	Obese	54.67	Unhealthy	1	1	22.43	563.12
(U) Pakistani, 60	Obese	53.26	Unhealthy	1	1	19.67	598.93
(V) Pakistani, 39	Obese	57.1	Unhealthy	2	2	20.67	533.8
(W)Bangladeshi, 38	Normal	40.56	Healthy	2	2	8.33	622.64
(X) Bangladeshi, 36	Normal	41.23	Healthy	2	2	10.58	602.39

[1] Participant identification code, [*]BMI categories as defined by the WHO [25]; [+]Healthy waist circumference ≤80cm, unhealthy ≥81cm; [++]Based on IMD ranks for Wales [20]; [+++]1=Self-reported English fluency, 2=self-reported non-English fluency; [#]reported in minutes

Conceptualisation and Contextualisation: Physical Activity

Very often the terms PA and exercise are used interchangeably in the literature to indicate bodily movement above rest that results in energy expenditure [8]. Therefore interview questions began with asking if SA women would explain what each term meant to them before asking how much activity they engage in. Women conceptualised PA as keeping busy or just moving around a lot. This can be seen in the many references to being active through daily housework. As one 36 year-old Bangladeshi woman (S) described:

> "…Physically active to me means doing things. Being busy with life, housework, cooking, cleaning and going out and about."

The majority of women responded that walking was a form of PA and that they did not need to go to the gym to keep active. Some women also responded that being physically active meant to do exercise. Examples of this were going to the gym, doing aerobics, and taking yoga. Women conceptualised exercise similarly and used the terms PA and exercise interchangeably. Many responses included references to walking and housework, as with PA. Most structured activities such as aerobics, yoga, swimming and going to the gym were repeatedly mentioned as activities that would be considered as exercise. Some women had the belief that exercise required "extra effort" and would be "harder" than just PA. One Pakistani 52 year-old woman (P) explained:

> "Exercise probably means a bit more in depth, like doing a lot more…Whereas physical activities I just consider like, walking you know."

Another major theme was the idea that PA equates to being healthy. Nearly all women indicated that being physically active meant being healthy. Particularly, being active helped keep illnesses away, helped with depression, can lead to weight loss, maintained healthy joints and helped with stress relief. A 39 year-old Pakistani woman (V), when asked what she thought it meant to be physically active, commented that:

> "I think it's good to be active. It's good for your health. Um, otherwise you've got all these other illnesses that come along."

Similarly a 60 year-old Pakistani woman (L) responded that it meant:

> "Good health. Good mind. Help stay away from illnesses."

This was a common response from SA women when discussing concepts around PA and there always seemed to be an innate link between PA and health for them. Of particular importance was the idea that being physically active would help women maintain their independence and be free from relying on others to take care of them. One 46 year-old Bangladeshi woman (N) stated:

> "…you know, it's really important to keep yourself healthy because you've got to think as well…who's going to look after you?"

A 38 year-old Pakistani woman (B) also commented on keeping her independence:

> "Physically active [is] um, that we can do you know, um, all the work

and can enjoy our life you know, without other people's help."

Remaining free from pain and stiffness was a major concern for the older women who were interviewed. They expressed concern that they would not be able to enjoy doing the things they wanted to without staying active. For example, a 58 year-old Pakistani woman (K) said:

> "Physically active means whatever you want to do, you are able to do it without ah, feeling you're ah, you know, you're in pain or anything like that."

Conceptualisation and Contextualisation: Sedentary Time

The findings reported in Chapter 4 indicated that SA women may not fully understand the concept of being sedentary. Therefore the definition and concept of "sedentary" was explored before asking participants how much ST they engage in. Most women did not know what the word sedentary meant and required an explanation by the interviewer. Once defined, participants expressed the concept of being sedentary as falling into two main categories. Firstly, being sedentary was seen as resting or "taking it easy." Nearly all women who referred to being sedentary as resting commented on a sense of deserving a rest after a long and busy day. Many women wanted to relax after doing their housework. One 61 year-old Pakistani woman (R) said:

> "I have um, something…to do all the time. Either cleaning the house or like you know…Well in the evening I do take rest. I just um, I lay down and then I do nothing. But um, I think that I deserve [to rest] after the whole day."

Other women referred to being sedentary as being lazy. These women conceptualised being sedentary as not keeping busy, not keeping up with their housework and being a "lady of leisure." Importantly, both younger and older women remarked that after a woman becomes a grandmother (around the age of 40 years), she becomes very sedentary and stop doing things for herself. This was said to be a widespread phenomenon in the community. The daughter-in-law was identified as being primarily responsible for taking care of the older woman and what used to be her household duties. One older (60 year-old) Pakistani woman (L) commented:

> "…problem becomes when woman becomes mother-in-law and come homes and that's it. It's my time to sit now. She [daughter-in-law] will do everything. It's her responsibility. I done my job. Even mother-in-law may still be in early forties. So that's where the thing goes wrong. Personally that's my view."

One younger (36 year old) Bangladeshi woman (X) agreed, but expresses difficulty in changing this cultural norm:

> "They [daughters-in-law] have to encourage their mother-in-law to do a little bit of housework. Um, I know like within Asian culture it's rude to ask somebody to do that."

Additionally, most women stated that being sedentary either exacerbated their current illnesses and injuries or could bring about new ones. Obesity, diabetes, depression, and limb pain were the most common conditions mentioned in interviews.

How much and what type of PA?

A total of 21 women reported being active. Of these women, 87.5% said that they did so by doing housework throughout the day. This included tasks such as cooking, cleaning, hoovering, and ironing. None of these women gave a specific amount of time spent on housework, but broadly indicated that it was done throughout the day and in between prayer times and eating times. Even those who did not report currently being active also said that doing more housework would keep them active. Younger women who were not yet grandmothers reported that they were able to stay active because they were busy taking care of their children in addition to housework. One 38 year-old Bangladeshi woman (O) recounted her busy day:

> "Ok. I wake up in the morning and get the kids ready, make their breakfasts. Um, then when I take them school, come back home, clean the house, do the cooking. Um, after that you know, when the cooking is done, by that time the kids are home. I pick 'em up. I drop them off. I pick them up. Getting them ready again to go to the mosque. Feeding them. And then when it's evening time um, when they're in the mosque, the little ones are there so I'm either doing ironing, or something, I'll be doing. Just to get all the housework out of the way. I'll be doing that. And um, and when the kids come home, bedtime, getting them ready, bathing them and bedtime. And um, in the mornings, sorry sometimes when I don't have housework and um, I don't have um, what's it called, um, cooking to do then I'll do my business. Sit down and do some calls. So I am active every day. I don't, it's only when the kids go to the mosque, I think that's when I have a little bit of time to myself. And when they go to bed I'm like too tired now and I want to go to bed (laughs)."

Many women reported similar daily schedules and reported this pattern of being busy as being physically active.

Taking care of children was not the only source of activity for women; 29.2% (n=7) of women reported being active through caring for another family member. This often included a mother-in-law, father-in-law, or grandchildren. One 52 year-old Pakistani woman (P) spoke about her many responsibilities:

> "I'm a housewife. So busy in the home.Because we are Asian, Pakistani. I have 3 sons grown up. And um, husband has not been very well. He was engineer but he can't work because he's so ill. Um, and I have a mother-in-law. Ya, she's old. She's over 70. My father-in-law passed away about 7 year ago so then I look after my mother-in-law. And my children, my husband."

Eight (33.3%) of the women interviewed reported that they currently walk for PA. Only three women were able to recall how for the length of time they walked. One woman reported walking for 15-20 minutes per day, one stated she walked for at least 45 minutes per day, and another stated she walked for 1 hour per day. Four women reported that they were active when they went shopping during the day, but did not report the length of time for this activity or how many days per week they engaged in shopping. Four women cited group classes as another popular way of staying active. These classes included Extend (seated or standing light exercise class), Zumba (or other dance class), and yoga. One 36 year-old Bangladeshi woman (S) recalled:

> "…with my friends whenever, every week we get together. So after our chit chat, food and everything we do …at least we do Zumba. That could be sometimes two, three times a week."

None reported the duration of the classes, although based on this researcher's observations of classes held in community centres in the area, these classes typically last for approximately 1 hour. One woman stated that she took a class 2 days per week, while the others did not specify frequency. Three women recalled that they

went to the gym to stay active, although none specified what types of activities they engaged in at the gym. One woman, the same woman who recalled 2 days of group classes, reported 1 day per week of going to the gym.

Results from objective measurements (reported in Chapters 4&5) indicated that on average, the entire sample of women did not achieve the recommended levels of MVPA (30 minutes on most days in bouts of at least 10 minutes). Mean MVPA was 34.66±21.52. This should be cautiously interpreted due to the small sample size and some women with very high levels of MVPA, which drove up the mean. The amount of MVPA engaged in for the individuals who were interviewed are reported in Table 6.10. A total of 5 women (20.8%) achieved an average of 30 minutes or more MVPA per day, with 3 women achieving the recommendation of at least 30 minutes per day being done in 10-minute bouts. Thirteen (54.2%) of the women interviewed were unable to achieve 20 minutes or more of MVPA per day.

How much and what type of ST?

Few women reported that they were sedentary. The favoured activity of the women who did report being sedentary was watching television. This reportedly most commonly takes place in the evenings, after dinnertime. Few participants reported how long they watched television per day. One 38 year-old Bangladeshi woman (W) describes why television may be so attractive to SA women:

> "…these days um, everybody, every community has their own channel [referring to South Asian TV channels in native languages]. Which means they are being lazy. Because um, there's no um, language barrier and they just watch their language channels. They understand them. They enjoy it. So that means um, after lunch or after… they just sit there and um, as a family and watch TV. Which is again, not good."

Other popular activities done while sedentary were reading and attending prayer groups with friends. During these times women were engaging in religious readings or prayer by themselves or with friends. Women did not report the duration of these activities but broadly indicated that they were afternoons away from the home or during quiet times in the evenings.

Results from objective measures conducted with this sample (Chapters 4&5) indicate that on average this sample of women engaged in 553.2±59.4 minutes of ST per day. Individual results for the women who participated in the interviews are reported in Table 6.10. Women with the highest accumulation of ST were in their 30's or 40's, while women with the lowest amount of ST were in their 50's and 60's.

Perceived vs. Objectively Measured PA and ST

In this section, a comparison is made between objectively measured PA and ST, and the reported perceptions of engagement in PA and ST from the interviews.

Physical Activity

21 of the women who were interviewed reported being active throughout the day by keeping busy doing housework. Since MVPA is a benchmark for activity for health benefits, a comparison was made between reported activity with objectively measured MVPA. Figure 6.1 shows the mean daily objective MVPA data for the total sample. The data show that during the time periods from 7:00-9:00, 13:00-14:00, and 18:00-19.00, women are the most active. The hour from 18:00-19:00 is the only time throughout the day when women reached the goal of at least 30 minutes of MVPA for health benefits. When objective data are examined for accumulation of light intensity activity, there is some indication that women are engaging in some light intensity PA throughout the day. Light intensity PA was accumulated at an average of nearly 10-15 minutes of every hour from 9:00-18:00 (Figure 6.2). This light intensity PA may reflect women's engagement in housework activities throughout their day.

Figure 6.1: Mean Daily MVPA for Total Sample

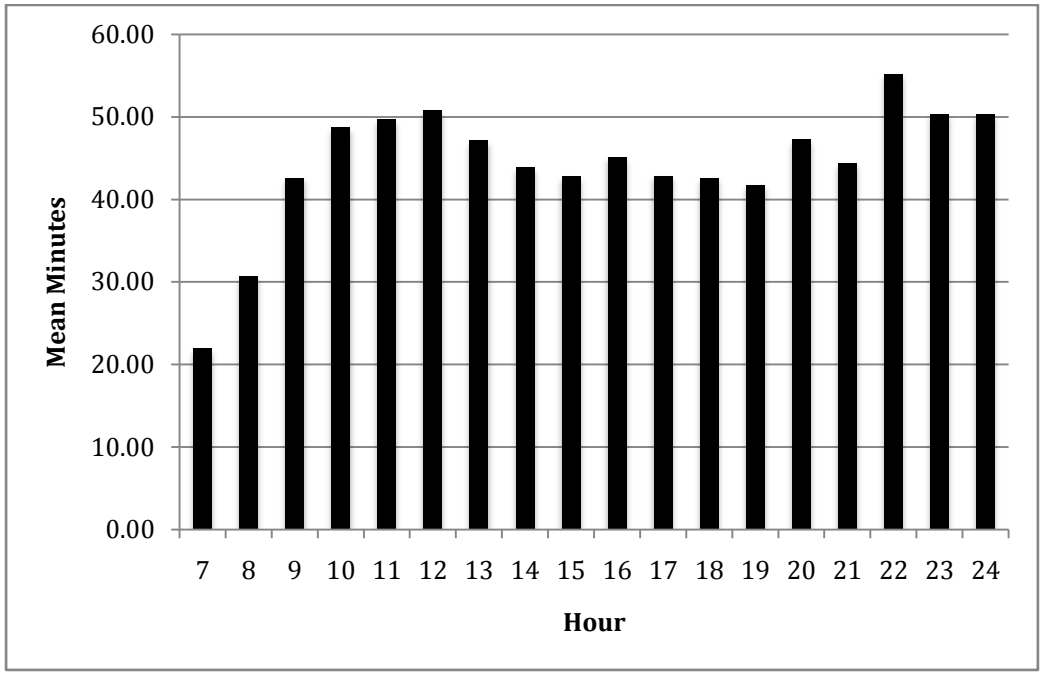
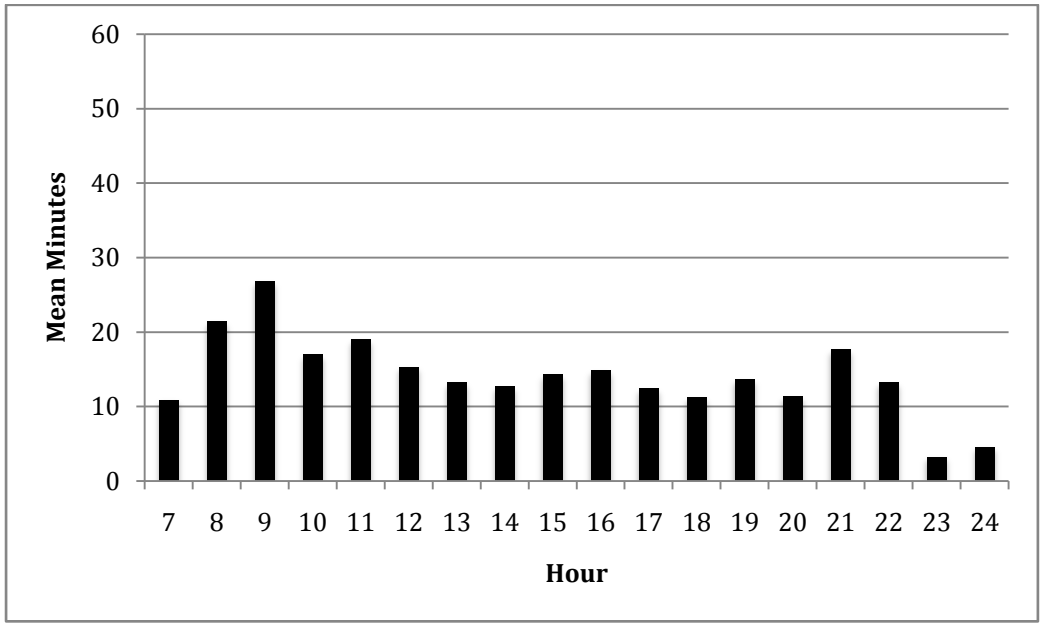


Figure 6.2: Light Intensity PA for Total Sample

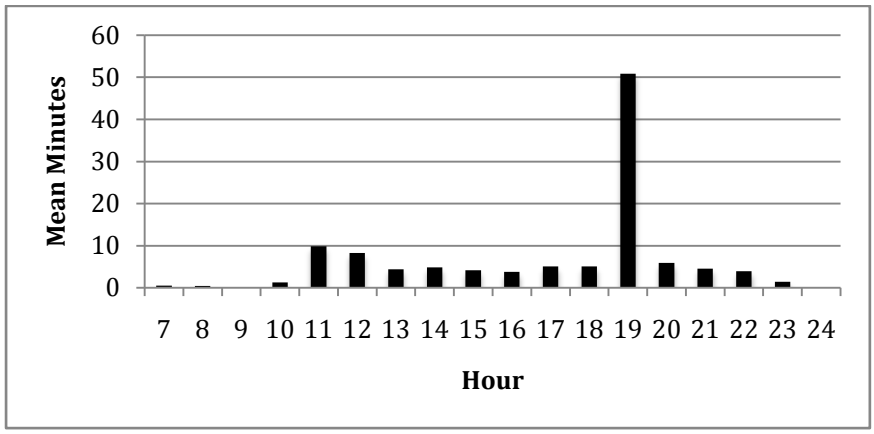


Individual results of objectively measured MVPA for interviewees who reported duration of walking can be seen in Figure 3a-c. Participant (C) reported walking for an hour per day. As can be seen from her objective data (Figure 6.3a), she achieved

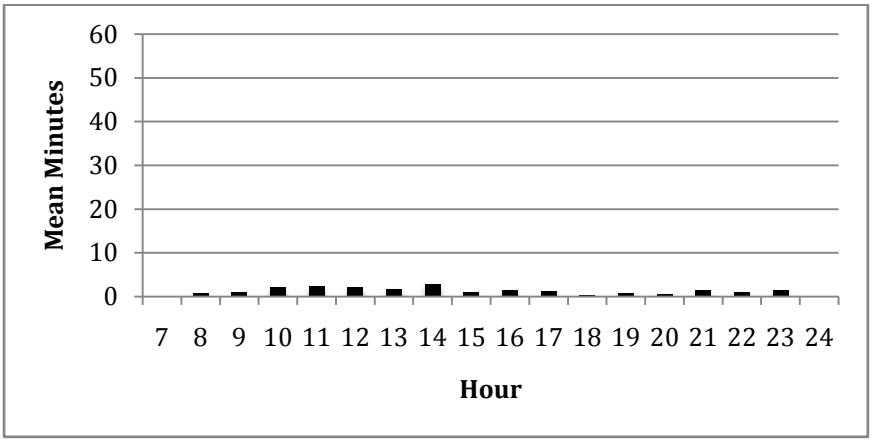
50 minutes of MVPA in the hour from 19:00-20:00. For the rest of the day she accrued minimal MVPA and had only one hour in which she accumulated MVPA in at least 10-minute bouts. Participant (C)'s perceived levels of PA were nearly the same as her objectively measured PA. Participant (O) reported taking 45-minute walks on most days, but her objectively measured MVPA (Figure 6.3b) did not accrue above 3 minutes at any point in her day. Her perceived levels of PA and her objectively measured levels were drastically different. Participant (D) reported engaging in 15-20 minutes of walking in the morning. Objectively measured MVPA for this participant (Figure 6.3c) indicates that her perceived level of PA does match with her objectively measured MVPA. She engaged in nearly 16 mean minutes of MVPA in the hour from 9:00-10:00. Additionally, she accumulated just over 16 mean minutes of MVPA during the hour from 13:00-14:00. She also accumulated a mean 10-minute bout of MVPA from 3-4pm.

Figure 6.3: Individual Daily MVPA for Walkers

a) Participant (C)



b) Participant (O)



c) Participant (D)

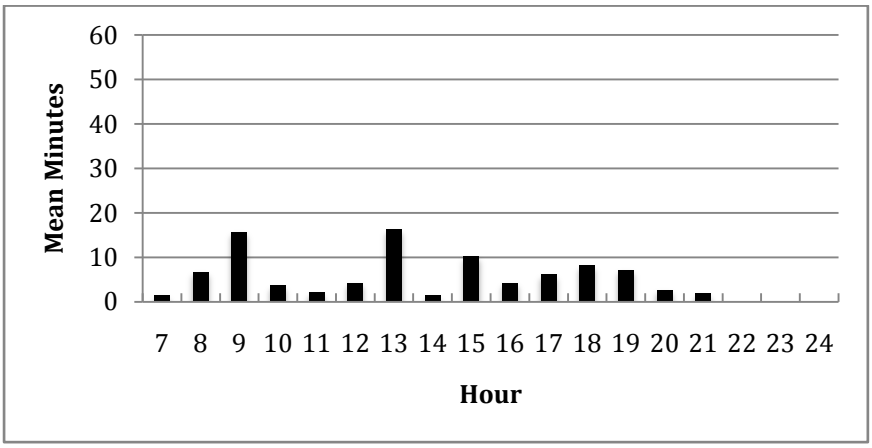
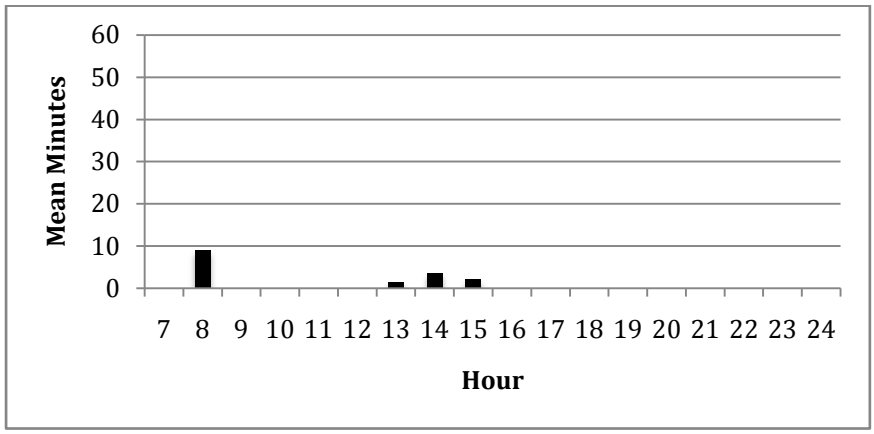


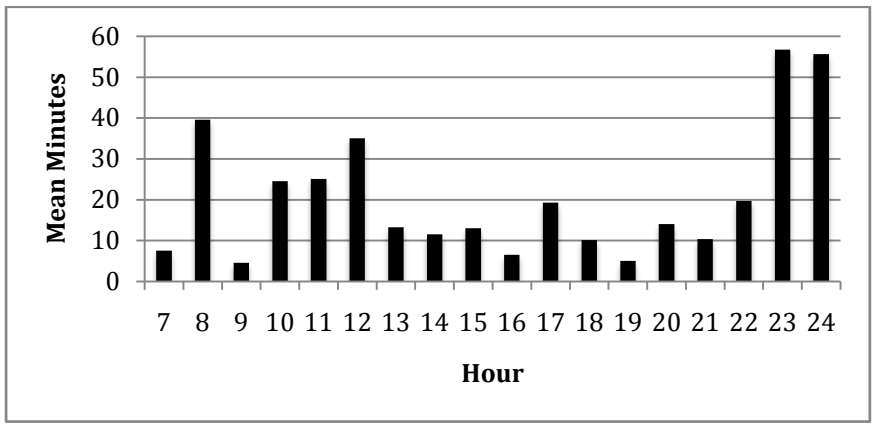
Figure 6.4a-c shows the results of objectively measured light intensity PA for participants C,D and O. Although Participant (O) did not accumulate 45 minutes of MVPA per day, she did accumulate over 30 minutes of might PA during the hours of 8:00-9:00 and 11:00-12:00 and 50 minutes of light PA during the hours of 22:00-00:00. While MVPA is the benchmark for health benefits from PA, Participant (O)'s perceived amount of PA was accurate when taking into account light intensity PA. Participant (D) engaged in bouts of at least 10 minutes of light PA throughout her day, indicating her perceived levels of PA do match her objectively measured levels when light intensity PA is taken into account.

Figure 6.4: Light Intensity PA for Walkers

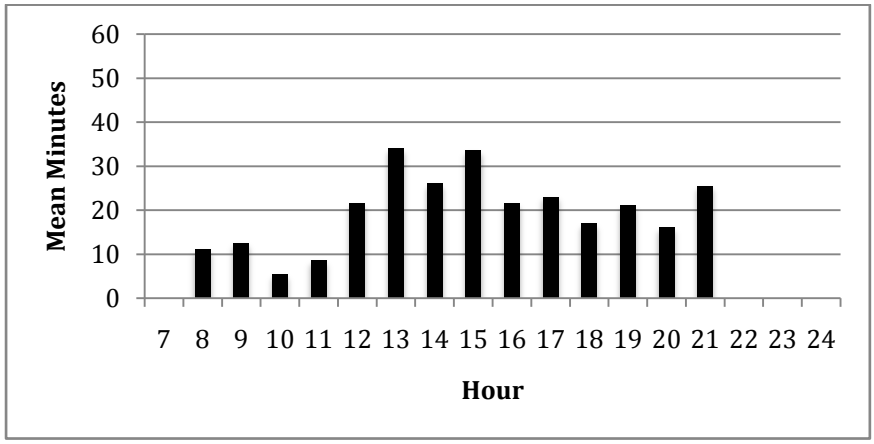
a) Participant (C)



b) Participant (O)



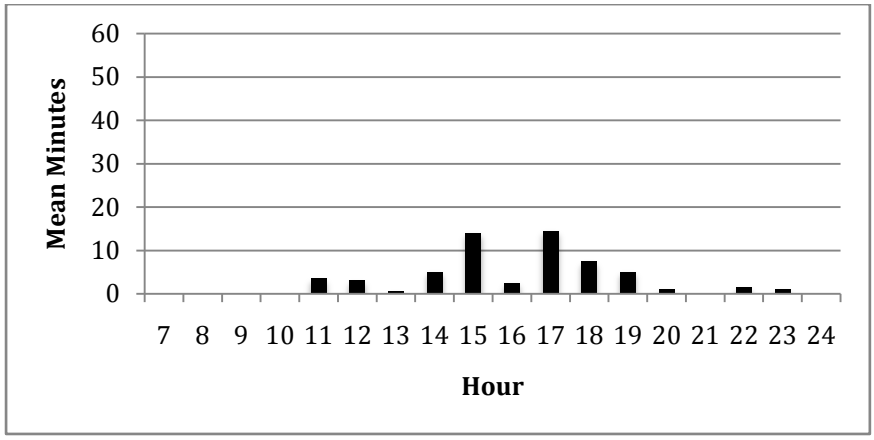
c) Participant (D)



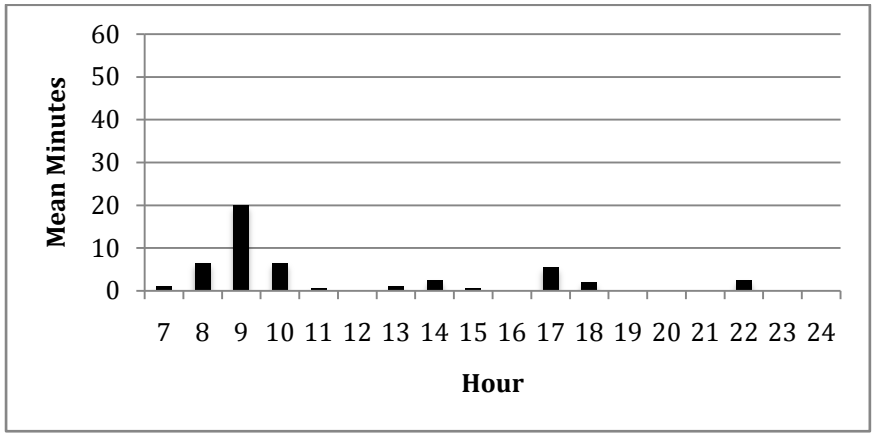
Objectively measured MVPA levels for the 3 women who reported that they engaged in group exercise or dance classes during the week are reported in Figure 6.5a-c. Participants (W) & (X) engaged in some MVPA during the mid-afternoon hours during the week. Since this accumulation does not approach 60 minutes, it can be inferred that women may not have participated in these classes during the week that activity was objectively measured, that the classes in which they participated did not constitute moderate or vigorous intensity activity levels, or that participants engaged at a lower intensity level during classes. Participant (V) engaged in an average of 20 minutes of MVPA around 9:00, but again this does not seem likely to be the length of a group exercise class or it simply was not of that intensity. Levels of objectively measured light intensity PA for these individuals can be seen in Figure 6.6a-c. When PA is examined at the light intensity level, participants are much more active at this lower intensity level. In fact, they reach above 50 minutes of light PA on several occasions throughout the day.

Figure 6.5a-c: Objectively Measured MVPA for Group Exercisers

a) Participant (W)



b) Participant (V)



c) Participant (X)

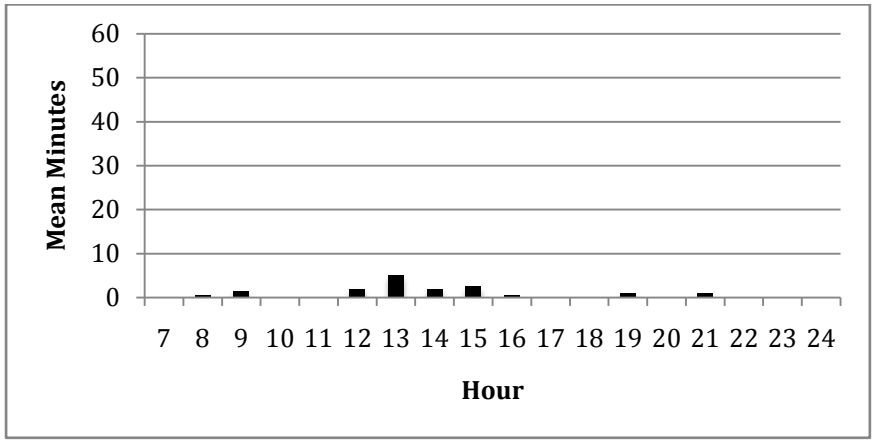
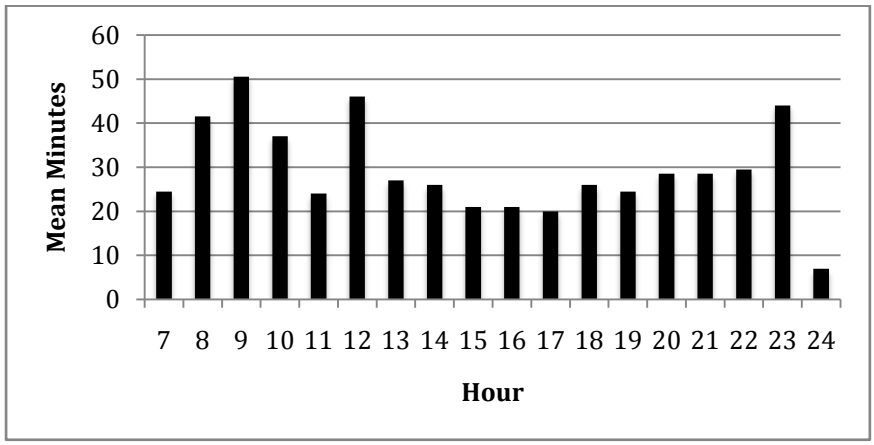
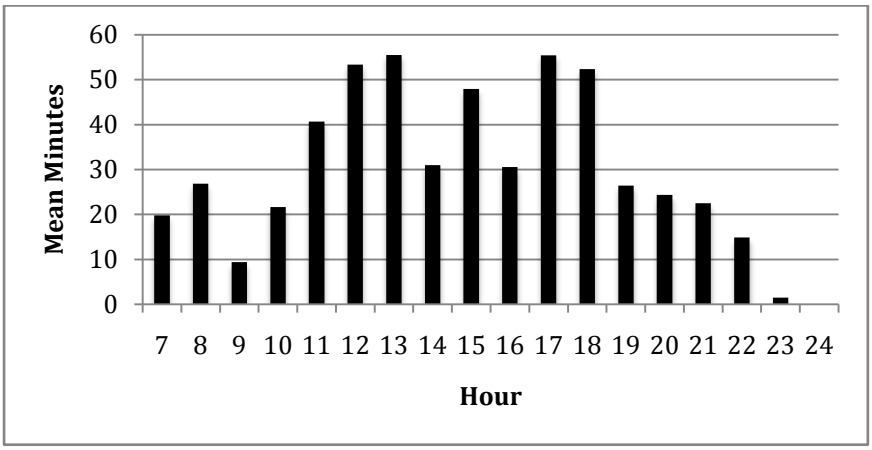


Figure 6.6a-c: Objectively Measured Light Intensity PA for Participants #4-6

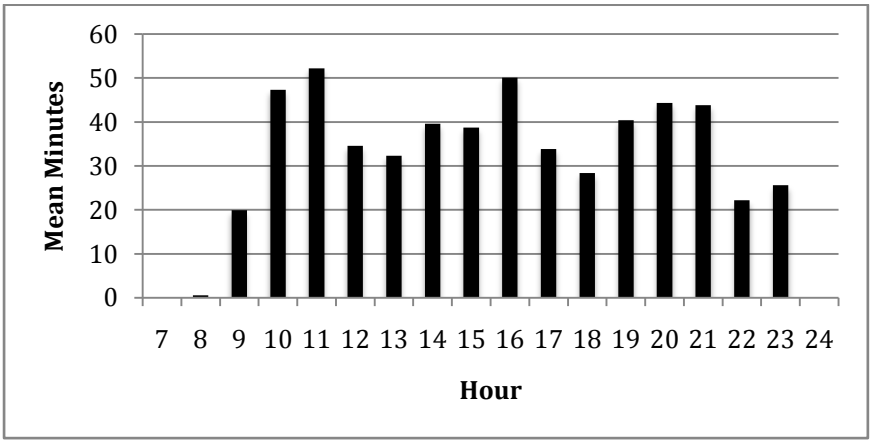
a) Participant (W)



b) Participant (V)



c) Participant (X)

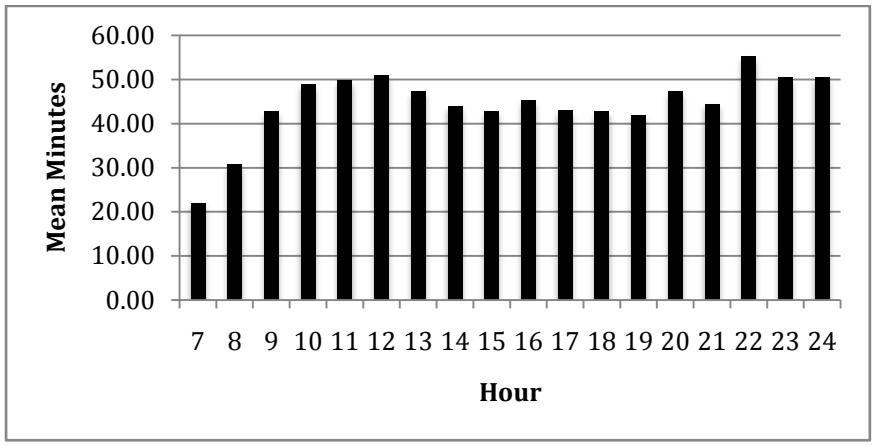


Sedentary Time

Most of the women in this study did not indicate the duration of their ST during the day. Many responded that they were busy throughout the day with housework, but more sedentary during the evenings. Figure 6.7 shows the mean hourly ST for the total sample. ST seems to be lower in the earlier hours of the day from 7:00-8:00 and then remains constant for the rest of the day, with around 45-55 minutes of each hour spent being sedentary. Women's perceptions that they are not sedentary during the day are not supported by these results. The most sedentary time of day does appear to

be the evening during 22:00-23:00. This may be a time for reading or television watching as respondents indicated in interviews.

Figure 6.7: Objectively Measured ST for Total Sample



Women with the highest and lowest objectively measured levels of ST are shown in Figure 6.8a-b. Participant (B) had the highest levels of objectively measured ST in the sample. She accumulated less ST around what might be considered traditional times (morning, mid-day and early evening). This could be a time when she was cooking and therefore not sitting down to accumulate as much ST as other times during the day. Participant (B) says:

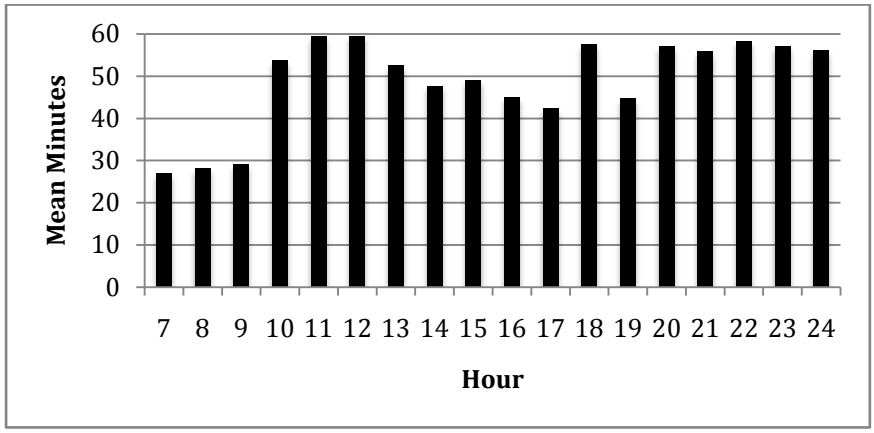
> "In the daytime I supposed you know, there [are]…things you can find to do…in the house. There's always, you know, if it's not washing, it's ironing…".

She also commented on being sedentary in the evenings:

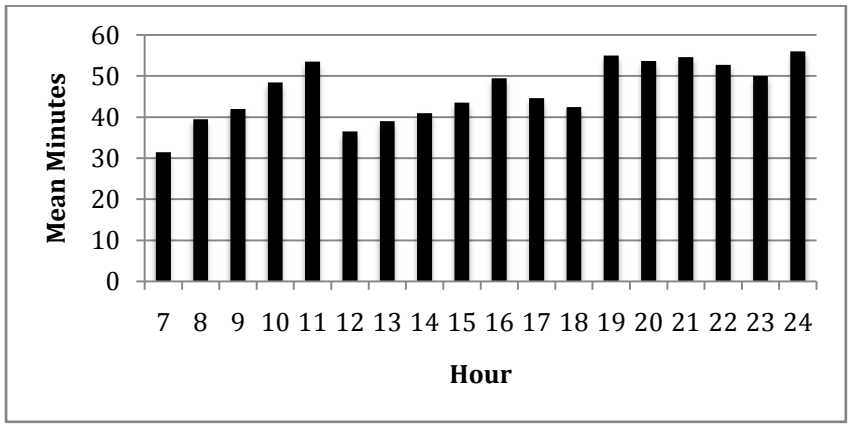
> "…you know, you gotta face the evenings and that's the worst part of it you know, sitting home and doing nothing."

Figure 6.8: Highest (B) and Lowest (G) Objectively MeasuredST

a) Participant (B)



b) Participant (G)



Participant (G) had the lowest levels of objectively measured ST of the sample (Figure 6.8b). Her levels of ST were lower in the morning from 7:00-9:00 and then still relatively low, compared to the total sample, from 12:00 until around 18:00. The interview with this participant revealed that she did housework in the mornings, looked after her 3-month-old granddaughter during the day, and by the evening she was able to sit and relax. After a long day of being busy she notes that:

> "Evening times especially [I am sedentary]. Because I get up early [in] the morning and I'm tired by evening…[I] lie down on the sofa."

Key Barriers and Enablers to PA and ST

Barriers and enablers of PA and ST in SA women were found to map onto the socio-ecological model of determinants as discussed in Chapter 2. These barriers and enablers exert their influence through multiple levels and pathways to influence PA and ST. These levels include the individual, the social environment, the physical environment and policy.

Barriers to PA

Many key barriers to PA were identified in interviews with SA women. Table 6.3 shows all major themes identified in this analysis. Barriers to PA were identified as being specific to the individual herself, or specific to others. This bifurcation is also illustrated in Table 6.3.

Barriers Ascribed to Oneself

On the individual level there were several major barriers to PA that were identified. Health problems, illnesses or injuries were recognised as main barriers to engaging in PA. Many women had diseases such as diabetes, heart problems, high cholesterol and hypertension. One 66 year-old Pakistani woman (I) explained why she is no longer active:

> "I just realize after my heart attack (laughs). I had um, three months ago I had 2 stint on, ya. But before that I was doing [exercise]. I was very active."

In addition to feeling that these diseases or illnesses held them back from engaging in PA, some were advised by their GPs to be cautious about doing activity. Injuries to back, knees and neck were cited as difficulties for PA. One 46 year-old Bangladeshi woman (N) described why she cannot be active:

> "I try to be but my health prevents it at the moment. 'Cause I've got so many kinds of illnesses so there are certain exercises that I wanted to do which I am not able at the moment. That's because doctors told me to take things easy."

Another key barrier to being active was having poor English skills. This prevented women from seeking advice on what to do to be active. One 62 year-old Bangladeshi woman (Q) described her experience with limited English skills:

> "My own problem is I don't know English. I need to learn English… There's a lot of ladies who can't speak English. I just hope to go to doctor on my own and speak to doctor. But because I always need to have some help."

Additionally, not being able to drive or not having a bus pass were named as barriers to PA. Other individual level barriers included lack of confidence that they are able to do PA, disliking PA, and not wanting to engage in PA. A 38 year-old Bangladeshi woman (W) explained:

> "There's two kinds. Like there's some people like I know they're " oh no, I don't want to go. I don't want to do it." Then there's some of them that are really outgoing. Like my mum would give it a go um, and all that."

One 39 year-old Pakistani woman (V) described her mother-in-law:

> "Ya, my mother-in-law is home and she sitting all day. She wake up and go in the toilet. That is all. She no speak. No nothing, ya… She don't like it [PA]."

The main social barrier to being physically active for SA women that were reported in this study was becoming a mother-in-law. When women were asked how to get older ladies to be more active, they said that mothers-in-law should not allow their daughter-in-law to do everything for them. It is a cultural tradition for this to happen, but both younger and older participants agreed that it had become an unhealthy tradition. One 39 year-old Pakistani woman (V) described this:

> "…well the daughters all help the mothers anyway. But um, mothers should be active in some way and be more independent and not rely on other people. Mainly because they think they can't do it. That's the situation isn't it?"

A personal need to be social during PA was found among SA women. Many women preferred to engage in PA with other women and also needed the encouragement of others to motivate them to be active. When these were not in place women are less likely to engage in PA. One 58 year-old Pakistani woman (K) described why this is the case:

> "I'm more of a social person. So I find exercising or going for walks with someone enjoyable. I'm not one of those people who will just get

> up and go for a walk by themselves. So I always need to arrange some things."

Finally, the main environmental barrier to PA was lack of space or equipment in the home to be physically active.

Barriers Ascribed to Others

Barriers ascribed to others were identified at social, environmental and policy levels. The major social barrier to PA that was mentioned in 100% of interviews was family caring responsibilities. This took the form of caring for husbands, children and ageing parents. No woman in this sample was free from some type of family caring obligation. One 55 year-old Bangladeshi woman (E) recounted her daily responsibilities:

> "Monday is a busy day for me. Um, I have to take my father-in-law to drop him at his other daughter's so I can go out. So [then] I go to my Arabic class. Then I pick up kids, feed them, take them to mosque. Then do some voluntary work with the um, teacher in the Arabic class. Come home after 7. Ya, and then do housework (laughs). "

Another barrier overlapping with caring responsibilities is family pressure to prioritise housework over PA. Women frequently noted that they were expected to ensure that all family and household needs were met before engaging in any outside activities. Again, daughters-in-law caring for mothers-in-law was seen as the norm and daughters felt pressure to continue this tradition. One daughter explained that in fact it is not the daughter who can encourage mothers to be active but it is the "younger ones and husbands. Can't forget them."

Other notable social barriers reported were having to rely on others for transportation to activities, mixed sex classes that were unsuitable for SA women to engage in, and finally, activity times conflicting with prayer times.

Environmental barriers that were barriers to PA were poor weather conditions and lack of activities accessible in the neighbourhood. Weather was the leading environmental factor that prevented women from being physically active. SA women reported not wanting to go outside to be active because of the cold. One 60 year-old Pakistani woman (L) described activity that took place in the summer:

> "If, we like, um, not in winter, but in summer, if, we like, last time [community group meeting], we went outside for walking and you know, these things. It's more better for us, everybody."

Policy level barriers that were identified mostly revolved around gyms and group exercise classes. Gyms were cited as being too expensive. In fact, one 56 year-old Pakistani woman (A) had to stop going because she could not afford the high membership rates:

> "I used to go to gym only once a week on Thursday. And last time when I went there she said she refused me. She said you can't do any more because you are not entitled because you know, you are not [paying]. If you're having any um, benefits then you can go for £1.50. Otherwise you have to pay £4."

Group exercise classes were seen as only being available to certain neighbourhoods and were too crowded to be enjoyable. Scheduling of ladies-only classes at gyms or other community centres conflicted with prayer times of the women who wanted to participate in them. Finally, guidance from GPs on PA was seen as a barrier. Women

indicated that GPs did not spend enough time with them or give them enough guidance on what to do for PA. The only guidance they were offered was that they needed to exercise for their health. A 52 year-old Pakistani woman (P) explained how more help from GPs would break this barrier to PA:

> "I think actually give them [referring to the patient] a bit more time when they go to see you [referring to the GP]. Actually listen to your problems. No, it's true. Because half the problem is solved when the professional you speak to actually listens to you."

A 61 year-old Bangladeshi woman (T) remarked that"

> "Ya, whenever they go and visit the doctor they [referring to the doctor] always say walking is good but they don't give information on how to walk, where to walk, how to go about this. Just that walking is good for you."

Barriers to ST

Barriers Ascribed to Oneself

Two major barriers to ST that participants ascribed to themselves emerged in the analysis. At the individual level, motivation to be healthier can be seen as a major barrier to ST among SA women. Due to the high prevalence of chronic diseases in this group, many women had diseases that they wanted to improve, and knew that being less sedentary was likely to help. One 52 year-old Pakistani woman (P) remarked about the health risks of being sedentary:

> "Yes, loads [of health risks] you know. You gain weight for a start. You gain weight and obviously there's a lot um, like I've got diabetes. I think they say there's a small chance you know, if you're eating and you're not fully using it up, it's a bigger risk."

Another major individual barrier to PA was feeling a sense of guilt if they did not do their housework. As mentioned previously, housework is seen as a form of PA to SA women. Therefore, a sense of guilt from not doing that housework is one way women motivate themselves to be less sedentary. One 36 year-old Bangladeshi woman (X) commented that:

> "Well basically if I'm sitting down for too long and watching TV in the evenings I feel guilty. Then I feel, ok, I'm not being physically active. But if I'm in the house popping into the kitchen or picking things up, running around, then I feel you know, I'm being active. I'm not just sitting in one place."

Barriers Ascribed to Others

At the social level, family obligations and judgment from others in the community were found to be barriers to ST. Most women reported having many family obligations such as care taking and housework that limited the amount of time they had to be sedentary. One 38 year-old Bangladeshi woman (W) described her day and why she has little time to be sedentary:

> "I am really, really busy right now with um, family. Ya, I've got my own family plus I look after my mum in her house. So I'm like running around both houses."

Furthermore, women did not want to be seen by others in the community as being lazy or 'sitting around doing nothing.' Women who were seen to be sitting around and seemingly not doing their housework were judged negatively. One Pakistani woman said she would call a sedentary woman a "lady of leisure," which was emphasized as a derogatory reference.

Enablers to PA

Enablers Ascribed to Oneself

Many enablers at the individual, social and environmental levels were identified in this analysis. At the individual level, most women stated that they preferred walking and swimming to all other forms of PA or exercise. These were seen as forms of PA that almost anyone could perform and also had health benefits. These were activities that participants felt could be enjoyed on their own or with others. One 66 year-old Pakistani woman (I) responded when asked what activities SA women prefer:

> "Swimming, they love it. They go, some of them, swimming. And um, walking evening and morning. They love it."

In terms of the activities themselves, women preferred activities that were fun, they preferred to gradually learn and try new activities, they wanted to know where more opportunities for PA could be found, and they preferred shorter bouts of PA to longer bouts. Additionally, the ability to drive and having enough money to afford gym memberships and groups exercise classes were other key individual enablers to PA.

At the social level, women wanted PA so be a social activity itself. SA women preferred to do PA if it meant that they could visit with their friends and family at the

same time. One 46 year-old Bangladeshi woman (N) described how socialisation encourages her to go walking:

> "…you know, we've done a few walks on Cardiff Bay. Which you know, when you do something in a group it's more enjoyable because you can have your little chit chats. You know, have a little bit of an exercise as well. Whereas if you were to do it on your own you probably wouldn't feel like going on your own."

Walking was seen as an important way to be physically active and to be social. Women walked to go meet with their friends, walked with their daughters, or walked in a group of women from a local community centre. When these opportunities were not available or not organized for them, they stopped walking. One 58 year-old Pakistani woman (M), who was also a community group leader, talked about how her walking group fell apart when she was unable to coordinate it:

> "Um, well, once you're known in the community like this [as a leader], they want you to do things like this, arrange walks and things like that. And they're very happy to participate then. But as long as you're organising it. Once you do, like I'm going to walk on um, Monday morning in the park. It was my day off and I couldn't make it every [Monday]…and it fizzled out."

Other enablers on the social level included modelling behaviour after other active women in the community, just getting out of the house, and having more free time on the weekdays which allowed for more time to be active. One Bangladeshi mother explained that when her children are not around she has time to herself, and can do what she wants to do.

The major environmental level enabler to PA was to have space and equipment to exercise in one's own home. Several women expressed an interested in being active in the home rather than the gym, but would only do so if they had enough room and any equipment to use. One 61 year-old Pakistani woman (R) described how she is active in her home:

> "…in the morning I do some yoga and ball exercises on my own. Like you know, just watching the television or listening to music. I do it every day."

Enablers Ascribed to Others

At the social level, other family members such as a daughter or friends were the most influential in encouraging SA women to be more active. Women said that having other women to be active with made the activity more fun, therefore they would be more likely to continue. Additionally, other women were the source of knowledge on the benefits of PA as well as where activities were taking place. One 36 year-old Bangladeshi woman (S) talks about her enjoyment of being social during PA:

> "I think we go through phases where my friends and my sister, if we are doing something for an event we all get together and we perform and we dance. And that's when we're doing lots of dancing and practices."

Other social level enablers included getting children involved in PA at a young age and having young people help to educate older women. Several mothers of younger children who were interviewed encouraged their children to be more active. This was through after-school activities and sports such as karate. Utilising younger people to help encourage older women to be more active was suggested by several participants, although this was seen as a difficult subject to tackle due to cultural norms.

At the environmental level, better weather and close proximity to parks and gyms were cited as key enablers to PA. Many women remarked that they were more active in the summer time versus the winter and that the poor/cold weather prevented them from being active.

Many enablers at the policy level were identified. Discounts on gym memberships, more ladies-only group exercise classes, and more ladies-only swimming classes were identified as main enablers to SA women's PA. One 60 year-old Pakistani woman (L) discussed issues around the cost of swimming:

> "Swimming for over 60s used to be free but now it's not. The leisure centres are being taken over by the private companies and now they want to charge. And I know if they [women] have to pay they won't come."

Incentives such as gym discounts or vouchers, going on trips outside of the local area, and providing health checks were recommended as ways to encourage SA women to be more active. Finally, women expressed an interest in receiving more advice from their GPs on being active. Women stated that having longer consultations with their GPs would allow then to be able to ask questions and gain more advice on their concerns regarding starting or maintaining PA. One 52 year-old Pakistani woman (P) expressed her concern over a lack of time spent with her GP:

> "I think actually give them [referring to the patient] a bit more time when they go to see you. Actually listen to your problems. No, it's true. Because half the problem is solved when the professional you speak to actually listens to you. Especially the GP and your nurse. But they don't seem to have that."

Enablers to ST

Enablers Ascribed to Oneself

The major enabler to ST among SA women in this sample was a personal sense that as they get older, they are entitled to relax. Many women explained that they had "done their job" and that now it was time to enjoy life, which included spending a great deal of their time in sedentary time. Others were sedentary out of habit, while many were sedentary because they enjoyed watching television or reading. Many women admitted to being bored in the evenings and therefore were more sedentary during that time. Health problems and injuries were also a main concern. Many women had been injured in the past and were afraid of experiencing a reoccurrence if they were to become active. This fear of injury led to being sedentary. One 67 year-old Bangladeshi woman (J) described her injury:

> "…I got problem with my knees and if I walk alone, maybe sometime I'll slip and fall down or something. I feel scared because I carry a stick as well you know."

Enablers Ascribed to Others

Social level enablers to ST centred on friends and family. Many women cited family obligations and visits with friends and family as being major enablers to increased ST. Many hours were also spent sitting and reading the Holy Koran or studying Islam with other women.

The major environmental enabler to ST was poor weather in the wintertime. The cold was cited as preventing women from going out to be active and encouraging them to stay inside.

Knowledge and Awareness of PA Benefits and ST Risks

SA women seemed to have some knowledge and awareness of the benefits of PA and the health risks of ST. They reported that PA was good for their health. Specifically it would help control diseases such as diabetes and obesity, and help manage hypercholesterolemia and hypertension. There was a sense that PA was beneficial for keeping women independent as they age. It was known to be good for joint mobility and to alleviate tiredness. Benefits for mental health were also cited on multiple occasions. One 61 year-old Pakistani woman (R) described her understanding of PA and mental health:

> "…even mentally they get lethargic. So physical fitness goes with the mental fitness and emotional fitness at the same time."

SA women reported several risks of being sedentary. Most women were aware that being sedentary could cause negative health consequences. ST was cited as leading to illness or disease. A major risk of being sedentary identified during interviews was becoming overweight or obese. This was a worry for many women in this study. Other risks were causing tiredness and stiffness and pain in joints. Mental health issues such as depression were also mentioned as risks of being sedentary.

6.6 Discussion & Recommendations

This qualitative study offers useful insights into the PA and ST of SA women in the UK. Findings suggest that SA women have their own concepts and contextualisations of PA and ST that may not coincide with those of health professionals and policy makers. Perceived levels of PA and ST differ from levels of objectively measured PA and ST in this group. Additionally, many barriers and enablers to PA and ST were identified that may be of use when planning and implementing interventions to increase PA and decrease ST.

Awareness of Physical Activity and Sedentary Time

SA women in this study conceptualised PA first and foremost as being good for their health. This was the most salient concept for them, perhaps because of the very high prevalence of chronic disease, disability or injuries among this group. Nearly all women reported having at least one of these conditions and nearly all women responded with "good for health" when asked what PA meant to them. When probed for what types of activities might constitute PA, most identified housework and "keeping busy" as their main modes of PA. Although previously identified as one of the means by which people can accrue moderate levels of PA, more recent research indicates that housework may not contribute to reducing conditions such as CVD and obesity, although has been found to be associated with lower all-cause mortality [18]. This has important implications if SA women are hoping that their housework will give them health benefits such as managing diabetes or reducing CVD and obesity.

The majority of women reported not knowing what the word "sedentary" meant when asked. After the researcher provided a definition and brief explanation of being sedentary (sitting or doing very little movement), women identified one of two conceptualisations of this term: resting or being lazy. Since most women perceived their days to be filled with housework and family obligations that kept them busy, many believed that they deserved to rest in the evenings. This was most often done while sitting and watching television. In contrast, women saw it as being lazy if a woman was known to be 'sitting around.' If this was the case, she was not completing her household tasks and was therefore seen negatively by others in the community. The only exception to this negative opinion was in reference to mothers-in-law. It was an accepted fact that once a woman is a mother-in-law, they were entitled to do a great deal of sitting after having raised a family and done the housework for many years. At this point in the life course, the daughters-in-law take over these responsibilities. While everyone acknowledged this was the case, both the younger (not yet mothers-in-law) and older (mothers-in-law) women conceded that this habit was not healthy to engage in. All women recognised that there are health risks that result from leading a sedentary lifestyle. The importance of family traditions has been found in other studies on SA women [19, 22]. These studies also found that women

understood the importance of being active, but that family responsibilities and traditions often prevented them from engaging in PA.

These concepts and contextualisations have important implications for the use of self-report methods of assessing PA and ST among SA women. As indicated in Chapter 4, there may be issues with SA women's interpretation of certain terms and concepts from self-report questionnaires such as the IPAQ. The findings of this qualitative study illustrate that while women know the general benefits of PA and risks of ST, they may have a very narrow understanding of the meaning of each term and a limited knowledge of what activities constitute PA or ST. It is even more challenging for women who have limited or no English language skills.

Comparison of Perceived versus Objectively Measured PA and ST

Housework was the main form of PA, reported by 87.5% (n=21) of the interviewees. While women assumed that housework was keeping them sufficiently active, only 20.8% (n=5) of women actually met recommended guidelines for PA adequate to achieve health benefits. Of the 6 women who were able to quantify their daily PA, 2 women's perceived PA matched the MPVA data obtained from objective measures. Although when looking at light intensity PA, all 6 women were as active as they perceived. This highlights the importance of clearly defining and emphasising the intensity level of PA needed to achieve health benefits. SA women may perceive themselves to be physically active, but may not be meeting recommendations due to a lower than adequate level of intensity of their activity. As most of these women lead busy lives, they equate this 'busy-ness' to being sufficiently physically active. This finding has been reported by other studies on SA women and other ethnic minority women [8]. Skriskantharajah, et al. (2007) reported that SA women believed daily housework and walking in a shop were significant enough activities to contribute to PA for health [22]. A study from Lawton, et al. (2006) reported similar findings [19]. Moreover a large study ofNative American, Latina and white women in the US also had similar findings [8]. When developing future health promotion and interventions

aimed at this group it is advised that activity intensity be emphasised for health benefits.

The majority of women in this sample did not recall specifically when and for how long they were sedentary, although they easily recalled what activities they engaged in while being sedentary. Television watching and reading were the most popular forms of sedentary behaviour. The total sample accumulated nearly 6 hours per day of ST, which is similar to the findings of the HSE for the general population [15]. When examining the sample as a whole, women appear to be sedentary for the majority of every hour during the day from 7:00-00:00. But when individual activity patterns are investigated, some variation can be seen. The times around meals are less sedentary times for some women. This is most likely due to women getting up and moving about to prepare meals. Other women were slightly less sedentary during each hour throughout the day. This may be due to the constant housework that many women cited as a major part of their daily routines. Many women perceived that they were not sedentary due to these busy schedules, but objective data reveals that most women in this sample were highly sedentary. These findings are comparable to those from other studies on SA women and PA [8, 22]. Future health promotion interventions should aim to encourage women to engage in less sitting time throughout their day, even if they are unable to participate in more physical activity. Findings from this study indicate that tasks such as housework or preparing meals may reduce time spent being sedentary, even though these tasks may not be intense enough to count toward time in MVPA.

This study's unique comparison of SA women's perceived PA/ST with objectively measures PA/ST provides several important insights. Firstly, this study demonstrates that SA women may not accurately recall their levels of PA or ST. This has been shown in other studies with both ethnic minority groups and the general population [5,23]. While self-report methods of assessing PA and ST are popular due to their ease of use and low cost, they may not accurately reflect actual PA and ST among SA women. It is recommended that objective measures should bemore widely used in this

and other comparable populations as the preferred method to accurately measure PA and ST.

Another advantage of this study's comparison of perceived and objectively measured PA/ST is a more in-depth understanding of the levels of intensity of activities that SA women currently engage in. Most women's belief that housework was an activity that helped them to achieve an appropriate level of PA for health benefits may not be the case if it is not done at the moderate-to-vigorous intensity level for sufficient periods of time. The majority of objectively measured PA in this study was light intensity activity. SA women may believe that they are already being physically active due to their busy schedules and may not always see the utility of further or higher intensity activity. Health promotion interventions can benefit from this insight and build upon the light intensity activities that women already engage in to promote engagement in MVPA.

Barriers and Enablers to PA and ST

Barriers to PA included disease and illness, family obligations, lack of motivation, lack of facilities, and poor weather to name a few. Although there is limited published literature on SA women and PA, these have all been previously identified as major PA barriers [2, 7, 12, 16, 19, 21, 22]. In fact, diseases, illnesses, and injuries were cited as both barriers and enablers to PA and ST. Comparisons to other studies is limited due to a lack of published research in ST. Seemingly contradictory, these health problems both encourage women to be active, but hinder their ability to do so. One key finding from this study that has not been previously identified in relation to PA is the cultural tradition of the mother-in-law retiring from housework and family obligations to have a more "relaxed" life, while the daughter-in-law takes on those tasks. This transition into a more sedentary lifestyle as a woman ages has negative implications for her health and well being later in life. Future health promotion programmes and interventions should take into account issues with disease, illness and injury as well as incorporate culturally appropriate ways for SA women to be active and promote healthy aging.

Poor English language skills were a barrier to PA for some women in this study. Women without English skills were concerned with being able to communicate with their GPs about their health problems, as well as about how to be more physically active. Some women were unable to visit their GP or other health practitioner unless they had an English-speaking family member take them. Lawton, et al. (2006) also reported similar findings in their qualitative investigation of SA women and PA [19]. Future interventions may consider incorporating language courses or health literacy education as a means to enable more SA women to communicate with health professionals. This will increase the likelihood that health and PA messages are reaching and being understood by SA women. Furthermore, health professionals should receive additional training on how to communicate PA-related information to patients who have diverse linguistic backgrounds.

Further to this, many SA women reported that lack of time and information from their GP or other health professionals were barriers to being more active. They required more time to discuss their health problems, reassurance from the health professional as to which activities were appropriate for them given their disease status, and more details of how much and where they could be physically active. This barrier has been found in other studies as well [19, 22]. The published literature often reports that ethnic minority groups do not access healthcare, but this sample of SA women appeared to access healthcare regularly [11,19]. Since this group wants more from their GPs, future health promotion programmes and interventions can use this high rate of healthcare access as an opportunity to provide practical health education on PA through GPs.

Key enablers to PA among SA women in this study included having activities be a social time for women, encouragement from family and peers, and incentives such as discounted gym memberships or ladies-only group exercise classes. Walking and swimming were seen as the most preferred forms of being active in this group. Most women agreed that walking with a daughter or their friends would encourage them to

engage in PA more frequently. Most women cited free time away from the home and obligations as another key enabler. As this and other studies have found, housework and family obligations are often reported to limit SA women's time and motivation to engage in PA [10, 12, 19]. Community centres that offered group exercise classes, walking groups and opportunities for socialising were important for getting women out of the house. Future health promotion programmes and interventions should focus on utilising and expanding programs such as these and providing access to a wider range of activities within neighbourhoods.

6.7 Limitations & Strengths

This study is not without limitations. The sample is small and is not representative; therefore generalisations about these findings must be made with caution. Purposive sampling was used in order to gain a range of perspectives among SA women since it was not possible to collect and analyse data from a much larger sample within the scope and timeframe of this doctoral research. The majority of the women who participated in this study were recruited from community centres where many activities are offered for SA women. These women are therefore more likely to know what is available in their local area, as well as more likely to know about and participate in PA, than SA women in the general community. Interview questions about PA and ST patterns did not probe specifically into frequency and duration, therefore in the future these questions should be more specific. This will help build a more accurate picture of SA women's perceived levels of PA and ST. A major strength of this study was the inclusion of non-English speaking women in the interviews who are often identified as 'hard to reach' and difficult to recruit. Finally, this study benefits from the use of objective measures of PA and ST to use for comparison with women's perceived levels. This approach allows for comparisons of the two methods as well as the identification of behavioural patterns throughout that day that objective measurement neglects.

6.8 Conclusions

Findings from this study suggest that self-report methods of measuring PA and ST among SA women may not produce accurate data due to participants' understanding of those terms. It is recommended that objective measurement of PA and ST be used more widely in this group. Since this is not always possible due to cost and time constraints, it is suggested that a more culturally appropriate self-report tool be developed to ensure the accuracy of PA and ST data. Based on self-reported perception and objectively measured PA and ST of this sample, it appears that SA women do not report or accumulate the recommended amount of MPVA for health benefits. They do engage in higher levels of light intensity PA when compared to MVPA. While interpretation of these data must be cautious due to the very small sample size, these findings suggest that SA women may only need to increase their activity intensity in order to reach MVPA guidelines. Future interventions and health promotion programmes should focus on helping SA women to understand PA intensity and to encourage them to increase that intensity in their daily activities. Moreover, these interventions should build upon the enablers discussed in this chapter, as they have been identified by the women themselves as the most critical ways of increasing PA and reducing ST in this group.

ST is very high in this sample, with previous research also identifying high ST among SA women as a major health risk (as discussed in Chapters 4&5). While increasing MVPA in this group may generally be achieved by increasing intensity of PA already being performed, reducing ST will take much more complex and comprehensive approaches. These must include culturally tailoring health promotion programmes and interventions to work within the traditions of the SA community in an effort to get women to be less sedentary.

Finally, this sample, similar to other ethnic minority groups [8,9,24], are aware that moving more and sitting less will have health benefits. Increasing PA and decreasing ST in this population will take culturally competent health promotion, interventions

and health practitioners, along with community groups and lay leaders all working together to encourage engagement in healthier lifestyles.

6.9 Future Publication

The comparison of self-reported activity data through interviews, with accelerometer data, offers unique insights into perceived versus objectively measured PA and ST. The first paper that will be written from these data will focus on this topic. Very little research on this topic has been published in the literature (Chapters 2&3) making this comparison, and these findings offer valuable information on SA women's perceptions of activity and the validity of self-report methods of PA/ST data collection.

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CHAPTER 7

GENERAL DISCUSSION

7.1 Overview

This thesis used a mixed-methods design to comprehensively examine PA and ST among SA women in the UK. Using a wide range of methods (e.g. systematic review, self-report questionnaires, semi-structured interviews, and accelerometry), strong new evidence has been produced that adds to the understanding of PA and ST levels of SA women in the UK, investigates the strength of the methods used to assess PA and ST, and examines SA women's own experiences of PA and ST. Specifically, this thesis highlights the major gaps in the literature on PA and ST in SA women through the mixed-methods systematic review (Chapter 3) that examined and synthesised all available evidence in the English language research literature on both levels of PA and ST and their determinants. Further, this thesis sought to fill the gaps in knowledge by assessing PA and ST using self-report methods (questionnaires) and objective measures (accelerometry) to quantify PA and ST in UK SA women, and to compare the validity of these two methods for use with a mixed-literacy, multicultural group (Chapter 4). Finally, semi-structured interviews were used to examine the ways in which SA women conceptualise and contextualise PA and ST, explore perceptions of their own PA and ST, and investigate ways in which SA women envision increasing their levels of PA and reducing levels of ST (Chapter 6).

This chapter highlights the main findings from the three studies (Chapters 3-6) in this research project. Additionally, a discussion of the implications for future research, health promotion, and interventions is also provided.

7.2 Summary of Research Findings: Study 1

Study 1 (Chapter 3) was a mixed-methods systematic review that examined and synthesised all available evidence on PA and ST among SA women. This study sought to answer the following main research questions of this doctoral project (Chapter 1):

RQ1. What is currently known about the levels and determinants of PA and ST among SA women?

RQ4. What conditions promote participation in PA, and what are the key barriers to increasing PA and reducing ST?

A thorough search of the English language literature revealed a total of 26 quantitative and 12 qualitative studies that met the inclusion criteria.

While the heterogeneity of the studies on SA women's PA and ST makes it difficult to draw specific conclusions, some broad conclusions can be made. Firstly, the majority of studies, based predominantly on self-report methods, found that SA women engaged in less PA than the general or white populations of the host countries. One group, SA Indian women, generally had higher levels of PA in comparison to other SA groups such as Bangladeshi and Pakistani women [11, 12, 13, 26, 30]. The majority of studies investigated LTPA, and reported that SA women were less active than their white European counterparts [5, 11, 16-22, 24, 25, 26, 30]. Only 2 studies investigated ST and both used the IPAQ [29,33]. Findings from this limited number of studies indicate that SA women are highly sedentary and that their ST is similar to the general population. Qualitative studies broadly indicated that barriers to PA included family obligations, lack of female only facilities, lack of English language skills, concerns for safety, and poor weather. Facilitators of PA included motivation to improve health, exercise equipment in the home, and faith education.

This systematic review identified gaps in the literature on PA and ST among SA women. Only 5.3% (n=2) of the studies included in this review used objective measurements to obtain PA or ST data. None of the self-report tools used to obtain PA and ST data have been validated on SA women, and all are known to have issues such a recall bias and are prone misinterpretation. Moreover, few studies used the same self-report tool and some used only part of questionnaires. There were no randomised controlled trials conducted in this area, indicating that there is not enough high quality evidence on SA women's PA and ST to make specific recommendations for health promotion programmes or interventions. Studies used a range of self-report tools, measured demographic variables such as deprivation differently, classified SAs differently and in some cases did not account for differences in religious or cultural practices. Subsequently, generalisations from these studies must be made cautiously.

The answer to the question "What is currently known about the levels and determinants of PA and ST among SA women in the UK?" is: very little. Based upon limited and often low quality data, is appears that SA women are likely to be inactive and highly sedentary. Main findings from this systematic review indicate that standardisation of PA/ST measurement methods is needed. Self-report tools can be a low cost and easy way of collecting activity data, but the findings of this study show that a validated questionnaire tool is needed to assess PA and ST among SA women. Furthermore, wider use of objective methods such as accelerometry should be used whenever possible. Accelerometry offers a useful way of assessing activity in SA women that avoids misinterpretation and recall bias. Data from accelerometers can easily be compared to one another across participants and across studies.

Findings of this systematic review indicate that there are a range of factors that may be determinants, barriers or enablers to PA, while very limited attention was given to ST. These are consistent with research findings from other ethnic minority groups such as African Americans and Hispanics [7, 8, 31]. Since findings from these studies are varied and sometimes contradictory, it is recommended that further research be undertaken to investigate these factors. As a result of these contradictory findings, it is also recommended that SA women's understanding and experiences of PA and ST be investigated. The seemingly different results may be due to the way SA women interpret the terminology and concepts within the questions they are being asked.

This study benefits from the inclusion of both quantitative and qualitative studies and provides a comprehensive account of the current available evidence on PA and ST in SA women. Finally, it makes a significant contribution to the understanding of PA and ST among SA women by identifying the gaps in the literature and making recommendations for future research.

7.3 Summary of Research Findings: Study 2

Study 2 (Chapter 4) of this research project was designed based upon the findings of the literature (Chapter 2) and the systematic review (Chapter 3). The aims of this study were to: 1) assess the comparability of accelerometer and IPAQ-SF derived PA/ST measures among SA women in the UK via mixed methods; and 2) to provide a description of their understanding of the terminology, content and context of the IPAQ-SF. This study sought to answer the following main research question of this doctoral project (Chapter 1):

RQ3. Are self-report methods comparable to objective methods of measuring PA and ST?

As the literature review (Chapter 2) and the findings of the systematic review (Chapter 3) have indicated, there is little published data on objectively measured PA and ST in SA women. Furthermore, there is little evidence that data obtained from self-report methods in this population are comparable to objectively measured data. This mixed-methods study used accelerometry to objectively measure PA and ST, along with a self-report questionnaire (IPAQ-SF) to measure PA and ST. Brief structured interviews to examine ease of use of the questionnaire, understanding of terms used in the IPAQ-SF, and cultural contextualizations of PA/ST in daily life. Results from this study indicate that the IPAQ-SF underestimates PA and ST among SA women when compared to objectively measured activity data. These findings were supported by qualitative evidence from brief structured interviews that indicated issues with interpretation and recall of PA/ST in this sample of SA women.

Respondents were unable to equate their own activity with examples from the IPAQ-SF and had difficulty recalling sitting time. Compared to other studies on SAs using the IPAQ, IPAQ data indicate that our sample was highly sedentary [29,32].

Since the majority of available evidence on PA/ST in SA women has been generated using self-report methods such as the IPAQ-SF, the findings of this study have important implications for the continued use of these methods. As this was a relatively small, non-representative sample of SA women, further validation of the IPAQ-SF is recommended to determine its validity in this population. Further research must be conducted (and was in Chapter 4) to explore how SA women conceptualise and contextualise PA and ST. A more culturally tailored self-report tool should be developed in order to increase the likelihood of obtaining more valid self-reported PA and ST data on SA women. According to the IPAQ-SF, this sample was much more sedentary than has been found in other studies, and may be partially due to including women with low English literacy skills in the study, even though trained interpreters where employed to translate the IPAQ-SF as needed. Thus, the translation issues may be more about the lack of broader cultural and linguistic conceptualisations and contextualisations of PA and ST in this population, illustrating the complexities of direct translations of terms from English into other languages. This highlights the need for wider use of objective measurement of PA and ST in SA women as well as other multi-cultural populations for whom English may be a second language.

7.4 Summary of Research Findings: Study 3

Study 3 (Chapter 5) was an investigation into the levels and patterns of PA and ST of SA women using objective measurement (accelerometry). Studies 1&2 (Chapters 3&4) revealed the need to accurately measure PA and ST in lieu of flawed self-report tools. Therefore the aim of this study was to objectively measure and report levels and patterns of PA/ST and to examine potential socio-demographic correlates of PA/ST among SA women in this group. This study sought to answer the following main research questions of this doctoral project (Chapter 1):

RQ1. What is currently known about the levels and determinants of PA and ST among SA women?

RQ2. How much and what types of PA do UK Bangladeshi and Pakistani women participate in?

The mean ST per day was 530.20±81.76 (minutes), and mean moderate-to-vigorous PA (MVPA) per day was 34.66±21.52 (minutes). While the mean daily MVPA for the total sample was 34.66±21.52 minutes, when activity was separated by age group, a significant difference was seen in mean daily MVPA, with older SA women (65 years and older) engaging in an average of 16 minutes less MVPA than 18-64 year old women. It may appear from these results that SA women in the UK are particularly active, but when the PA data are examined in bouts of 10 minutes (the amount recommended for health benefits), only 34.7% of the sample met PA recommendations of 30 minutes of MVPA on most days [10]. Future health promotion campaigns and interventions will need to highlight the importance of accumulating MVPA in bouts of at least 10 minutes for health benefits.

The only two additional studies published in the literature that reported objectively measured PA among SA women found similar rates of PA, although measurement was taken with other devices [34, 35]. These results are also similar to the general UK population of women. The HSE found that 71% of the general population of women in the UK did not meet PA recommendations [26]. Multiple linear regression analysis using socio-demographic predictor variables resulted in no significant models for ST, while 5 significant models emerged for MVPA. The model that explained the most variance in MVPA (19%) included the variables age and waist circumference. On weekends women accrued more ST than on weekdays, while more MVPA was accrued on weekdays than weekends.

The findings of this study are also consistent with findings for the general population according to the HSE [2]. SA women do not differ greatly from the general

population in their ST accumulation. This sample was somewhat more active compared to the general population sampled in the HSE. It is recommended that future research is conducted on a larger, more representative sample before conclusions can be drawn from these results. The weak models that emerged from the multiple regression analysis indicate a possible lack of pertinent predictor variables measured in this study. It is recommended that future studies include psychosocial, environmental and cultural factors that can subsequently modelled.

The differences seen in weekday and weekend day activity patterns highlight the need for further research into the behaviours that are taking place during those times, to better understand why there is such a drastic shift in patterns. Hourly patterns of PA and ST reveal that SA women are engaging in higher levels of MVPA before and after meal times during the day. When not engaging in MVPA women are either sedentary or engaging in light intensity activities. More in-depth research is needed to explore the patterns and behaviours of ST in SA women throughout the day to identify key pinch points for implementing behaviour change interventions.

This study has provided a much-needed investigation into the levels and patterns of PA and ST among SA women in the UK. This objectively measured data may provide a more accurate assessment of PA and ST levels than previous studies using self-report methods. The evidence presented in this study highlights the need for health promotion campaigns and interventions aimed at increasing MPVA and reducing ST among SA women in the UK. Data on hourly patterns of activity and ST may help to inform future interventions as to the most effective times to deliver interventions and effect sustainable change.

7.5 Summary of Research Findings: Study 4

As discussed in previous chapters (Chapters 3-5), the limited and inconclusive current evidence on SA women's PA and ST indicates that there is little knowledge about the levels of PA and ST among SA women. Further efforts must be made to understand their experiences and subsequently develop tailored interventions to increase PA and decrease ST. Therefore the aim of this study was to use semi-structured interviews to compare qualitative data to the objective measurement data from Study 3 to explore the shared experiences of SA women in the UK in relation to PA and ST. This study sought to answer the following main research questions of this doctoral project (Chapter 1):

RQ2. How much and what types of PA do UK Bangladeshi and Pakistani women participate in?

RQ3. Are self-report methods comparable to objective methods of measuring PA and ST?

RQ4. What conditions promote participation in PA, and what are the key barriers to increasing PA and reducing ST?

RQ5. What strategies can be used to increase PA and decrease ST in this population?

RQ6. In what ways can policy makers and public health professionals engage with culturally diverse groups to increase PA and decrease ST in an effort to reduce health inequalities?

Several major themes were identified in this study. PA was most often equated to being healthy and to the concept of exercise. Walking and swimming were the most popular forms of PA and women understood there were many health benefits to being active. Being sedentary was seen as either being lazy or taking a well-deserved rest. Most women watched television or read during their ST. Importantly, nearly all

women recognised that the tradition of the mother-in-law being sedentary while a daughter-in-law took over her household responsibilities, was unhealthy.

Most women said they walked and did housework to stay active, although most did not report a duration or frequency of activity. Many women said they were not sedentary. When they did say they were sedentary, very often they did not give a specified amount of time. Most women who perceived themselves to be active did not meet MVPA recommendations based on objectively measured data, but did accumulate light intensity activity throughout their day. Most women in the study were sedentary for the majority of every hour in their day, even though they perceived themselves to be quite active due to being 'busy.'

Most barriers to PA reported by the participants in this study were similar to those seen in other studies of SA women [1, 4, 9, 14, 15, 27, 28]. A novel barrier that emerged from this study was the mother/daughter-in-law dynamic previously mentioned. All women acknowledged this prevented mothers from being active by sitting all day and prevented daughters from being active because they had too many obligations. Other major barriers to PA in this group were poor English skills and lack of guidance from GPs. These were also seen as enablers to ST. Enablers to PA included social activities, encouragement from friends and family, and ladies only classes. Most women said they would walk with a friend or family member as a preferred form of activity.

This study has important implications for PA and ST measurement. Women's perceptions of their PA and ST did not often agree with the objectively measured levels of PA and ST. Findings from this study support the findings from study 2 (Chapter 4) that self-reported methods of measuring PA and ST may not be as accurate as objective measurement. Future studies should use the findings related to SA women's conceptualisations of PA and ST to develop a more culturally appropriate self-report tool. Wider use of objective measurement tools to obtain more accurate PA and ST data is recommended. Future health promotion programmes and

interventions can use data on barriers and enablers to PA and ST to develop programs to utilise the resources that are most salient to SA women to encourage an increase in PA and reduction of ST. It will be particularly important to develop programs that cater to the needs of mothers and daughters while working within the cultural norms of the group.

7.6 Limitations and Future Directions

This thesis provides a thorough examination of PA and ST among SA women in the UK. Each study in this research project has increased the body of knowledge in this area and helped to fill gaps in the literature. However, there are some notable limitations to the studies found in this thesis and future research can benefit from reflection on these.

Study 1 (Chapter 3) examined all evidence on PA and ST in SA women, including both quantitative and qualitative studies. There is currently no standardised way of extracting data or assessing quality of both types of studies [6]. As a result, two methods were used [3, 23]. A meta-analysis was not possible due to the lack of randomised controlled trials and significant heterogeneity between studies. A narrative approach was therefore taken in order to synthesise all available evidence. Analyses of many studies was limited due to the lack of detail provided in many papers on sample, methods, and findings, therefore conclusions from this study must be made with caution. Additionally, this suggests a need for improved reporting of details by authors, which needs to be promoted and ensured via journal editors and reviewers.

Although, this study has its limitations, its strengths include transparent methodology and the inclusion of all types of evidence to yield a comprehensive synthesis of evidence on PA and ST in SA women. In the future, methodologies should be developed to standardize methods of data extraction and quality assessment of quantitative and qualitative evidence. It is also recommended that more rigorous study

designs and randomised controlled trials be developed and evaluated to investigate PA and ST among SA women.

Study 2 (Chapter 4) assessed the comparibility of the IPAQ-SF with accelerometry in a group of SA women in the UK using a mixed methods approach. It also provided a description of their understanding of the terminology, content and context of the IPAQ-SF. One limitation of this study was the relatively small sample size. This sample was also not representative of all SA women in the UK. Additionally, since the majority of participants were recruited from community centres or women's groups who provided access to many physical activity opportunities, this group of women may be more active and less sedentary that SA women in general.

A strength of the recruitment technique in this study was the inclusion of women across a range of age, activity levels and English literacy levels. Moreover this study benefits from the use of objective measurement to quantify PA and ST, and the triangulation of quantitative data with qualitative interview data. Future validation studies should increase the sample size, include randomisation in the sampling framework and attempt to recruit women from a wider range of areas.

Study 3 (Chapter 5) reported the levels and patterns of PA and ST among SA women in the UK and examined socio-demographic correlates of PA and ST in this group. While this is the largest reported objectively measured sample of SA women, the cross-sectional and non-randomised design limits generalisibility. Another limitation was the exclusion of some psychosocial, environmental and cultural factors that may act as determinants or moderators of PA and ST.

This study benefits from the use of accelerometry to objectively measure PA and ST and avoiding the pitfalls of self-report methods with culturally and linguistically diverse groups. Future studies would benefit from a larger, randomized, representative sample. As in study 2, is it recommended that future studies recruit samples from a

wider range of sources. A comparison of results from these samples with the present study will show whether SA women in this study are more active and less sedentary than the general population of SA women, or if SA women are overall, more active and less sedentary than has been previously assumed.

Study 4 (Chapter 6) explored SA women's experiences, conceptualisations and perceptions of PA and ST using semi-structured interviews and previously collected accelerometry data (Chapters 4&5). Since the sample in this study was a sub-sample from previous studies (Chapters 4&5), the same sampling limitations apply. Generalisations based on the findings of this study must be made with caution due to the small and non-random sample. The women who chose to participate in this study may be particularly motivated in terms of PA and may therefore be more aware of PA and ST than SA women in general. The majority of women in this sample were obese; therefore the experiences and knowledge of women who are underweight, normal weight or overweight may not be represented in this study.

This study benefits from a purposive sample of women with various health issues, language abilities, activity levels and ages. This sampling method helped to gain a range of perspectives on PA and ST. The inclusion of women with limited or no English speaking skills is a main strength of this study. This group is often labelled as "hard to reach" and often overlooked in PA/ST research. This study benefits from the inclusion of their perspectives. Finally, this study benefits from the use of mixed methods to provide a comparison of perceived levels of PA/ST in comparison with objectively measured levels of PA/ST. A search of the literature revealed no other studies having previously used this combination of methods.

Although challenging in qualitative research, future studies should seek to recruit a larger and random sample in order to make findings more generalisable. The inclusion of women from a broader range of BMI is encouraged in order to gain the perspectives of more types of SA women. Finally, a comparison study with more in depth questions on SA women's perceptions of their levels of PA/ST and

accelerometry is recommended. More in-depth probing into frequency and duration of perceived activities is needed.

7.7 Conclusionsand Implications

Since many SA women in this study did not achieve the recommended amount of PA in bouts of 10 minutes or more, future interventions should aim to promote MVPA that is sustained for at least 10 minutes at a time. This could be achieved in several ways. Firstly, an intervention promoting brisk walking would be effective based on the results of the qualitative study (Chapter 6). An intervention of this kind may use techniques such as providing or creating more walking groups, walking maps with safe and well lit routes, and points of interest along the routes such as parks or river walks. Many women in this study reported that they would be more active if the activity was a social one. Implementing walking groups would be a cost effective and easy way to introduce SA women to PA while incorporating a social aspect that SA women would enjoy. Additionally, walking is an activity that many older ladies reportedly enjoyed. Walking groups may encourage them to engage in more PA and less ST.

This thesis also found that many SA women thought they were active because they were busy with housework, but objective measurement revealed that this activity did not reach the intensity level of MVPA. Future interventions could also focus on education on how to achieve a higher PA intensity level for health benefits. It is recommended that this type of intervention involve general practitioners (GP)s since many SA women reported that they would like to have more PA information from their GP. Many women also reported that they would like to have more community groups or community centres that provide women's only PA and age appropriate PA such as gentle aerobics swimming and yoga. Future interventions could use the already existing SA community groups and make these activities more readily available to SA women. Keeping these low cost, easily accessible and providing childcare will be essential in the success of such interventions.

Interventions aimed at decreasing ST among SA women might involve encouraging women to get out and about in their communities more. This will involve getting out of the house, less television viewing time, and potentially more time spent walking. Encouraging older ladies to come together to do more of their own shopping and other activities in the community would reduce time spent being sedentary and increase time spent walking. Providing free or low cost childcare at community or leisure centres will give many younger SA women with busy family lives the opportunity to engage in PA and reduce ST by allowing them time to get out of the house.

In conclusion, limited previous research on the PA and ST of SA women indicates that this is a highly inactive and sedentary group in need of health promotion and interventions to increase PA and reduce ST. This thesis employed a variety of methods to measure PA/ST, evaluate methods of PA/ST data collection, and examine SA women's perceptions of their own PA and ST. Through the use of these various strategies, or triangulation, this thesis can be recognised for the rigor of the studies and validity of the results. Key findings from this thesis indicate that objective measurement of PA and ST should be more widely used among culturally and linguistically diverse groups. If self-report methods continue to be used, a culturally contextualised tool should be developed to more accurately assess PA and ST in this, and other comparable groups. The findings of this thesis can be used to develop culturally appropriate health promotion programmes, campaigns, and interventions aimed at increasing PA and decreasing ST among SA women in the UK.

7.8 References

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APPENDICES

Appendix 1: International Physical Activity Questionnaire-Short Form

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

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

   _____ **days per week**

   ☐ No vigorous physical activities → ***Skip to question 3***

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

   _____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ **days per week**

☐ No moderate physical activities → ***Skip to question 5***

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ **days per week**

☐ No walking → ***Skip to question 7***

6. How much time did you usually spend **walking** on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

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

Appendix 2: Brief Structured Interview

ID:_____Date: _____

1. In general what do you think about the questionnaire?
    a. Was it easy to complete?
    b. Do you feel confident you could complete it on your own without a researcher being present?
2. Were you able to understand the questions?
    a. If not, which questions were not clear and why?
3. Do you feel this questionnaire be easily translated for use with those who speak Sylheti/Bengali/Urdu/Punjabi/Gujarati? (interviewer circle relevant language)
    a. What issues might arise for the individuals acting as interpreters?
    b. Is there a direct, or relatively simple translation for the various terms/concepts used for exercise and physical activity in the questionnaire?
4. Were there any terms used in the questionnaire that were unclear?

Appendix 3: Semi-structured Interview

1. What do you think it means to be physically active?

   a. Prompt: do the terms “physical activity” and “exercise” have different meanings for you? If so, how do they differ? Which term would you prefer is used? Is there a more appropriate term to use that is neither of these?

2. What do you think it means to be sedentary?

   a. Prompt: is there another term you would prefer is used when referring to being “sedentary?”

3. Are you aware of any health risks related to being sedentary?

4. Are you physically active?

   a. If so, what activities do you do, and how often do you do them?

   b. How long do you do them for each time you are active?

5. Are you sedentary?

   a. What are you doing during sedentary times?

   b. Why are you sedentary?

6. What things are happening at home that make it easier or harder to be physically active?

7. What are things in the neighbourhood and community make it easier or harder to be physically active?

8. Do you have any health goals? What are they?

9. Describe your typical weekday.

10. Describe your typical weekend day.

11. Do you feel being physically active is acceptable for Bangladeshi women?

    a. Do you have different views on acceptability of physical activity based on the age of a woman (for instance, do you feel older women, or “Murubbi” should avoid physical activity)?

b. What types of activities are acceptable for Bangladeshi women to participate in?

    i. Probe: Would these types of activities differ across age groups and generations of women?

12. What could be done at home to help women, particularly older women, to decrease the amount of time they are sedentary?

    a. Probe: are there acceptable things older women, or "Murubbi" could do to break up their sedentary time and still be respected and honoured for their position in the family and society?

13. If you were a decision maker in government, how would you help Bangladeshi women in the UK be more active?

14. If you were a health care professional, how would you help Bangladeshi women in the UK be more active?