University of Oxford

Balance Beyond Work Life:
An Empirical Study of Older People's Time Use in the UK

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Submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy

Department of Sociology
Trinity Term, 2014

This thesis is submitted to the Department of Sociology, University of Oxford, in fulfilment of the requirements for the degree of Doctor of Philosophy. This thesis is entirely my own work and, except where otherwise stated, describes my own research.

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Abstract

This thesis examines how patterns of time use change in later life and how the way in which older people use their time is related to well-being. Arguing that maintaining balance in time use concerns not only people of working age but matters for people of all ages, we propose an alternative theoretical framework of life balance. This consists of two conceptual models: The Life Balance Triangle and Multidimensional Life Balance (MLB). Using UK time use data, the thesis demonstrates the empirical applicability of these two models in enhancing our understanding of older people's daily lives.

The life balance model, which we built by modifying the theoretical categorisation of time use by Å s (1978) and the work-leisure triangle of Gershuny (2003), identifies and presents alteration in time use across the life course as changes in balance between constraints (committed time) and freedom of choice (discretionary time), controlling for time spent on biological/physiological maintenance (regenerative time). We find the balance shifts towards greater discretionary, and less committed, time in later life, with a significant gender gap. Life stage, which reflects social structure and expectations, rather than biological ageing, was found to be the most influential factor for life balance dynamics. Findings suggest that men may find it more difficult to adjust to life beyond work because of abrupt and greater changes in life balance, which may disrupt their daily time structure.

The multidimensional life balance model challenges the assumption of a linear relationship between the level of activity and well-being of older people. Adapting the Alkire-Foster method (Alkire and Foster, 2011), we propose a threshold-based approach that takes the heterogeneity of older people and multidimensionality of daily life into account, and emphasises overall balance in the level of activities across various activity domains. Results show MLB is associated positively with better self-assessed health, suggesting a threshold effect. We also identify the demographic/socio-economic groups more likely to lack MLB, as well as domains in which most people are deficient. The thesis contributes to work-life balance research by moving beyond paid-work centrality, and to ageing research by providing a multidimensional approach to activities and well-being in later life.

Acknowledgements

Only now do I finally understand why writing a thesis is likened to an intellectual journey. The journey has been exciting, challenging, often sorrowful, and yet rewarding. I am grateful that I have never been alone along the way.

First and foremost, I thank my supervisors, Dr George W Leeson and Dr Kimberly Fisher. I am grateful to Dr Leeson for having confidence in me and patiently supporting my various intellectual adventures. His insight as a demographer prompted me to think about the extended time we spend in later life and its implications for society. Dr Fisher led me to time use studies and the empirical investigation of daily life from a multidimensional perspective. Without her detailed feedback and comments at every important step, I would not have completed my journey. I thank her deeply for her valuable support – she was my Galadriel, who guided me through the dark caves and valleys, and through the beautiful fields.

My heartfelt gratitude goes to Professor Jonathan Gershuny. His insightful work on the work-leisure balance triangle formed an important basis of my thesis, and his encouraging comments at my confirmation examination have been most helpful in developing my ideas. Professor Gershuny provided intellectual stimulus over Nuffield lunches and guided me to many classic works in sociology, in particular Marie Jahoda's.

I would like to thank Professor Sarah Harper for enhancing my understanding of later life as a life stage in affluent societies. Researchers and staff at the Oxford Institute of Population Ageing, including Kenneth Howse, Professor Bleddyn Davies, and Debbie Alder, created a warm and welcoming environment for discussion, and I benefited greatly from the Institute's seminars and informal meetings.

I am indebted to Dr Sabina Alkire at the Oxford Poverty and Human Development Initiative (OPHI) for introducing me the Alkire-Foster methodology. Thanks to the detailed resources, seminars and kind advice provided, I was able to apply this innovative methodology to my research. I am grateful to Dr José Manuel Roche and Dr Suman Seth for their helpful advice in this regard. I thank the faculty and staff in the Department of Sociology, especially Dr Michael Biggs and Dr Tak Wing Chan, for nurturing and transforming me from a journalist into a sociologist.

St. Cross College provided me with a friendly and international community, which gave me much comfort. I would like to thank Professor Herb Marsh, my college advisor, his wife Margaret Marsh, and Professor Andrew Goudie, the former Master of St. Cross, for their kind support. The award of a Chevening Scholarship supported my study in the UK, and is gratefully acknowledged.

I owe a debt of gratitude to many scholars in Korea, who encouraged and supported me throughout my study. I thank Professor Un-Chan Chung, the former prime minister of Korea, for his encouragements and for advising me to embark on the adventure in the first

place. I owe much to Professor Ki-Soo Eun at Seoul National University for leading me into a new direction of research: the international workshop on work-life balance he organised in 2011 was a turning point in my research, as I changed the subject of my thesis from looking at retirement decision to balance in time use. He gave me precious opportunities and resources, with warm encouragement, and above all a place to finish my thesis with coffee. I am grateful to Professor Seung-Eun Cha for her consistent support and bright energy, which always motivated me. I express my gratitude to Professor Jeong-Jae Lee, Professor Kyung-Bum Kim, and Professor Myung-Koo Kang for valuable guidance and encouragement over a decade.

Throughout the journey, I have been blessed with many talented and sweet-hearted friends who added much delight to times spent in Oxford. I thank them for their friendship and memories I will cherish. To name just a few: Qianhan Lin (Lily), Taichang Chen, Patricia O'Neill,Yiu-tung Suen, Mathieu Verbaere and Dorothée François, Man-yee Kan and Jooyoung Jeon. I also thank Jinam, Jaedong, Eunryung, Hoon, and my other former colleagues and dear friends at the *Dong-A Daily* for being my source of comfort and shelter.

My very special thanks go to my South African friends, Dr Jacobus Hoffman, Amanda Diener and Kareni Bannister, for showing me examples of ubuntu. Without Kareni's love, dedication and her attention to detail, my thesis would not have been completed. I am most grateful for all her warm care as my Oxford aunt.

My father, Woong Jun, my mother-in-law, Youngsuk Bang, and my grandmother Bongsoo Choi are inspiring examples of people who maintain life balance in later life. My father became the director of a national choir of senior people after he retired as a fund manager. My mother-in-law started learning the English alphabet and mathematics in her early sixties, and is now beginning her journey as a university student in English literature. My grandmother, who is in her late eighties, enjoys maintaining her daily schedule and goes out every day despite her leg problems. I am grateful to them and all my family – Jongmok and Hyunmi; Jooyoung, Seongjae and Jigang – for their achievements and victories over life's many challenges, and for and their love and support.

Seeing me writing this, my everlasting companion, my husband Jeongwoo Park, said: 'Come to think of it again, it was a lovely journey – but just this once.'

My deepest thanks go to him.

To my mother Bok-sun Moon and my sister Hei-won Jun,
who lived wonderful young lives,
but left too soon to be cherished in later life.
They remain forever young in my heart.

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1. Introduction

> Thus for the first time since his creation man will be faced with his real, his permanent problem – how to use his freedom from pressing economic cares, how to occupy the leisure […] to live wisely and agreeably and well.
>
> John Maynard Keynes, *Economic Prospects of Our Grandchildren* (1930/1973)

Quoting Keynes, Jonathan Gershuny (2003) posed a 'permanent problem for the human race' in his seminal work, *Changing Times: Work and Leisure in Postindustrial Society* – that is, 'finding enough things to occupy the day with […] filling the space left by the decline of work' (p. 59). What they probably had in mind was an image of a leisured society, in which the problem of providing for basic needs such as food and shelter may well no longer be central for the community. Although we may or may not agree that the leisured society has come into being or will come into being in near future, it can certainly be argued that, at least for the majority of contemporary retired people in affluent societies, the problem of finding things to occupy the day with has been a valid one, and is at least as important as the problem of providing for basic needs.

This thesis sets out to explore empirically an answer to this problem – how older people in an affluent society 'occupy the day' (Gershuny, 2003, p. 59); and whether the way they occupy their time in the course of the day is linked to living 'wisely and agreeably and well' (Keynes, 1930). Using the time diary data, we investigate how patterns of time use change in later life when paid work no longer holds a central position in daily life, and seek to find out whether specific patterns of time use are associated with enhancing well-being in later life. In particular, we incorporate the perspective of 'balance' in time use

research (Gershuny, 2003) to develop a conceptual framework of *life balance* for later life, and based on this framework, we develop new empirical measurements to study the daily activity of older people and its relationship to well-being. This brief introduction provides the background for our research, followed by primary research aims and an overview of the data and the thesis structure.

1.1 Background

With the increased life expectancy and trends towards earlier retirement that continued throughout the later part of 20th century, the phase occupied by later life has been considerably extended (Gruber and Wise, 2004). For instance, Lee (2001) reported that the expected average length of retirement in the US has increased more than six times between 1850 and 1990. In 1850, men aged 20 were expected to spend on average less than three years in retirement, while in 1990 this period increased to more than 16 years (Lee, 2001, p. 645). In Western Europe, it has been estimated that half the population will be aged over 50 by 2030, and people who reach age 50 then are predicted to be able to anticipate a further 40 years of life expectancy (Harper, 2006)[1]. This growth in the proportion of the population that occupies this phase of life as well as the increase in the length of time that we expect to spend in it is likely to continue with the population ageing (see Leeson, forthcoming, for further discussion of the increase in life expectancy). Both for individuals and for societies, later life can no longer be said to represent 'a postscript

[1] Many developing countries are expected to follow this pattern as their populations age rapidly.

to working life, a brief and insignificant interlude between the end of economic activity and the end of physical existence', as it used to be regarded as until the mid-20th century (Johnson, 1998, p. 221).

Not only have the length of time and the size of population in later life increased, but the characteristics of people in this phase of life have changed considerably as well. The health of the older population has improved significantly during the last few decades, now that many older people are in good health and relatively free from physical dependency until they reach 'oldest-old', a stage which is often regarded to begin on average at the ages of 80 to 85 in developed countries (Baltes and Smith, 2003). In affluent societies, older people are found to perceive themselves younger than their chronological age (Demakakos, Gjonca, and Nazroo, 2007). Thus it has often been argued that 'today's 70-year-olds are comparable to 65-year-olds who lived 30 years ago' in terms of physical and mental fitness (Baltes and Smith, 2003, p. 126)[2]. Older people's economic situation has also improved in many affluent countries; although poverty and financial insecurity still exist in old age there, poverty is no longer regarded as 'an explicit old-age risk', and older people with higher economic resources are frequently depicted as important targets for future consumer markets (Weidekamp-Maicher and Naegele, 2007, p. 65).

[2] For instance, in Korea, the celebration of the 60th birthday (Hwan-Gap), which traditionally marked a major transition to old age, has lost its significance, and the celebration of the 70th birthday (Go-Hee), which used to represent a celebration of 'hard-to-reach' longevity, has come instead to represent the transition to old age which age 60 once signified.

However, because of the speed and the magnitude of these changes, there have been cultural, structural, and individual gaps and delays in understanding and making use of this extended phase of life (Harper, 2006; Riley and Riley, 1994). Riley and Riley pointed out the existence of an imbalance between 'the mounting numbers of long-lived people (the unprecedented transformation of ageing) and the lack of meaningful role opportunities or places in the social structure that can recognise, foster, and reward these capacities' (1994, p. 110). While later life has become established as one of the main spheres of the modern life course[3] (Moen, 2011), this phase, unlike other stages of life where specific normative guidelines and defined roles exist (e.g. education, work, and family responsibilities), has been regarded as lacking such guidelines. For instance, the term 'retirement', which is often used as the equivalent of 'later life' (e.g. in retirement; retired people), has been defined mostly by what people are *not doing* (e.g. not being in the labour force, leaving in one's main career) rather than by what they are actually *doing*[4]. For instance, discussing the social expectations about 'appropriate activity across life cycle' (Robinson and Godbey, 1997, p. 18), Robinson and Godbey stated that:

> In Western societies, early life is expected to be a period of learning and socialization, largely in preparation for the 'work' expected of individuals in the middle part of their lives. After a certain age, people move into the retirement phase

[3] The tripartite model of education-work-retirement became widely accepted in life course research (Settersten, 2003). Although the timing and pathways of transition to later life are found to be increasingly diverse (Henretta, 1992), the eventuality of this transition has been argued to be stable (Ekerdt, 2004).

[4] This may be one of the reasons that retirement has been known to be notoriously difficult to define and measure. For instance, it has been regarded as problematic to define the retirement of women who did not participate in paid work, or of older people who start working again after initially leaving their full-time job (Ekerdt and DeViney, 1990; Denton and Spencer, 2009).

> of life, in which they are freed of the necessity of doing most forms of work. (Robinson and Godbey, 1997, p. 18)

The expression 'role-less role', applied to older people by Ernest Burgess, indicates this absence of behavioural expectation in later life (Riley and Riley, 1994). Yet, such social assumptions were established in the mid-20th century, when people were expected to have only a few years of healthy life left before the onset of physical and mental frailty[5]; this is no longer is the case for the majority of people in affluent societies. In this regard, James and Wink (2006, p. xi) pointed out that 'contemporary social institutions have not kept up with the added years of life', and that society is without 'a societal map of what we will as a society do with this great expanse of time' (James and Wink, 2006, p. xxi).

Thus, while possibly providing opportunities for freedom of choice, autonomy, and potential for self-fulfilment by releasing people from the obligation of work, later life has posed challenges both for individuals and for society. For individuals, new responsibility for planning and maintaining later life has emerged: 'Without taken-for-granted blueprints, people must strategically select their own pathways through this emerging life stage' (Moen, 2011, p. 14). For society, with the concerns over the increase in the burdens of social security, medical expenses and expected labour force shortage, finding ways to

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[5]When retirement as a social institution was initially designed, long and healthy later life was not something to be expected:

> In the 1919 report of the Ohio Health and Old Age Insurance Commission, Dr John O'Grady wrote, 'Very few wage-earners can expect to be able to work until the end of their lives. They ordinarily look forward to *a few years before death* when they will no longer be able to earn wages. How are they to obtain a livelihood during those last years of life?' (Costa, 1998, p. 4)

‘harness the experience, expertise and creativity of such a historically large number of older people’ (Harper, 2006, p. 34) as well as improving health and independence of older people has become one of the priorities in formulating policy.

Understanding how older people spend time and identifying what activities promote health and well-being in later life have thus become important issues both for individuals and for society. At the same time, it has been argued that despite such increasing interests in the topic of daily life in old age and its importance in understanding and preparing for later life, ‘the knowledge of older people’s everyday life remains surprisingly limited’ (Chatzitheochari and Arber, 2011, p. 128). Empirical studies of older people’s use of time are relatively few, and while they provide valuable information regarding older people’s time use patterns (Moss and Lawton, 1982; Ujimoto, 1988; Altergott, 1988; Gauthier and Smeeding, 2003; Chatzitheochari and Arber, 2011), empirical research into how we spend time in later life has been identified as needing comprehensive framework and methodological development beyond descriptive accounts. For instance, as most studies focused on measuring older people’s participation in certain/specific kinds of activities in isolation (e.g., paid work, unpaid work, and active /passive leisure) without considering older people’s daily time use as a whole, we know little about how, in reality, the day is spent in later life and how the various elements of daily activities are related with one another.

Moreover, while the volume of studies of older people’s participation in activities and well-being has grown (Everard et al., 2000; Maier and Klumb, 2005; Glass et al., 2006;

Janke, Payne and Van Puymbroeck, 2008; see Adams et al., 2011, for a review), the empirical evidence regarding the relationship has been found mixed and inconsistent. For example, while volunteering, as an activity, has been known to be generally beneficial for the well-being of older people, some studies have found a negative or non-significant relationship between volunteering and well-being (Li, Pickles and Savage, 2005; Bjørnskov, 2003; Haller and Hadler, 2006). While some research found a positive relationship between unpaid work and well-being, others identified a negative and detrimental effect for unpaid work such as household activities (Sonnentag, 2001; Demerouti et al., 2009). Similar discrepancies in findings were found in terms of social and leisure activities (Adams et al., 2011).

One of the main reasons for such discrepancy in empirical findings is the lack of a comprehensive framework based on theoretical principals regarding older people's daily activities. In an extensive review of the literature regarding the relationship between activities and well-being, Adams et al. (2011) argued that because of the numerous ways of defining and measuring, it is difficult to draw inferences about the relationship between activity and well-being from existing evidence. From the 42 studies reviewed, they found the number of activity domains used in the studies ranged from one to 13, which generated a 'confusing array of outcomes' (Adams et al., 2011, p.686). Kerby and Ragan (2002, p. 118) also pointed out that there is an 'absence of an empirical basis for the classification' in activities and ageing research, since many studies 'simply classify with an ad hoc approach'. As activities are studied in isolation without a comprehensive framework, the findings tend to remain fragmented.

Furthermore, most research into the relationship between activities and well-being is based on activity theory, which assumes a linear relationship: the more activity, the better for the well-being of older people (Havighurst, 1961; Lemon et al., 1972; Rosenkoetter et al., 2013). This assumption, while widely held, also contributes to the discrepancy in empirical findings. First, different types of activities are found to have different benefits (Menec, 2003). However, due to the zero-sum property of time (Fisher et al., 2007), if one spends too much time on one activity, there is less time left for other activities. Moreover, even if an older person actively engages in one activity dimension, this does not mean that he or she actively engages in other activity dimensions as well. Therefore, the positive outcome of engaging in one activity dimension can be off-set by a lack of participation in other dimensions. Second, the linearity assumption between certain activity and well-being does not consider the heterogeneity of older people. Despite a number of findings of positive association between activity and well-being, it remains unclear 'whether different types of activity are equally important for the well-being of older adults, or for all groups of older adults' (Adams et al., 2011:685).

In addition, by placing the emphasis on 'active engagement' without considering the different health conditions and socio-economic circumstances, and above all the preference, of older people, the linearity assumption between activity and well-being holds the danger of marginalising a sub-group of older people who cannot or do not wish to 'actively engage' in recommended activities. For example, in the case of 'productive ageing' movement in the U.S., concerns have been raised that emphasising productive activities and civic engagement in later life can contribute to 'the stigmatization and

disempowerment of those elders who fail to meet our criteria for "a good old age"' (Martinson and Minkler, 2006:323).

The insufficient empirical research into how older people use time impedes our understanding of contemporary later life, and makes it difficult to develop policy that properly reflects the needs and condition of older people. One example of such an issue is the mismatch between the real life of older people and the image of 'Third Age' (Laslett, 1996) or 'successful ageing' (Rowe and Kahn, 1997), which have been widely promoted during the last few decades. With the increase in the number of older people in good health and free from physical dependency as well as with better financial conditions (Banks et al., 2010; Wahrendorf and Siegrist, 2010), a tendency to regard later life as a time of self-realisation and opportunity became prevalent during the last few decades (Laslett, 1996). It has been argued that a significant paradigm shift regarding later life has occurred in Western industrialised societies, 'from approaches that were built around the ideas of exclusion, disengagement, and dependency of older people toward a new paradigm that viewed life after retirement as an expanded phase of high involvement in [active] leisure activities' (Chatzitheochari and Arber, 2011, p. 127).

However, few empirical studies investigated whether there have been changes in the patterns of time use with respect to these changes in expectations and meanings regarding later life. More importantly, few considered the issue of whether older people's activities do in fact respond to the expectations and meanings attached to later life. For instance, whether older people's capacity and actual behavioural patterns match expectations has

rarely been examined in empirical studies. In one of the few studies of older people's use of time in the United Kingdom, Chatzitheochari and Arber (2011) found that despite the prevalence of theoretical arguments about a 'Third Age' which views later life as a time of self-fulfilment and active leisure pursuits, only a small minority of British retirees participate in 'active' leisure, while the majority engage extensively in 'passive' leisure activities and a large proportion of retirees reported lengthy periods of 'resting'.

Thus, this thesis sets out to develop a comprehensive, theory-guided framework and innovative empirical measurements to study how patterns of time use change in later life and how the way older people spend their time is linked to their well-being. As Robinson and Converse (1972) argued in *The Human Meaning of Social Change*, by utilising 'the exhaustive catalogues of what individuals do during the 24 hours', we hope to realise the "capital attraction of time budget studies […], the promise of putting these fragments of experience back together again in their realistic composite"' (p. 18). In next section, we briefly introduce the primary aims of the thesis.

1.2. Primary Research Aims

The purpose of this thesis is to explore how older people use time, and how the manner in which they use time is linked with well-being in later life. Specifically, we have three primary research aims.

First, we aim to develop a comprehensive framework for studying how patterns of time use change in later life by incorporating the perspective of balance. As this thesis will

demonstrate, balance matters in later life. The existing literature on balance concentrates on work-life balance during primary working and child-rearing ages. This research builds on this literature, but moves beyond the paid-work focus in work-life balance research to construct a multidimensional approach to activity and well-being research. In doing so, we aim to build two conceptual frameworks for life balance: the life balance triangle and the multidimensional life balance model.

Second, we aim to provide an intuitive empirical measurement of the life balance triangle that can effectively visualise how the balance in time use varies by various factors. In doing so, we aim to enhance our understanding of the dynamics of time use in later life by empirically investigating the demographic and socio-economic factors that are associated with the time use of older people.

Third, using a threshold-based approach, we aim to build an empirical measurement for a multidimensional life balance that considers the multidimensionality of daily life and heterogeneity of older people. By examining the relationship between daily activities and well-being based on the multidimensional framework, we propose that what matters for well-being is to achieve overall balance rather than whether the person participates in a certain activity or not.

1.3. An Overview of the Data

1.3.1. The UK

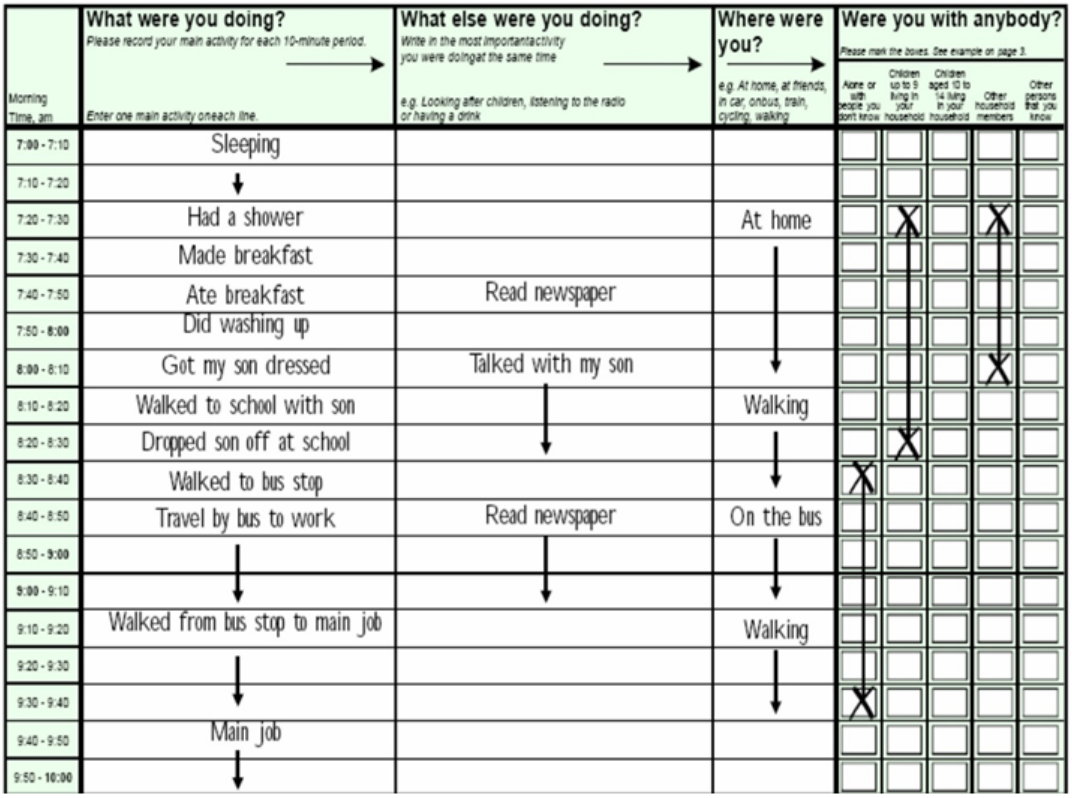
In this thesis, we focus on the patterns of time use of older people in the UK. As one of the most highly developed countries, we consider the UK an appropriate starting point for exploring the issue. Unlike in emerging countries, such as South Korea or China, where population ageing is happening rapidly, population ageing in the UK has progressed over a relatively long period. Furthermore, unlike Northern European countries where the state is mainly responsible for the welfare of its older people, in the UK the responsibility is shared between state and individual by means of a basic social security system and substantial private pensions (Ebbinghaus, 2006). This suggests that the case of the UK would be one of the models developing countries are most likely to follow. Most importantly, the tripartite model of life course was established and has existed for several decades in the UK. It has been argued that it was during the post-war period (1945-1965) that old age became a distinct stage in life course in the UK (Harper and Thane, 1989; Harper, 2006). Unlike countries such as Japan, where older people tend to be encouraged to work as long as their health permits, the UK has seen an established trend of retirement as a distinct life stage separate from paid work. This provides a promising field to explore the changes in the balance of time use in response to the life stage transitions. Moreover, despite the availability of good quality data as well as methodological advancements, research into the time use of older people in the UK has been limited (Chatzitheochari and Arber, 2011). Therefore we believe that studying the

dynamics of life balance in later life in the UK will provide a fruitful starting point for understanding daily life experiences and well-being in later life.

1.3.2. Value of Time Diary Data for Later Life Research

In studying the daily life of older people, we use time diary data. Time diary is a record of time spent on different kinds of activities throughout a specified period, usually for 24 hours (Gershuny, 2011; Fisher et al., 2007). It provides the most suitable data for our research, as it yields exhaustive accounts of how people spend the day. As can be seen in Figure 1.1 bel, an example of time diary from the UK 2000-2001 Time Use Survey (Gershuny, 2011), the data not only show the amounts of time spent on each activity, but also the contextual information of each activity, such as who else was present during the activity and where the activity occurred, as well as the sequence of activities throughout the day (Fisher et al., 2007). Therefore, the data enable us to examine patterns of time use from a multidimensional perspective. Below, we discuss further why we use time diary data for our analysis.

Figure 1.1. Example of a Time Diary, UK 2000-2001 Time Use Data



Morning Time, am	What were you doing? Please record your main activity for each 10-minute period. Enter one main activity oneach line.	What else were you doing? Write in the most importantactivity you were doingat the same time e.g. Looking after children, listening to the radio or having a drink	Where were you? e.g. At home, at friends, in car, onbus, train, cycling, walking	Were you with anybody? Please mark the boxes. See example on page 3. Alone or with people you don't know	Children up to 9 living in your household	Children aged 10 to 14 living in your household	Other household members	Other persons that you know
7:00 - 7:10	Sleeping							
7:10 - 7:20	↓							
7:20 - 7:30	Had a shower		At home		X		X	
7:30 - 7:40	Made breakfast		↓					
7:40 - 7:50	Ate breakfast	Read newspaper						
7:50 - 8:00	Did washing up							
8:00 - 8:10	Got my son dressed	Talked with my son	↓				X	
8:10 - 8:20	Walked to school with son	↓	Walking					
8:20 - 8:30	Dropped son off at school		↓		X			
8:30 - 8:40	Walked to bus stop		↓	X				
8:40 - 8:50	Travel by bus to work	Read newspaper	On the bus					
8:50 - 9:00	↓	↓	↓					
9:00 - 9:10	↓	↓	↓					
9:10 - 9:20	Walked from bus stop to main job		Walking					
9:20 - 9:30	↓		↓					
9:30 - 9:40	↓		↓	X				
9:40 - 9:50	Main job							
9:50 - 10:00	↓							

Source: Gershuny (2011, p. 9)

One of the reasons that we use time diary data is that they are recognised as the most persuasive source for the study of daily activity patterns. An extensive literature confirmed the reliability and validity of the time diary data and found they provide the most comparable estimates of time use (Fisher and Gershuny, 2013; Robinson and Godbey, 1997; Bittman and Wajcman, 2000; Gershuny, 2011). Compared with other alternative methodological approaches, such as stylised questionnaire methods, time diaries have less recall bias because the respondents are not asked ‘to make complex yet vague calculations’ (Fisher et al., 2007, p. 4) such as asking ‘How many hours did you

work last week?'[6] but instead asked respondents to recall their activities sequentially for a specified period, which corresponds to the way people usually store daily events in memory (Chatzitheochari and Arber, 2011).

Furthermore, stylised questionnaires tend to collect information about only a limited number of activities so that it is not possible to study the daily life of people as a whole, or to capture activities that are not asked in the stylised question. As the time diary is a self-reported account of how someone spent a 24-hour period, and includes contextual information, it provides a detailed and rich description of a person's daily life. More importantly, as the time spent on each individual activity adds up to the 1440 minutes (24 hours), it enables us to observe balance in terms of daily activity: if you spend too much time on certain activities, there remains less time to spend on others (the 'zero-sum' property) (Fisher et al., 2007). Thus, time diary data provide 'a comprehensive account of rhythm and balance among all the conditions and circumstances of daily life' (Gershuny, 2011, p. 4)[7], which makes the time dairy materials most appropriate for our study of life balance in later life.

[6] Fisher et al. (2007, p. 3) explain that this question assumes that 'each respondent interprets "work" the same way, searches memory for all episodes of work, and is able to correctly identify and sum all the episode lengths across the day or across days in the last week'. Furthermore, respondents are expected to answer these questions in a few seconds.

[7] For more information regarding time diary methods, see Fisher and Gershuny (2013) Gershuny (2011; 2003); Fisher et al. (2007); Robinson and Godbey (1999); Juster and Stafford (1985).

In this thesis, we aim to utilise the advantages and potential of time diary materials further by proposing new methodological approaches. Despite the well-established advantages and potential of time diary data in studying the daily life, the use of these data to investigate older people's daily life has been relatively rare (see Gauthier and Smeeding, 2001; 2003; Chatzitheochari and Arber, 2011a; 2011b for discussion). In particular, most existing studies focused on identifying the kinds and duration of certain activities that older people engage in, rather than considering older people's day as a whole and taking the balance between life dimensions into account. Furthermore, in most of the research contextual information such as 'who else was present' and where the activity occurred was less utilised, although this kind of information can provide important clues regarding older people's daily life, for example, at the issue of isolation. We develop two empirical measurements of life balance (the life balance triangle and the multidimensional life balance index) to make use of the rich information the diary data provide. The empirical chapters (Chapter 3 to Chapter 6) focus on introducing these approaches and their applications.

1.3.3. Value of Multinational Time Use Study (MTUS) Version of UK Data for this Research

For most empirical analyses in the thesis, we have used the Multinational Time Use Study (MTUS) version of the 2000 UK Time Use Survey (Gershuny, 2003; 2011; Fisher et al., 2013; Short, 2006). MTUS is a harmonised set of nationally representative time use diary surveys collected since the 1960s, and which currently contains surveys from 23 countries

across time periods[8]. This is the largest harmonised dataset of cross-country and cross-time data available which enables international and inter-temporal studies.

Although in this thesis we are studying a single country rather than making a cross-country comparison, we use the MTUS version of the UK time use data for two main reasons. First, the harmonised activity codes and background variables (demographic, socio-economic, and health related) in the MTUS have been carefully constructed and revised over the years, and any missing or imputed values are explicitly stated. This study also provides information about low-quality diaries which may lead to biased results and/or which lack important basic background information such as age and gender (Fisher and Gershuny, 2013). In this thesis, we used only good-quality diaries that meet the criteria set by the MTUS (see Fisher and Gershuny, 2013, p. 18 for detailed information). Second, although the cross-time, cross-country analyses are beyond the scope of the current thesis, we deliberately designed the life balance triangle and the multidimensional life balance index based on the 69 harmonised MTUS activity codes so that such comparative studies can be conducted at the next stage[9] (See section 7.5.5. for further discussion).

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[8] The MTUS is harmonised by the Centre for Time Use Research, University of Oxford. For more information, see www.timeuse.org/mtus

[9] We conducted some preliminary cross-time analysis by comparing 1983 and 2000 UK data (Chapter 3). We also replicated our analysis of the determinants of life balance in Chapter 4 using the 2005 UK data (Appendix) for the validation purpose.

The original 2000 UK Time Survey was conducted by the Office for National Statistics (ONS) of the UK. It was based on a nationally representative sample, collected between June 2000 and September 2001[10]. Individuals aged over eight in each household were asked to complete two diaries (one week day, one weekend day) in their own words (Short, 2006). The diary was designed to be comparable with the Harmonised European Time Use Study (HETUS), and consisted of 144 ten-minute slots (1440 minutes in total)[11]. Other than the background variables that are harmonised into the MTUS, the original survey had several variables that were of interest to our study, such as the reason for not being in paid work and questions regarding long-term health status. We extracted these variables and matched with the MTUS data for our analysis. The variables as well as the harmonised MTUS activity codes are introduced in each relevant empirical chapter.

Except for Chapter 3, where we compare the life balance between younger adults and older adults, people aged over 50 years only were selected for most analyses. Although studies regarding the daily life of older people commonly use age 65 as the reference point, we selected people aged 50 and over for our analysis of later life as we are of the view that the transition to later life may start earlier than the official pension age[12]. In the

[10] Although not the most recent data, they are the most comprehensive UK data available at the time of this study. The collection of 2014-2015 UK time use data would enable us to conduct further research.

[11] For more information regarding the 2000 UK Time Use Survey and how the data were harmonised, see http://www.timeuse.org/mtus/surveys/GBR/2990

[12] With the emergence of early retirement, the timing of transition to later life became varied and for many older people the transition to life beyond work life often begins in their fifties. Surveys of ageing, such as

MTUS, the age of people aged over 80 was coded as 80 to protect the anonymity of the diarist (Fisher and Gershuny, 2013)[13]. Each empirical chapter discusses the characteristics of the sample used.

1.4. Thesis Overview

The thesis is divided into three major parts. The first two chapters provide the brief introduction and conceptual framework of the study. Four subsequent empirical chapters investigate the issue of balance beyond work life, based on the new methodological approaches using UK time use data. The concluding chapter summarises and discusses the main findings, limitations and the implication of the study. The current section provides a brief overview of the thesis.

Chapter 2 considers the conceptual issue of balance beyond work life. After critically reviewing the framework of work-life balance that places paid work in a central position, we ask whether the issue of balance is no longer relevant in later life, when we are supposed to 'be freed of the necessity of doing most forms of work' (Robinson and Godbey, 1997:18). Arguing that balance matters to everyone, not just to the working-age

English Longitudinal Study of Ageing (ELSA), also collect data from those aged 50 years and older. Chapter 4 addresses the timing of transition to later life in relation to changes in life balance.

[13] Although it is beyond the scope of the current thesis, the patterns of time use of the oldest old people are worth further research. With increasing longevity, it would be interesting to examine whether the patterns of time use become vary over time in this oldest old group.

population, we propose two conceptual frameworks for life balance in later life: the life balance triangle and the multidimensional life balance.

The four empirical chapters concentrate on developing the life balance measurements and their applications using the UK time use data. Chapter 3 and Chapter 4 explore how patterns of time use changes in later life from the perspective of life balance. In Chapter 3 we explain how the life balance triangle model is constructed, including the modification of the four classic categories of time use by Ås (1978) into three dimensions of life balance (discretionary, committed, and regenerative), and the adaptation of Gershuny's work-leisure balance triangle (2003). The effectiveness of the life balance triangle model in visualising and exploring the patterns of time use in later life is demonstrated. For instance, we show that in later life, the balance in daily time use shifts towards having more discretionary time and less committed time, with a significant gender difference.

Chapter 4 investigates the main determinants of life balance dynamics. We argue that life balance should be understood as a dynamic process that changes across the life course, rather than as a static status that has one 'optimal' balance point between the three dimensions of time use. We test whether the dynamics of life balance is more influenced by age/health (biological/physiological factors) or life stage (social structure), and whether the effects are gender specific. We show that life balance can be an effective indicator for the life course transition, as it reflects the expectations and obligations that are attached to each life stage.

In Chapter 5 and Chapter 6 we address the question of how the way people spend time is related to well-being in later life. Chapter 5 explains how we constructed the multidimensional life balance model based on the Alkire-Foster (AF) multidimensional poverty measurement method (Alkire and Foster, 2011). In particular, we discuss how the multidimensionality of daily life and heterogeneity of older people are taken into account in constructing the model by using a threshold-based approach. We then apply this model using the UK time use data to identify who have achieved the multidimensional life balance, and who have not, among British older people. We demonstrate the strength of the multidimensional life balance model in identifying and targeting older people with multiple insufficiencies across daily activity domains.

The final empirical chapter, Chapter 6, explores whether having multidimensional life balance positively contributes to well-being in later life, focusing on the relationship between achieving multidimensional life balance and self-assessed health status. In particular, we test whether our assumption of a 'threshold effect' in daily activities is supported by empirical evidence. This chapter presents the analytical value of multidimensional life balance model in explaining the relationship between activity and positive outcomes in later life.

The concluding chapter, Chapter 7, brings together the findings from the four empirical chapters, and discusses the theoretical, methodological, and policy implications of the research. A discussion regarding the limitations of the research and future avenues is also included in this chapter.

2. Balance in Later Life: Beyond Work-Life Balance Dichotomy

> For satisfaction, balance is the key.
>
> Avner Offer, *The Challenge of Affluence* (2006, p. 9)

What happens to work-life balance in later life, when paid work does not hold a central position in daily life? Would there be no need to consider the issue of balance in retirement because we are supposed to be freed from many commitments and obligations? This chapter considers the conceptual issue of balance beyond work life. We argue that maintaining balance is not confined to managing conflicting roles, and that the issue of balance still matters in later life. In addition, we argue that maintaining the balance in daily activities is a key to a successful adaptation to later life.

Researchers often describe maintaining balance as 'struggle to juggle' (Bacik and Drew, 2006, p. 136). The main concerns in the field are time pressure and stress due to the double burden of paid work and care obligations, as well as paucity of leisure time (Robinson and Godbey, 1997; Offer and Schneider, 2011). However, for other life stages such later life, maintaining balance also can be about 'occupying oneself'. In 1930, John Maynard Keynes pointed out that the 'age of leisure' can also present a 'fearful problem':

> […] there is no country and no people, I think, who can look forward to the age of leisure and of abundance without a dread. For we have been trained too long to strive and not to enjoy. It is a fearful problem for the ordinary person, with no special talents, to occupy himself. (Keynes, 1930/1973, p. 368)

For instance, Haller et al. (2013) reported that psychological problems such as boredom may arise for retired people as they experience 'the loss of a well-structured working day' and find it difficult 'to fill the day with meaningful and challenging activities, especially for less well educated individuals' (p. 411).

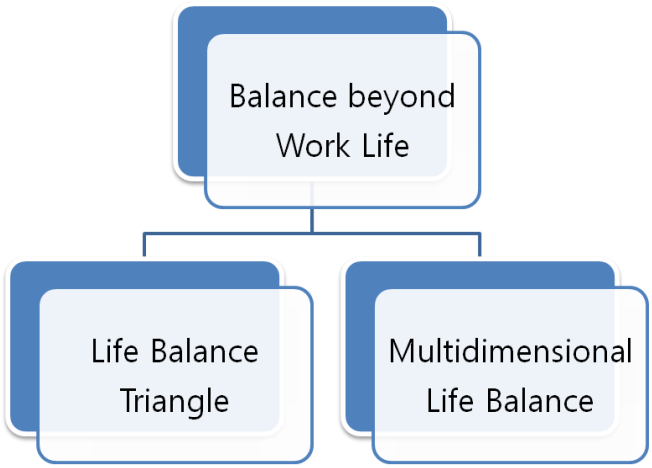
Little research has paid attention, however, to the negative consequences of losing balance due to excessive free time[14], which can be as problematic as losing balance from time pressure. Of course, maintaining balance in later life can also involve dealing with time constraints as a result of increasing physical frailty and care obligations. We therefore propose that it is important to consider the consequences of both time pressure and time abundance, and argue that balance matters to people at all life stages, not only to people of working age.

In addition, there is another sort of balance we should like to apply in studying time use of older people: that is, multidimensional life balance as a way of adaptation in later life. While the issue of maintaining balance in work life is often regarded as finding an 'optimal' allocation of time to meet various needs across multiple domains, we argue that maintaining balance in later life is more about 'adapting to and making peace with the inevitable physical disintegration of ageing' (Erikson et al., 1986). Instead of focusing on whether older people participate in a specific activity or not, we focus on the overall

[14] Gershuny pointed out that 'the vehemence and wide visibility of the current "running-out-of-time" argument may relate to the specific life-circumstances of the writers on this subject' (Gershuny, 2003, p. 74) who themselves are more likely experiencing 'time pressure' due to paid work and family life.

balance across domains in terms of daily activity. Specifically, we take a threshold-based approach that considers maintaining at least a certain level of activity across various life domains as an important source for well-being in later life[15].

Figure 2.1. Two Conceptual Models to Study Balance beyond Work Life



This chapter consists of two main parts. As Figure 2.1 shows, we propose the two conceptual models to study the problem of balance beyond work life: the life balance triangle and the multidimensional life balance. First, we discuss the limitations of the current work-life balance framework in studying patterns of time use in later life, and propose a conceptual model of the life balance triangle that focuses on the balance between time constraints and freedom of choice. This model addresses how the balance

[15] An analogy may be found in the 'five-a-day' food campaign in the UK. For health benefits, people are recommended to eat *at least* five portions from a variety of fruit and vegetables a day (NHS, 2013), as different fruits and vegetables contain different combinations of nutrients. Likewise, we argue that to achieve balance, people should include a variety of activities in their daily life above a minimum threshold, as different activities lead to different combinations of benefits.

in time use changes throughout the life course. Second, we critically review the dichotomous approaches of studying older people's activity and well-being in later life, and propose a multidimensional life balance model that takes into account the multidimensionality of daily life and the heterogeneity of older people. This model addresses how individuals respond to challenges and opportunities of later life to maintain well-being by adjusting their daily activities.

2.1. The Life Balance Triangle Model

2.1.1. Balance Matters to Everyone

The idea of life balance as a theoretical framework stems from the limitations of current work-life balance research. Work-life balance has been a topic of much interest to researchers and policy makers. This concept has been widely applied and has played an important role in identifying the quality of working life and its impact on family life, including the issue of time pressure due to the demands of work and the issue of gender gap in time use patterns (Schieman, Milkie and Glavin, 2009; Offer and Schneider, 2011).

A large number of studies have investigated the determinants and consequences of work-life (im)balance (for review, Fagan et al., 2012; Drobnič, 2011; Guest 2002), as well as the mechanism for achieving work-life balance (Lambert,1990; Clark, 2000). While the exact definition of the concept is still being debated, in work-life balance research the term 'work' has been generally restricted to mean 'paid work' and 'life' has been used to refer to 'the rest of life' or 'family life' (Drobnič, 2011). Although the term 'balance' is

often replaced by ‘interference’ or ‘conflict’ to refer to the strain caused by the inability to fulfil demands from work and life (Blyton et al., 2011; Bellavia and Frone, 2005; Schieman et al., 2009; Drobnič, 2011) and some argue that the term ‘life’ should be replaced by ‘non-work’ to encompass broad aspects of life, the centrality of ‘paid work’ in the framework of work-life balance has rarely been challenged[16].

By treating the concept as a dichotomy between ‘paid work’ and ‘the rest of life’, however, this framework fails to encompass other stages of life in which paid work holds much less meaning. In work-life balance research, maintaining balance usually implies that individuals manage to meet the demands of two competitive spheres: paid work and other aspects of life, such as family (Blunsdon et al., 2006; Ungerson and Yeandle, 2005). In the context of work-life balance research, problems thus arise when individuals fail to fulfil family responsibilities because of work pressure or vice versa. Accordingly, current research on work-life balance tends to focus on working-age people, such as dual earner couples with young children for whom the issue of paid work’s interference with family life more likely causes the most stress (Fagan et al., 2012). Yet the importance of maintaining balance over life domains is not restricted to working-age people only, nor is the interference of paid work the only source of imbalance. For instance, a child with enormous study burdens and tight schedules imposed by excessive competition in

[16] This may be because the work-life balance became a research focus when Guest (2002) noted that ‘the excessive demands of work are perceived to present a distinctive issue that needs to be addressed’ (2002, p. 256).

education or a 70-year-old husband who provides full time care for his wife with Alzheimer's disease can also suffer time pressure even in the absence of paid work. Furthermore, at other stages of life, such as retirement, the cause and consequence of losing balance may differ from those of working-age people, i.e. rather than suffering time pressure from having too much to do, some older people may suffer boredom and depression from having too little to be engaged in. In the current work-life balance research framework, where paid work occupies such a central position, the issue of balance at other stages of life cannot be properly explored.

Also, by treating 'the rest of life' as one residual category, the framework fails to reflect the complex nature of daily activities. The 'life' category includes both unpaid work (e.g. housework, caring for elderly person, caring for children) and personal activities (e.g. leisure, rest, socialising). However, the former is found to be more similar in nature and in actual tasks required to paid work (Ungerson and Yeandle, 2005). Therefore, the commonly encountered argument in work-life balance literature, that more time and energy could be secured to deal with unpaid work by reducing the interference from paid work, may actually be solely about *work-work balance*, excluding other important aspects of daily life where maintaining balance also matters. In addition, household-related activities are found to be generally associated with negative effects on psychological well-being, while other activities, such as physical, cognitive, and social, are found to have positive effects (Oerlemans et al., 2011). Therefore, treating unpaid work and other aspects of daily life as a residual category to paid work is problematical, especially if one is interested in studying the relationship between balance and well-being.

Thus we set out to propose an alternative framework of balance in time use which can be applied to all the life stages and to broader population sub-groups. In particular, we aim to move beyond the paid-work centrality of the current work-life balance framework by building a conceptual model of life balance focusing on later life, where paid work no longer occupies the central position in daily life. The following section introduces the basic idea behind the life balance triangle framework.

2.1.2. Balance between Constraints and Freedom of Choice

In studying the issue of balance in later life, we propose that it is important to look at the balance between constrained time and free time. As traditional work-life balance research was mainly concerned with the pressure and stress arising from the struggling to manage competing or often conflicting roles, having more free time was usually regarded as positive in most studies. However, as Jahoda et al. (1933/1972) describe in a beautifully written study about Marienthal, a village with mass unemployment in 1930s Austria, too much leisure can also be a 'tragic gift':

> Anyone who knows how tenaciously the working class has fought for more leisure ever since it began to fight for its rights might think that even amid the misery of unemployment, men would still benefit from having unlimited free time. On examination this leisure proves to be a tragic gift. […] now that they are no longer under any pressure, they undertake nothing new and drift gradually out of an ordered existence into one that is undisciplined and empty. Looking over any period of this free time, they are unable to recall anything worth mentioning. Marienthal (Jahoda, Lazarsfeld, and Zeisel (1933/1972, p. 66)

They found, especially for men, that time loses its meaning and 'idleness rules the day' (1972, p. 33) once the paid work was disappeared from their life. Jahoda (1982, p. 22)

thus argued that one of the most serious consequences of unemployment was psychological distress due to the 'destruction of a habitual time structure for the waking day'. In later life, which is characterised by the reduction or cessation of paid-work with retirement, it is possible that older people may experience similar psychological consequences due to the lack of time structure caused by sudden increase in the proportion of discretionary time. Indeed, in earlier periods, retirement was frequently identified as an experience of 'role-loss' and boredom, which was often linked to depression and deterioration of health. Harper presents a Ministry of Health circular of 1954 describing a case of a man's retirement:

> After six weeks of this existence, life began to pall. He became unsettled, restless and irritable. He really had nothing to do and longed to be back at work. He was repeatedly asked to take up some hobby, which he readily promised to do but his restlessness prevented him from seriously attempting it and a laissez-faire attitude resulted… Eventually getting up in the morning became an effort, and in a short time all his interest in everything flagged. The peace of death came to him soon. (Harper, 2006, p. 100)

Thus, in studying the issue of balance in later life, we argue that it is important not only to consider the consequences of imbalance due to excessive commitment as in traditional work-life balance research, but also to consider the consequences of imbalance due to excessive discretionary time and lack of time structure. We argue that too much free time leads to the loss of time structure, which is detrimental to one's well-being (Jahoda, Lazarsfeld, and Zeisel, 1933/1972; Ekerdt, 2004), while too many constraints also diminish one's well-being by causing stress and time pressure.

To study the issue of balance in later life, we construct our first model of life balance – the life balance triangle. This model represents the balance between 'freedom of choice' (discretionary time), 'constraints' (committed time), and 'biological/physiological needs' (regenerative time) (Figure 2.2). The key assumption for this model is that in life it is important to maintain balance between discretionary and constrained time, provided that there is time available for meeting the biological/physiological needs.

Figure 2.2 Life Balance Model

Two classic approaches in time use study were modified to construct the life balance triangle: the theoretical categorisation of time by Dagfinn Ås (1978), and the virtuous triangle of work-leisure balance by Jonathan Gershuny (2003). In Chapter 3, we discuss these two approaches and explain how we modified them to construct the life balance triangle, including explanations about each of the three dimensions. Subsequently, we apply the triangle in examining empirically the life balance of older people in the UK by using time use data. It is important to note that we understand life balance as a dynamic process, not as a static concept. We do not assume an 'optimal' balance point between

these three dimensions of time. We argue that life balance changes in response to the expectations, meanings, and obligations attached to life stages, resulting in a different equilibrium according to each life stage. Figure 2.3 shows the conceptual model of how balance between discretionary time and committed time changes across the life course. We did not include regenerative time as it remains generally more stable, although it may increase in very old age. (For the discussion of regenerative time, see Chapters 3 and 4).

Figure 2.3. Conceptual Model of Life Balance Across Life Course

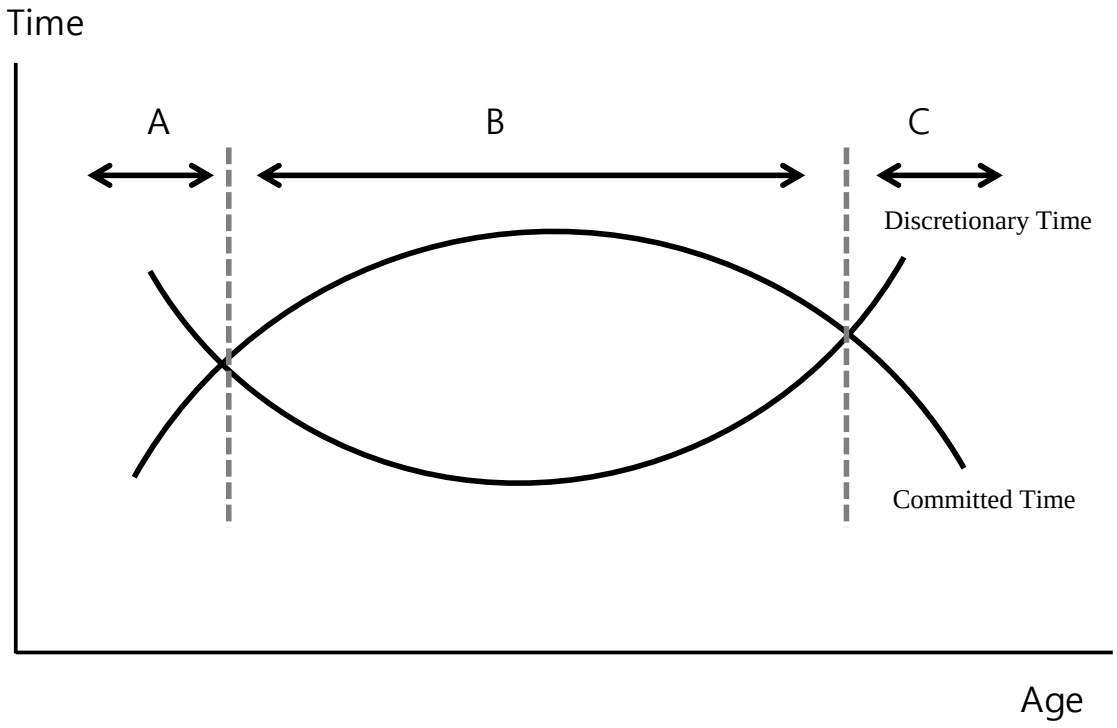


Figure 2.3 offers a simplified representation of life balance over the life course. This model was built on the life-course framework, which considers modern life course as being divided into three separate life stages: education, work, and retirement (Settersten, 2003). Period A indicates childhood, characterised by education and training for work.

As the person moves to adulthood, the share of discretionary time is reduced and committed time is increased. Period B indicates adulthood, when paid work and parenting occupy a central position. This is the period with the highest proportion of committed time and the least discretionary time, as responsibilities involving work and family are greatest (Haller et al., 2013). It is therefore the period that most work-life balance literature focuses on when discussing 'time-pressure' or 'time-squeeze'. Period C is later life, when discretionary time increases and committed time reduces as most people are freed from the obligation to be in paid work and are generally have fewer family responsibilities.

Thus, we can assume that the representation of the share of discretionary time will follow a U-shape across the life course, while that of committed time will adopt an inverted U-shape. The two dividing lines indicate where the two curves meet, which are the points where the balance changes. This feature of the life balance model enables us to explore how balance changes with life course transition. For instance, in Chapter 4 we test whether these points (where the two curves meet) correspond to the life course transition period, such as childhood to adulthood and adulthood to later life, and investigate what factors affect this change. We expect that social structure such as retirement, rather than ageing per se, would affect the change in the life balance. If our assumption holds, we should be able to measure the life course transition by the changes in life balance, and identify other factors that affect the change in balance.

The life balance triangle model addresses the first question of the thesis: how the way people spend time changes in later life. This model enables us to understand how patterns of time use change across the life course through life balance dynamics, which emphasise the changing balance between constraints and freedom of choice in time use. We argue that this level of life balance reflects social expectations and structures that are attached to the life stage, and thus can be used as an indicator for the life course transition. In Chapter 3 and Chapter 4 we empirically demonstrate the strength of this model in visualising and identifying the patterns of time use in later life.

2.2. A Multidimensional Approach to Life Balance

The second model, the multidimensional life balance model, addresses the second question of the thesis: how the way people spend time is related to well-being in later life. If the life balance triangle model is about exploring the general direction of the changes in time use in later life (e.g. an increase in discretionary time), the multidimensional life balance model is more about how individuals respond to challenges and opportunities in later life by adjusting daily activities. For instance, if increasing discretionary time is what characterises later life, and time abundance can also be a source of negative outcomes in later life, older people are faced with common challenges of how to maintain time structure by managing the increased free time. In addition, older people need to manage age-related losses such as reduced mobility and increasing frailty, which may limit the kind, duration, and strength of activities they can be involved in. Thus we argue that whether older people make a successful adaptation in terms of daily activities or not would be one of the key factors that contribute to well-being in later life.

This section introduces the multidimensional life balance model. To explain why we take a multidimensional approach, we begin by critically reviewing the two classic theories of ageing that apply to the relationship between activities and well-being: Disengagement Theory (Cumming, 1963) and Activity Theory (Havighurst, 1961). We subsequently discuss how we attempt to move away from these traditional unidimensional frameworks, based on the assumption of linear relationship between activity and well-being, to the multidimensional framework, relying on a threshold-based approach to take into account the heterogeneity of older people and multidimensionality of daily life.

2.2.1. Activities and Well-Being in Later Life

Although disengagement theory and activity theory were proposed in the 1960s, they continue to provide important perspectives on how to spend time in later life in order to achieve well-being. In particular, the basic assumption of activity theory (the linear relationship between activity and well-being) has influenced a number of other theories of activity and ageing, such as 'successful ageing' (Rowe and Kahn, 1997), that encourage older people's active engagement. Before we explain the multidimensional life balance model, we briefly review disengagement theory and activity theory as they represent the two contrasting views of the relationship between activity and well-being based on the unidimensional approach.

Disengagement theory proposed that 'normal ageing is a mutual withdrawal or "disengagement" between the ageing person and others in the social system to which he belongs' (Cumming, 1963/2000, p. 377). According to disengagement theory,

normal/successful ageing is associated with reducing social involvement and interaction, and replacing these with more self-reflective moments 'weaving the past into a satisfactory moral fabric' until the ultimate withdrawal of death (Cumming, 1963/2000; Victor, 2005). Disengagement is believed to be mutually beneficial both for society and for the ageing individual. For society, disengagement of older people allows smooth transfer between generations. Cummings describes this: 'When a middle-aged, fully-engaged person dies, he leaves many broken ties, and disrupted situations. Disengagement thus frees the old to die without disrupting vital affairs' (1963/2000, p. 30). For the ageing individual, withdrawal means a release from binding obligation, stress, competition, and the expectation of continued achievement – 'a freedom from the constraint of being needed in an interlocking system of divided tasks' (Cumming, (1963/2000, p. 28). Accordingly, in the framework of disengagement theory, older people are expected to fill their day with less committed activities, to be less likely to take on new ideas or contacts, but to maintain minimum stimulation through close and tight ties, such as kinship and friendship. Often, the favoured image of old age in disengagement theory is depicted as '[they are] content to sit back, smell the roses, and reflect on his or her past life and accomplishments' (Aiken, 2001, p. 220).

In contrast, activity theory, which was developed by Havighurst (1961), strongly objects to the idea proposed by the disengagement theory. Activity theory argues that 'normal and successful ageing involves preserving, for as long as possible, the attitudes and activities of middle age […], activity and engagement offer the path to successful ageing'(Victor, 2005:23). According to activity theory, continued productivity and social

interaction are essential to satisfaction and a sense of well-being (Maddox, 1968; Aiken, 2001); older people are thus encouraged to maintain high levels of activity and commitment – if a role was lost by retirement, then it must be substituted for by compensatory activities, and older people should remain 'productive' as long as possible. Aiken (2001:220) describes an extreme form of activity theory as expecting individual to be 'dying with his boots on'. In the framework of activity theory, older people are encouraged to find new satisfactory activities 'to replace discarded activities' (Pushkar et al., 2010).

Disengagement theory and activity theory reflect two contrasting expectations of later life regarding how older people ought to spend later life to maintain well-being. One is a life of leisure and relaxation; the other is being 'busy and as engaged as mid-life', which is increasingly popular, with the emphasis on older people's participation in productive activity. Although these theories themselves are often regarded as outdated, the idea that originated from them is still influential in studies on the relationship between activity and well-being of older people (Adams et al., 2011).

However, because of their one-dimensional nature, both frameworks are not sufficient to properly reflect the nature of older people's daily lives. As a result, the empirical findings regarding what kinds of activities are beneficial for the well-being of older people based on these frameworks are mixed and inconclusive (Oerlemans et al., 2011; Adams et al., 2011). For instance, restful activities (which represent the disengagement assumption) were found to be positively related to well-being in one study, while others found no

relationship, or a negative relationship, between restful activities and well-being (Oerlemans et al., 2011). The positive effect of doing volunteer work, one of the best-known activities presented as evidence of activity theory, is also being challenged (see Windsor et al., 2008).

Furthermore, as these frameworks do not consider the heterogeneity of older people, they cannot account for differences in direction or magnitude of effect of activities across groups of older people. For instance, while social engagement benefits were positively related to women's well-being, men are found to be helped more by solitary activities such as reading, hobbies and gardening (Agahi and Parker, 2008; Jacobs et al., 2008). In addition, while doing administrative work was found to be associated with an increased level of happiness for older people without a paid job, spending time on administrative work was found to be negatively associated with happiness for older people with a paid job (Tadic et al., 2013).

Thus, in constructing an alternative framework for studying the relationship between activity and well-being in later life, we consider the following two points as essential. First, the framework must reflect the multidimensionality of daily life. Studies based on unidimensional approaches often assume a linear relationship between activity and well-being: the higher the level of participation, the better the outcome. However, daily activity patterns are influenced by constraints and opportunities posed by time and space (Gershuny, 2003), and multiple activity domains are involved in maintaining our well-being. If we spend a long time on one activity, there is less time and capacity for other

activities[17]. Therefore, displaying a high level of activity in one dimension does not automatically mean that this individual also engages actively in other activities that are known to be important for older people's well-being. For instance, a 67-year-old woman who takes care of her frail husband may score high in terms of her participation in productive activity, but she may suffer from negative consequences due to the lack of physical, mental, and social activities. Thus, the framework needs to consider the multidimensionality of daily life (i.e. balance across different life domains) while acknowledging the limitation of a day.

Second, the framework must reflect the heterogeneity of older people. Older people are 'highly diverse, perhaps the most heterogeneous of any age strata in regard to psychological and physiological characteristics, material security, and life-style' (Nelson and Dannefer, 1992, p. 17). However, their heterogeneity has rarely been considered in studies on the relationship between daily activity and well-being. After reviewing studies on this relationship, Adams et al. (2011) concluded that while positive effects of activity are observed, these effects depend on individual characteristics. They argued that the activity and successful ageing paradigms should recognise that 'all activities are not equally valued by all older adults for disparate psychological, developmental and pragmatic reasons' (2011, p. 708). Older people have different preferences and

[17] Studies based on stylised questions such as 'how often did you … in the last month' tend to be less aware of this problem – time as a limited resource. However, we argue that to examine the relationship between activity and well-being it is important to investigate how we spend time in daily life within the 24 hours' constraints. We use time diary data to address this problem.

capabilities. Some may find being alone at home for several hours very pleasant and restful, while others may find it very depressing. The existing frameworks that look at linear relationship between a certain type of activity and well-being do not allow room for this heterogeneity. Furthermore, the 'sweeping generalizations about the relationship of activity to wellbeing and health' (Adams et al., 2011, p. 706) have been criticised as inappropriate, as it holds the risk of marginalising older people who do not meet the expectation of being active or productive. We thus argue that the new framework needs to take into account the differing preference and varying conditions of older individuals.

In the following section, we discuss the concept of balance in relation to the adaptations older people make to maintain well-being in later life, which is the basis of the multidimensional life balance model. Afterwards, we briefly introduce the multidimensional life balance model, which we build by adapting the Alkire-Foster method in multidimensional poverty research (Alkire-Foster, 2011). Chapter 5 provides a detailed explanation of the model construction and empirical application.

2.2.2. Balance as an Adaptation in Later Life

We propose that maintaining balance in later life is a means of adaptation for older people dealing with the various challenges they face in later life. We take a threshold-based approach that considers reaching minimum activity thresholds across multiple daily activity dimensions as a sign of adaptation, instead of prevailing approaches based on activity theory that aim for activity maximisation. To explain the idea of multidimensional life balance as an adaptation, we begin by discussing the theoretical

model of selective optimisation with compensation (SOC) developed by Paul and Margret Baltes (Baltes and Baltes, 1990; Baltes, 1997).

In *The Process of Successful Ageing* (1996), Baltes and Carstensen emphasised that 'a useful model of successful ageing must account for the dynamics between gains and losses' (1996, p. 405). They argued that the model should consider both the reduction in reserves and challenges presented in many life spheres in old age and the potential growth and plasticity of older people facing such challenges. The SOC model proceeds from the recognition that 'with increasing age, more and more resources are invested into maintenance and repair' (Baltes and Smith, 2003, p. 132), and focuses on the process of adaptation. This model posits that the interplay between selection, optimisation, and compensation enables older people to maintain their goals and adapt to the increasing vulnerabilities (Baltes and Carstensen, 1996). An illustrative example of the interplay of these three processes is found in Baltes (1997, p. 371):

> When the concert pianist Arthur Rubinstein, as an 80-year-old, was asked in a television interview how he managed to maintain such a high level of expert piano playing, he hinted at the coordination of three strategies. First, Rubinstein said that he played fewer pieces (selection); second, he indicated that he now practiced these pieces more often (optimization); and third, he suggested that to counteract his loss in mechanical speed, he now used a kind of impression management, such as introducing slower play before fast segments, so to make the latter appear faster (compensation). (Baltes, 1997, p. 371)

Likewise, we argue that as long as such processes of adaptation are successfully at work in terms of daily activities, the well-being of older people can be maintained even though they do not participate in all the recommended activities. That is, maintaining balance in

later life can be a way of adaptation for older people to compensate for losses. For instance, a 68-year-old woman may not be able to do vigorous physical exercise such as aerobics due to her worsening knee condition, but she may compensate for it by doing yoga and gentle swimming and remain healthy. An 80-year-old man who has limited mobility may not be able to attend club meetings in person as he used to, but he may still feel socially active if he engages in group decisions by email, online or in phone conversations with members or if friends often visit him. Menec's description of changing activities in later life provides an illustrative example. He argued that 'the importance and benefits of different activities change as individuals experience declines in various life domains' (Menec, 2003, p. S79) stating:

> […] as function declines, an individual who loved to garden may have to substitute that activity with less physically demanding ones, such as reading or listening to music. Similarly, the satisfaction gained from participating in social activities outside the home may later be derived from activities in the home, once travelling becomes too onerous. (Menec, 2003, p. S80)

Thus, in constructing the framework for multidimensional life balance, we do not assume that it is necessary for older people to maintain high levels of activity in all the recommended activity domains. Nor do we assume that engaging in a greater number of activities or for a longer time would lead to better outcomes. Instead, we focus on whether the person has reached an overall balance across various activity categories that are known to be beneficial to well-being in later life. In other words, we hold that a person is considered to have achieved multidimensional life balance in daily life if he or she has

maintained a certain level of activity across a sufficient number of dimensions[18]. We assume that once the person reaches the minimum threshold of activity level recommended for older people in a certain range of activity dimensions, he or she would be more likely to maintain well-being. Note that once the minimum threshold has been achieved, we do not consider whether the person is engaged in a greater number of activity domains or for a longer duration as being important, because we regard this as a matter of personal preference. Likewise, we regard someone's choice of activities among several recommended as a matter of personal taste, as long as the person achieves overall sufficiency. However, if someone does not take part in sufficient activities to reach the overall sufficiency level of participation, we assume that this person would be more likely to experience negative consequences, even if he or she displays high level of activity in a specific domain.

This threshold-based approach builds on the innovative work of Alkire and Foster (2011) which developed a multidimensional measurement for poverty[20]. In the Alkire-Foster model (the AF method), poor people are identified on the basis of the 'dual cut-offs' method. First, dimensions that are important to measure poverty, such as health, education, and living standards, are identified. Then, deprivation cut-offs are set to

[18] The problem of deciding a 'sufficient' number of dimensions as well as selecting the kinds of dimensions is discussed in Chapter 5.

[20] Chapter 5 discusses the methodology and the construction of multidimensional life balance measure in detail.

determine whether a person is deprived in each dimension. A person is deprived in dimension X if his or her achievement is less than the deprivation cut-off for dimension X. Afterwards, the total number of deprivations the person experiences is calculated (deprivation counts). Second, a poverty cut-off, which distinguishes poor and non-poor people based on the total deprivation counts of individuals, is applied. If the total deprivation counts for the person exceed the poverty cut-off, the person is identified as multidimensionally poor (2011, pp. 295-296).

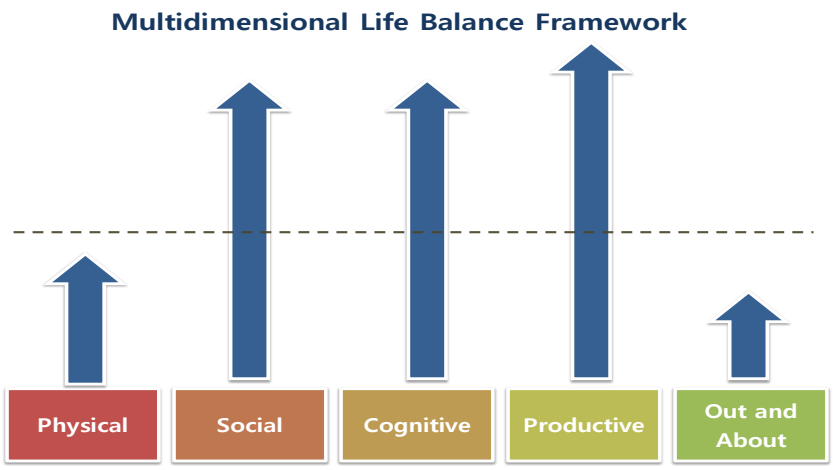
Employing and adapting the AF method, we identify five dimensions that are known to be beneficial to older people in previous empirical studies: physical, cognitive, social, productive, and out and about. Indicators that measure each dimension are then constructed, with a minimum threshold for sufficiency for each indicator. (We discuss these dimensions, indicators and activity level cut-offs in each dimension in Chapter 5). Based on the total number of indicators that show that the person has reached the threshold, we identify people with multidimensional life balance if they have achieved sufficiency in roughly more than three out of five dimensions[22]. The following anecdotal example based on the experience of an older woman illustrates the daily life of someone who has achieved multidimensional life balance despite a loss of physical mobility:

[22] This is a simplified guideline for illustrative purposes. In constructing the actual measurement, we use achieving sufficiency in more than 60% of weighted indicators as the threshold for balance. See Chapter 5 for more discussion.

> Mrs C is an 87-year-old woman with limited mobility, due to her frail legs. She can move around, but cannot travel far or walk for long hours. She thus spends most of the day at home, and does little physical exercise. From the point of the existing framework that emphasises physical activity, she would score poorly on the scale. However, her friends visit her almost every day, and they have tea and play cards together for several hours. In the evening, after doing all the housework including cooking and cleaning, she watches the news and reads newspapers, as she is very interested in current affairs. She frequently discusses the implications of the news with her grandchildren over the phone. Despite the fact that she often complains about her legs, she is satisfied with her life and regards her overall health as good, except for her legs.

Figure 2.4 below shows the multidimensional life balance framework based on Mrs C's daily life. Although she does not meet the sufficiency thresholds in physical and out and about dimensions, she achieved sufficiency in social, cognitive, and productive dimensions, which are all known to contribute positively to the well-being of older people. The fact that she positively assesses her life and health despite the loss of physical mobility implies that maintaining overall balance in terms of daily activity might be her secret of maintaining well-being in old age. The case of Mrs C, while a real case, is given as an illustrative example. In Chapter 6 we empirically examine this assumption using time diary data.

Figure 2.4. Multidimensional Life Balance Framework



The multidimensional life balance model somewhat differs from AF model as we identify people who achieved overall balance and examine the role of multidimensional life balance on positive outcomes such as health. However, as in the AF multidimensional poverty model, we also pay particular attention to the experience of people who are deprived (in our study, with low activity levels) in multiple dimensions. Quoting Stiglitz, Sen and Fitoussi (2009, pp. 15-16), Alkire and Foster emphasised the need to investigate the joint distribution of the disadvantages: 'The consequences for quality of life having multiple disadvantages far exceed the sum of their individual effects' (2011, p. 305). Similarly, we view that while not participating in some activities is a matter of personal preference, failing to reach the minimum threshold of activity level in multiple dimensions can be a sign of a problem in adaptation. For instance, we find it more problematic if an older person routinely spends all day alone in a room, sitting or lying down, watching TV or doing nothing most of the day. We argue that while some inactivity can be a matter of personal preference, inactivity in multiple dimensions of daily life is

related to negative outcomes in later life, in particular when we assess the level of activity based on the minimal thresholds.

2.3. Conclusions

In this chapter, we discussed the conceptual issue of balance beyond work life. First, we argued that the importance of maintaining balance in time use is not limited to people of working-age, but matters at all ages. Not only time constraints, but also time abundance, can be detrimental to well-being. The former causes stress from time pressure, but the latter can also be a source of stress because an overabundance of discretionary time can destroy time structure. To address this issue, we proposed a new life balance framework for older people that focuses on maintaining balance between committed time (constraints) and discretionary time (freedom of choice), provided that there is sufficient regenerative time for our biological/physical needs. Building on the classic works in the time use study by Ås (the four categories of time) and by Gershuny (work-leisure triangle), we developed the model of the life balance triangle. We also introduced the conceptual model of life balance across the life course, arguing that life balance is a dynamic process that changes across the life course, not a static concept which has a universal 'optimal' point.

Second, we argued that maintaining balance in later life is a way of adaptation for older people, compensating for losses and enhancing gains in old age. Older people are heterogeneous in that they have different personal preferences for how to spend their time,

and face different physical, psychological, and socio-economic challenges. Furthermore, our daily life is multidimensional in the sense that various activity domains are involved in maintaining well-being. Therefore, just as eating only protein would not enable us to remain healthy, high levels of activity in a specific domain do not guarantee well-being in later life. Traditional frameworks of disengagement theory and activity that assume a linear relationship between certain types of activity and older people's well-being people cannot address such heterogeneity and multidimensionality in later life. Adjusting and adapting the multidimensional poverty framework by Alkire and Foster, we thus proposed the multidimensional life balance model, which focuses on maintaining overall balance across various activity domains. We argue that by maintaining the overall balance, older people can compensate for not being able to (or not wishing to) participate in all recommended activities that are known to be beneficial to their well-being. We assume that once the sufficiency thresholds for overall sufficiency across daily activity domains have been reached, whether the person engages in a wider range of activities or for a longer duration is a matter of personal preference. However, if the person fails to reach overall sufficiency and experiences lack of activity in multiple activity domains simultaneously, we argue that this would be associated with negative outcomes, as it may be a sign of failed adaptation in later life.

The two life balance frameworks we introduced in this chapter are outcomes of an effort to overcome dichotomous approaches in work-life balance research and ageing research. To answer the question of what happens to work-life balance when paid work no longer occupies a central position in our lives, we developed the life balance triangle model,

which can be applied to all life stages. To move beyond the disengagement–activity frameworks that may have caused discrepancies in empirical findings regarding the relationship between daily activity of older people and well-being, we proposed the multidimensional life balance model, which is a threshold-based approach that incorporates the heterogeneity and multidimensionality of later life.

One of the main questions regarding older age is why ‘considerable numbers of individuals age with few health problems or disabilities, while others face such difficulties quite early in life’ (Moen et al., 1992, p. 1612). We propose that whether older people maintain a time structure through a balance between committed time and discretionary time, and whether they maintain sufficient levels of daily activity across life domains, may contribute to such differences in outcomes in later life. In the following chapters we empirically demonstrate the applicability of the life balance framework using UK time use data.

3. The Life Balance Triangle: An Illustrative Analysis of Life Balance in Later Life in the UK

In 'Social Change Reflected in the Use of Time' (1972), Robinson and Converse noted that 'the way time as a resource is used would seem to give the theorist a unique view of *the intersection between the imperatives of the human condition and the range of individual choice*' (p.17). They argued that 'much of the 24-hour day that contains all human experience is tightly constrained by the physiology of the species and the impress of the immediate economic environment' with 'margins of discretionary time remain in the daily round' (p.18). The conceptual framework of the life balance triangle we proposed in Chapter 2 considers this intersection: it addresses how the balance between constrained time (committed time, regenerative time) and free time (discretionary time) changes across the life course.

Based on this framework, this chapter provides an empirical illustration of the life balance of older people in the United Kingdom using the UK 2000-2001 time use data. The main focus of this chapter is to explore and *visualise* how the balance between three dimensions of time use varies according to demographic, socio-economic and health status. Using the life balance triangle, we hope to provide an intuitive approach to exploring older people's use of time[24] by considering older people's day as a totality. In so doing, we aim to

[24] In Chapter 4, we adopt a more analytical approach and identify the main determinants of life balance.

contribute to the development of a comprehensive and readily accessible tool to show how people use time in later life.

This chapter consists of three main parts. We begin by explaining how we constructed the life balance triangle model based on the life balance framework we discussed in Chapter 2. Next, we demonstrate the empirical applicability of the life balance triangle model in understanding the time use of older people by drawing on the UK data. We show that in later life the balance in daily time use shifts towards having more discretionary time and less committed time, with a significant gender difference. We also examine how life balance varies according to health status. We find, for example, a linear association between life balance and self-assessed health status, with poor health being associated with the highest level of discretionary time. The concluding section provides a brief summary and discussion of the findings.

3.1. Construction of the Life Balance Triangle

This section explains how we constructed the life balance triangle model. As we discussed in Chapter 2, in constructing the model we modified and adapted two classic approaches of the time use study: the categorisation of time by Å s and the work-leisure triangle by Gershuny. We first discuss how and why we modified the four categories of time use by Ås into the three dimensions of life balance. Then we explain how we adapted Gershuny's virtuous triangle of work-leisure balance to create the life balance triangle in order to deal with the issue of balance when paid work is removed from the major components of daily life.

3.1.1. Three Dimensions of Life Balance: Adaptation of the Å s Categories of Time

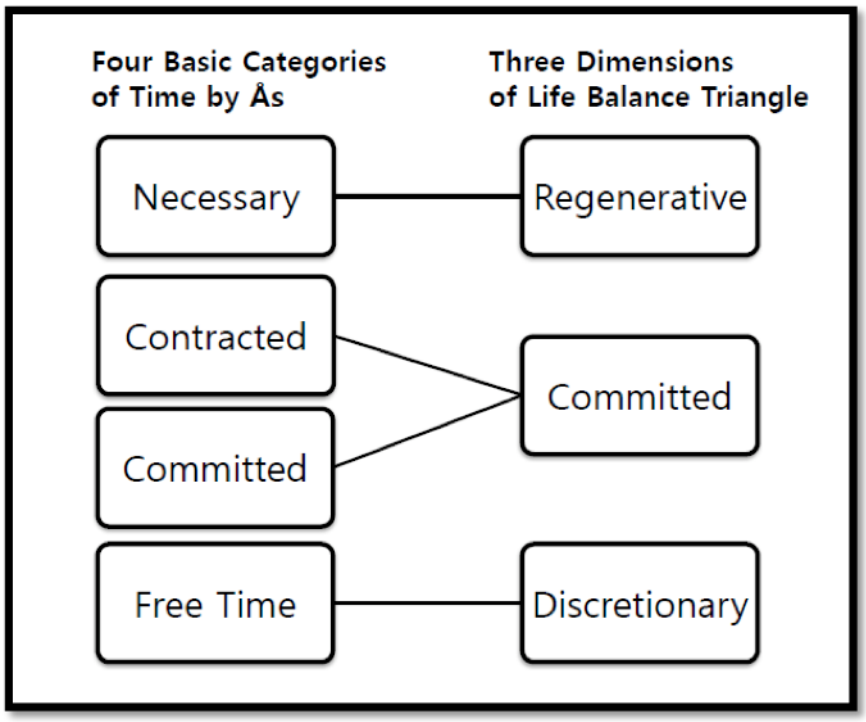
In his article, *'Studies of Time-Use: Problems and Prospects'* (1978), Å s proposed four basic categories of time use depending on the degree of choice and constraint: Necessary Time, Contracted Time, Committed Time, and Free Time. Although a number of attempts have been made to provide theoretical categorisation of time use since Ås's proposal (e.g. Maier and Klumb, 2005), we find his categorisation based on the level of constraints and freedom in time use most relevant to our idea of life balance triangle, which represents the balance between the freedom of choice, constraints, and biological/physiological needs (Figure 2.1, Chapter 2).According to Ås, Necessary Time refers to 'the time needed to satisfy the basic physiological needs' (1978:134) such as sleep, personal health care and hygiene. He argued that this category of time is highly constrained, i.e. there is not much freedom of choice[25]. Contracted Time refers to regular paid work, which is linked to contractual work arrangements and a regular schedule, including the time for travel to and from work. Å s explained that contracted time is usually long and structures the other daily activities. In this sense, regular schooling is also classified as contracted time in Å s category, while other various kinds of adult education are classified as free time. Committed Time represents activities that people are committed to doing, including household management, help and care, and shopping for daily goods. He noted that these

[25] Robinson and Godbey argue otherwise: 'Personal time has considerable flexibility or elasticity about it – that is, for example, humans can function adequately whether they wash their hair every day or only once a month, or whether they take one hour or three hours to eat meals. Thus, much personal-care activity can have a discretionary quality about it' (1997, p.12). However, as we cannot survive or function properly without a certain level of sleep, eating and personal care, we follow Å s in regarding this category as highly constrained.

activities all have ‘the character of work, although not paid’ and can be done by a third party (1978, p.134). Å s also sees Committed Time as being closer to constraints rather than freedom of choice, because although there is ‘a certain degree of freedom concerning these activities, usually it is just a postponement of time’ (p.135). Free Time is the remaining time, which offers the most freedom of choice. For Å s, the order of the list also matters because it represents the priority of each category of time in daily life depending on the level of flexibility. Necessary Time is least changeable – we must sleep, eat, and attend to some personal care – so it takes the highest priority. Contracted Time and Committed Time take the next priority, and Free Time occupies the last as it is dependent on how other types of Time are organised.

In constructing the life balance triangle, we modified the four categories of time as set out by Å s into three dimensions: Regenerative, Committed, and Discretionary (Figure 3.1 below). Overall, we followed the main principal of Ås’s categorisation, which considers the degree of choice and constraint involved in the use of time.

Figure 3.1. Modification of the Four Å s Categories of Time into Three Dimensions of the Life Balance Triangle



However, we have combined the Contracted and Committed time into one category (Committed). Most activities in Contracted Time and Committed Time share the same characteristics of 'work', paid or unpaid (Robinson and Godbey, 1997). Activities in these categories are often described as obligatory and productive, and more constrained than free time (Southerton, 2006; Maier and Klumb, 2005). As we are developing the concept of life balance attempting to overcome the paid-unpaid work dichotomy in the current work-life balance framework, we find it more appropriate to combine these two categories. More importantly, the distinction between Contracted Time and Committed Time in terms of the degree of constraint is less clear in later life. In younger age, Contracted time, such as being in paid work or in regular education, may have a more

pronounced obligatory character. You are required to attend school at certain ages, and after reaching adulthood you cannot support yourself or family unless you are in paid work. In this sense, it might be necessary to distinguish between Contracted Time and Committed Time in younger age as there may be a different degree of constraint and freedom of choice involved. However, in later life, especially in affluent societies, older people in general are no longer required to be in the labour market or in education. If an older person is in regular schooling or in paid work, in most cases it may be more likely to be by choice rather than out of obligation[26]. Yet, because of the nature of activities, these are distinct from free time: the participant is certainly 'committed' to the activities – the day is constrained by prior arrangements, and both dimensions provide a range of time structure and routine for older people. Thus, we combine these two categories into one, 'Committed', focusing on the degree of constraint these categories pose.

We use the terms Regenerative and Discretionary (Maier and Klumb, 2005) instead of Necessary and Free, respectively. They are equivalent in classification principle, but we find the terms Regenerative and Discretionary better reflect the nature of activities that are included. Thus, in the life balance triangle, *Committed* refers to activities that people are committed to perform either to maintain their life, such as household management and caring for the family, or to carry out prior arrangements, such as regular schooling and being in paid work. It is quite close to the concept of 'total work' which combines

[26] Note that this may not be applied to most developing countries with insufficient pension or other support system where older people must work for a living as long as their health allows.

paid work and unpaid work (Bittman and Wajcman, 2000), but it is distinct from it because we regard regular schooling as a committed activity. This is the dimension that mainly provides 'a series of routines giving structure to people's lives' (Barnes and Parry, 2004:218). *Regenerative* refers to 'activities that have to be carried out to maintain one's physical existence' (Maier and Klumb, 2005, p. 32) and to 'maintain one's body in a healthy and socially acceptable status' (Bittman and Wajcman, 2000, p. 167). This includes sleep, personal toilet, and eating[27]. *Discretionary* refers to free time, activities that are 'presumably self-chosen and likely to involve needs for affection, knowledge, or pleasure' (Moss and Lawton, 1982:115), and this category includes discretionary pursuits such as leisure (including TV viewing), socialisation, and civic activities[28]. Table 3.1 presents the classification of activities, based on the Multinational Time Use Study (MTUS)[29] activity codes which we used to build the life balance triangle measure.

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[27] Goodin et al. (2008) argue that activities such as eating and bathing may be regarded as discretionary rather than necessary because people engage in these activities to a certain extent only. However, for some older people these activities may take more time due to physical frailty, and it is more difficult to fully account for the overlapping influence of ageing and disability and the duration of activities for self-maintenance. Thus, we do not distinguish regenerative and discretionary on the basis of duration in this study.

[28] Voluntary activities are classified as 'discretionary' here, yet it may also be classified as 'committed' if they are done regularly based on a schedule. However, diaries are often recorded only for one day or two days per individual, which makes it difficult to identify regular voluntary activities. Therefore, we do not make the distinction between voluntary activities performed with a regular schedule or without a regular schedule.

[29] In this thesis, we used the harmonised activity codes from Multinational Time Use Study, which is described in Chapter 1. (For detailed information of MTUS see Gershuny, 2003; Fisher and Gershuny, 2013).

Table 3.1 MTUS 69 Codes Classified by Life Balance Dimensions

Main	Activity	Committed	Discretionary	Regenerative
1	Imputed personal or household care			
2	Sleep or nap			
3	Imputed sleep			
4	Wash/dress/self care			
5	Meals at work/school			
6	Other meals			
7	Paid work, main job, not at home			
8	Paid work at home			
9	Second or other job at home			
10	Unpaid work to generate household income			
11	Travel as a part of work			
12	Work breaks			
13	Other time at work			
14	Look for work*			
15	Regular schooling, education			
16	Homework**			
17	Leisure/other education or training			
18	Food preparation/cooking			
19	Set table, wash dishes			
20	Cleaning			
21	Laundry, ironing			
22	Home maintenance			
23	Other domestic work			
24	Purchase goods			
25	Consume personal service			
26	Consume other service			
27	Pet care			
28	Physical child care			
29	Teach/help with homework			
30	Read to play with child			
31	Supervise accompany child			
32	Adult care			
33	Voluntary, civic activity			
34	Worship and religion			
35	General out-of home leisure			
36	Attend sporting event			
37	Cinema, theatre, opera concert			
38	Other public event, venue			
39	Restaurant, café, bar, pub			
40	Party, reception, social event, gambling			

Main	Activity	Committed	Discretionary	Regenerative
41	Imputed time away from home			
42	General sport or exercise			
43	Walking			
44	Cycling			
45	Other out-of-doors recreation			
46	Garden, forage(pick mushrooms), hunt/fish			
47	Walk dogs			
48	Receive or visit friends			
49	Conversation (in person, phone)			
50	Other in-home social, games			
51	General indoor leisure			
52	Artistic or musical act			
53	Written correspondence			
54	Knit, crafts, hobbies			
55	Relax, think, do nothing,			
56	Read			
57	Listen to music, iPod, CD			
58	Listen to radio			
59	Watch TV, DVD, video			
60	Play computer games			
61	Send e-mail, surf internet, computing			
62	No activity but recorded mode of travel			
63	Travel to and from work			
64	Education-related travel			
65	Voluntary, civic, religious travel			
66	Child and adult care travel			
67	Shopping, personal and household care travel			
68	Other travel			
69	No recorded activity***			

Note: *We classified time spent looking for work as discretionary rather than committed, based on the assumption that in affluent societies older people are no longer required to be in the labour market. Although looking for work may still be a serious matter for some older people, it may not be as obligatory as for younger people. For instance, in UK 2000-2001 time use data, 80% of men aged over 50 who are not in paid work gave retirement as the reason for not being in the labour market, and 15% gave bad health as the reason.

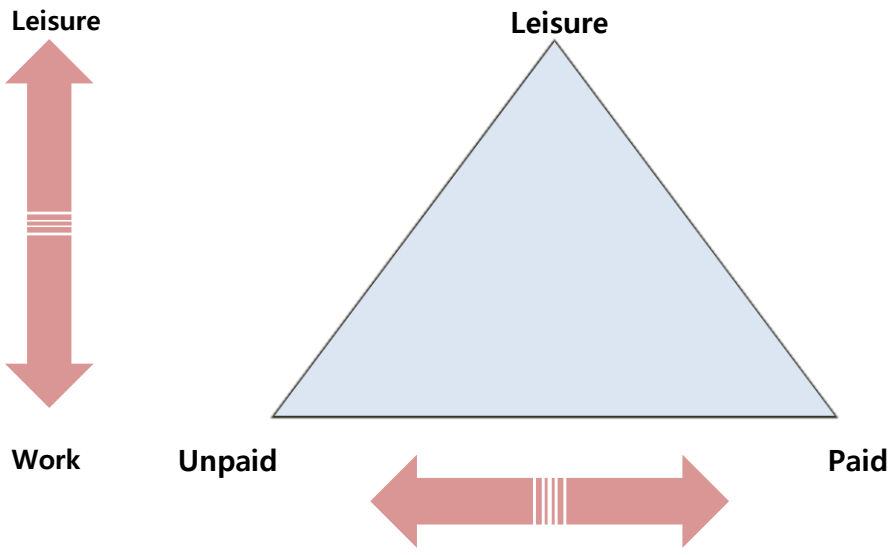
** Only regular schooling was classified as committed; homework and leisure related education were classified as discretionary, as we assume regular schooling provides time structure and imposes more time constraints because it is usually of long duration and is governed by prior arrangements.

***As explained in Chapter 1, we only used good diaries for our analyses. Therefore, diaries in the sample include no more than 90 minutes of 'no recorded activity' by definition.

3.1.2. The Gershuny Virtuous Triangle of Work and Leisure

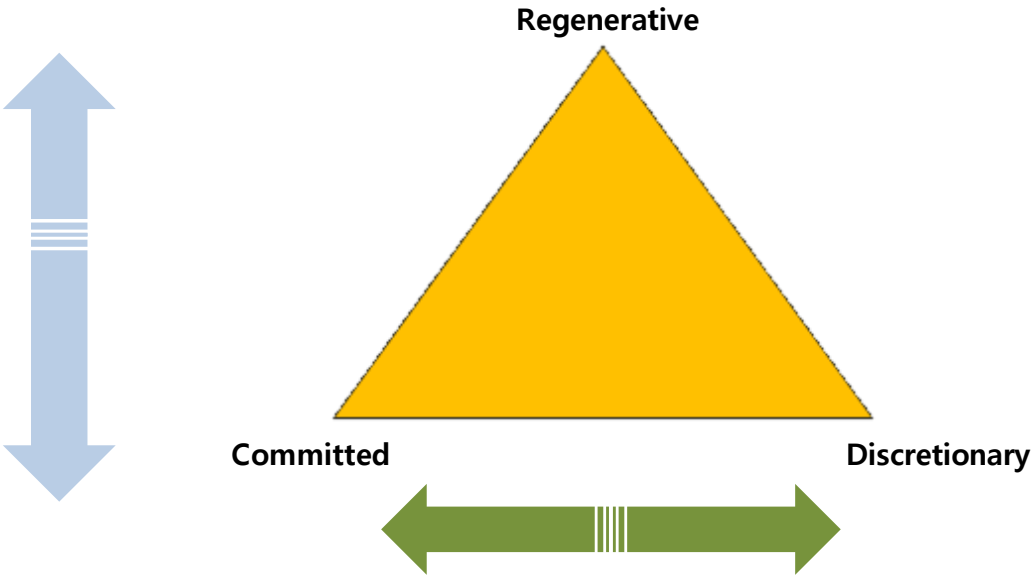
The idea of the triangle comes from Jonathan Gershuny's model of the virtuous triangle, which was developed to effectively summarise the overall change in time use across time, focusing on work-leisure balance (Gershuny, 2003). The Gershuny virtuous triangle is made up of three dimensions: paid work, unpaid work, and leisure time. The vertical axis represents the balance between work and leisure, and the horizontal axis represents the balance between unpaid and paid work time, summarising the disposition of all waking time (Figure 3.2). For instance, if someone spends all her waking time (i.e. excluding sleep and personal care) on unpaid work, she would be located at the left apex of the triangle; and if someone does no paid or unpaid work but spends all his time on leisure, he will be located at the top apex of the triangle (see Gershuny, 2003, p. 133 for more discussion).

Figure 3.2 The Virtuous Triangle of Work and Leisure (Gershuny, 2003)



Based on his analysis using the virtuous triangle, Gershuny identified three important changes in work-leisure balance over time: the convergences in time-use structure of nation, gender, and status group (2003, p. 221). However, as the focus of his virtuous triangle was to identify how the balance between unpaid work, paid work, and leisure has changed over time, his analysis was confined to the working-age population (aged 20 to 60) and the time spent on sleep and personal care was excluded from the triangle. In constructing the life balance triangle, we have included sleep and personal care time as one of the dimensions (*Regenerative*), as it may have more implications in later life, especially for the oldest group for whom time spent for personal care can be one of the main sources of constraint. Therefore, the balance point in the life balance triangle represents the division of the whole day (1440 minutes), rather than the disposition of waking time only (if we add up all three proportions, it becomes 1). We have also modified the axis according to the life balance framework (Figure 3.3). Thus, in the life balance triangle, the vertical axis represents the balance between the level of regenerative time and the other two dimensions. In effect, this controls for the constraints imposed by biological needs. The horizontal axis represents the balance between the level of freedom and constraint, as the discretionary dimension represents 'freedom of choice' and committed dimension represents activities that are 'constrained' (obligation or commitment).

Figure 3.3. The Life Balance Triangle



3.2. Time Use of Older People in the UK through the Life Balance Triangle

The life balance triangle provides an intuitive guide to understanding the issue of balance in later life. In this section, we demonstrate the applicability of the life balance triangle in empirical research by providing an illustrative analysis of the time use patterns of older people in the United Kingdom. We show how life balance varies by age, gender, economic activity status, and health status, thus demonstrating how the triangle can be used for exploration by effectively visualising the patterns. We also explore how life balance may have changed over time in the UK, between 1983-1984 and 2000-2001.

For most of the analyses in this chapter, we used the nationally representative UK time use survey data collected from 2000 to 2001 (Gershuny, 2003; Fisher and Gershuny,

2013). For cross-time analysis, the 1983-1984 UK time use data were used[30]. We looked mainly at diaries completed by people aged 50 years and over, although we also examined diaries from people aged 18 to 49 years for comparison. Information about time diary data is discussed in Chapter 1, section 1.3. We excluded cases with missing values in demographic and socio-economic variables. The sample characteristics of data are included in Appendix (A3.1, A3.2)

3.2.1. Life Balance by Age, Gender and Socio-Economic Status

We start by examining the average time spent on each dimension for the total sample (aged 18-80+). Table 3.2 below presents the average minutes per day spent on each of the three life balance dimensions by gender. On average, in 2000-2001, people in the UK had 6.8 hours (410 min.) of committed time, 10.6 hours (638 min.) of regenerative time, and 6.5 hours (391 min.) of discretionary time per day.

[30] The original UK 1983-1984 was collected diaries for seven days for each individual aged 14 to 97, and the original response rate was 51%. It should be noted that the while MTUS provided most clean dataset and weights, the results in this chapter may have been affected by the sampling issues. The historical comparison in this chapter is thus preliminary and exploratory. For more information about the 1983-1984 UK time use data and MTUS, see Readme File UK 1983-1987 Survey Data (Fisher, 2011).

Table 3.2 Average Time in Minutes per Day Spent on Each Dimension by Gender, UK 2000-2001

	Dimension		
Gender	Committed	Regenerative	Discretionary
Men	407.7	625.3	407
	(3.0)	(1.5)	(2.6)
Women	412.2	649.7	378.1
	(2.3)	(1.3)	(2.0)
Total	410.1	638.1	391.9
	(1.9)	(1.0)	(1.6)

Note: Standard errors are in parentheses.

On the whole, people had relatively similar amounts of committed and discretionary time during the day, with larger amounts of regenerative time, which includes sleep. However, if we examine the data by demographic and socio-economic characteristics, different pictures emerge. Let us begin by examining the life balance by age and gender.

Life Balance by Age and Gender

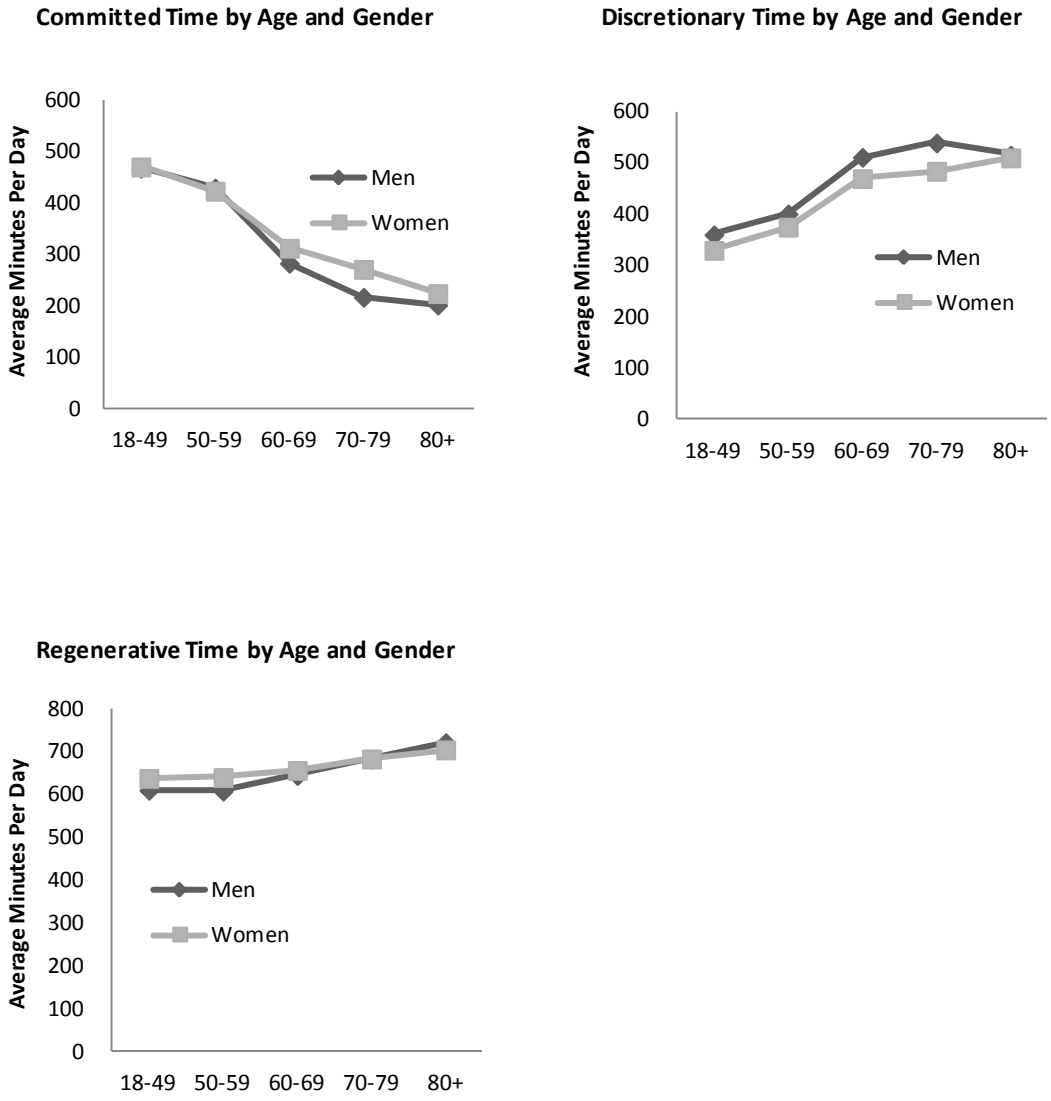
Figure 3.4 below shows how the average number of minutes per day spent on each dimension varies across age groups by gender. As the focus of our research is investigating life balance in later life, we created five age groups, treating those aged 18 to 49 years as one group representing younger age group[31], with three 10-year age groups

[31] We use age 50 as a reference point for working age population (i.e. we treat those aged 18-49 as a working age group), because although it is below the state pension age, the emergence of early retirement has led to the timing of transition to later life becoming varied, with the transition often beginning in the fifties. Surveys of ageing, such as the English Longitudinal Study of Ageing (ELSA), also collect data from aged 50 years and older.

(aged 50-59; 60-69; 70-79), and one group of oldest old (aged 80 and over)[32]. As can be seen, with age, the average time in minutes per day spent on committed time declines (a), while discretionary time increases (b). Regenerative time remains relatively stable across age groups compared with the other two dimensions (c), but we can nevertheless observe a statistically significant upward trend as age increases. For instance, average regenerative time for women increases from 10.6 hours per day at 50-59 years to 11.7 hours per day at 80 years and older.

[32] In the MTUS, those aged 80 and over are coded together to protect the anonymity of the oldest diarists (Fisher and Gershuny, 2013). It should also be noted that above this age the numbers of respondents are not sufficient to analyse by separate group breakdowns. See Chapter 1, Section 1.3.

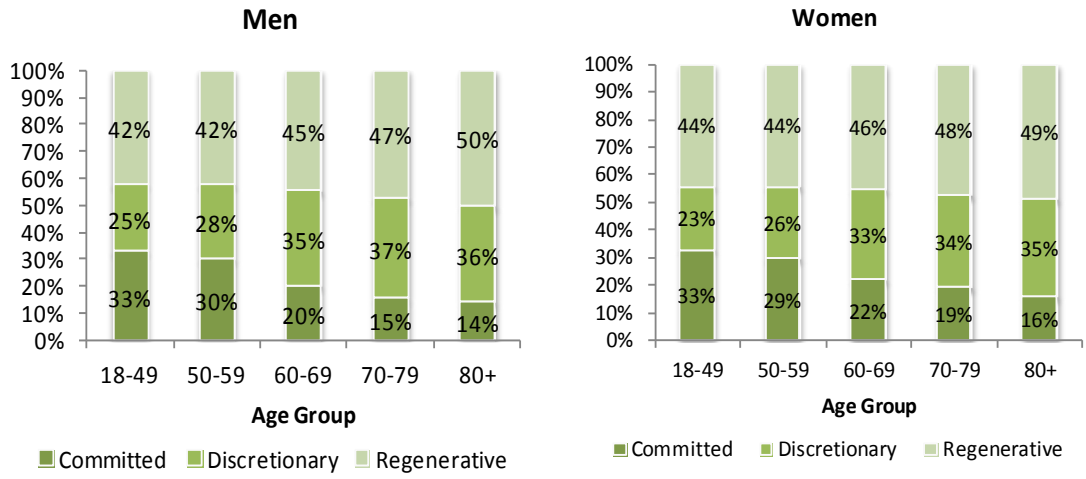
Figure 3.4 Average Time in Minutes per Day Spent on Three Life Balance Dimensions by Age Group and Gender, MTUS, UK 2000-2001



Our results also show that in the younger age group (aged 18-49), there is little difference between men and women in the average level of committed time. This finding is consistent with the previous research, which found little gender gap in total workload (i.e. paid work and unpaid work combined) in the working age population (Bianchi, Robinson

and Milkie, 2006; Bittman and Wajcman, 2000). At older ages, however, we found women devote considerably more time than men to the committed dimension. We also found that while the level of discretionary time is higher for men at all ages, the gender gap in discretionary time is larger in the groups aged 60-69 and 70-79. These findings imply that, unlike in the working age population, where little quantitative difference in total work and leisure has been observed (Offer and Schneider, 2011), a quantitative gender gap in patterns of time use in the older population does in fact exist. Furthermore, as the level of committed time drops with age at a greater rate for men than for women, it can be inferred that men may experience greater changes in terms of time structure in later life compared with women, although we would need longitudinal data to test this properly. The gap is reduced again in the oldest old age group (aged 80 and over). We return to the issue of gender gap when we look at the life balance triangle.

Figure 3.5 Life Balance by Age Group and Gender: Average Percentages of Three Dimensions for the Whole Day, MTUS, UK 2000-2001



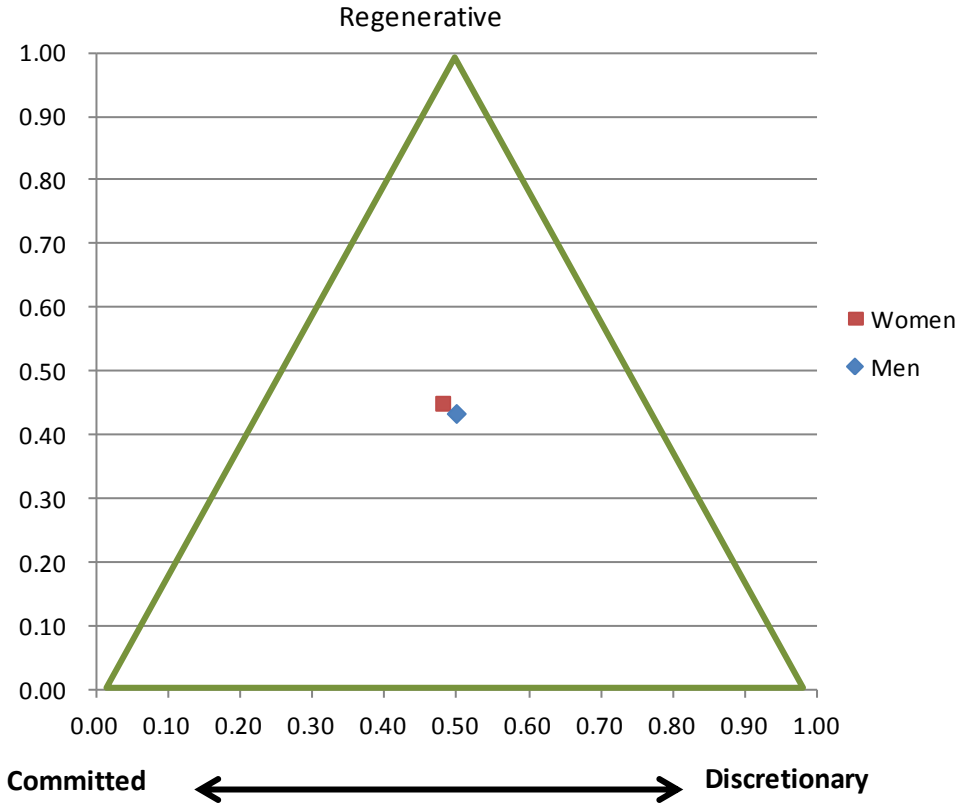
Before we look at the triangle, we first examine how the actual balance between dimensions in terms of portions of the day differs by age and gender. As a day is limited to 24 hours, an increase in one dimension means a decrease in another or more dimensions. Therefore, thinking in terms of balance enables us to explore how 'the distribution of a fixed resource across the different spheres of daily life' (Gershuny, 2011, p. 12) in the course of a day varies by population sup-groups. Figure 3.5 above presents the average percentages that each category takes for the whole day (1440 minutes) by age and gender. For instance, in case of men, at the younger age group (aged 18-49) committed time takes 33% of the day, while discretionary time and regenerative time take 25% and 42% respectively. As expected from the trend in average minutes allocated, across the age groups, the shares of discretionary and regenerative time increase, and that of committed time decreases. The difference is most pronounced between the age groups of 50-59 and 60-69. Between these two groups, the share of committed time decreases by 10 percentage points, while discretionary time and regenerative time increase by 7 percentage points and 3 percentage points respectively, resulting in a reversal of the ratio between committed time and discretionary time. We can speculate that this may be related to the timing of retirement. From the 60-69 years onwards, discretionary time occupies a larger share of the day than committed time. At the oldest group (aged over 80), committed time is reduced to 14% of the day, while regenerative time takes half the day (50%) and discretionary time takes 36% of the day. Women show a similar trend, although the share of committed time decreases by a smaller rate than for men. The patterns that emerge from this analysis suggest that the balance between these dimensions changes as people grow older. We explore these patterns further using the life balance

triangle, which provides a more intuitive approach that enables us to see the patterns at a glance.

Life Balance by Age and Gender at a Glance: Life Balance Triangle

The life balance triangle effectively summarises the equilibrium between the three dimensions by providing balance points. Figure 3.6 below shows the balance points by gender for the total sample aged 18-80+.

Figure 3.6 Life Balance Triangle by Gender, Total Sample, UK 2000-2001

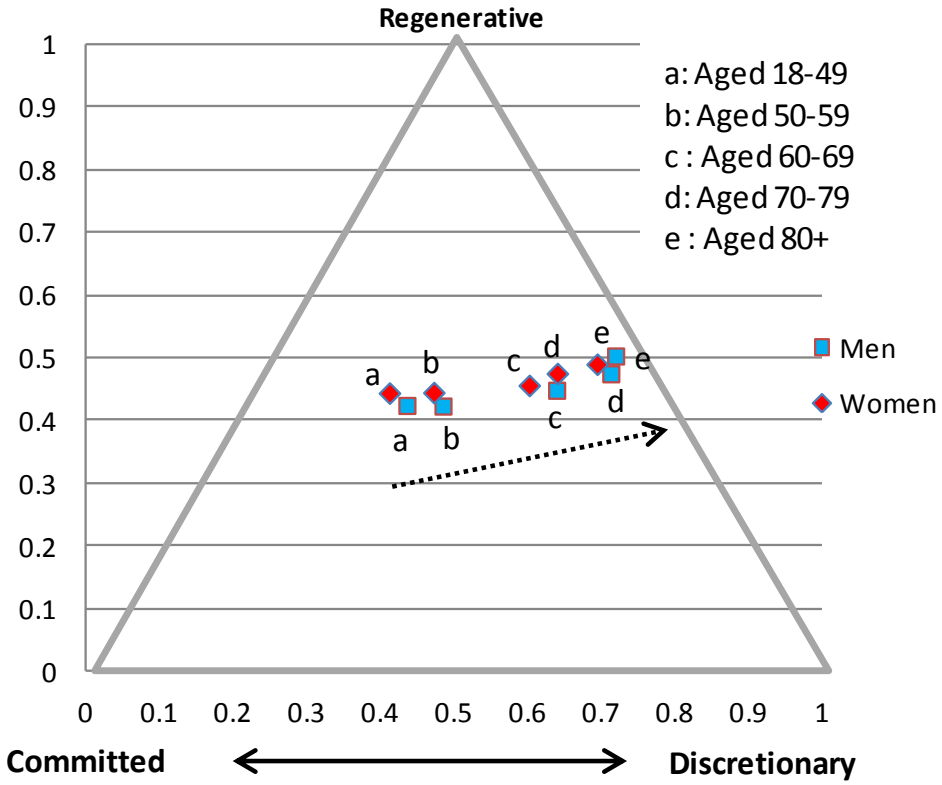


As discussed in section 3.1.2., the horizontal axis indicates the balance between committed time and discretionary time, while the vertical axis indicates the balance between regenerative time and the other two dimensions. For instance, someone who spends all his or her time on the discretionary dimension would be located at the bottom right apex of the triangle. Someone who is very ill and spends all day in bed sleeping would be located at the top apex of the triangle. From Figure 3.6 we can see that, overall, similar proportions of time are spent on committed and discretionary dimensions, with around 45% of the day spent on regenerative dimensions. The balance point for women

is located slightly to the upper left side of men's balance point, indicating somewhat higher committed and regenerative time, and lower discretionary time than men (see Table 3.2)[33]. The triangle enables us to see at a glance how the 24 hours are distributed between these three dimensions.

[33] The gender differences in average discretionary time and regenerative time are statistically significant ($t=8.27$, $p<0.0001$; $t=-11.58$, $p<0.0001$). The difference in committed time is not significant ($t=-1.07$; $p=0.284$).

Figure 3.7 Life Balance Triangle by Age Group and Gender, UK 2000-2001



More interesting patterns emerge once we 'unfold' the balance points. Figure 3.7 displays the balance points of different age groups by gender. For both genders, the balance point of each group moves towards upper right side of the triangle as age increases (a → e). It indicates that in later life the balance shifts towards the direction of an increasing proportion of regenerative and discretionary time, while having a smaller proportion of committed time. Comparing the vertical and horizontal distance between balance points, we can see that major changes in life balance in relation to age occurs at the level of

committed and discretionary time rather than at the level of regenerative time, although the share of regenerative time does increase with age.

In addition, the triangle more clearly displays the gender gap in life balance that we briefly mentioned in the previous section. Men and women have different balance points regarding the three dimensions: at all ages, the balance point for men is lower, and to the right of women's, indicating that men have available a lower proportion of regenerative and a higher proportion of discretionary time than women. Moreover, the horizontal distance between the balance points of men and women for each age group shows that the gender gap in life balance is larger in the age group of 60-69 (c↔c) and aged 70-79 (d↔d), and reduced again in the oldest age group (e↔e).

One possible explanation for this divergence and convergence in life balance between men and women in later life can be provided by the persistence of gendered division of labour. While women maintain care and household management responsibilities until they reach very old age, men, once they leave the labour market, may not be involved in such activities in the committed dimension to the same extent as women. The behaviours between genders may converge again only when women become too old to manage the household or provide care for others[34]. If this is the case, we can assume that the life balance of women would be affected more by age and physical limitation that old age

[34] This might support the old-age-as-leveller hypothesis which predicts diminishing variance in old age (Dupre, 2007), although further analysis is required to properly investigate this.

imposes, while the life balance of men would be affected more by labour market status such as retirement. Another possibility is that the observed differences by gender across age groups may be reflecting cohort effects, rather than reflecting age-related patterns. For example, men who were born in 1930s (group *c*, aged 60-69) may be more likely to share household work and care responsibilities than men of earlier cohort who were born in 1920s (group *d*, aged 70-79). Regrettably, we were not able to conduct pseudo cohort analysis as it is beyond the scope of current research. However, in preliminary analyses of the UK 1983-1984 and UK 2005 surveys, we found similar gender gaps in life balance among older people in both surveys. Thus, the gender gaps we observe are more likely to reflect a gender-specific age effect on life balance rather than just cohort differences[35]. We return to this issue in Chapter 4 when we discuss the gender-specific effects of determinants of life balance.

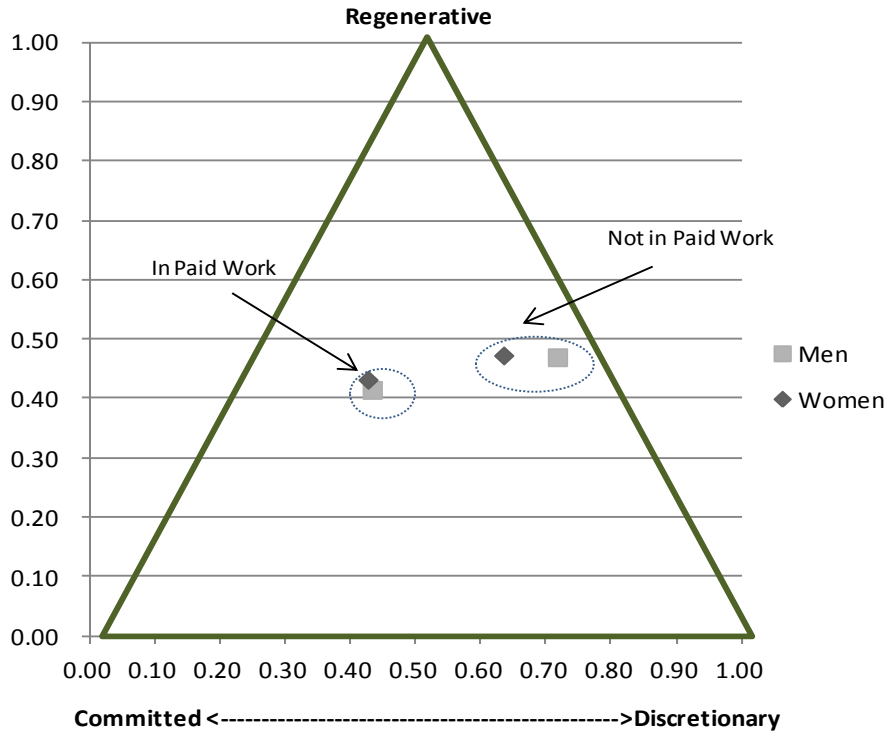
Life Balance by Economic Activity Status

Next, we investigate how life balance varies according to economic activity status. One of the main features of later life is that people are no longer expected to be in full-time paid work. In affluent societies, at least, later life after retirement has been regarded as 'a fairly long and well-deserved period in one's life when one is no longer required to pay

[35] This does not mean we rule out the presence of the possible cohort effect. While the magnitude of gender gap in the groups aged 70-79 was similar across surveys, the gender gap in the groups aged 60-69 reduced considerably across surveys, which may reflect changes in cohort characteristics (e.g. men contributing more to household management and care). The future release of 2014 UK time use data would enable us to investigate such trends further.

attention to the demands of paid work' (Adams and Beehr 2003, p. 3). Thus, examining the life balance by economic activity status provides an important clue to understanding how life balance may change after the transition to later life. Figure 3.8 shows how life balance differs by economic activity status.

Figure 3.8 Life Balance Triangle by Economic Activity Status and Gender, UK 2000-2001, Aged Over 50



First, we can see that the balance points for both men and women move towards the upper right side of the triangle for the group not in paid work, indicating less committed time and more discretionary and regenerative time. Of course, by definition 'not in paid work', which implies a reduction in paid work hours, should be associated with the shift of life balance to the right side of the triangle in any age group. However, as the majority of the

people who are not in paid work gave retirement as the reason for this (80%), followed by health limitations (15% for men, 8% for women), the observed shift here can be regarded as the consequence of life stage transition to later life, which is mainly induced by retirement as a social institution. Comparing the vertical and horizontal distance between balance points, we can see that major changes in life balance with respect to the transition to later life occur again at the level of committed and discretionary time, rather than in terms of regenerative time.

Second, the horizontal distance between the balance points of men and women is much wider in the group not in paid work, displaying a significant gender gap in life balance in the period after paid work. This indicates that the changes in balance between committed and discretionary dimension associated with the economic activity status are greater for men than for women: the balance point for men who are not in paid work is much closer to the right of the triangle, displaying a higher level of discretionary time. The existence of a gender gap in life balance by men's having more discretionary time in retirement is consistent with the previous research. It has been found that retired husbands increase their involvement in housework only marginally (even when wives are still employed), which often becomes a source of marital conflict and dissatisfaction in later life (Brubaker and Hennon, 1982; Lee and Shehan, 1989). Our results reflect this tendency: that although men are freed from paid work by retirement, they do not replace the newly available time with unpaid work, at least not to the same extent as women, resulting in gender inequality in life balance in later life. More importantly, greater changes in life balance with a higher reduction in committed time imply that men may experience the

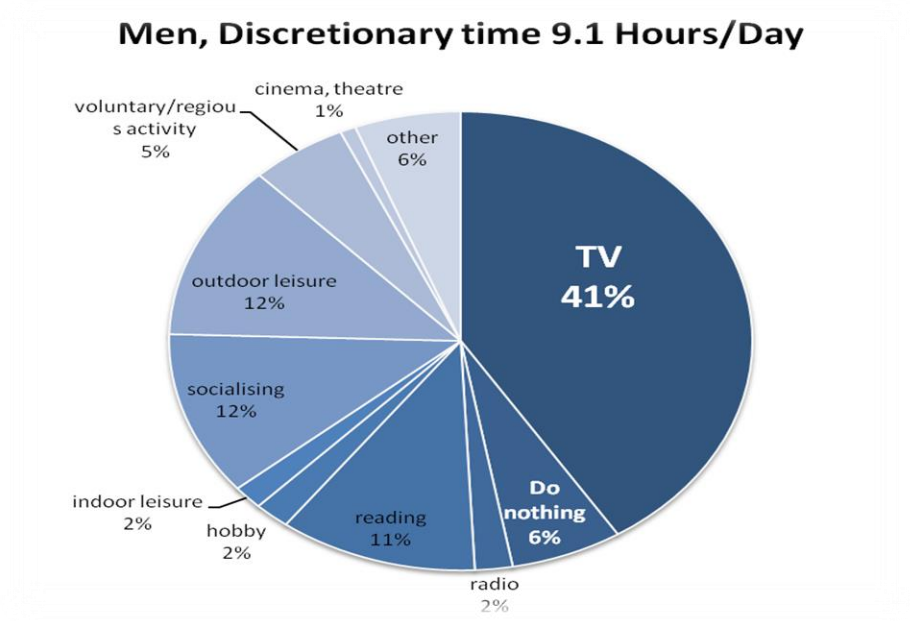
loss of time structure acutely once they leave the labour market. Studying the negative psychological consequence of unemployment, Gershuny (1994) pointed out that although women in employment may bear a double burden, this also means that 'they are likely still to have a clearly defined set of valued activities when unemployed' because women 'retain responsibilities for the domestic work of the household' (1994, p. 214), which provides an alternative time structure. This insight can also be applied to explain the gender-specific effects of retirement on the well-being of older people. For instance, Kim and Moen (2002) found that except for the initial honeymoon period (newly retired), retirement was associated with more depressive symptoms and lower psychological well-being for men, while they found no effect of retirement on women's psychological well-being. Ekerdt and Vinick (1991) also reported that while the retirement of wives made little difference to the level of husbands' complaints in the marital relationship, wives of fully retired husbands reported wanting their spouses to be involved in more pursuits. The lack of routines offering time structure for men (Barnes and Parry, 2004), shown by the high increase of discretionary time in retirement, may explain to some extent why some of the negative outcomes of retirement were observed only for men, and why men who contributed more to housework after retirement reported improved well-being.

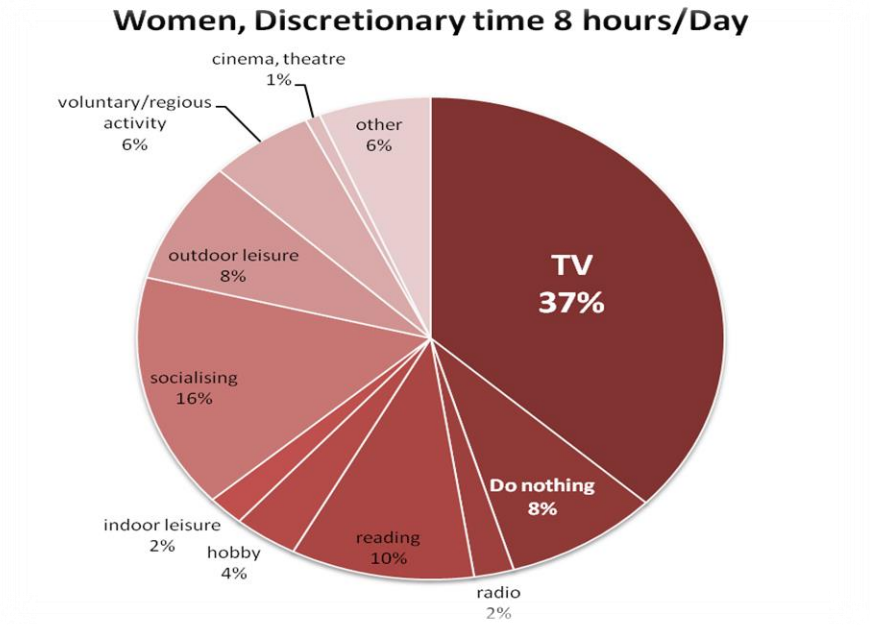
We also suspect that the changes in life balance for men in later life can be more abrupt than for women, as men's life balance seems to be more strongly linked with economic activity status rather than age, while life balance for women changes more gradually across age groups, even after retirement (see Figure 3.7, Figure 3.8). Thus, unlike working age people for whom having more leisure and less work is generally regarded

as positive for well-being, from the perspective of life balance, a larger reduction in committed time in retirement for men may contribute negatively to men's well-being as it deprives them of the daily routine and time structure. Of course, it may not be reasonable to assume a lack of time structure solely on the basis of a higher proportion of discretionary time. As Gershuny (1994) pointed out, it may be possible that time structure can be maintained by other activities, such as regular participation in community leisure, that are not classified as a committed dimension. Southerton (2006), for instance, argued that the temporal rhythm of the day (time structure) can be formed by activities that hold a 'fixed' position in daily activity sequences. Activities that involve other people's participation, that involve a high degree of obligation to others, or that hold a significant degree of personal commitment were suggested as having such fixed positions (Southerton, 2006). However, we found little evidence that the increased discretionary time is spent on activities that provide the kind of fixed position that can contribute to shaping the temporal rhythm of the day. Figure 3.9 below shows how people aged over 50 and not in paid work spent the discretionary time on average by gender. A large part of the discretionary time was spent watching TV. For older men not in paid work, 41% of discretionary time (about 4 hours) was spent watching TV, and 6% of the discretionary time on doing nothing. For women who are not in paid work, 37% of discretionary time was spent watching TV (about 3 hours), and 8% on doing nothing. Men also spent less time than women on social activities, which is one of the elements that provide time structure by requiring coordination and pre-arrangement (Southerton, 2006). Although this evidence alone is not sufficient to diagnose the existence or lack of existence of time structure, it appears to be less likely that this group (older people who

are not in paid work) would be routinely involved in the kinds of discretionary activities that provide time structure.

Figure 3.9 The Composition of Discretionary Time for People Aged Over 50 by Gender, Not in Paid Work, UK 2000-2001





Changes in Life Balance between 1983-1984 and 2000-2001

We have also examined whether there have been any changes in life balance over time. Figure 3.10 presents the life balance triangle for the total sampled aged 18 to 79 using MTUS versions of UK 2000-2001 and UK 1983-1984 time use data[36]. The overall balance moved to the left, implying that the share of committed time has increased between these two periods. In particular, the men's share of committed time has increased quite substantially (+3%p, CI [2, 4], $p<0.001$) while discretionary time (-2%p, CI [-3, -2], $p<0.001$) and regenerative time (-1%p CI [-1,-0.3], $p<0.001$) decreased. Although to a lesser degree, women's balance point has also moved towards the left, and the difference is statistically significant ($p=0.005$).

[36] Although the MTUS includes more surveys from different years (from 1974 to 2005), because of the difference in diary format, we find that UK 1983-1984 is most closely comparable to UK 2000-2001. Due to the limitation in the 1983 data, which included only 13 people aged over 80, we have excluded that age group from this analysis.

Figure 3.10 Changes in Life Balance Over Time by Gender, UK 1983-2000, MTUS, UK

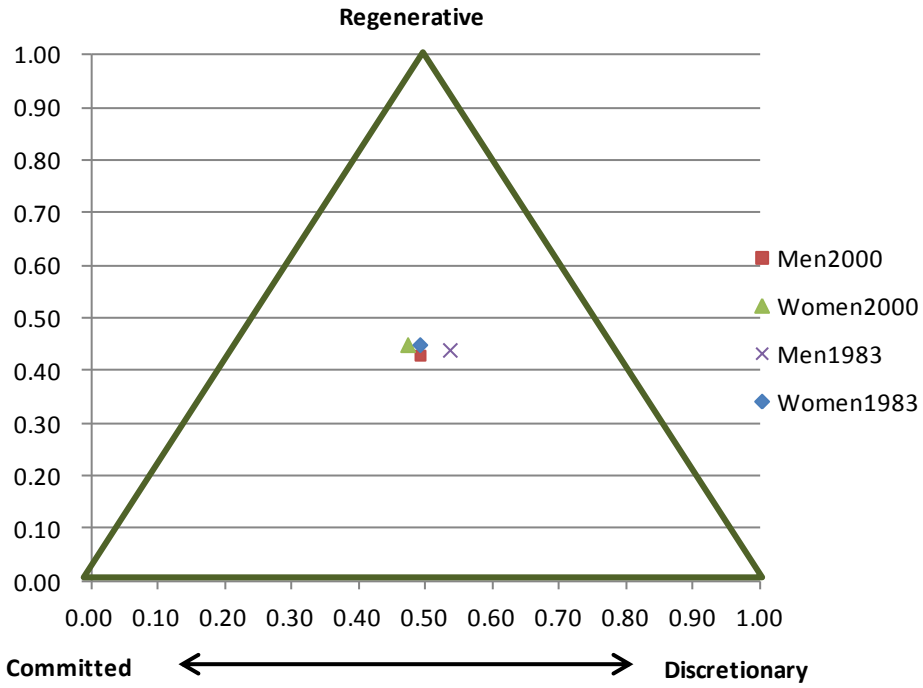
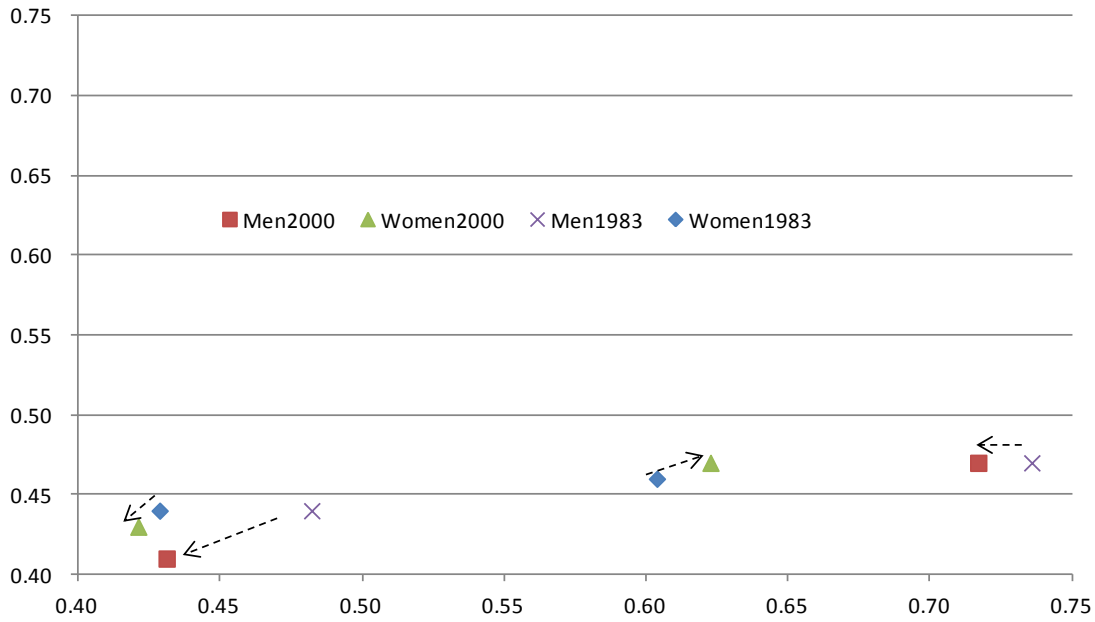


Figure 3.11 shows how life balance changed between 1983 and 2000 among people aged over 50 by economic activity status and gender. As can be seen from the distance between balance points, there have been only minor changes in balance in terms of magnitude. What is interesting, however, is the direction of change and the gap between genders. The arrows show the direction from the earlier survey (1983-1984) to the later survey (2000-2001). For older people who are in paid work, the balance moves towards the left, indicating reduced discretionary time and increased committed time. For instance, in the case of older men who are in paid work, the average committed time increased by almost 60 minutes (CI [34.9, 82.2] $t=4.86$, $p<0.001$) between 1983 and 2000, while discretionary time and regenerative time have reduced. As a result, the distance between genders in 2000-2001 is much less than in 1983-1984 (although the direction of change was similar,

the difference for older women in paid work was not statistically significant). For older people not in paid work, the direction of changes in balance is opposite for men and for women. While the balance point for men without paid work moves towards the right, that for women moves towards the left, also displaying a reduction in gender gap in life balance in later life between 1983 and 2000. This reflects the changing trend of housework participation across cohorts, 'with more recently born women doing less and their male partners doing somewhat more' (Hank and Jürges, 2007:400). This shift may become more prominent in later life when unpaid work tends to occupy a greater proportion of the committed dimension.

Figure 3.11 Life Balance for People Aged 50 and Over, by Gender and Economic Activity Status, UK 1983-1984 to 2000-2001 (Section Enlarged)



3.2.2. Health and Life Balance in Later Life

Self-assessed health is known as a good indicator of overall health status and a robust predictor of mortality (Foraker et al. 2011; Singh-Manoux et al. 2006). It is also commonly used as a proxy for measuring the quality of life. Therefore, examining the relationship between life balance and health status can provide an important clue to understanding the value of life balance measure in relation to well-being.

Figure 3.12 Life Balance Triangle by Self-Assessed Health Status, Aged Over 50, MTUS, UK 2000-2001

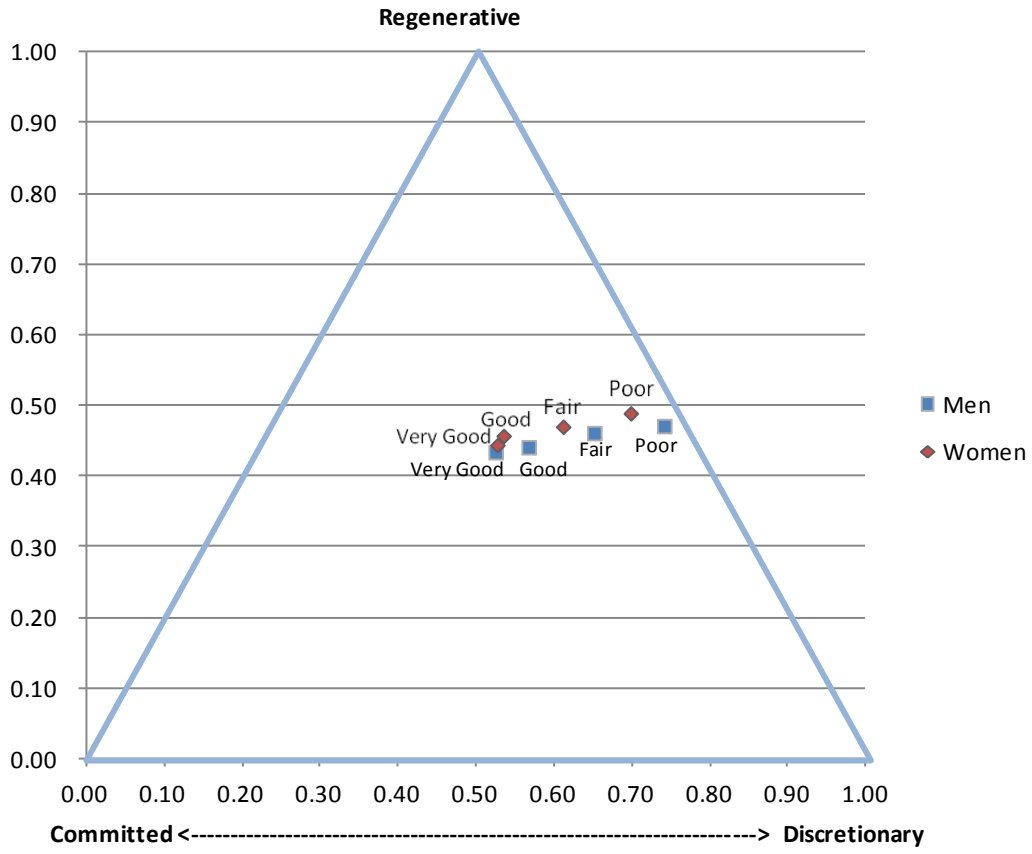
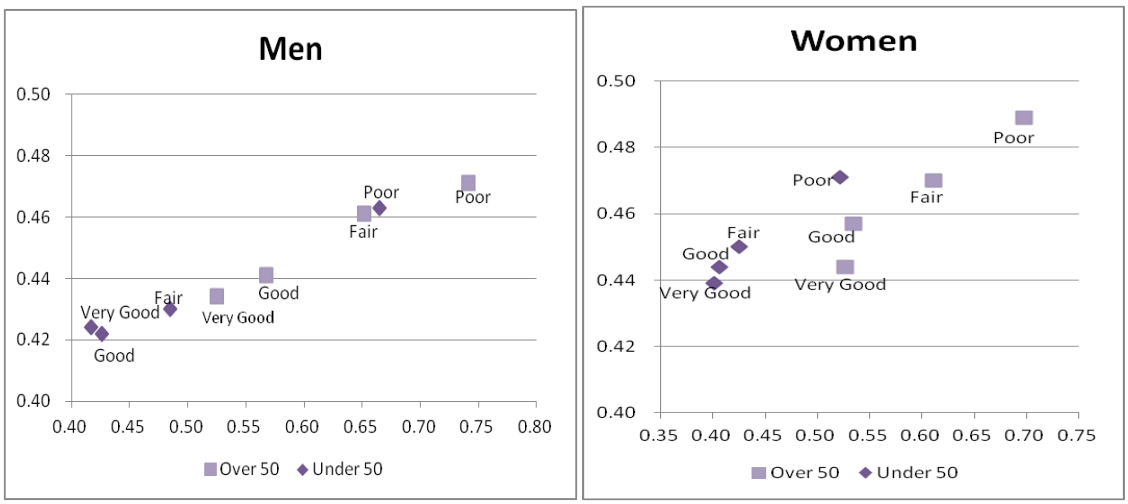


Figure 3.12 above displays the life balance by self-assessed health status for people aged over 50[37]. Better health is associated with a greater amount of committed time and with less regenerative time. That is, the balance point for the better health group is located to the lower left of the other groups. By contrast, the balance point of poor health group is located at the far right side of the triangle, indicating that older people with poor health tend to have increased regenerative time and greater discretionary time, and assign less of their time to the committed dimension. It should be noted that due to the cross-sectional nature of the data, we cannot identify the causal direction. For instance, it may be that maintaining a higher level of committed time improves health, or that having better health enables people to devote more time to the committed dimension. However, the observed association between health and life balance lends face and construct validity to the life balance triangle model, which assumes that too much discretionary time would be negatively associated with health and well-being in later life. In Chapter 4 we examine whether this relationship remains significant, controlling for other factors including the presence of long-term illness.

[37] In MTUS self-rated health status was coded as: Poor, Fair, Good, and Very Good. See Chapter 4 and Chapter 6 for further discussion of this variable.

Although we have focused mainly on the balance between committed time and discretionary time so far, for self-assessed health we further examined the movement of the balance point in the regenerative dimension, which may be more directly associated with health status. Figure 3.13 below shows an enlarged version of the central part of the triangle, which demonstrates the relationship between health status and regenerative time more clearly. We have also added the balance points from the younger age group (18-49) for reference. An upward trend is observed in terms of regenerative time as health status moves from very good to poor. Again, we cannot distinguish whether spending a greater proportion of regenerative time is the cause of poor health or whether people with poor health need more regenerative time, for example for longer hours of sleep or personal care due to the limiting health condition. However, we can at least state that the proportion of regenerative time is inversely associated with health status, both in the younger and the older age groups.

Figure 3.13 Life Balance Triangle by Health and Age, MTUS, UK 2000-2001 (Section Enlarged)



Findings in Figure 3.13 also lead us to another interesting aspect of the life balance. In Chapter 2 we proposed life balance as a dynamic concept rather than a static one, which changes over the life course responding to the life course transition. That is, we do not regard having a balance point at the centre of the triangle as 'optimal' or 'normal' for everyone, but expect each life stage to have a distinct balance point appropriate for the life stage. For instance, from Figure 3.13 we can see that although the overall trend by health status is similar for younger and older groups, the balance points of the older group are located to the right of the balance points of the younger group regardless of the health

status, except for the younger men with poor health status[38]. We discuss the issue of life balance dynamics across the life course in Chapter 4.

3.3. Discussion and Conclusion

Maintaining balance over different life domains in daily life matters not only to the working-age population, but to everyone. The core idea of a life balance framework is that it is important to maintain a balance between the level of constraint and freedom of choice, so that we do not suffer stress from time pressure due to having too many constraints or from a lack of time structure due to too much free time. In addition, it is important to maintain a certain level of regenerative time, as it represents the time necessary for meeting our physiological needs for survival.

Based on the framework, this chapter presented the life balance triangle model we developed from classic approaches in time use studies. First, we modified the four basic time use categories by Ås (1978) into three life balance dimensions: committed (constraints), discretionary (individual choice), and regenerative (biological/physiological needs). Second, we adapted the virtuous triangle of work and leisure balance developed by Gershuny (2003), and which consists of unpaid work, paid work, and leisure, to create the life balance triangle as a tool to explore the issue of

[38] This group may be identified as 'out-of-balance', possibly due to the poor health, since they have a similar level of balance to the older age group although they are at a different life stage.

balance in later life when paid work is removed from the main aspects of daily life. In so doing, we aimed to propose a comprehensive theoretical framework which deals with the daily life of older people as a totality, considering both 'the imperatives of the human condition and the range of individual choice' (Robinson and Converse, 1972, p. 17). In building the balance model for later life, we challenged a common assumption in work-life balance research that focuses on the issue of time pressure and role conflicts from too many obligations; instead we proposed the lack of committed time as an additional source of negative outcomes, focusing on the loss of time structure that has been identified as one of major problems in unemployment studies (Jahoda et al., 1933/1972; Gershuny, 1994).

The second part of the chapter was devoted to demonstrating the empirical applicability of the life balance triangle model. Using the MTUS version of UK time use data, we explored how life balance varies across age, gender, economic activity status and health status. In particular, we focused on exploring the bivariate relationships through visualisation, to demonstrate the main strength of the life balance triangle, which provides, at a glance, an effective and intuitive representation of the balance between the three life domains by different groups. Let us highlight some of the findings from the life balance triangle, which also raise interesting questions that form the basis of further investigation in Chapter 4.

First, we found that life balance shifts to the right of the triangle as age increases, which indicates that committed time is negatively associated with age, while discretionary and

regenerative time are positively associated with it. From the distance between the balance points, we also found that, in terms of magnitude of change, the balance moves horizontally, rather than vertically, which means that a major shift in life balance in later life is observed in terms of balance between discretionary time and committed time, rather than regenerative time. Examining the relationship between life balance and economic activity status, we found a similar trend. The balance point for older people who are not in paid work was located closer to the right side of the triangle: indicating more discretionary time and less committed time.

These results seem to be certainly in line with the picture of later life that was depicted by disengagement theory (Cumming and Henry, 1961) viewing later life as a time for disengagement from obligations and commitments – or the modern idea of retirement in affluent societies as a time for discretionary pursuits[39]. An interesting question then is whether the shift in life balance towards this direction of increasing discretionary time, as we observe in the triangle, is determined by old age (ageing) or economic activity status (structure). For instance, if age is more influential or at least the effect of age is independent of the effect of economic activity status, we can expect that the changes in life balance may be gradual as we grow older. On the other hand, if economic activity status (i.e. retirement) is the main determinant, we can expect the changes in life balance

[39] It may be possible that the life balance of older people in developing countries differs from that of older people in the UK, because in many of those countries older people are still expected remain in paid work until they can no longer work.

to be more abrupt, and the timing of the changes to be influenced by the labour market situation or retirement policy. In Chapter 4 we address this question by looking at the main determinants of the life balance in later life.

Another important finding is the quantitative gender gap in life balance in later life. A large body of literature has examined the issue of gender inequality in patterns of time use among the working-age population. In particular, whether a quantitative gap exists between men's and women's time use has posed one of the central questions in the field. For instance, the 'dual burden' argument pointed out that in modern societies, with the increase in dual-earner families, women tend to shoulder the dual burden of doing paid work as well as unpaid work, including housework and child care (Hochschild 1997). According to this argument, with the increase in women's paid employment, women bear quantitatively more of a burden than men, either because of the added demands of paid work or because of an insufficient reduction in unpaid work in exchange for paid work. However, recent research has found that, in terms of total work, there is little difference in total workload between men and women (Bianchi, Robinson and Milkie, 2006). The distribution of primary leisure time was also found to be similar between genders (Bittman and Wajcman, 2000). Thus there has been a tendency to focus on qualitative difference in patterns of time use such as multitasking and quality of leisure (Offer and Schneider, 2011) instead of identifying the quantitative gender gap.

However, our results show that while little difference was found in life balance between genders in work life, a quantitative gender gap does exist in later life as women devote

considerably more proportion of their time than men to the committed dimension. Although this is a preliminary analysis based on cross-sectional data, it demonstrates the potential of the life balance triangle as a tool in understanding the issue of gender gap in time use patterns in later life. For instance, from the greater distance between the balance points for men by economic activity status, we can expect that they may experience a greater degree of change in terms of balance between committed and discretionary time in retirement. Moreover, a higher degree of discretionary time for men implies they may be more likely to suffer from the destruction of habitual time structure in retirement. In the study of unemployment, Gershuny (1994) found that while a majority of men complained about having time on their hands, only a minority of women did so. He reported that unemployed women maintained a level of activity and a sense of purpose in activity close to that of employed people. He argued that 'the more substantial responsibilities that women undertake in the domestic sphere provide a sense of identity and a patterning of activity that help to some degree to offset certain of the psychological consequences of unemployment' (Gershuny, 1994, p. 218). This insight also can be applied to explain why retired men who contribute to domestic work report better well-being.

Another interesting finding is the convergence in the gender gap in life balance in the oldest old group (aged above 80). From the triangle, we observed that the balance point of women catches up with the balance point of men (i.e. reaches a similar level of discretionary time) only in the oldest old group. The balance points of women also appear to move more gradually across age groups compared to those of men. This suggests that

there may be different factors at work in determining the life balance of men and of women in later life. (In Chapter 4 we examine whether the effects of determinants of the life balance are gender specific.) The observed convergence of the life balance is also interesting in terms of testing the age-as-leveller hypothesis. However, as the sample of people aged over 80 is limited, we were not able to explore how the life balance moves further in very old age. Considering the increasing longevity and the increasing number of oldest-old people in the UK (Leeson, in press), the issue of life balance of very old people warrants further investigation in the future.

Finally, we found that self-reported health is negatively associated with discretionary time, and positively associated with committed time. People in poor health had greater discretionary and regenerative time. We also found that the distance between balance points by health status is greater for older people, suggesting more variance in patterns of time use in relation to health status. However, it should be noted that the analyses in this chapter are preliminary, without controlling for other factors such as level of income and education. Furthermore, the observed pattern of life balance by health status does not tell us about the causal direction. For instance, we were not able to test whether better health enables people to devote more to committed time, or vice versa. Although we found an association between too much discretionary time and poor health in old age, which is consistent with the assumption of the life balance framework that assumes the possible negative effects on well-being of having too much discretionary time, we cannot empirically establish the causal direction between the two.

Yet we believe the attempts we made in this chapter could be an important starting point to further explore the issue of balance beyond work life. By proposing an alternative framework of balance that can be applied to people of all ages, the life balance triangle model extends the advantage of Gershuny's virtuous triangle, which effectively summarised how the balance between work and leisure changed into life beyond paid work. Above all, the life balance triangle provides an intuitive graphic representation of how balance varies by various factors. For instance, the life balance triangle for health status shows that the health status is almost linearly related to shifts in the balance between three dimensions. Although they may not give direct answers, such graphical representations reveal interesting patterns to be explored further, as well as enabling an intuitive understanding of how balance varies in later life. Building on the exploratory findings in this chapter, we investigate the main determinants of life balance and discuss the life balance dynamics across the life course in Chapter 4.

4. Dynamics of Life Balance in Later Life

In this chapter, we seek to identify the main determinants of life balance dynamics in later life. The graphical exploration of older people's use of time in the UK using the life balance triangle in Chapter 3 revealed that in later life the balance in daily time use shifts to greater discretionary time and regenerative time, and less committed time. Several factors were found to be associated with the shift in the life balance towards this direction from the bivariate analyses. Using multivariate analyses, this chapter further investigates the relationship between life balance and various demographic and socio-economic factors to identify the most influential factor that determines the life balance dynamics.

In particular, we focus on investigating whether the shift in life balance in later life is determined by old age (ageing) or life course transition (structure). In the study of young adults, Gauthier and Furstenberg (2002) found that it is the stage of the transition rather than age itself that determines the allocation of time. They argued that the pattern of time use could be a strong indicator for the transition to adulthood because young people's patterns of time use are regulated by social roles, constraints, and obligations the life stage offers. With the establishment of retirement as a social institution, later life became a stage in the life course which involves a distinct set of social roles, constraints and obligations (Harper, 2006; Ekerdt, 2004). Older people in affluent societies have been expected to leave paid work when they reach a certain age and to spend their time on leisure and other discretionary pursuits. If the allocation of time is indeed determined by such expectations and a social institution attached to the life stage (e.g. retirement), we should observe life balance to be responsive to the transition to later life.

On the other hand, it is also possible that the influence of life course transition on time allocation such as this may not be significant in later life or that the magnitude of effect may be substantially reduced once age and health are taken into account, because later life also involves biological ageing and increasing physical constraints which can be quite influential. Indeed, the exploratory analyses in Chapter 3 using the life balance triangle showed that a linear relationship may be present between age and life balance, and between health and life balance. In this chapter we examine whether the effect of life course transition remains significant after controlling for other factors such as age and health, and vice versa.

In addition, we further explore the issue of gender gap in life balance in later life we observed in Chapter 3. Although both the balance point of men and of women moved towards more discretionary time and less committed time in later life, the degree of change was much larger for men. By investigating whether the effects of determinants are gender-specific, we attempt to find out what factors may be associated with the gender gap in life balance in later life.

4.1. Main Determinants of Changes in Life Balance

Research Question 1: Is life balance responsive to the transition to later life?

We first examine whether life balance is responsive to changes in the life stages. In this study, we consider that an older person has made the transition into later life if he or she

is no longer in paid work[40]. We find this distinction adequate for our purpose although it is not without limitations, as the purpose of our study is to examine how life balance changes when paid work is removed from daily life. The majority of the older people in our sample who are not in paid work reported that this was because they had retired [41](Chapter 3), which implies that their departure from the paid work is linked with the social institution of retirement. Thus, we expect that people who had made the transition would have less committed time and more discretionary time, reflecting the expectation attached to retirement as a time for leisure and discretionary pursuits. More specifically, we hypothesise that *transition to later life would be negatively associated with committed time, while positively associated with discretionary and regenerative time* (Hypothesis 1). We also expect the freed time from the *Committed* dimension to be disproportionately redistributed between the *Discretionary* and *Regenerative*, as regenerative time, which includes sleep, has been found to be more stable across the life course (Gershuny, 2003).

[40] Ideally, we would have used self-defined retirement status as the marker, because claiming to be retired may imply acceptance of this identity, which reflects the broad set of meanings and expectations regarding retirement. It would have enabled us to test whether considering oneself retired would influence life balance controlling for employment status. However, in the UK 2000-2001 time use study, only people not in paid work reported whether they had retired. Thus, people who might have regarded themselves as retired but were still in paid work could not be identified.

[41] Appendix A4.1 presents the reason for not being in paid work.

Research Question 2: Does the effect of life stage remain significant after controlling for demographic factors, in particular, age?

Next, we test whether the effects of life stage remain significant after we control for demographic factors. First, we examine the relationship between life balance and age. In a descriptive study, Gauthier and Smeeding (2003) found older people did less paid work as they age, and that this freed time was reallocated to discretionary activities such as leisure. Altergott (1988) reported that older groups devoted more time to sleep than the younger group (aged 55-64). We thus first test whether the proportion of committed time decreases with age while discretionary and regenerative time increase. We hypothesise that *people in the older age group will have less share of committed time compared with people in younger age group (e.g. aged 50-59)* (Hypothesis 2). We also examine whether this freed time redistributed more to regenerative time or discretionary time. If older people spend more time on personal care or tend to sleep more, it may be expected that the regenerative time will increase as they grow older.

Second, we investigate whether the effect of life stage changes when we control for age. Comparing the patterns of time use between people aged 65-74 and aged 75 and over, Robinson and Godbey (1997) argued that greatest difference in time use comes from the difference in employment status, not from ageing. If life balance is responsive to stages in life independently of ageing, then the effect of work status should not disappear even if age is included in the model. Thus, we hypothesise that *the effect of life stage would remain significant and substantial even after we control for age* (Hypothesis 3). At the same time, we expect *the magnitude of age effect to be reduced when the life stage is*

included in the model (Hypothesis 4). These tests will enable us to explore whether the changes in life balance are associated with more with social structure (paid work/retirement) or with ageing itself.

Third, we examine whether gender affects life balance. The gender gap in time use patterns regarding the working-age population has been well documented. Although the gender differences in total workload have been found to be small (Offer and Schneider, 2011; Bianchi, Robinson and Milkie, 2006; Bittman and Wajcman, 2000), the gendered division of work has been known to persist in the working-age population (Craig and Bittman, 2008; Bianchi, Robinson, and Milkie, 2006). That is, women tend to do more domestic work and family care while men do more paid work. Our question is whether gender still affects the time allocation in later life. If gendered division of labour continues into later life, we should find that women have more committed time while men have more discretionary time, because the burden of paid work is has been removed from the men while the responsibility of housework still rests on women. From the triangle in Chapter 3 we observed that life balance in later life differs by gender and that the balance moves towards the right apex of the triangle for men, implying that they have more discretionary time. Here we test whether this gender gap remains significant after controlling for other factors and investigate how each dimension actually differs by gender. We expect *women would have more committed time and less discretionary time relative to men, controlling for other factors* (Hypothesis 5).

Research Question 3: Is life balance associated with socio-economic factors such as marital status, level of education, and level of household income?

We also examine whether life balance is associated with socio-economic characteristics. In studies of working-age population, factors such as family status, the level of education, presence of children and household income have been regarded as important variables for explaining time use patterns (Gershuny, 2003; Juster and Stafford, 1985; Schieman et al., 2009). Therefore we examine whether these factors have explanatory powers in casting light on the variance in life balance in later life, and test whether the effects of life stage change remain significant after controlling for socio-economic variables.

First, we investigate whether being in a couple is associated with life balance. Although we observed a significant gender gap in life balance in later life in Chapter 3, it has been argued that retired husbands do contribute to unpaid work more than their non-retired counterparts (Robinson and Godbey, 1997). If this is the case and the housework is shared between the couple in later life, it would be more likely that people who are in a couple have less committed time than those who are not. Thus, we hypothesise that *being in a couple would result in decrease in the share of committed time while increasing the share of discretionary time* (Hypothesis 6)[42].

[42] We examine the effect of marital status further when we look at gender-specific models.

Next, we examine the relationship between level of education and life balance. In a study of the working-age population (aged 20-60), a higher level of education has been found to be associated with an increase in paid work time, but with a decrease in unpaid, personal care, and leisure time (Gershuny, 2003). In a study of leisure inequality, the level of education was found to be significantly related to disparity in leisure time as the leisure time of the higher-educated group reduced over time while the leisure time of the lower educated group increased significantly (Attanasio et al., 2012) Thus we hypothesise that a *lower level of education will be associated with an increase in the share of discretionary time* (Hypothesis 7).

Finally, we test whether the level of household income is associated with life balance. It might be possible that older people with less income would spend more time on the committed dimension as they may have to work longer to maintain their living standards or may not able to afford household maintenance services. Thus, we hypothesise that a *lower level of household income will increase the proportion of committed time, while reducing the share of discretionary time* (Hypothesis 8). It should be noted that due to the cross-sectional nature of the data, it is not possible to test the causal relationship between household income variables and life balance. For instance, a higher level of household income may also be associated with an increase in the proportion of committed time because it might mean that they earn more by working longer.

Research Question 4: How is health related to life balance?

In Chapter 3 we observed that, for the people who assess their health as poor, the balance point moves towards the upper right apex of the life balance triangle, implying an increase in discretionary and in regenerative time. First, we examine whether this relationship between the life balance and self-assessed health status we observed in the triangle remains significant when we control for other demographic and socio-economic factors. In particular, we control for the existence of long-term health problems to see whether the relationship between self-assessed health and life balance remains significant after we take the state of physical health into account. As we discussed in Chapter 3, we cannot identify the causal direction between life balance and health status based on current data: for instance, it may be that better health enables older people to engage in more activities in the committed dimension, or that being engaged in committed time contributes to better health. By controlling for long-term health problems, we attempt to adjust the physical constraints that might affect use of time. We hypothesise that *compared with people who answered their health status as fair, those who assessed their health as poor would have a smaller proportion of committed time, while having more regenerative time or discretionary time* (Hypothesis 9). We also examine how having a better perception of one's own health is associated with life balance. If our assumption that too much discretionary time would lead to a poor health outcome is correct, *we would observe a negative relationship between the proportion of discretionary time and self-assessed health status after controlling for other factors* (Hypothesis 10). Finally, we investigate whether the effect of life stage variable on life balance remains significant and substantial

after we control for health status. If the balance in time allocation in later life is largely determined by health status rather than the life stage, we would observe the effect of life stage reduces substantially. We hypotheses that *the effect of life stage on life balance would remain substantial even after controlling for the self-rated health status* (Hypothesis 11).

Research Question 5: Are the effects of determinants gender specific?

Next, we investigate whether the magnitude of effects of each determinant is gender specific. First, we examine whether the effects of life stage transition differ depending on gender. The reduction of paid work will affect both men and women, but if the gendered division of work persists after retirement, women would be affected to a lesser degree because the amount of domestic work may not be reduced. Thus *we expect the impact of life stage transition to be more pronounced for men than women* (Hypothesis 12). Second, we examine whether the effect of age is gender specific. In chapter 3, we observed that the balance points of women appeared to move more gradually across age groups compared to those of men, and that the balance points between genders converged at the oldest old group. *We expect that the effect of age, especially being in the oldest old group, would be more pronounced for women* (Hypothesis 13).

We also test whether being in a couple has different effects on men and women. It has been argued that the gender gap in housework is widest between people who are married because women tend to do more housework when in a couple, and this often results in their sacrificing their leisure time (South and Spitze, 1994). We thus expect that *being in*

a couple will increase the share of women's committed time and decrease the share of discretionary time while having a negative or no significant effect for men (Hypothesis 14). Finally, we examine whether the effects of health, level of education and the level of household income have are gender specific.

4.2. Data and Measures

4.2.1. Data and Sample

We use the UK 2000-2001 data from the Multinational Time-Use Study (MTUS). For regression analysis in this chapter, we selected a sample of respondents aged over 50[43]. We only included those who had completed a good quality diary (see Fisher and Gershuny, 2013, for details), and respondents who answered the questions for demographic, socio-economic, and health status. For the gender-specific analyses, we estimated the effects on each subsample of men and women, as the Chow test and the joint test of the interaction coefficients reject the null hypothesis of independence of the gender. Table 4.1 below gives an overview of sample characteristics.

[43] See Chapter 1 for information about the time diary data.

Table 4.1 Sample Characteristics

	Proportions/Mean(SD)	Number of Observations
Demographic Factors		
Gender		
Men	.48	2,409
Women	.52	2,629
Total	1.00	5038
Age	64.08(9.56)	5,038
Socio-Economic Factors		
Life Stage		
Beyond Work Life	.65	3,286
Work Life	.35	1,752
Total	1.00	5,038
Marital Status		
Couple	.70	3,523
Not in Couple	.30	1,515
Total	1.00	5,038
Level of Education		
Lower	.60	3,035
Secondary	.22	1,083
Higher (Above Secondary)	.18	920
Total	1.00	5,038
Income		
Lower 25%	.48	1,879
Middle 50%	.39	1,557
Upper 25%	.13	504
Total	1.00	3,940
Self-Rated Health		
Poor	.11	535
Fair	.27	1382
Good	.36	1814
Very Good	.26	1307
Total	1.00	5,038
Long-term Health Problem		
Yes	.52	2,593
No	.48	2,352
Total	1.00	4,945

4.2.2. Measures

Dependent Variables

We created a set of three ratio measures as dependent variables to examine the change in dimensions of life balance. We first classified activities into three categories representing the life balance triangle: *Committed*, *Regenerative*, and *Discretionary*. As we discussed in Chapter 3, *Committed* includes paid-work-related activities, regular schooling, household maintenance, and care-related activities. *Regenerative* consists of activities that are necessary for our physical existence, such as sleep, personal toilet, and eating. *Discretionary* includes activities that are undertaken by choice, such as leisure, socialisation, and other discretionary pursuits, including civic activities. Next, we computed the total minutes per day for each category and divided them by 1440 minutes (24 hours) to create three ratio measures of life balance. Note that ratio measures sum to one, as they are proportions of total day time. Thus, in our models, *an increase in one coefficient implies decreases in other coefficients in the same row* (see Craig and Mullan, 2011), which enables us to examine how the balance changes depending on the effect of variables.

Independent Variables

Beyond Work Life (BWL). To identify people who have made the transition to later life (i.e. beyond work life), we coded people who are not in paid work as BWL=1, and people who are still in paid work as BWL=0. In our sample, 59% of men (N=1421) and 71% of

women (N=1865) are not in paid work, and we regard them as having made the transition to later life.

Demographic Characteristics. *Female* is a dummy variable for gender (Female=1, Male=0). *Age* is included as a set of dummy variables (aged 50-59; aged 60-69; aged 70-79; aged 80+), and aged 50-59 is used as the reference category.

Socio-Economic Characteristics. Marital status, level of education, and relative income status are included as respondents' socio-economic status. *Couple* is a dummy variable that indicates whether the person is in a relationship (Married/Cohabitating/Civil Partnership) or not. In our sample, 70% are in a couple (Couple=1) while 30% are not (Couple=0). *Education* comprises three categories: *Uncompleted secondary or less*, *Completed secondary*, and *Above secondary education*. We use *Completed secondary* as the reference category. For the income status, as we are interested in the relative position of the respondents' household in national income distribution, we used a set of dummy variables for *Income*, which records the annual household income grouped in quartiles (Gershuny, 2003): *Lowest 25%, Middle 50%, and Highest 25%*. In the analysis, we use the *Middle 50%* category as the reference category[44].

[44] Due to the high number of missing values, we ran a separate analysis based on samples without missing values.

Health Status. Health indicates the self-assessed health status, and has four categories: *Poor, Fair, Good, Very Good*. We use *Fair* as the reference category. *Long-Term Illness* is a dummy variable for long-term health problems. The variable takes the value of 1 if the respondent reported he/she had a long-term health problem, 0 if otherwise.

4.3. Results

4.3.1. The Effect of Life Stage on Life Balance

Table 2 shows the results from the OLS regression for the proportion of committed, regenerative, and discretionary time per day for the people aged 50 and over. As mentioned in the measurement section, an increase in coefficients in one dimension means a decrease in other dimensions because the ratio measures sum to 1. For convenience, we will report the results focusing on the *Committed* dimension, although *Discretionary* and *Regenerative* will be discussed where appropriate, especially where the reallocation of time is of interest.

Table 4.2. Estimated Effects of Life Stage on the Share of Committed, Regenerative, and Discretionary Time per Day, Total Sample Aged over 50

	Model 1		
	Committed	Regenerative	Discretionary
Beyond Work Life	**-0.17*** **	**0.05*** **	**0.12*** **
	(0.00)	(0.00)	(0.00)
Constant	0.35***	0.42***	0.23***
	(0.00)	(0.00)	(0.00)
N	5038	5038	5038
F	1774	527	1059
R^2	0.324	0.103	0.201

*p<0.05, ** p<0.01, *** p<0.001

Note: Robust Standard Errors are in parentheses. UK 2000-2001, OLS Regression

To test whether the transition to later life is significantly associated with changes in life balance, we first estimated a bivariate model with *Beyond Work Life* as the independent variable. As expected in Hypothesis 1, making transition to later life was found to be associated with a substantial reduction in the share of committed time (17%p), while associated with increases in the shares of regenerative time (5%p) and discretionary time (12%p). We can see that the reduced time from the committed dimension is disproportionally redistributed: more than two thirds of the reduced time goes to discretionary dimension. However, as this relationship may be spurious, reflecting the effect of other demographic/socio-economic factors or health status, we proceed to multivariate analyses.

4.3.2. Life Balance, Demographic Characteristics and Socio-Economic Status

Demographic Characteristics

To examine the relationship between demographic characteristics and life balance, we first constructed a model with *female* and a set of *age group* dummies (Table 3, Model 2). Consistent with Hypothesis 2 that predicts people will have less committed time as growing older, we found the older age groups show substantial decreases in the share of committed time compared with the reference category (aged 50-59), and the magnitude of the effect is the largest at the oldest group (16%p decrease). A greater proportion of time is reallocated to discretionary time across the age groups. In aged 60-69 group, only 20% of the reduced committed time go to regenerative time and 80% is redistributed to discretionary time. About 30% of the reduced committed time go to regenerative time and 70% go to discretionary time in aged 70-79 group. About 38% of the reduced committed time go to regenerative time, and 62 % to discretionary time in aged over 80.

Table 4.3. Estimated Effects of Demographic and Life Stage Variables on the Share of Committed, Regenerative, and Discretionary Time per Day, Total Sample Aged over 50

	Model 2			Model 3		
	Committed	Regenerative	Discrecretionary	Committed	Regenerative	Discrecretionary
Female	0.01***	0.01***	-0.02***	0.03***	0.01**	-0.03***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age Group						
50-59	Reference			50-59	Reference	
60-69	-0.10***	0.02***	0.08***	-0.03***	0.00	0.03***
	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)
70-79	-0.14***	0.04***	0.09***	-0.04***	0.02***	0.02***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)
80+	-0.16***	0.06***	0.10***	-0.06***	0.04***	0.03***
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Beyond Work Life				-0.15***	0.04***	0.11***
				(0.01)	(0.00)	(0.00)
Constant	0.30***	0.43***	0.27***	0.35***	0.41***	0.24***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N	5038	5038	5038	5038	5038	5038
F	276	83	152	448	117	269
R^2	0.186	0.078	0.118	0.346	0.119	0.226

*p<0.05, ** p<0.01, *** p<0.001

Note: Robust Standard Errors are in parentheses. UK 2000-2001, OLS Regression

In Model 3, we have taken the life stage variable and demographic variables together. The inclusion of age dummies and gender had little influence on the effects of being beyond work life, although the magnitude of the effect decreased somewhat. This supports Hypothesis 3 that predicts the effect of life stage will remain significant even after we control for gender and age. It implies that the life stage plays an independent and substantial role in determining the life balance. On the other hand, the magnitudes of age effects are reduced considerably when the life stage is included in the model, although still significant. This confirms Hypothesis 4, which predicted that the effect of age would

be largely reflecting the life stage transition[45]. Next, we examined the effect of gender on life balance. As expected in Hypothesis 5, women have more committed time and less discretionary time compared to the men controlling for age and the life stage, confirming the gender gap in life balance in later life we observed in chapter 3. We return to the relationship between gender and life balance later in the chapter when we discuss the gender-specific effects of determinants.

Socio-Economic Status

We now turn to the question of whether socio-economic status matters for life balance (Table 4). Model 4 shows the results of examining the influence of marital status and level of education. Contrary to Hypothesis 6, which predicted the decrease in the share of committed time for people in a couple, we found that being in a couple reduced the share of discretionary time, while increasing the share of regenerative time. The share of committed time was increased for people in couple, but it was not statistically significant at the 0.05 level ($p=0.09$)[46]. As for the other socio-economic variables, only a higher level of education was found to be significantly associated with the life balance. Compared with people with secondary education, older people with higher education had more discretionary time, and less regenerative time, controlling for other factors. The effect of

[45] Yet, in contrast to Robinson and Godbey (1997), who argued that it is employment status, not age, that influences time allocation in later life, we found the influence of age to be still significant and not small, and the direction of effects consistent.

[46] We discuss this issue further when we report the gender-specific effects of this variable.

committed time was not significant. Thus, hypothesis 7, which expected an increase in the discretionary time for people with lower education, was not supported. We have also run an additional analysis to include the level of income variables, but none of the income dummy variables was significant[47] (A4.2). The effect of life stage variable remained significant and consistent controlling for socio-economic factors.

[47] The relatively small or insignificant effects of socio-economic variables on life balance contrast with other research findings on working-age population, where education was found to be most influential factor (Attanasio et al, 2012).

Table 4.4. Estimated Effects of Socioeconomic Variables and Health Status on the Share of Committed, Regenerative, and Discretionary Time per Day, Total Sample Aged over 50

	Model 4			Model 5			Model 6		
	Com	Reg	Discre	Com	Reg	Discre	Com	Reg	Discre
Female	0.03***	0.01***	-0.04***	0.03***	0.01***	-0.03***	0.03***	0.01***	-0.03***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age Group									
50-59	Reference								
60-69	-0.03***	0.00	0.03***	-0.04***	0.00	0.03***	-0.03***	0.00	0.03***
	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
70-79	-0.04***	0.02***	0.02***	-0.04***	0.02***	0.02***	-0.04***	0.02***	0.02***
	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
80+	-0.06***	0.04***	0.02**	-0.06***	0.04***	0.02**	-0.06***	0.04***	0.02**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Beyond Work Life	-0.15***	0.04***	0.11***	-0.14***	0.04***	0.10***	-0.14***	0.04***	0.10***
	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)
Couple	0.01	0.01***	-0.02***	0.00	0.01***	-0.02***	0.00	0.01***	-0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Education									
Lower	-0.00	-0.00	0.00	-0.00	-0.00	0.00	-0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Secondary	Reference								
Higher	-0.01	-0.01***	0.02***	-0.01	-0.01***	0.02***	-0.01	-0.01***	0.02***
	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
Health									
Poor				-0.03***	0.01	0.03***	-0.03***	0.00	0.03***
				(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
Fair	Reference								
Good				0.02***	-0.00	-0.01**	0.01**	-0.00	-0.01*
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
VeryGood				0.02***	-0.01***	-0.01	0.01*	-0.01*	-0.00
				(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)
Long-Term Illness							-0.01**	0.01	0.01
							(0.00)	(0.00)	(0.00)
Constant	0.35***	0.41***	0.24***	0.33***	0.41***	0.26***	0.34***	0.41***	0.25***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
N	5038	5038	5038	5038	5038	5038	4945	4945	4945
F	448	117	269	218	59	133	199	53	122
R^2	0.346	0.119	0.226	0.358	0.131	0.240	0.359	0.129	0.242

*p<0.05, ** p<0.01, *** p<0.001

Note: Robust Standard Errors are in parentheses. UK 2000-2001, OLS Regression

Self-Assessed Health Status

Next, we added self-assessed health status variable (Model 5, Model 6) to examine the relationship between life balance and health status (Table 4.4). We found that health status is significantly associated with life balance controlling for other factors, especially in terms of changes in committed time and discretionary time. Better health status was found to increase the share of committed time: older people with better health status had 2%p more share of committed time than people with fair health. Compared with people with fair health, people who reported their health as poor had a 3%p smaller share of the committed time. This confirms Hypothesis 9, which expected poor health would be associated with reduction of committed time. Interestingly, the reduced proportion of committed time for the poor health group was mainly reallocated to discretionary time rather than to regenerative time. Overall, the share of discretionary time was negatively associated with self-reported health status (Hypothesis 10).

Due to data limitation, we were not be able to distinguish in this study whether having good health status enabled people to do more activities related to committed dimension or whether people who do more activities in committed dimension are healthier. However, as the relationship between life balance and health status remains significant after controlling for the existence of long-term health problems, it may be more likely that life balance affects subjective health status, rather than physical constraints dominate the relationship.

We also examined whether the effect of the life stage variable remains significant after controlling for the self-assessed health status. The life stage variable still remained as the most influential determinants of life balance, although the magnitude of effect was slightly reduced when controlling for the self-reported health status. This supports Hypothesis 11.

4.3.3.Gender-Specific Effects of Life Balance Determinants

Table 4.5. the Effects of Life Stage on the Share of Committed, Regenerative, and Discretionary Time per Day, By Gender

	Committed		Regenerative		Discretionary	
	Men	Women	Men	Women	Men	Women
Beyond Work Life	-0.20***	-0.15***	0.06***	0.04***	0.14***	0.11***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
Constant	0.35***	0.34***	0.41***	0.43***	0.24***	0.23***
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N	2374	2664	2374	2664	2374	2664
F	1129	756	314	195	689	462
R^2	0.373	0.288	0.127	0.072	0.254	0.171

*p<0.05, ** p<0.01, *** p<0.001

Note: Robust Standard Errors are in parentheses. UK 2000-2001, Aged over 50, OLS Regression

We now turn to the question of whether change in life stage and other demographic and socio-economic variables have a different influence on life balance for men and women. Model 1 (Table 4.5) shows the bivariate estimates for the effect of being beyond work life for men and for women. The results support Hypothesis 12, which predicted that the effect of life course transition would be more pronounced for men. Men seem to be more affected than women by work status, and the difference in magnitude is not small. For men, the effect of being beyond work life leads to a 20%p reduction in the share of

committed time, while the reduction for women is 15%p. The gaps are consistent in other dimensions, and all are statistically significant. The difference in the magnitude of effect of life stage transition by gender persisted even after we controlled for other variables (See Table 4.6 and Table 4.7).

Table 4.6 the Effects of Demographic and Life Stage Variables on the Share of Committed, Regenerative, and Discretionary Time per Day, By Gender

	Model 2						Model 3					
	Committed		Regenerative		Discretionary		Committed		Regenerative		Discretionary	
	Men	Women	Men	Women	Men	Women	Male	Female	Male	Female	Male	Female
Age Group												
50-59	Reference											
60-69	-0.11***	-0.09***	0.03***	0.02***	0.08***	0.07***	-0.03***	-0.04***	0.01	-0.00	0.03***	0.04***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
70-79	-0.16***	-0.12***	0.05***	0.04***	0.11***	0.08***	-0.03***	-0.05***	0.02***	0.01**	0.02	0.03***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
80+	-0.17***	-0.16***	0.08***	0.05***	0.09***	0.10***	-0.04***	-0.08***	0.05***	0.03***	-0.00	0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Beyond work Life							-0.18***	-0.12***	0.05***	0.04***	0.14***	0.08***
							(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Constant	0.31***	0.31***	0.42***	0.44***	0.27***	0.25***	0.36***	0.35***	0.41***	0.43***	0.23***	0.22***
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N	2374	2664	2374	2664	2374	2664	2374	2664	2374	2664	2374	2664
F	172	190	66	39	85	108	319	233	88	54	187	139
R^2	0.179	0.202	0.092	0.055	0.109	0.123	0.381	0.316	0.145	0.085	0.260	0.189

*p<0.05, ** p<0.01, *** p<0.001

Note: Robust Standard Errors are in parentheses. UK 2000-2001, OLS

Next, we examined how the effects of age differ by gender. In Model 2, we included only age dummies. As can be seen, for both genders, the share of committed time reduced with age, while regenerative and discretionary time increased. The effects of age are greater for men across all the age groups. For instance, the 70-79 age group is associated with

16%p reduction in the share of committed time compared with the 50-59 age group for men, while it is associated with 12%p reduction for women.

However, when we control for the life stage, a different picture emerge. The inclusion of life stage as a variable reduces the effect of age dummies for both genders, but to different degrees (Model 3). The rate of reduction in the effect of age is much higher for men so that the effect of age groups is larger for women compared with men once the life stage is controlled. If we look at the oldest age group (80+), for instance, the effect of age on committed time is twice as large for women (men, 4%p decrease, women, 8%p decrease). This supports Hypothesis 13, which expected gender-specific effects of age and a more pronounced effect of oldest old age for women. More interestingly, except for the aged 60-69 group, the effect of age on discretionary time became not significant for men once the life stage transition was controlled, indicating that what determines the ratio of discretionary time for men is mainly the life-course transition from work life to retirement, rather than age. By contrast, for women, the effects of age on discretionary time remain significant for all the age groups: the older the person, the greater the discretionary time. This suggests that, for women's life balance, age still matters substantially after controlling for the life stage variable.

We then tested whether socio-economic variables affect life balance differently for men and for women (Table 4.7). In Hypothesis 14, we expected that being in a couple would positively affect the share of the committed time for women, while it would negatively affect the committed time for men. The findings support the hypothesis. For women,

being a couple increases the share of committed time by 2%p, while reducing the share of discretionary time by 3%p. For men, committed time was negatively associated with being a couple, but it was not statistically significant (p=0.181). For both genders, the share of regenerative time increased by 1%p for the two individuals in a couple.

In taking education into account, we found that while a higher level of education is associated with an increase in discretionary time for men (3%p more), it was not significant for women. For both genders, poor health was positively associated with discretionary time, while negatively associated with committed time. The reduction in the share of committed time was slightly larger for men, but overall, the magnitude of effects of health status was similar between genders. We also ran a separate model using the relative income variable, but none of the income dummies was significant, and it had made little difference to other variables (Appendix A4.2)

Table 4.7. The Share of Committed, Regenerative, and Discretionary Time per Day, By Gender

	Model 4						Model 5					
	Committed		Regenerative		Discretionary		Committed		Regenerative		Discretionary	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Age Group												
50~59	Reference											
60-69	-0.03***	-0.03***	0.01	0.00	0.02***	0.03***	-0.04***	-0.04***	0.01	0.00	0.03***	0.03***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
70-79	-0.03***	-0.04***	0.02***	0.02**	0.02	0.02***	-0.04***	-0.04***	0.02***	0.02**	0.02*	0.03***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
80+	-0.04***	-0.07***	0.05***	0.03***	-0.00	0.04***	-0.05***	-0.07***	0.05***	0.03***	0.00	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Beyond Work Life	-0.18***	-0.12***	0.05***	0.03***	0.14***	0.08***	-0.17***	-0.11***	0.04***	0.03***	0.13***	0.08***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Couple	-0.01	0.02***	0.01***	0.01**	-0.01	-0.03***	-0.01	0.01**	0.02***	0.01**	-0.01	-0.02***
	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
Education												
Lower	-0.00	-0.00	-0.00	0.00	0.00	0.00	-0.00	-0.00	-0.00	0.00	0.00	0.00
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Secondary	Reference											
Higher	-0.01	0.00	-0.01**	-0.01*	0.03***	0.01	-0.02*	0.00	-0.01**	-0.01*	0.03***	0.01
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Health												
Poor							-0.04***	-0.03***	0.01	0.00	0.03**	0.03**
							(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Fair	Reference											
Good							0.02*	0.02***	-0.00	-0.01	-0.01	-0.01*
							(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
VeryGood							0.02*	0.02**	-0.01	-0.02***	-0.01	-0.00
							(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Constant	0.37***	0.34***	0.40***	0.42***	0.23***	0.24***	0.36***	0.33***	0.40***	0.43***	0.24***	0.24***
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
N	2374	2664	2374	2664	2374	2664	2374	2664	2374	2664	2374	2664
F	183	139	56	33	112	89	137	103	39	24	82	64
R^2	0.383	0.320	0.153	0.091	0.265	0.199	0.392	0.333	0.156	0.098	0.272	0.208

*p<0.05, ** p<0.01, *** p<0.001

4.4. Discussion and Conclusion

The main question we set out to explore in this chapter was whether patterns of time use are more influenced by life stage (structure), or old age (ageing). In answering this question, we explored how the balance in time use changes according to these factors. We found that life balance, which consists of proportions of committed time, discretionary time, and regenerative time relative to total day time (1440 minutes), is highly responsive to changes in life stage. Controlling for other factors that are known to influence patterns of time use, making transition to a life stage where paid work does not occupy a central position (measured by not in paid work) was found to be the most influential factor determining life balance. Moving beyond work life was associated with substantial decreases in the share of committed time, and this newly available time was found to be disproportionately reallocated to regenerative time and discretionary time: more time was allocated to discretionary than to regenerative time. This confirms our findings from the life balance triangle in Chapter 3 that, with the transition to later life, life balance moves mainly between committed time and discretionary time.

More importantly, our findings provide support for Robinson and Godbey (1997), who argued that 'employment, not age, is the major influence on an older person's time use' (1997:215). Older age was associated with a decrease in committed time, and an increase in regenerative and discretionary time. However, the influence of old age diminished considerably once the life stage change had been taken into account. In particular, for men, the effect of age on the share of discretionary time became insignificant when life stage change was considered. The effect of life stage was still significant and substantial

after we controlled for long-term illness and self-assessed health. It implies that the changes in life balance in later life are mainly consequences of the social structure (e.g., retirement) rather than physical constraints from ageing.

These findings shed lights on the relationship between the life course transition and changes in patterns of time use. In Chapter 2 we proposed a conceptual model of life balance across the life course, based on the idea that life balance is not a static but a dynamic status that varies across the life course. We have assumed that the level of committed time would follow an inverted U-shape over life, while the level of discretionary time takes a U-shape, and the point where the two graphs cross may indicate a change in the life stage (Figure 4.1): from youth to adulthood, and later life.

Figure 4.1. Conceptual Model of Life Balance across the Life Course

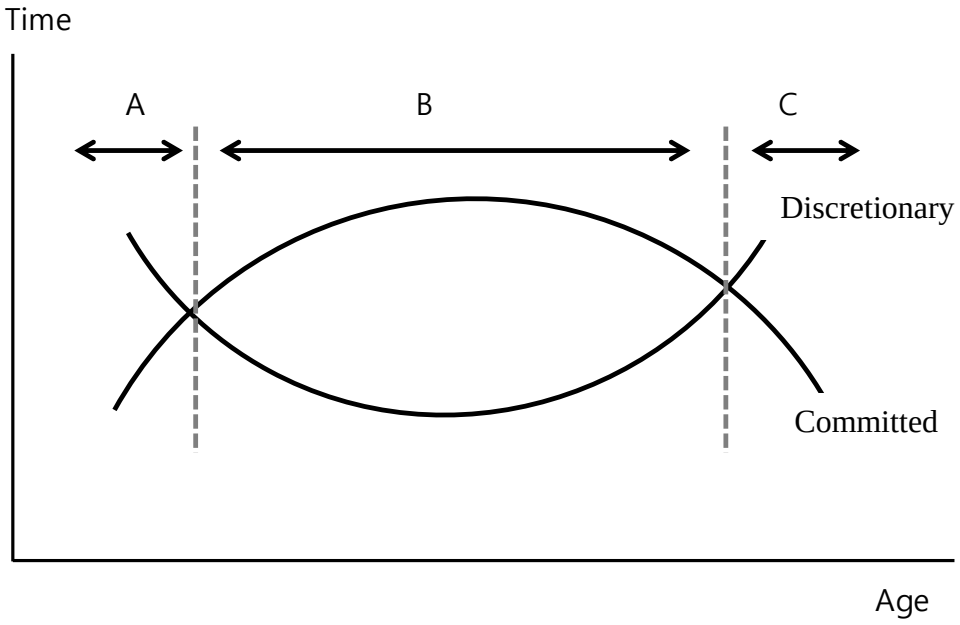
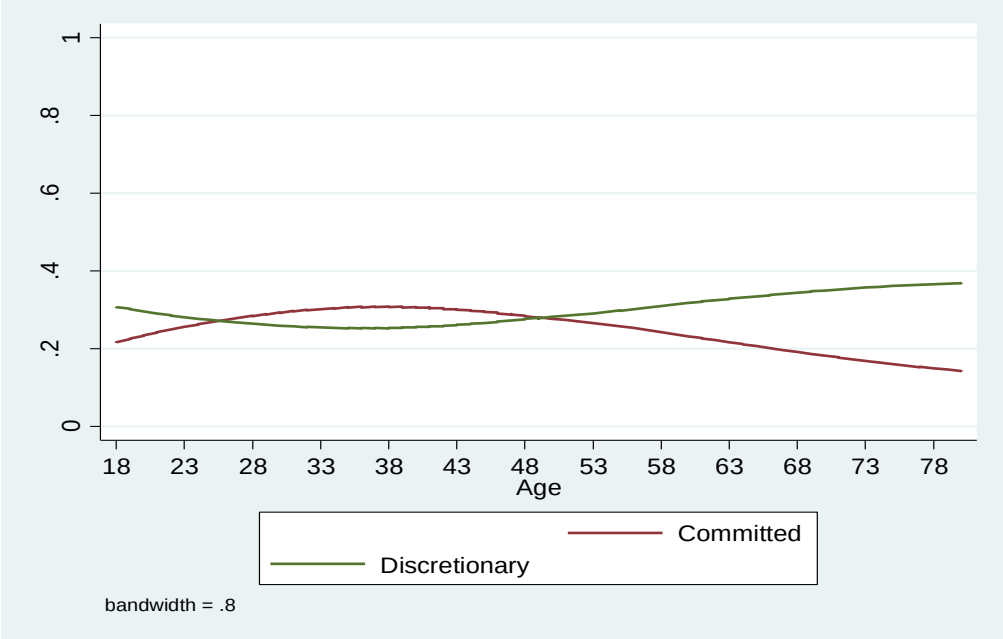


Figure 4.2 presents the actual changes in life balance over life course based on the UK 2000-2001 time use data. We can observe a similar trend to our conceptual model.

Figure 4.2 Lowess[48] Smoothing Graph for Life Balance over the Life Course (Aged 18-80+), UK2000-2001, Unadjusted



As this is not based on longitudinal data that follow the life cycle of the same people, we cannot argue that the crossing point occurs when the transition to later life begins for an individual. However, we can argue that, at the population level, the shift in life balance towards increased discretionary time and decreased committed time seems to begin

[48] For further information on Lowess Smoothing / Locally Weighted Regression Smoothing – see Cleveland (1979); Yau (2011)

around this age point (around age 50), and this could be used as an indicator of the beginning point of later life in terms of patterns of time use at the societal level. In a study on age identity, Demakakos, Gjonca and Nazroo (2007:282) found that about 36% of the respondents perceived that middle age ended between 51 and 60 years of age, about 13% of the respondents perceived that it ended at or before age of 50. Our finding shows that similar patterns are observed in terms of balance in time use.[49] Furthermore, as the life balance is found to be determined largely by structure rather than chronological age, it can be inferred that the timing of transition to later life may differ depending on the social structure, such as the existence of mandatory retirement or early retirement schemes. Further research using data from different time periods or from other countries would reveal more interesting trends including differences in the timing of the transition and the shape of the graph.

We also found that transition to later life is experienced differently by gender. The magnitude of effects of life stage transition on life balance were considerably larger for men than for women, which suggests that men experience greater changes in their patterns of time use as they make their transition to later life. In a study of young adults, Gauthier and Furstenberg (2002) reported that it was women who experiencing greater changes when they enter adulthood. In later life, our findings show the opposite. This

[49] Demakakos, Gjonca and Nazroo (2007) found that the majority of people perceived old age begins after 65. 34% reported that old age started between 66-70 years of age, and 40% reported that it began after age 70. This may reflect the shifts in life balance. Further research on the perception of old age and life balance may reveal the link between perception of old age and use of time.

may suggest that moving into later life may be a more significant experience for men when compared with women. While the magnitudes of the effects of age were reduced for both men and women when we controlled for the life stage variables, the rates of reduction in the effects of age were greater for men. Especially for women in the oldest old age group (aged 80+), the effect of age remained highly substantial. Furthermore, being in a couple increased the share of committed time and reduced the share of discretionary time only for women. The direction of effect was opposite for men, although it was statistically not significant. These findings imply that the factors that influence life balance in later life differ by gender.

Figure 4.3 Lowess Smoothing Graph for Life Balance over Life Course (Aged 18-80+) by Gender, UK 2000-2001, Unadjusted

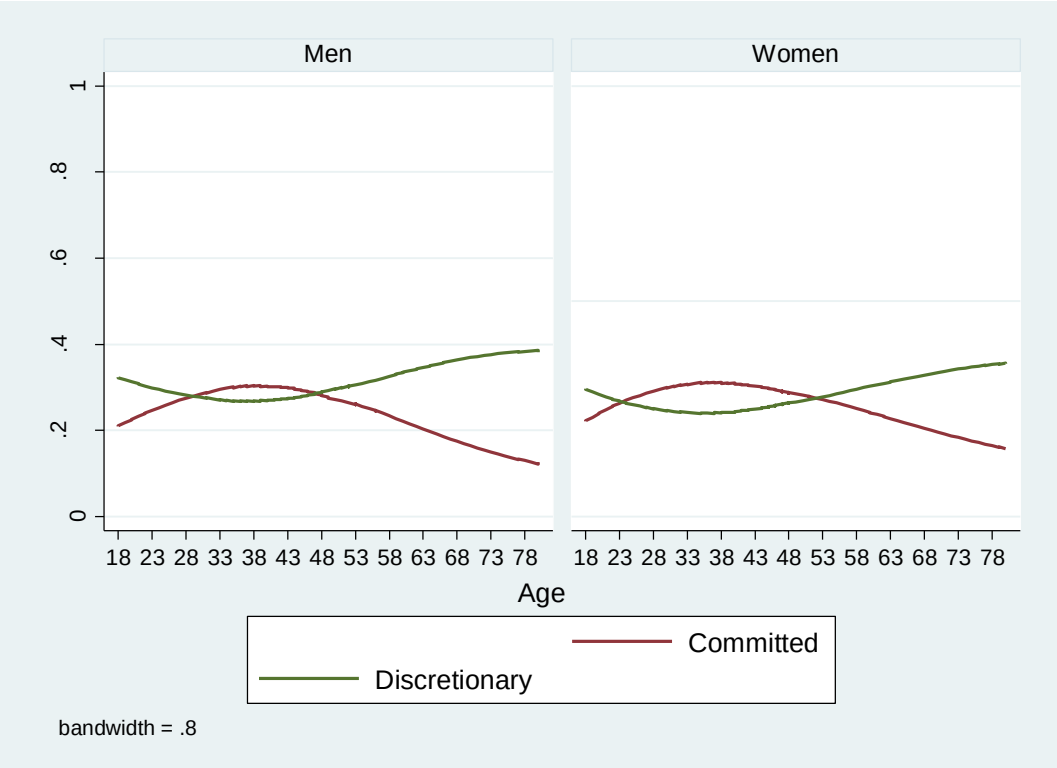


Figure 4.3 demonstrates how the changes in life balance across the life course vary by gender. It is interesting to note that the shape of the graph implies that the transition to adulthood begins at an earlier age (at around age 24 for women, age 29 for men) and ends at a later age for women (at around age 53) than for men (at around age 48). Along with our findings about gender specific effects of life balance determinants, this graph suggests that there is a considerable difference in life balance dynamics by gender. Further research on the gender difference in life balance could reveal the mechanism behind this difference, and would be able to examine whether the trend has changed over time.

We also found that life balance was significantly associated with self-assessed health status. Older people with poor self-assessed health had a greater share of discretionary time, and a lesser share of committed time. People with better self-assessed health were found to be with less discretionary time, and more committed time. It is interesting that the reduced committed time for poor health group mainly reallocated to the discretionary dimension. Considering that the category of discretionary time also includes restful activities, it may be the case that people with poor health tend to spend more time on passive leisure activities due to physical limitations. Or, as we have assumed, it may be the case that too much discretionary time contributes to negative health outcomes for older people. However, with this data we were not able to distinguish whether having a greater share of discretionary time leads to poor perception of health or vice versa.

In addition to the problem of not being able to identify the causal relationship between life balance and self-assessed health status, some other limitations must be noted. First, the cross-sectional nature of the data does not allow us to compare life balance before and after the actual transition at the individual level. While we made an assumption that older people who are not in paid work have moved into a life stage where paid work does not occupy central position in daily life, it requires longitudinal data to properly examine the actual change in individual balance before and after the transition. Second, we were not able to test the relationship between self-defined retirement status and life balance. Although being in paid work significantly increased the share of committed time, we suspect that the effect of being in paid work on life balance would differ between those older people who regard themselves as retired and those who do not. If the cultural

expectations and meanings of retirement as a period of discretionary pursuit (Laslett, 1996; Gilleard and Higgs, 2002) are reflected in time allocation, people who regard themselves as retired may have less committed time and more discretionary time even though they still do some paid work. Third, the insignificant effect of income variable on life balance warrants further investigation. It has been pointed out that in later life, wealth is considered to capture the financial conditions of older people more accurately than level of income (McMunn, Nazroo, and Breeze, 2009). Therefore, to properly test the influence of financial resources on life balance in later life, information about wealth would be necessary. Likewise, we were not able to take account the issue of class or occupation (or former occupation for people who are not in paid work), which may also be related to time allocation. Analyses using more refined socio-economic variables would enable us to understand the life balance dynamics and its determinants further.

From the analyses in Chapters 3 and 4, we found that life balance shifts towards having more discretionary time and less committed time in later life, and this is largely determined by the social structure (retirement). In the following chapters we examine how older people respond to the challenges and opportunities that the later life presents, including managing increased discretionary time in order to maintain time structure.

5. Life Balance from a Multidimensional Perspective

> Peter's grandmother is a very old lady. She is bent and blind, and spends most of her day lying in bed or sitting in front of the spinning-wheel. Despite her blindness, she mends Peter's clothes. Heidi visits her every day, and reads books to her. Peter's grandmother also enjoys having a conversation with Heidi and Peter. She often says with happiness: 'Oh, Heidi, everything seems bright to me and my heart is light.'
>
> Adapted from a novel, Heidi (Johanna Spyri, 1880/1996)

How we measure a concept 'can importantly influence how we come to understand it, how we analyse it, and how we create policies to influence it' (Alkire and Foster, 2011, p. 290). From the viewpoint of the daily physical activity level recommended for successful ageing, Peter's grandmother's daily routine is far from ideal. She spends almost all day without much physical activity, and because of her physical constraints she hardly ever leaves home. If we measure and assess her daily activity in terms of participation in the recommended level of physical or outdoor activities, her score would be at the lowest end. However, if we measure and assess her daily activity from the perspective of social, cognitive, or productive activities, the picture would be very different.

The example of Peter's grandmother is a fictional one, but in reality the daily life of older people in the 21st century is as multidimensional as Peter's grandmother's, if not more so. Older people are recognised as being highly diverse and heterogeneous in terms of their capabilities, resources and preferences (McMunn, Nazroo et al., 2009). Furthermore, spending more time on one activity means there is less time for other

activities in a day that is limited to 24 hours. Thus, although various kinds of activity, such as physical, social, and cognitive, have been found to be associated independently with well-being in later life, it may not be possible or even desirable for older people to maintain high levels of participation in all the recommended activity dimensions. More importantly, like Peter's grandmother, many older people maintain well-being by adjusting and substituting the level or kinds of activities they engage in, even though they may be dealing with loss and decline in advanced age, which often limit their participation in certain activities. In studying the relationship between daily activities and well-being in later life, it is thus important to understand the multidimensionality of daily life and the heterogeneity of older people, as well as the adaptations and adjustments they make across daily activity domains.

In Chapter 2 we proposed the concept of multidimensional life balance for older people as a framework to encompass the multidimensionality of their daily lives and their heterogeneity. We argued that maintaining balance in later life is a way of adaptation for older people facing the challenges and opportunities in later life, and that what matters is achieving overall balance across daily activity domains, rather than participating or not participating in one activity.

In this chapter, we focus on how to empirically implement this idea of multidimensional life balance to study daily activity of older people[50]. The first part of this chapter (Section 5.1 to Section 5.2.) therefore focuses on explaining how we constructed the Multidimensional Life Balance Index (MLBI) to measure and assess the overall achievement of older people in terms of recommended daily activities. We introduce the Alkire–Foster method, which we adapted to build the MLBI, and discuss the five dimensions and their indicators that we include in the multidimensional life balance model. The second part of this chapter (Section 5.3) provides an illustrative example of analyses using the MLBI to investigate the multidimensional life balance of people aged over 50 in the UK by drawing on UK 2000-2001 time use data. We show that about 40% of older people in the UK did not meet the minimum thresholds in multiple activity domains (i.e. had not achieved multidimensional life balance), and present that they are disproportionately distributed by demographic, socio-economic, and health status. The concluding section (Section 5.4) summarises the main findings and discusses the implication of this approach.

[50] For the explanation of the concept of multidimensional life balance, including the theoretical background, see Section 2.2 in Chapter 2.

5.1. Measuring the Multidimensional Life Balance: The Alkire–Foster Method

To measure the multidimensional life balance, we adapt an innovative method developed by Sabina Alkire and James Foster in multidimensional poverty research. The Alkire-Foster (AF) method (Alkire and Foster, 2011) focuses on identifying people who are experiencing multiple deprivations simultaneously, based on the idea that the negative consequences of having multiple disadvantages 'far exceed the sum of their individual effects' (Alkire and Foster, 2011; Roche, 2013). This method provides an intuitive counting approach, combined with an aggregation method that enables cross-time, cross-country comparison (Alkire and Foster, 2011; Roche, 2013). Compared with other approaches for multidimensional measurements, the AF method has a number of useful properties, such as flexibility and decomposability. (For detailed descriptions of this method, see Alkire and Foster, 2011).

As we explained briefly in Chapter 2, in identifying 'who is poor' in a multidimensional context, the AF method uses two forms of cut-offs (Alkire and Seth, 2013). The first of these, the deprivation cut-off, identifies people who fail to reach the minimum standards in each indicator, such as being deprived of clean drinking water, having no clean fuel, or having less than a minimum level of income. The person (or household, depending on the unit of analysis) is considered deprived in an indicator if his or her achievements are less than the deprivation cut-off in this indicator. The indicators are then weighted

(indicators may take equal or different weights)[51] and the sum of weighted deprivations for each person is calculated. Afterwards, the second poverty cut-off is set to identify the 'multidimensionally poor' who experience multiple deprivations at the same time, such as having no access to clean water as well as having a low income and lacking clean fuel (Alkire and Santos, 2013). A person is identified as multidimensionally poor if the sum of weighted deprivations experienced is greater than, or equal to, the poverty cut-off.

This dual cut-off method can be effectively applied to identify older people with or without life balance in a multidimensional context. We consider the person as having achieved multidimensional life balance if the level of activity exceeds the *minimum* thresholds in a range of activity dimensions. The AF method enables us first to examine whether an older person has reached the minimum level of activity in each dimension (*sufficiency* cut-off[52]), and to assess overall achievements across dimensions. The second cut-off, which we name the *balance* cut-off, then distinguishes whether that individual has reached the 'overall balance', based on the sum of weighted sufficiency the person has achieved. The dual cut-off method allows us to reflect the heterogeneity of older people and their freedom of choice regarding what kinds of activity they participate in[53].

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[51] See Alkire and Foster (2011) for the discussion about weights.

52 In the AF method, 'sufficiency' or 'adequacy' for each dimension indicates that the person's achievements exceed the threshold for the dimension (Alkire and Santos, 2013).

[53] See Ura et al. (2012) for a related discussion regarding this cut-off. In creating the Gross National Happiness Index, Ura et al. (p. 29) also argued that 'a person is not required to achieve sufficiency in all indicators in order to be happy'.

That is, it is not necessary for the individual to engage in high levels of activity in all dimensions to maintain well-being; as long as he or she meets the thresholds for multidimensional life balance, the kinds of activity engaged in and their duration above the cut-off points are left to individual preference and ability[54].

5.2. Constructing a Multidimensional Life Balance Index for Older People in the UK

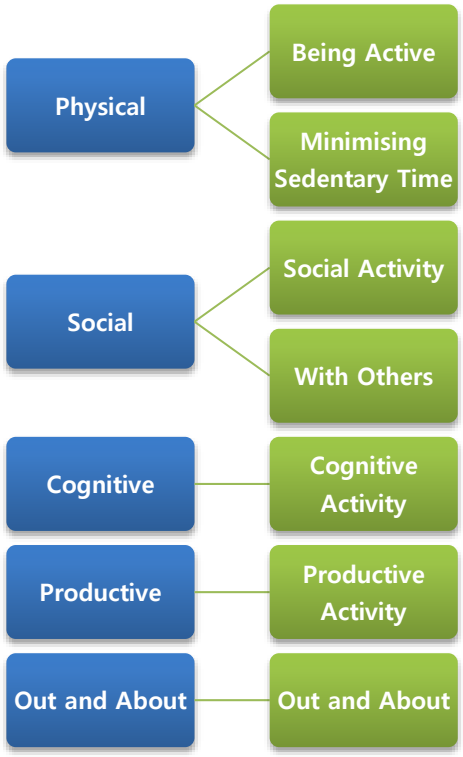
This section explains the construction of a multidimensional life balance index for older people in the UK by employing UK time use data. The first step in building the AF measure is choosing the dimensions. Section 5.2.1 introduces the five dimensions of daily activity for older people that are used to construct the Multidimensional Life Balance Index (MLBI). These dimensions are based on the literature about the relationship between daily activity and well-being in later life. In choosing the dimensions, we considered empirical evidence found in previous literature, theoretical relevance, and above all, data availability[55]. These five dimensions are by no means exhaustive; we aimed to reflect dimensions that are widely recognised as being important for older people's well-being. The five dimensions are: Physical, Social, Cognitive, Productive,

[54] In Chapter 6 we show that this 'threshold effect' is indeed found in the relationship between daily activity and subjective health status.

[55] For a discussion about selecting the dimensions, see Alkire and Foster (2011).

and Out and About. Dimensions are measured by indicators. Figure 5.1 shows the five dimensions, with indicators.

Figure 5.1. Dimensions and Indicators of the Multidimensional Life Balance Index



The second step is to select sufficiency cut-offs for each indicator. As this is a new initiative, we do not have established cut-offs for activity indicators[56]. We use guidelines from previous research for minimum thresholds (e.g. participating in moderate to vigorous physical activity for at least 30 minutes per day) where available, and

[56] Discussion regarding the cut-offs, the normative decision for dimensions and weights is found in Alkire (2013).

distributional cut-offs (e.g. 50% below median) where such recommendations are not available. Section 5.2.1 explains the choice of sufficiency cut-offs for each indicator. The third step is to choose the balance cut-off in order to assess the overall achievement of the individual's level of daily activity across various dimensions. In the absence of an established threshold, we define a person as having achieved multidimensional life balance if he or she has sufficiency in three out of the five dimensions, or in more than 60% of weighted indicators. Following the AF method, we apply equal weight per dimension. Thus, each dimension is given a weight of 1/5). Where there is more than one indicator, the indicators within a dimension were equally weighted (nested-weight). For instance, in the physical dimension of the index, *Being Active* and *Minimising Sedentary Time* are given 1/10 each (1/10+1/10=1/5, which is the weight for physical dimension). Alkire, Santos et al (2010) and Decancq and Lugo (2013) provide detailed information and discussion about setting weights in AF method.

5.2.1. Dimensions, Indicators, Sufficiency Cut-Offs

Table 5.1 Summary of the Dimensions, Indicators and Sufficiency Cut-Offs applied in MLBI

Dimension	Indicator	Sufficiency Cut-Off (Achieved sufficiency if the person…)	Weight
Physical	Being Active	…performed moderate to vigorous activities at least for 30 minutes	1/10
	Minimising Sedentary	…spent less than 4 hours of the day on sedentary activities	1/10
Social	Social Activity	…spent more than the 50 % below the median of the total social activity time distribution	1/10
	With Others	…spent less than 1.5 times of the median of the total time spent alone distribution	1/10
Cognitive	Cognitve Activity	…spent at least 30 minutes on cognitive activities	1/5
Productive	Productive Activity	…spent time on productive activity more than 50% below the median of the total productive activity distribution	1/5
Out and About	out-of-home	…spent time away from home more than 50% below the median of the time spent outdoors	1/5

Table 5.1 summarises the dimensions and indicators with sufficiency cut-offs. This section explains why we included these dimensions and indicators to construct the MLBI, and discusses the choice of sufficiency cut-off points. As in previous chapters, we used the MTUS version of the UK 2000-2001 time use data in building the measure (Chapter 1).

Physical Dimension

The extensive health benefits for older people of being physically active have been well-established (Vogel et al., 2009; see Paterson et al., 2007, for review). In particular, physical activity is known to increase longevity, to reduce the risk of chronic disease (e.g. cardiovascular diseases and diabetes) and delay the onset of disability in old age (Paterson et al., 2007; Nusselder et al., 2008). Physical inactivity, on the other hand, is found to be associated with increases in negative health outcomes, such as obesity, coronary heart disease, and type-2 diabetes (Westerterp, 2001; Booth et al., 2000). Thus, we include maintaining a sufficient level of physical activity as one of the dimensions for multidimensional life balance.

The physical dimension includes two indicators: *Being Active* and *Minimising Sedentary Time*. *Being Active* refers to achieving the recommended level of time spent on moderate to vigorous activities. We focus on moderate to vigorous physical activity rather than high-intensity activity because, especially for older people, a moderate level of activity is known to be more effective in reducing many health risks in addition to being more

sustainable than vigorous level of activity (Hamilton et al., 2007; Westerterp, 2001). Following the widely adopted evidence-based physical activity recommendation that older people engage in at least 30 minutes of moderate physical activity each day[57] (Nelson et al., 2007; Oja et al., 2010; Paterson et al., 2007), we consider the person to be have achieved sufficiency in *Being Active* if he or she took part in moderate to vigorous activities for at least 30 minutes on the day diary was filled in.

The measure *Minimising Sedentary Time* assesses whether the diarists spend excessive amounts of time sitting (while watching television, driving, or in the course of other passive activities), which involves low levels of energy expenditure (Stamatakis et al., 2011). A rapidly growing body of research has shown that greater amounts of sedentary time are associated with an increase in mortality from all causes, and with various health risk factors, independently of time spent undertaking moderate to vigorous activities (Stamatakis et al., 2011; Matthews et al., 2012; Dunton et al., 2009; van der Ploeg et al., 2012). That is, even though someone exercises vigorously for one hour, and then spends rest of the day sitting on the sofa to watch television, he or she will nevertheless run substantial health risks. For example, Matthew et al. (2012) found that people who participated in moderate to vigorous activities for more than seven hours per week but also watched television for more than seven hours per day had a '50% greater risk of

[57] 'To promote and maintain health, older adults need moderate-intensity aerobic physical activity for a minimum of 30 minutes, five days each week, or vigorous-intensity aerobic activity for a minimum of 20 minutes on three days each week. Also, combinations of moderate and vigorous-intensity activity can be performed to meet this recommendation.' American Heart Association (AHA) and the American College of Sports Medicine (ACSM) (Nelson et al., 2007, p.1479)

death from all cause and twice the risk of death from cardiovascular disease', compared with people who exercised for similar amounts of time but also engaged in less sedentary TV-watching time (Matthew et al., 2012, p. 442). Thus we include *Minimising Sedentary Time* as a separate indicator of the physical dimension. Despite the growing awareness of the importance of reducing sedentary behaviour, to our knowledge there is no specific guideline for the maximum amount sedentary behaviour that should not be exceeded. Based on previous research that argues the importance of limiting discretionary sedentary time to 'no more than two hours per day' (Owen et al., 2011, p. 193), and findings that associate negative health consequences with more than four hours' sedentary time per day, we consider someone has achieved sufficiency in *Minimising Sedentary Time* if he or she spends less than four hours of the day on sedentary activities. This is 'discretionary' sedentary time, and excludes sedentary time in paid work and sleep time.

To assign intensity levels to activities, we referred to the intensity coding system used in the American Time Use Survey (ATUS), which linked activity codes with the Compendium of Physical Activities estimates of physical activity intensity expressed in metabolic equivalent (METs) (Tudor-Locke et al., 2010; Tudor-Locke et al., 2009). Sedentary activities (METs<1.6) include eating and drinking, watching TV, and relaxing. Moderate to vigorous activities (METs>=3.0) include walking, household activities, and exercise. Table A5.1 in the Appendix presents the activity classifications for physical dimension based on the MTUS activity codes.

Social Dimension

A large body of literature has argued that social involvement is one of the key conditions for enhancing well-being in later life. For instance, social participation in later life is found to be associated with improved health outcomes such as prevention of dementia and disability, and better cognitive functioning (for review, see Bath and Deeg, 2005). Moreover, social activity is also known to promote emotional support, to enhance self-esteem through role performance, and to provide a sense of purpose and control (Mendes de Leon et al., 2003; Litwin and Shiovitz-ezra, 2006; Adams et al., 2011). At the same time, the detrimental effects of social isolation in later life, such as the increased risk of suicide, depression, stress, and higher mortality, are also well documented (Findlay, 2003).

In measuring sufficiency in the social dimension, we construct two indicators: *Social Activity* and *With Others*. The former measures whether the person had reached sufficiency in the level of participation in innately social activities, such as going to a party or visiting friends, while the latter measures the level of 'aloneness', i.e. whether the person has, or has not, reached sufficiency in time spent in the presence of others. It has been argued that not only time spent on social activities which involve social interaction, but also being with other people matter for achieving positive outcomes in later life (Menec, 2003). In particular, Maier and Klumb (2005) found an independent effect of time spent in the presence of other people compared with the time reported as 'alone', on reducing mortality risk, controlling for other factors including social activity.

Accordingly, we have constructed *Social Activity* and *With Others* as the two indicators for the social dimension.

It is difficult, if not impossible, to determine a 'sufficient' amount of social activity or time spent in the presence of others. In the absence of objective cut-off points or a recommended level of social activity per day, we use an alternative method of distance from median, suggested in time poverty research (Alkire et al., 2013; Bardasi and Wodon, 2006). In *Social Activity*, we consider the person has achieved sufficiency in this indicator if the time spent on social activity exceeds the 50% below the median of the total social activity time distribution. Some researchers used below and above median to distinguish high and low levels of participation (e.g. Maier and Klumb, 2005). However, as our purpose is to set a minimum threshold for sufficiency, we decided to use a narrower definition. Thus, failing to reach this threshold implies that the level of social activity for the individual or the group is considerably lower than that of other older people (aged over 50) in society.

In W*ith Others*, we consider people who have spent less than 1.5 times the median of total time spent alone distribution as having achieved sufficiency. That is, people who reported that they spent more than 1.5 times the median are classified as having excessive time alone. In MTUS, there are four variables that measure 'who else is present' while the diarist was engaged in a certain activity: alone or with strangers; at least one child aged under 18 present; spouse or partner present; and other adult present. To construct the indicator, we use the variable that measures time 'alone or with strangers', as this marks

the cases ‘where the diarist had an option on the survey instrument to indicate that he or she was alone and selected this option’ (Fisher and Gershuny, 2013).

Cognitive Dimension

Participation in cognitively stimulating activities has been associated with positive health outcomes in later life, especially with reducing the risk of Alzheimer’s disease and delaying cognitive decline (Hall et al., 2009; Wilson et al., 2002). For instance, Hall et al. (2009) found that each additional day of cognitive activity resulted in 0.18 years delay in the onset of accelerated memory decline. In a 21-year study, Verghese et al. (2006) demonstrated that each additional score of cognitive activity was associated with a 7% lower risk of developing dementia: people who had the highest cognitive activity score were 63% less likely to develop dementia than people with the lowest score. Wilson et al. (2007) also found that a low frequency of cognitively stimulating activity is associated with the risk of cognitive impairment. In particular, this study reported that a cognitively inactive person has 2.6 times higher risk of developing Alzheimer’s disease than a cognitively active person (Wilson et al., 2007). Thus we include cognitive activity as one of the dimensions, and incorporate the time spent on doing cognitive activity as an indicator.

In most previous studies, the frequency or level of cognitive activity was measured on a daily, weekly or monthly basis, regardless of the actual duration of the activity. For instance, Verghese et al. (2006) assigned one point to participation in one cognitive

activity for one day per week, and Wilson et al. (2002) used a 5-point scale, ranging from 1 (‘once a year or less’) to 5 (‘every day or about every day’), based on the respondents’ self-report. Thus, the actual duration of cognitive activity has rarely been considered in the literature. As in the case of social dimension, the absence of recommended guideline for the level of cognitive activity has posed a challenge for us in setting up the cut-off point. Lacking specific guidelines or recommendations for the minimum level of cognitive activity, we consider the person has reached sufficiency in the cognitive indicator if he or she has spent at least 30 minutes on cognitive activities, as 30 minutes per day is frequently used as the minimum duration for cognitive training proposed for older adults to enhance cognitive ability (See Yu et al., 2009 for a review).

Productive Dimension

The relationship between participation in productive activity and well-being in later life has been studied extensively. A large body of literature reported that participation in productive activity, such as voluntary and paid work, is positively associated with life satisfaction and improved health in old age (Hao, 2008; Waherndorf et al., 2006; Meier and Stutzer, 2008; Luoh and Herzog, 2002; Piliavin and Siegl, 2007; McMunn et al., 2009). In particular, Louh and Herzog (2002) demonstrated the beneficial effects of voluntary and paid work on various objective health outcomes, such as daily living functioning and subjective health. Productive activity, including household work, was also found to be protective against the risk of all causes mortality independently of physical activity engaged in (Glass et al., 1999).

The productive dimension consists of one indicator, *Productive*. We classified an activity as productive based on its purpose: 'the practical or instrumental functions of the activity, possibly including economic value, as distinct from a recreational or enjoyment purpose or function' (Adams et al., 2011, p. 698). Despite the abundance of studies of the relationship between productive activity and well-being, few have looked at the level of sufficiency in participating in productive activity. While increased time committed to productive activities was found to be associated with an increase in life satisfaction (Baker et al., 2005), it has also been reported that doing 'too much' productive activity was not associated with positive outcomes (Musick et al., 1999; Luoh and Herzog, 2002) For instance, Musick et al. (1999) suggested volunteering for 40 hours or less in a year

as the most beneficial threshold, and Luoh and Herzog (2002) found that participating in voluntary work for more than 100 hours annually was not associated with positive effects. As in case of other indicators without guidelines, we used the 50% below the median productive time distribution as our cut-off point. Thus, people who have spent time on productive activity for more than 50% below the median are considered to have achieved sufficiency in productive dimension.

Out and About Dimension

The ability to spending time away from home has been regarded as one of the important conditions for maintaining older people's quality of life (Kellaher et al., 2004). Being out of the house enhances older people's physical activity, such as walking, and provides social space for interaction and social involvement, including repeated visual contact, greetings and short conversations, which are important for building social ties among neighbours (Rantakokko et al., 2009; Sugiyama et al., 2005). Furthermore, it has been found that spending time outside the home, especially in open green spaces, is associated with a lower risk of stress-related illnesses (Grahn and Stigdotter, 2003). Fujita et al. (2006) thus argued that an increased frequency of going outdoors is beneficial for preserving functioning in later life, while a reduced frequency of going out is associated with negative health outcomes and reduced life-span. A longitudinal study of frail older people found that spending more time away from home contributed to maintaining physical and mental functioning, implying that it may work as an independent and

protective factor against negative health outcomes such as physical disability (Fujita et al., 2006).

Most studies of older people's time spent away from home include questions such as 'How often do you usually go outside?', which may be answered along the lines of 'Once a day or more', 'Once every 2-3 days', or 'Once a week and less often', and so on. Time diaries provide more precise information about how much time people spend outside the home by asking the respondents to record the location of the activities. We used a location code variable which distinguishes whether the respondent was at his or her own home or not, based on the location variables diarists supplied and embedded the information in the activity codes (Fisher and Gershuny, 2013). The frequency of going outdoors and the duration of time spent away from home are known to decrease with advancing age (Fujita et al., 2006). Thus we consider someone has reached sufficiency in the *Out and About* dimension if the time spent away from home is more than 50% below the median distribution of this dimension.

5.1.1. Computing the Multidimensional Life Balance Index

This section explains how we computed the multidimensional life balance index (MLBI) based on the AF method. Multidimensional measurements constructed by this method usually comprise three components (Roche, 2013, p. 2, Alkire et al., 2013):

H: The Headcount Ratio or percentage of people who are identified as having multiple deprivations. This indicates the incidence or prevalence of multidimensional deprivations (e.g. Poverty, Disempowerment).

A: The Average Insufficiency Score, which indicates the average breadth or multiplicity of deprivation people suffer at the same time. This shows the intensity of deprivation.

M_0: The Multidimensional Index. It reflects the level of multidimensional deprivations, summarising the incidence and intensity. It ranges between 0 and 1, with the higher value indicating greater deprivation. It is constructed by multiplying the incidence (H) by the average deprivation score (A) (M_0=H×A).

To be consistent with the AF method, we use the same terms and notations wherever possible (Alkire and Santos, 2013). However, because the concept of multidimensional life balance is about achievements rather than deprivations, we need an additional step (MLBI = 1-M_0). We follow the approach developed by Alkire et al. (2013) in computing the overall achievement index in terms of women's empowerment[58], which allows us to explore people both with and without multidimensional life balance.

We begin by computing the Imbalance Index (IMBI, M_0)[59]. First, we assess the person's level of activity in each indicator, *j*. If the level of activity of individual *i* does not meet the sufficiency cut-off in indicator *j*, the person *i* is considered to be experiencing insufficiency (I) in this indicator.

$$I_{ij} = 1, \text{ if } x_{ij} < z_j$$

[58] From Alkire et al. 2013

[59] IMBI is a summary measure that addresses the incidence of overall insufficiency and the breadth of insufficiency. The higher IMBI score indicates greater insufficiency, either in terms of incidence or intensity or both.

Where z_j is the sufficiency cut-off for the indicator *j*, and x_{ij} is the individual *i*'s activity level in indicator *j*.

Second, we compute the overall insufficiency score, c_i, for each individual, by summing the weighted insufficiencies that the individual experiences. The insufficiency score c_i thus reflects the breadth of insufficiency experienced by individual *i* (see Alkire and Foster, 2011). Note that we apply equal weights to dimensions, and indicators within each dimension are also equally weighted ($\sum_{j=1}^{d} w_j = 1$, where *d* denotes the number of dimensions) .

$$c_i = w_1 I_{i1} + w_2 I_{i2} + \ldots + w_d I_{id}$$

Next, the second cut-off, *k*, is applied. In AF method for multidimensional poverty, *k* denotes the poverty cut-off which indicates the share of weighted deprivations a household must have in order to be considered poor (Alkire and Santos, 2013). *k* can be decided between 0 and the total number of dimensions ($0 < k \leq d$). In this chapter, *k* indicates the balance cut-off that identifies people without multidimensional life balance. An individual is considered not to have reached multidimensional life balance if the overall insufficiency score is greater than or equal to *k*, which is, borrowing the expression of Alkire and Santos (2011), the share of weighted insufficiencies an individual must have in order to be considered without multidimensional life balance. If we denote an individual *i* without multidimensional life balance as IMB_i:

$$IMB_i=1, \text{ if } c_i \geq k$$

$$IMB_i=0, \text{ if } c_i < k$$

Thus, a person without multidimensional life balance takes the IMB value of 1, and a person who has achieved multidimensional life balance takes the IMB value of 0. From this, we obtain the multidimensional *imbalance* headcount ratio (H_{imb}) which indicates the proportion of individuals without multidimensional life balance in a given population (n).

$$H_{imb}=\frac{\sum_{i=1}^{n} IMB_i}{n}$$

Then, the headcount ratio for multidimensional life balance, H_{mlb} is obtained:

$$H_{mlb} = 1- H_{imb}$$

The Imbalance Index[60], IMBI (M_0 in AF method), is the product of the incidence (H_{imb}) and the intensity of insufficiency (A_{imb}). The average insufficiency score of people without multidimensional life balance, A_{imb}, is computed to investigate how many

[60] M_0 is termed as adjusted headcount ratio in the AF method.

dimensions people without multidimensional life balance lack sufficiency in. Note that A_{imb} is the average insufficiency share among the people experience multiple insufficiencies above the balance cut-off point, k. The insufficiency score of the individuals who achieved multidimensional life balance is replaced by zero, and hence not considered in computing A_{imb}. This process is called 'censoring', which is specifically developed to focus on the experience of people who suffer from multiple deprivations. (see Alkire and Santos, 2013, and Alkire and Foster, 2011 for a detailed discussion of censoring). The censored insufficiency score of individual *i* is denoted as $c_i(k)$, indicating the insufficiency score of people without multidimensional life balance based on the balance cut-off, k. The censoring is as follows (Alkire et al., 2013, p. 34):

$$c_i(k) = c_i, \text{ if } c_i > k$$

$$c_i(k) = 0, \text{ if } c_i \leq k$$

The average insufficiency score among those without multidimensional life balance can then be calculated as follows:

$$A_{imb} = \frac{\sum_{i=1}^{n} c_i(k)}{q}$$

where q is the number of people without multidimensional life balance ($q=\sum_{i=1}^{n} IMB_i$). A_{imb} would be equal to 1 if people without multidimensional life balance did not meet the sufficiency cut-offs in all the indicators.

The Imbalance Index (IMBI, M_0) is then calculated by multiplying the proportion of people who are without the multidimensional life balance (H_{imb}) and the average deprivation score (A_{imb}) ($M_0=H_{imb}\times A_{imb}$). This figure represents the proportion of the population without multidimensional life balance adjusted by the intensity of the deprivation suffered (Alkire and Santos, 2013). For instance, although Group X and Group Y both have the same imbalance headcount ratio (H), if people without balance in group Y suffer a wider range of insufficiencies, M_0 of Group Y would be higher than that of Group X. A higher M_0 shows higher level of imbalance.

Finally, we construct the multidimensional balance index (MLBI):

$$MLBI=1-M_0$$

Alternatively, as in Alkire et al. (2013, p. 35), this can be expressed as follows:

$$MLBI = H_{mlb} + (H_{imb} \times A_b)$$

where H_{mlb} denotes the headcount ratio of people with multidimensional life balance and A_b denotes the average sufficiency score of people without multidimensional life balance, which is based on the dimensions that people without MLB did have reached the sufficiency cut-offs ($A_b = 1 - A_{imb}$). This implies that greater MLBI can be achieved by 1) increasing the percentage of people with multidimensional life balance (H_{mlb}), and 2) increasing the sufficiency scores of people without multidimensional life balance (A_b)

(see Alkire et al., 2013). These M_0 measures are useful as headline figures when we compare the level of balance/imbalance over different countries, or examine how the level of multidimensional life balance has changed over time. For instance, we can identify whether the increase or decrease in the MLBI value is caused by the changes in the number of people who have reached the overall balance, or in the number of dimensions in which people experience sufficiency.

Another important feature of the AF method is its decomposability (Alkire and Foster, 2011). In particular, decomposing by population sub-groups and by indicators enables us to examine and compare the composition of multiple insufficiencies that older people without multidimensional life balance experience by demographic, socio-economic, and health status. To decompose by population sub-groups, we construct the AF measures (H, A, and M_0) for each group (Alkire and Santos, 2013). To decompose by indicators, we first compute the censored headcount ratio in each indicator, which indicates the share of people without the multidimensional life balance and who have not reached sufficiency in the indicator. Let us denote the censored headcount ratio for the indicator j as CH_j. Since

$$M_0 = w_1CH_1 + w_2CH_2 + \ldots + w_dCH_d$$

$$M_0 = \sum_{j=1}^{d} w_j \, CH_j$$

where $\sum_{j=1}^{d} w_j = 1$ and d denotes the number of dimensions, the contribution of each indicator to overall Imbalance Index is:

$$\text{Contribution of indicator } j \text{ to } M_0 = \frac{w_j CH_j}{M_0} \times 100$$

5.3. All Things Considered, Who Has Achieved Balance? An Empirical Application

In this section, we demonstrate the applicability of the multidimensional life balance measures using the UK 2000-2001 time use data[62]. First, we identify those who have achieved multidimensional life balance and those who do not have it, and we examine how the distribution varies by demographic characteristics, socio-economic status, and health status. Second, we focus on the experience of people without multidimensional life balance, and investigate the structure of imbalance to find out which dimension contributes most to the imbalance, and how the structure differs by population sub-groups. Lastly, we explore what the main determinants of multidimensional life balance might be.

Note that as time use data is a collection of random sample of diary days, the MLBI figures from one day alone do not tell whether the respondents live a multidimensionally balanced life in general. However, if people stated that this particular diary day was their

[62] See Chapter 1 for the information about the data.

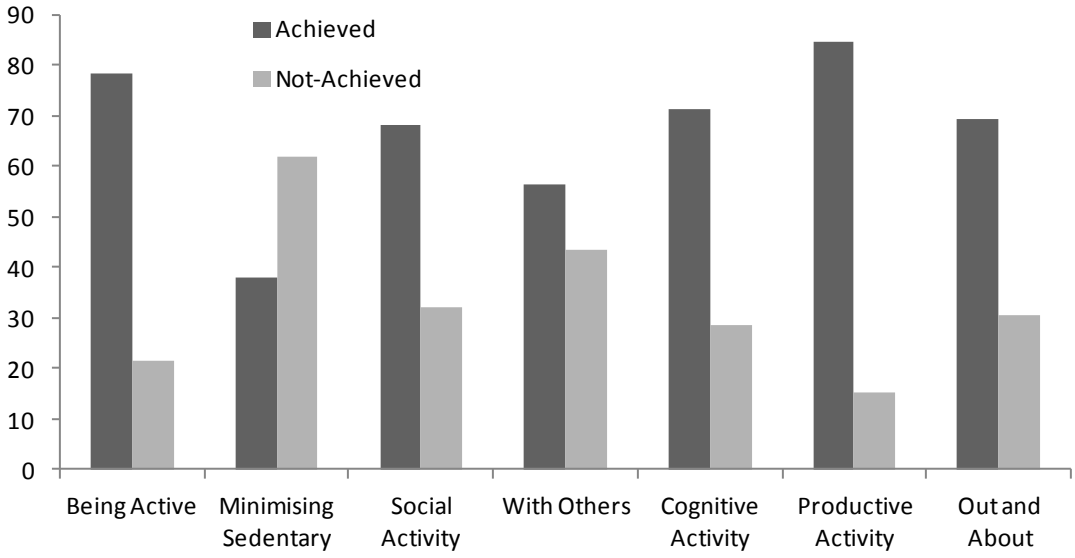
'usual day', it is more likely that the pattern of their daily activity on the day is similar to their general daily activity patterns. That is, although this is a strong assumption, we may be able to cautiously assume that if someone had lived a balanced day and it was his or her 'usual day', then it might be more likely that this person leads a daily life with a multidimensional life balance. In the original UK 2000-2001 data, respondents were asked to report whether the diary day was their usual day. In our sample, 78.5% of the respondents answered that the diary was recorded on a usual day, and 14.8% replied that it was an unusual day. 7% of the respondents did not answer the question. We used usual day diaries only for the analysis in this chapter, and provide MLBI values for the group of unusual days in Appendix (A5.6)

5.3.1 Distributions of Older People's Achievement in Each Indicator: Unidimensional Analysis

We start by examining the distributions of older people's achievement in each indicator. This is expressed as raw headcount ratio (Alkire and Foster, 2011), and shows the percentage of older people who have reached the sufficiency cut-off in each indicator (Figure 5.2). As can be seen, the indicator in which the highest percentage of older people in the UK lacks sufficiency is *Minimising Sedentary Time*. Unlike for other indicators where the percentage of people who have achieved sufficiency is larger than that of those who have not achieved it, more than 60% did not reach the minimum threshold for this indicator, demonstrating that a large number of older people in the UK spend more than four hours on sedentary activity per day. This is in line with current findings regarding the prevalence of sedentary activity among adults (Owen et al., 2011; Matthews et al.,

2012; Stamatakis et al., 2011). On the other hand, the majority of older people achieved sufficiency in *Being Active*: the proportion of people who reported that they did moderate to vigorous activity for at least 30 minutes on the day of survey is close to 80%. These apparently conflicting results prompt the need to look at active exercise and sedentary time separately when considering the pattern of older people's participation in the physical dimension.

Figure 5.2. Sufficiency in Each Indicator (Raw Headcounts, Total Sample)



In the social dimension, we also observe a difference between two indicators. More people enjoy sufficiency in *Social Activity* than in *With Others*. More than 40% of older people have been found to spend time alone above 1.5 times the median (which is, 3.8 hours per day). Note that as we discussed in the previous section, the 'alone' variable includes many zero values, as many people did not diarise whether they were alone or not and yet they were also coded as zero. In our sample, 27% had 0 values – thus the

actual time older people spent alone can be much higher than the figure we observe in our analysis.

From Figure 5.2, we can see that except in *Minimising Sedentary Time* and W*ith Others*, more than 60% of older people achieved sufficiency in each of the indicators. Considering that the sufficiency cut-offs are based on the minimum thresholds, this may not be surprising. However, this picture tells us only part of the story, as people who meet the sufficiency threshold of one activity indicator do not necessarily meet the cut-off in other indicators as well, and achieving or not achieving sufficiency in one activity indicator can be a result of daily circumstances or of one's personal preference while lacking sufficiency in multiple indicators may suggest problem. To investigate further, we now address the issue of multidimensional life balance, focusing on the joint distribution of activities. We investigate how the incidence of multidimensional life balance differs across demographic, socio-economic, and health groups, and identify the factors that are associated with the likelihood of achieving this life balance [63]. Subsequently we focus on the experience of people without multidimensional life balance and examine how the structure of imbalance differs across groups.

[63] In Chapter 6, we will explore whether people without multidimensional life balance are more likely to suffer negative outcomes compared with those with multidimensional life balance.

5.3.2. Multidimensional Life Balance of People Aged over 50 in the UK

Table 5.2 presents an overview of multidimensional life balance measures which will be discussed in this chapter. To assist in understanding their significance, we examine these results in the following sections by demographic, socio-economic, and health status using graphical representation. Here we briefly explain what these measures indicate for readers' reference. The first column shows the multidimensional life balance headcount ratio, which indicates the percentage of older people with multidimensional life balance (1-H, %). The second column shows the percentage of older people without multidimensional life balance (H, %). The Average Insufficiency Score (A) indicates the intensity of deprivation that people without multidimensional life balance experience. This score shows the breadth of insufficiency. If all the people in the sample are without multidimensional life balance and lack sufficiency in all the indicators, the score becomes 1. For instance, the average insufficiency score of 0.502 indicates that, on average, older people in the UK who lack multidimensional life balance experience insufficiency in about half (50.2%) of the weighted indicators. The IMBI (Imbalance Index, M_0) is the summary measure that represents the overall insufficiency: a group's higher IMBI score means either that there are more people without multidimensional life balance, or that people without multidimensional life balance in this group lack sufficiency in a greater number of indicators. MLBI is the Multidimensional Life Balance Index, which we constructed subtracting IMBI from 1 (see Section 5.1.1). A higher value of MLBI indicates either that there are more people with multidimensional life balance, or that

people without multidimensional life balance lack sufficiency in a smaller number of indicators.

Table 5.2. Multidimensional Life Balance Measures

	With Multidimensional Life Balance (1-H,%)	Without Multidimensional Life Balance (H,%)	Average Inadequacy Score (A)	MLBI (1-M0)	IMBI (M0)
Total	60.9%	39.1%	0.502	0.804	0.196
Gender					
Men	59.3%	40.7%	0.510	0.792	0.208
Women	62.3%	37.7%	0.494	0.814	0.186
Employment Status					
In Paid Work	68.7%	31.3%	0.471	0.852	0.148
Not in Paid Work	55.9%	44.1%	0.515	0.773	0.227
Income Status					
Lowest 25%	53.0%	47.0%	0.516	0.758	0.242
Middle 25%	65.4%	34.6%	0.483	0.833	0.167
Highest 25%	72.7%	27.3%	0.472	0.871	0.129
Missing	61.0%	39.0%	0.510	0.801	0.199
Education					
Seconday or Less	56.0%	44.0%	0.513	0.774	0.226
Completed Sececondary	63.9%	36.1%	0.490	0.823	0.177
Above Secondary	72.0%	28.0%	0.467	0.869	0.131
Health Status					
Poor	41.6%	58.4%	0.562	0.672	0.328
Fair	54.8%	45.2%	0.510	0.769	0.231
Good	65.6%	34.4%	0.480	0.835	0.165
Very good	67.7%	32.3%	0.481	0.845	0.155

We have defined people who achieved sufficiency in three out of five dimensions or in more than 60% of weighted indicators as having multidimensional life balance in daily life[64]. Among those aged 50 and over in the UK, 61% achieved multidimensional life balance *on a given day*, and 39% did not achieve it (Table 5.2). As we included only the

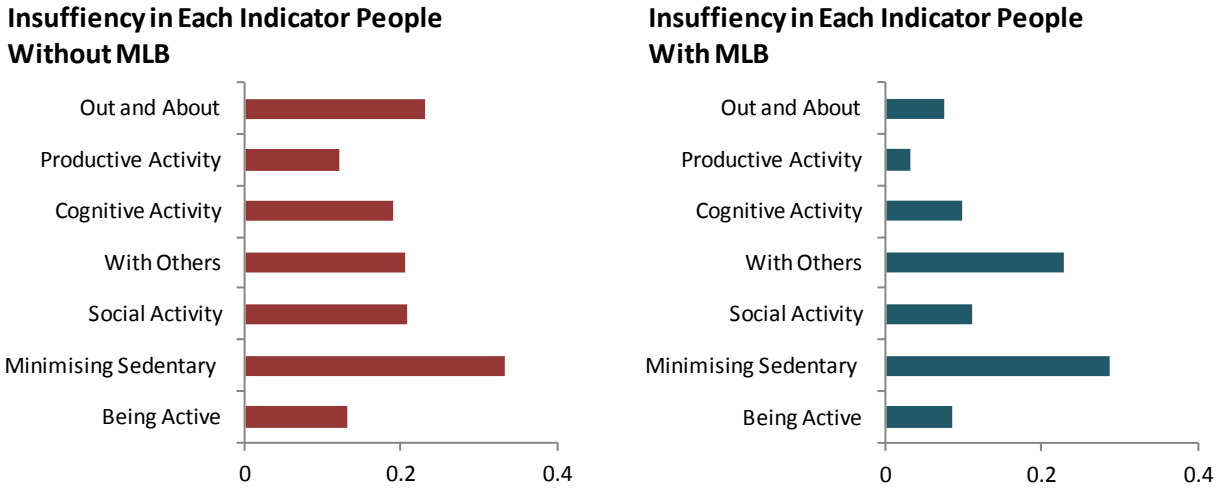
[64] The choice of balance cut-off was exploratory (see Chapter 7, Section 7.6.4). In Chapter 6, we compared the effect of applying different thresholds on self-assessed health status, and found the current choice of balance cut-off provided the most plausible results.

diaries that reported 'usual day'[65], it can be inferred cautiously that about 60% of older people in the UK are likely to have a multidimensional life balance in terms of recommended daily activities in their everyday life.

Our focus rests on the remaining 39%, who lack sufficiency in multiple activity indicators. From Figure 5.3, which shows the censored headcount ratio in each indicator by multidimensional life balance, we can see that older people without multidimensional life balance exhibit the highest insufficiency levels in *Minimising Sedentary Time* and *Out and About*, followed by *Social Activity*, *With Others*, and *Cognitive Activity*. This means that people without multidimensional life balance are more likely to lack sufficiency in the *Minimising Sedentary Time* and *Out and About* indicators. People with multidimensional life balance also show the highest insufficiency levels in *Minimising Sedentary Time*, but while they are more likely reach sufficiency in the *Out and About* and *Productive* indicators compared with people without multidimensional life balance, they tend commonly to experience insufficiency in *With Others*.

[65] The comparison of MLBI between usual days and unusual days are in Appendix A5.6

Figure 5.3 Insufficiency in Each Indicator for Older People With and Without Multidimensional Life Balance (MLB), Censored Headcount Ratio



One of the main advantages of the AF method is that it enables us to calculate the MLBI and related values at the sub-group levels. Thus we are able to examine whether people with and without multidimensional life balance are disproportionately distributed across demographic and socio-economic status.

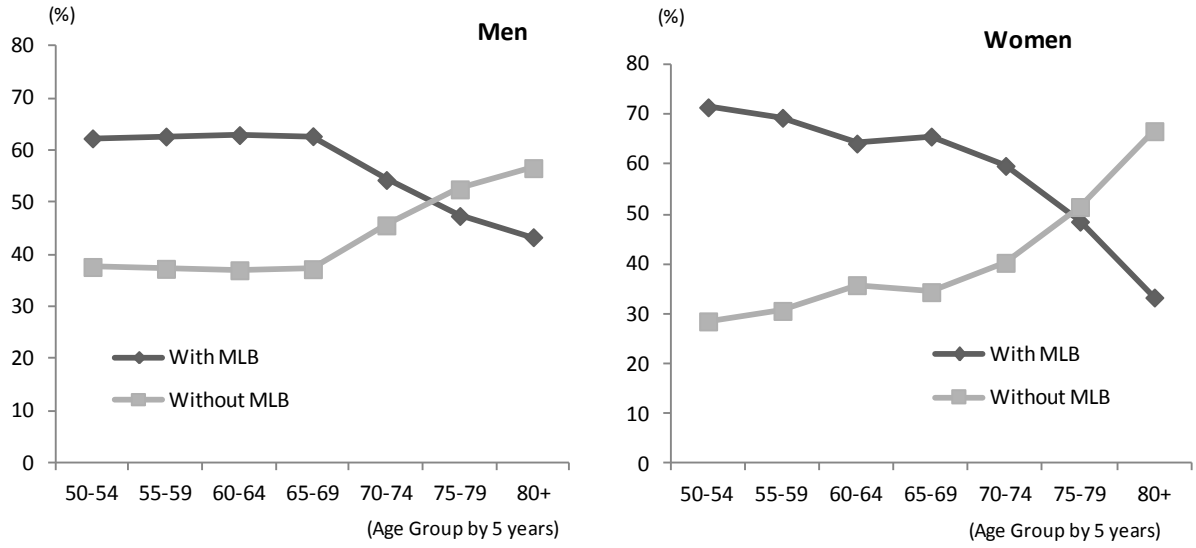
In the following, we investigate the distribution of older people with and without multidimensional life balance by demographic characteristics (gender and age), socio-economic status (level of education, level of household income) and self-assessed health status. We also explore how the underlying structure of imbalance differs by these sub-groups. In the AF method, decomposition by dimension reveals how the underlying structure of deprivations differs (Alkire and Foster, 2011). By identifying the dimension that contributes most to overall insufficiency, decomposition enables us which area in

older people's daily life deserves more attention to improve the MLBI. We graphically present how the composition of overall deprivation differs by each sup-group.

Multidimensional Life Balance by Gender and Age

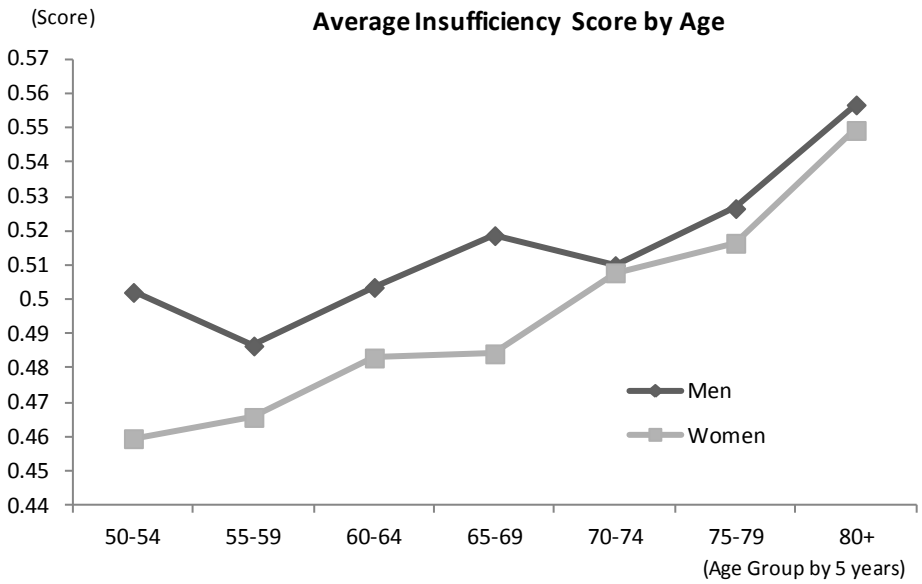
First we examined multidimensional life balance by gender. We found that the incidence of people without multidimensional life balance and the intensity of insufficiency experienced by people without MLB vary by gender. As can be seen in Table 5.2, a higher percentage of men than women lacks multidimensional life balance (H_{imb}, p=0.023). About 41% of men and 38% of women aged over 50 failed to achieve an overall balance in daily activities on a given day. The average insufficiency score (A_{imb}) is also somewhat higher for men.

Figure 5.4. Multidimensional Life Balance Headcount Ratio by Gender and Age Group



To understand the disparity between genders more clearly, we investigated the distribution of people with and without MLB by gender and by age group. Figure 5.4 shows the percentage of people with and without multidimensional life balance for men and for women by age group. For men, the ratio is stable until age 65-69, with the percentage of those with multidimensional life balance being around 63%. Beyond this age group, the percentage of people without MLB appears to increase linearly across age groups, and after the mid-70s, the percentage of people without MLB is higher than for people with MLB. For women, the linear relationship between age and the percentage of people without MLB is observed from the fifties. The percentage of women without multidimensional life balance increases with age while the percentage of women with multidimensional life balance decreases. For both genders the ratio between people with and without multidimensional life balance is inverted in the oldest age group, indicating a rapid increase in the percentage of people without multidimensional life balance in that group. The Average Insufficiency Score (A_{imb}) also increases with age, displaying that not only the incidence, but also the intensity, of multiple deprivation across activity dimensions increases as people grow older (Figure 5.5) In addition, it is shown not only that a higher incidence of older people without multidimensional life balance is found among men up to their seventies, but also that men without MLB tend to experience a wider range of insufficiency compared with women across all age groups.

Figure 5.5 Average Insufficiency Score by Age Group and Gender



Now we turn our focus exclusively to the people in our study without a multidimensional life balance. Admittedly, the sufficiency cut-offs and the balance cut-off involve normative decisions and are still exploratory. We cannot yet determine whether reaching the thresholds of MLB presented in this work is sufficient for maintaining well-being. However, because we have set the cut-offs as *minimum* thresholds, not meeting the cut-offs in multiple dimensions can be a clear sign of overall problems that can lead to negative outcomes in later life. Thus it is important to understand, by identifying the dimensions that need more attention, how these older people without MLB lack sufficiency.

Figure 5.6 The Contributions of Each Indicator by Gender to the IMBI(M_0)

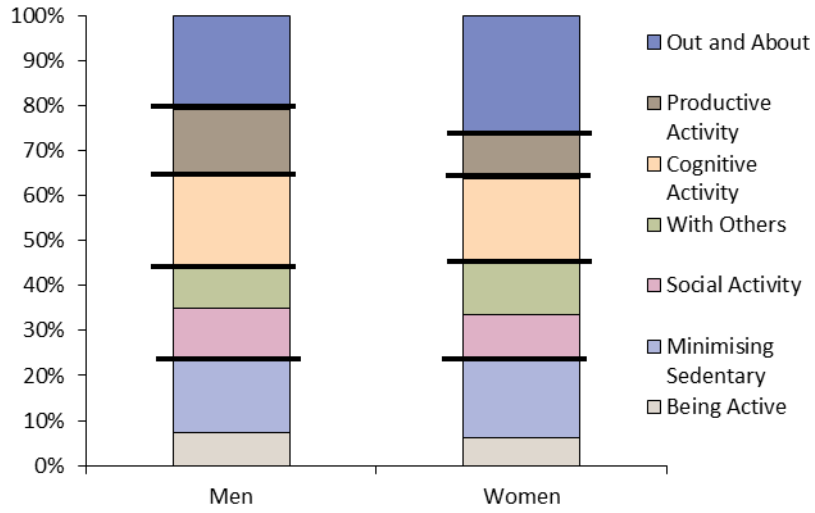
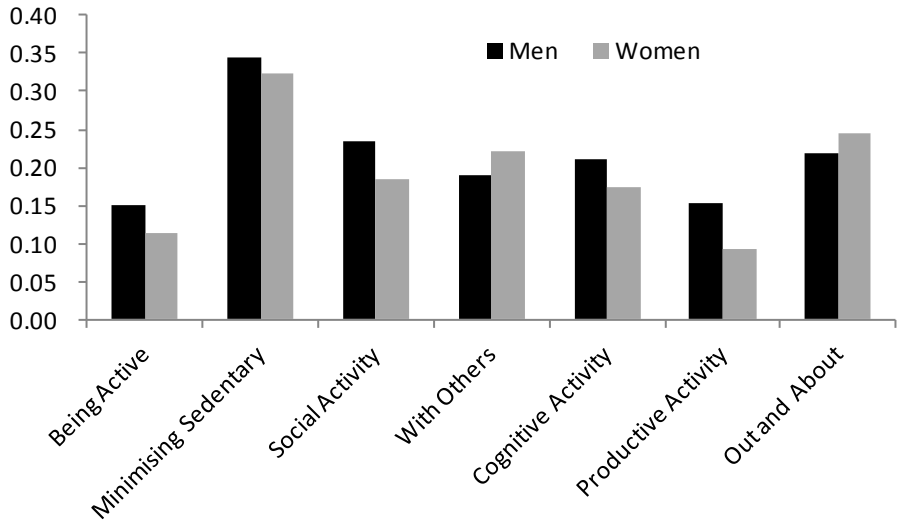


Figure 5.6 provides the percentage contribution of each indicator to the level of imbalance (IMBI, M_0) by gender[66]. We draw the black line to distinguish dimensions. The contribution from the dimensions thus can be obtained by adding up the contributions from each indicator that constitutes the dimension. For instance, the contribution of the physical dimension is obtained by adding up the contributions of *Being Active* and *Minimising Sedentary Time*. For men, the dimension that contributes most to imbalance is the *Physical* dimension (23%), followed by the *Out and About* dimension (21%). For women, the *Out and About* dimension (26%) is the highest contributing dimension, followed by the *Physical* dimension (24%).

[66] A5.5 in Appendix presents the contribution of each indicator to total imbalance for the total sample.

Note that at the indicator level, the contributions provide a picture of relative deprivation that also reflects weights that are applied to each indicator (Alkire and Santos, 2013). For instance, although the highest contribution to IMBI comes from *Out and About* indicator, if we look at the censored headcount ratio which shows the proportion of people without MLB lacking sufficiency in each indicator, the indicator occupied by the highest proportion of people without MLB lacking sufficiency is *Minimising Sedentary Time* (Figure 5.7). However, because the weight of *Minimising Sedentary* (w=0.10) is only half that of *Out and About* (w=0.20), the highest contribution comes from *Out and About*. Thus, it is important to note that the contribution of a certain indicator or dimension that greatly exceeds its weight suggests a relatively high insufficiency in this indicator (Alkire and Santos, 2013; Alkire et al., 2013). For both genders, spending too much time on sedentary activities contributes much more than its weight, indicating that people without multidimensional life balance are more likely to be deprived in this indicator than in others. It implies that reducing sedentary time can be an effective way to reduce the overall imbalance level for both men and women, as the adjustment will affect more people without multidimensional life balance.

Figure 5.7. Censored Headcount Ratio by Gender for People Without MLB

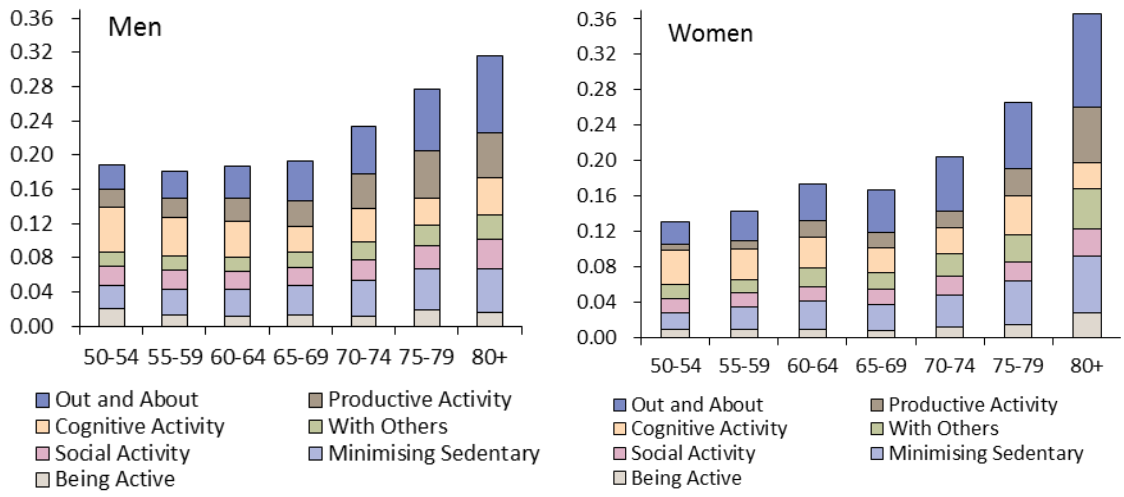


We also found some gender differences in the composition of overall insufficiency. As can be seen in Figure 5.6, a lack of productive activities contributes more to the imbalance experienced by men (15%) than that experienced by women (10%). In terms of the social dimension, we found that, while the lack of social activity participation contributes more to men's imbalance than spending too much time alone, it is the opposite for women. The censored headcount ratio (Figure 5.7) shows that 23% of men are without multidimensional life balance and have insufficiency in the Social Activity indicator, and 19% have insufficiency in the *With Others* indicator. The percentages for women are 18% and 22% respectively.

To investigate the difference further, we examined the structure of imbalance by age group and gender. Figure 5.8 presents the relative contribution of each indicator to the imbalance (IMBI, M_0) by age group and gender. With increasing age, the areas in which

people without multidimensional life balance most commonly lack sufficiency (the dimension that contributes most to the overall insufficiency) change. Most notable differences are the increase for older groups in the contribution of the *Out and About* and *Productive Activity* indicators and the decrease in the contribution of the *Cognitive* indicator. The contribution of the *Out and About* indicator was more than tripled among those aged 50-59, and aged 80 and over, implying that the oldest group without MLB tends to spend more time at home. The contributions from other indicators remain relatively stable across the age group and gender.

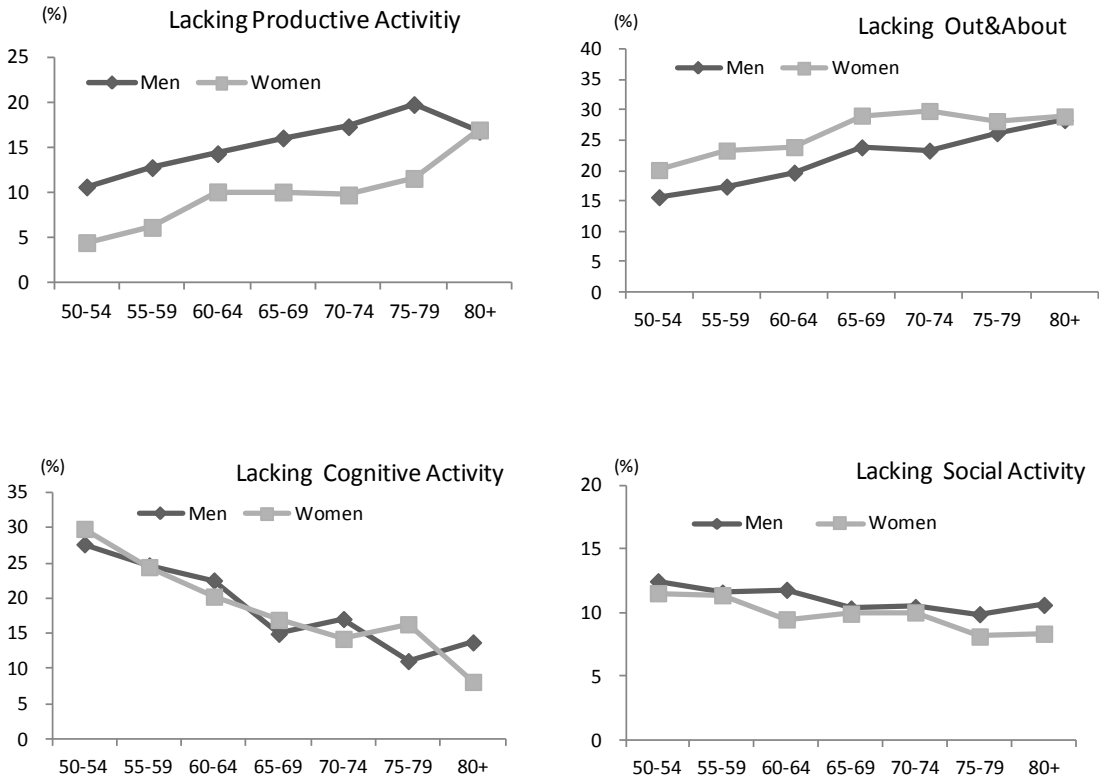
Figure 5.8. IMBI and Relative Contributions from Each Indicator by Age Group and Gender

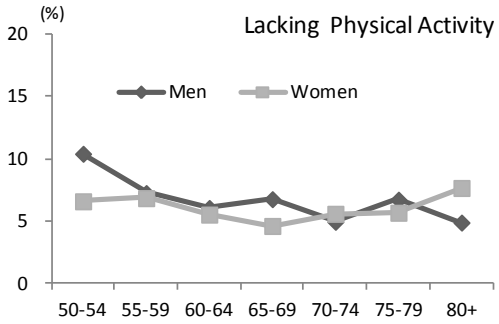


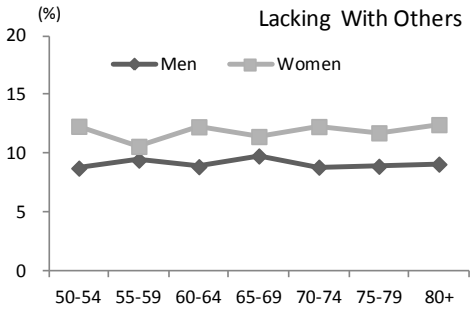
Some differences by gender are also observed. Figure 5.9 displays the contributions to imbalance by indicators for men and for women across age group. In the case of women, the contribution of the *Productive Activity* indicator is substantially lower than for men across all age groups, except for the oldest group, where the contribution of this indicator

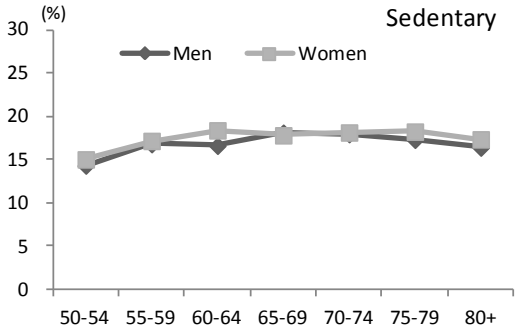
increases rapidly. The contribution of the *Out and About* indicator is higher for women than men across most age groups, although the trend is upward for both genders. On the other hand, the relative contribution of the *Cognitive* indicator decreases for both genders across age groups. The contributions from *Physical* and *Social* dimensions do not vary much by age group or by gender, and remain relatively consistent.

Figure 5.9. Contribution to Imbalance by Age and Gender, Selective Indicators









Multidimensional Life Balance by Socio-Economic Status

Next we examined the relationship between socio-economic status and multidimensional life balance. We investigate MLB by economic activity status, level of household income, and level of education.

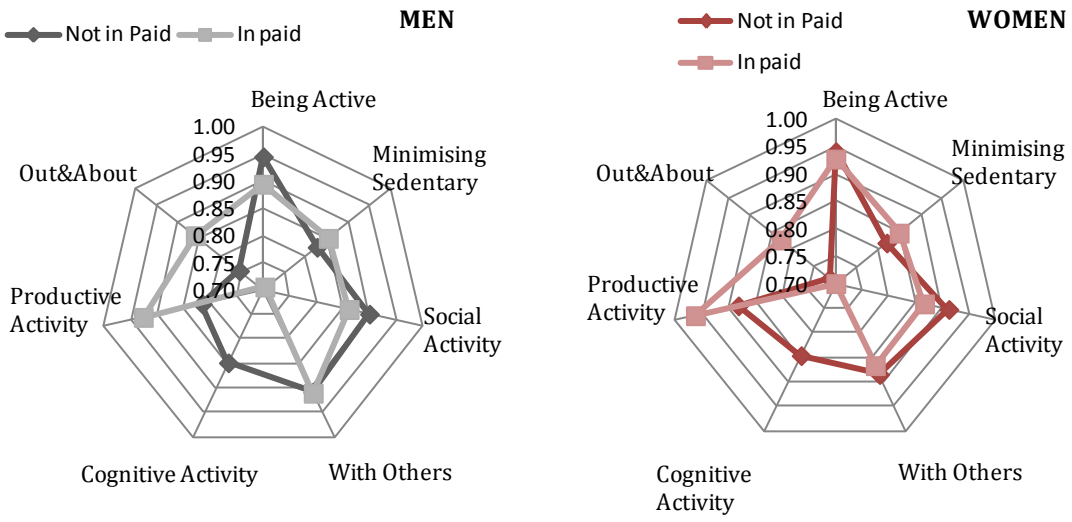
First we examine MLB by economic activity status. As this category is one of the most important factors that influence older people's daily activity patterns (see Chapters 3 and 4), we expect that multidimensional life balance would differ according to economic activity status.

As expected, the MLBI value is higher for the group in paid work (0.852) than for the group not in paid work (0.773) (Table 5.2), implying that leaving the labour force is negatively associated with maintaining multidimensional life balance. In terms of incidence, we found the lack of multidimensional life balance to be more prevalent among people without paid work. Of those older people who are not in paid work, 44% did not achieve the multidimensional life balance on a given day, while only 31% of people in paid work failed to do so ($p<0.001$). People not in paid work who are lacking in multidimensional life balance also have a higher average insufficiency score (A_{imb}= 0.515 for the group not in paid work, and A_{imb}= 0.471 for the group in paid work), indicating that they experience insufficiency in broader areas compared with people in paid work without MLB.

Figure 5.10 compares the structure of imbalance between the paid and not paid groups, for men and women. The relative contribution to multiple deprivations is smaller if the point is farther from the centre of the web, and larger if the point is closer to the centre. For both men and women in paid work, the main contributor to imbalance is insufficiency in the *Cognitive* indicator. For the people who are not in paid work, the contribution from the cognitive dimension to the overall imbalance reduces significantly, while the contributions from *Out and About* and *Productive* increase. Interestingly, contributions from other indicators vary only slightly by economic activity status. Note that the gap in the contribution of the productive dimension to the imbalance between people in paid work and not in paid work is considerably smaller for women than for men. This implies that the productive dimension is relatively less important as a determinant of imbalance

for women than for men who are not in paid work, as women are more likely to continue to participate in productive activity than men in retirement. This finding is consistent with previous chapters, which found the gender gap in the balance between committed time and discretionary time in later life.

Figure 5.10 The Structure of Imbalance by Economic Activity Status and Gender



We then investigated whether the multidimensional life balance differs by level of income[67]. The MLBI value increases with income, and the difference is considerable. (Table 5.2). As can be seen in Figure 5.11, the percentage of people with multidimensional life balance increases with the level of income ($p<0.001$). In the highest income group, more than 70% have reached multidimensional life balance. By comparison, the percentage of people without life balance is inversely related to the level

[67] In our data, 22% of respondents did not provide information about their income.

of income. We found the incidence of multiple deprivations was more common in the lowest income group (47%). In addition, the intensity of multiple deprivations is also negatively associated with the level of income. The lowest income group has the highest average insufficiency score (A_{imb}=0.516) which is considerably higher than that of the highest income group (A_{imb}=0.472). This result implies that not only is the lowest proportion of people without multidimensional life balance to be found in the highest income group, but also that they are insufficient in fewer dimensions (Figure 5.12). It can thus be inferred that multidimensional life balance is disproportionately distributed across income levels.

Figure 5.11. Multidimensional Life Balance Headcount ratio by Level of Income

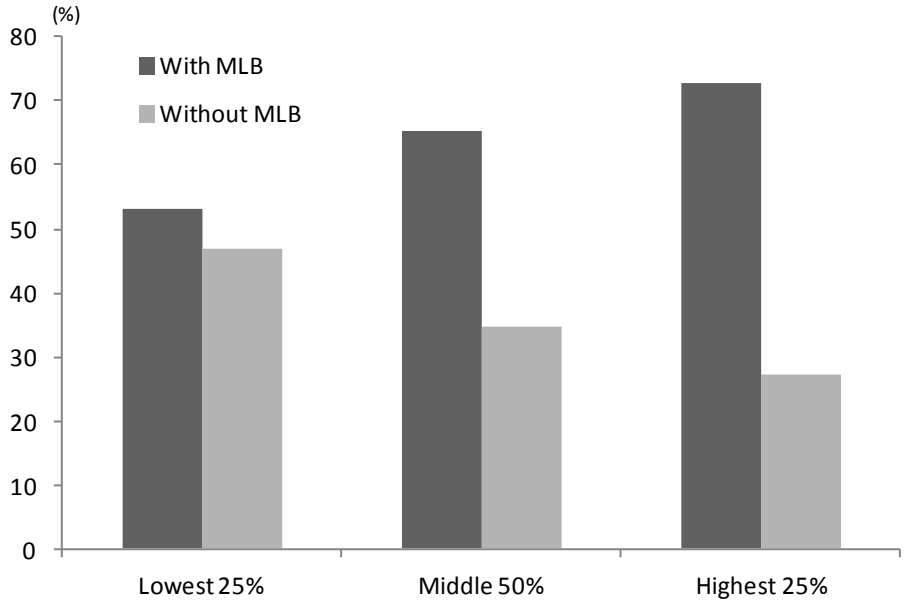
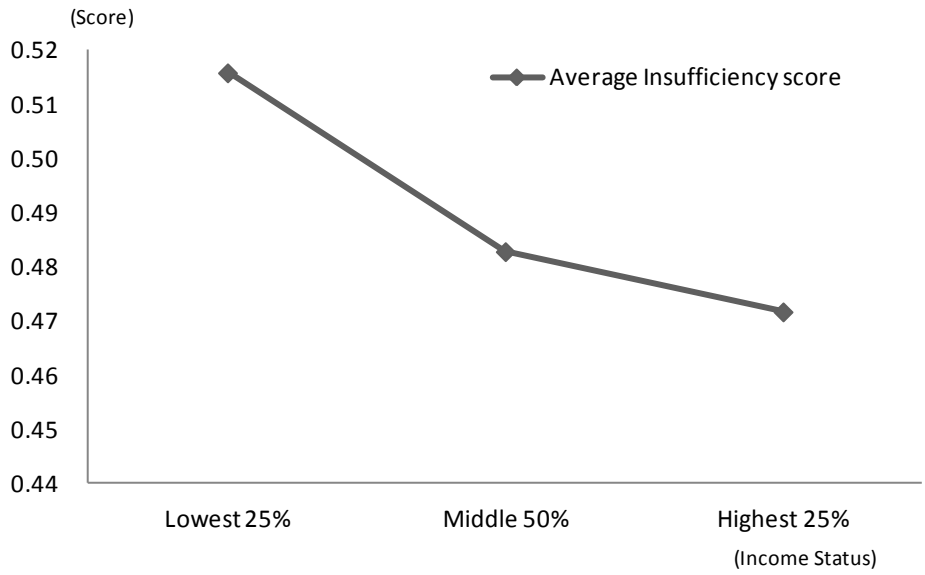
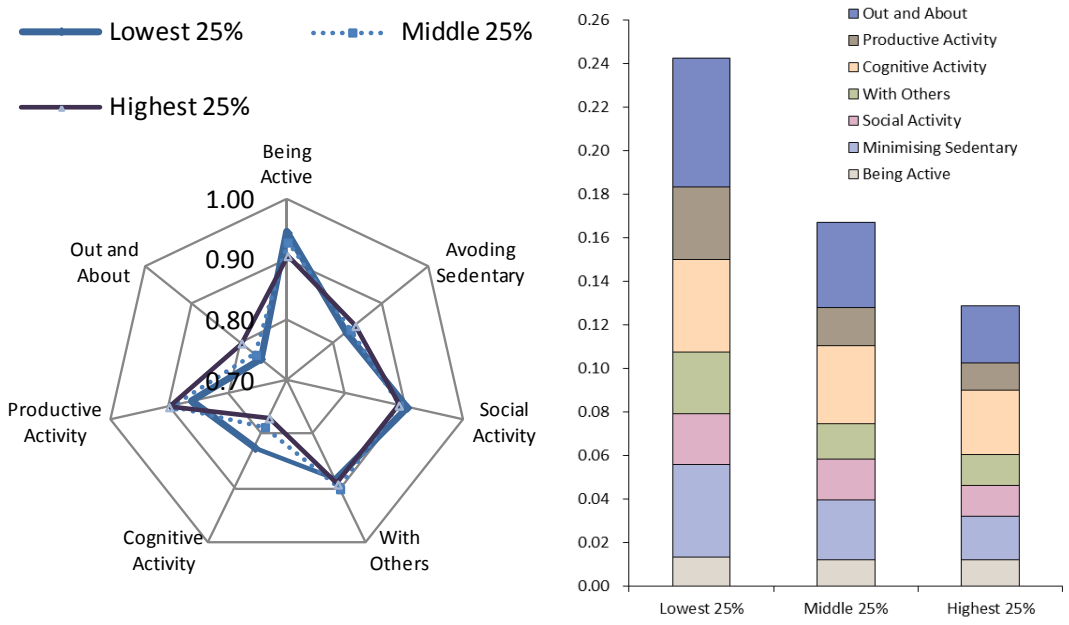


Figure 5.12. Average Insufficiency Score by Income Status



Examining the structure of imbalance by income status (Figure 5.13), we found two different trends. The contributions from O*ut and About*, *Productive*, and *Avoiding Sedentary* indicators decrease as the level of income increases. On the other hand, the contributions from the *Cognitive Activity* and the *Being Active* indicators increase across the income group. This implies that the structure of imbalance people experience differs according to the level of income. For the low income group, for instance, the highest contribution comes from the O*ut and About* indicator, while for the high income group, the *Cognitive* indicator contributes the most to the overall imbalance. However, these trends may only be reflecting the influence of the economic activity status we discussed above, because we did not control for the economic activity status in this analysis. In Section 5.3, we conduct a multivariate analysis to identify the main determinants of multidimensional life balance.

Figure 5.13 Structure of Imbalance by Income Status



Next, we have examined how multidimensional life balance varies by education level. Again, we found that a higher level of education is associated with a higher value of MLBI (Table 5.2.). Figure 5.14 shows that the incidence of people with multidimensional life balance increases linearly with the level of education ($p<0.001$). As in the case of income, the intensity of multiple deprivations is inversely associated with the level of education, indicating that it is older people with a low level of education who tend to experience multiple deprivations in terms of activity dimensions. The structure of imbalance by level of education does not differ considerably (Figure 5.15), although older people with a higher level of education who are without MLB tend to be less likely to lack sufficiency in cognitive dimension (3%p less contribution than in the other two groups) and more likely to lack sufficiency in the out and about dimension (2%p more

contribution than in the other two groups) compared to people with secondary or lower level of education.

Figure 5.14. Multidimensional Life Balance by Education

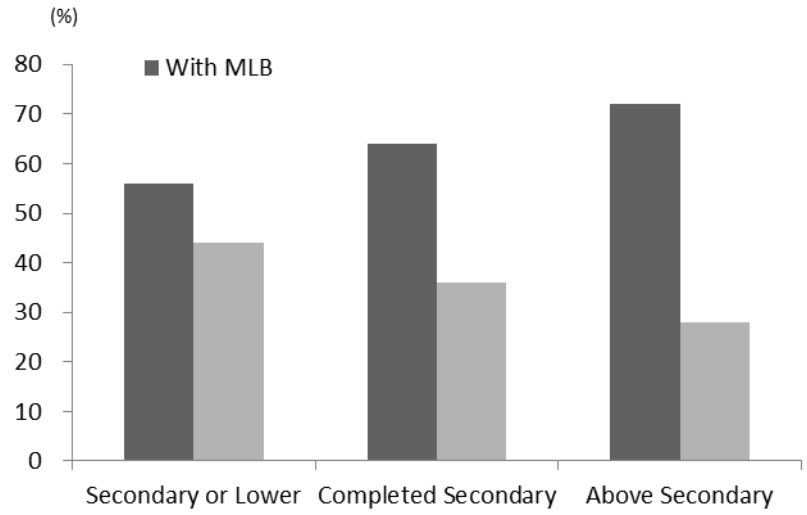
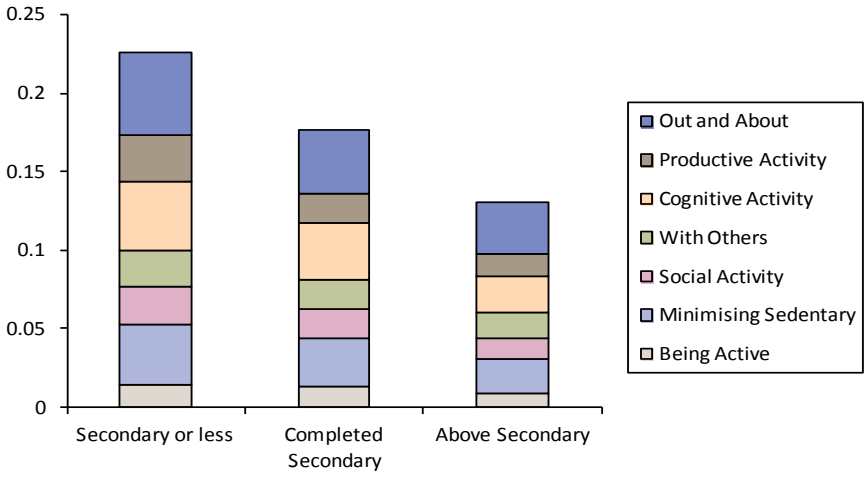


Figure 5.15. Structure of Imbalance by Level of Education

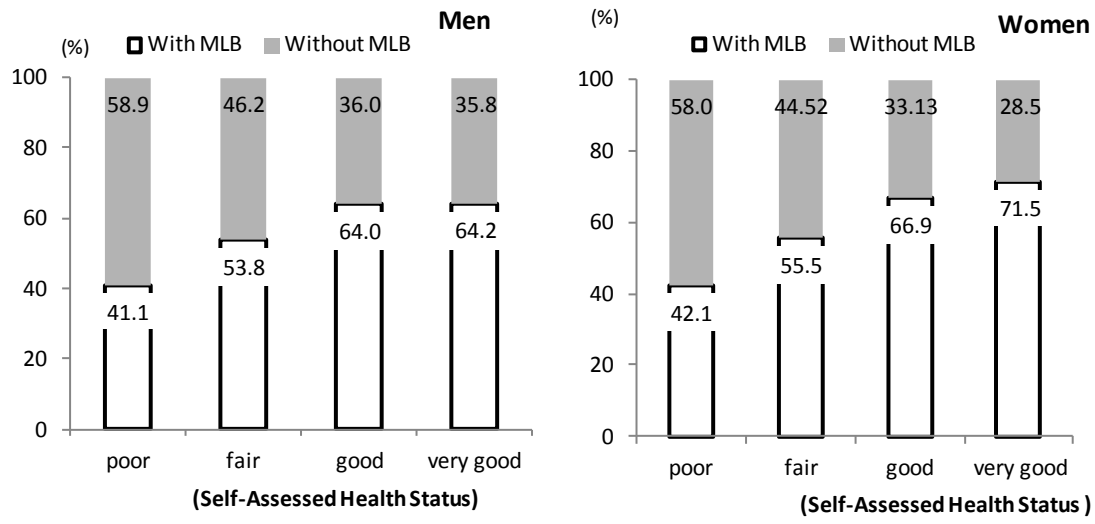


Multidimensional Life Balance by Health Status

Finally, we examined the relationship between self-assessed health status and multidimensional life balance. This works as a basic validation of the measure, because in constructing MLBI measurements we assumed that having multidimensional life balance would be associated with positive outcomes, such as better health. Although the causal relationship cannot be tested due to the cross-sectional nature of the data, we expect at least to observe a positive association between self-assessed health status and multidimensional life balance. In Chapter 6 we test this relationship further, controlling for other relevant variables and applying different balance cut-offs.

The findings support our assumption. We found that multidimensional life balance is positively associated with self-assessed health status ($p<0.001$). The MLBI value of people with poor health is only 0.672, while the MLBI of people with very good health is 0.845 (Table 5.2). In the poor health group, almost 60% were without multidimensional life balance (58.4%), with a high average inadequacy score (0.562). In the very good health group, only 32% were without multidimensional life balance, and the average inadequacy score for them is 0.481.

Figure 5.16 Multidimensional Life Balance by Health Status and Gender

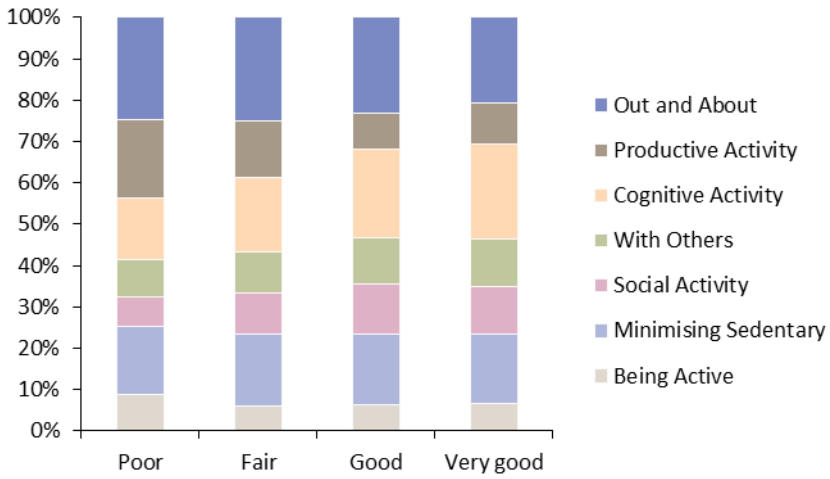


Considering the constraints those with poor health could impose on the general mobility of people, it might not be very surprising that people with poor health tend to experience increased deprivation in activity dimensions. What might be more interesting is the difference between the fair health group and good/very good health group (Figure 5.18). Although there is little difference in the MLBI of people with good health and very good health, a significant gap is observed between these better health groups and the fair health group. The better health groups (people who reported good, very good health status) display a lower incidence of people without multidimensional life balance, as well as a lower intensity of insufficiencies compared to the fair health group. The existence of a gap in MLBI between the fair health and good to very good health groups implies that physical constraints may not be the only factor that affects the relationship between health and MLB, as fair health does not usually imply the existence of physical constraints. Although we cannot examine the causal direction with the current data, we can observe

from the gap between fair health and good health groups that the multiple insufficiencies in activities cannot all be attributed to ill health limiting activity. We explore this issue further in Chapter 6, in which we investigate the relationship between self-assessed health and achieving MLB.

Figure 5.19 displays the contributions of each indicator to the imbalance by self-rated health status. Across the health status, the contribution from the physical dimension (*Being Active* + *Minimising Sedentary Time*) remains relatively stable except for the poor health group, which has a slightly larger contribution from the physical dimension due to the increased insufficiency in being active indicator. However, contributions from other dimensions vary across the health status. For instance, the contributions from the social dimension (*With Others* + *Social Activity*) and the cognitive dimension are considerably larger for the better health groups, while the contribution from the productive dimension is smaller in these groups. While little difference exists between the fair health group and better health groups regarding the contribution of the physical dimension, significant differences exist in terms of social, productive, and cognitive dimensions between these groups.

Figure 5.17 Structure of Imbalance by Health Status



5.3.3. Determinants of Multidimensional Life Balance

In this section, we examine the main determinants of multidimensional life balance to discover who is more likely to achieve it. We conducted multivariate analyses using the achievement of multidimensional life balance as the dependent variable to test whether the bivariate relationships between achieving MLB and demographic/socio-economic characteristics we observed in the previous sections remain significant after controlling for other factors.

The 2000-2001 UK time use study collected two diaries from each respondent, one for a weekday and another for a weekend day. As noted earlier, we made an assumption that if the respondent had achieved multidimensional life balance on the day of recording, and it was a 'usual' day, it would be more likely that he or she would maintain multidimensional life balance on other days as well (A5.6). It might be possible to assume

further that if the respondent had filled in two diaries of usual days, and had not achieved a multidimensional life balance on both days, he or she might be less likely to lead a multidimensionally balanced life relative to someone who had achieved balance on both days. We thus constructed a categorical variable *MLB* which has three categories: MLB=1, if achieved MLB for both diary days; MLB=2, if achieved MLB for one diary day; and MLB=3 if did not achieve MLB for both diary days. Then we built a series of multinomial logit models using two balanced days as the reference category[68]. Note that due to the large number of missing cases we were not able to build a nested model for the income variable. We consequently used a separate sample for this analysis, and we obtained similar results (Model 7).

Table 5.3 presents the results from the multinomial logit regression analyses. For the convenience of the discussion, we define people who did not achieve multidimensional life balance for both diaries as being *without MLB*, and discuss focusing on the factors that are associated with the likelihood of being in this group relative to the group of people who achieved multidimensional life balance on both diary days.

We first examined whether the demographic factors (gender and age) are associated with the increased likelihood of being without MLB (Model 1). Men were found to be more likely to be without MLB than women. The effects of gender remain significant

[68] We have also conducted a series of logit regression analyses for comparison, using the achievement of MLB as a dummy variable, and obtained similar results (see Appendix A5.5).

controlling for other factors. Age was also associated with the increased likelihood of not achieving a multidimensional life balance. Older people in their seventies and eighties were more likely to be without MLB than people in their fifties, and the magnitude of the effect was larger for the oldest old group (aged over 80). The effects of age remain significant controlling for other factors such as economic activity status, education, and health.

Next, we examined the effect of socio-economic factors. In the bivariate analysis in Section 5.3.1, we observed that the incidence of people without multidimensional life balance was more prevalent among those who are not in paid work. Our findings from the multinomial logit analysis show that this association remains significant after controlling for demographic and other socio-economic factors such as marital status and the level of education (Model2 – Model5)[69].

[69] However, the effect of economic activity status became non-significant when we controlled for health status (Model 6), implying that the effect of economic activity status may largely be reflecting the effect of health status.

Table 5.3. Results from Multinomial Logit Regression Analyses

No Balanced Day (relative to Two Balanced Days)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Female	-0.254**	-0.298***	-0.372***	-0.482***	-0.491***	-0.459***	-0.544***
	(0.08)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.10)
Age Group							
50-59	Reference						
60-69	0.192	-0.057	-0.101	-0.136	-0.098	-0.027	-0.031
	(0.10)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.14)
70-79	0.752***	0.393**	0.327*	0.229	0.300*	0.389**	0.400*
	(0.11)	(0.13)	(0.13)	(0.13)	(0.14)	(0.14)	(0.16)
80+	1.750***	1.385***	1.265***	0.996***	1.055***	1.163***	1.077***
	(0.16)	(0.18)	(0.18)	(0.18)	(0.18)	(0.19)	(0.22)
Not in Paid Work		0.582***	0.500***	0.454***	0.441***	0.115	-0.052
		(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.15)
Education							
Secondary	Reference						
Lower			0.400***	0.364**	0.361**	0.317**	0.411**
			(0.11)	(0.11)	(0.11)	(0.11)	(0.14)
Higher			-0.573***	-0.588***	-0.595***	-0.513***	-0.236
			(0.15)	(0.15)	(0.15)	(0.15)	(0.17)
Couple				-0.632***	-1.111***	-0.965***	-1.127***
				(0.10)	(0.16)	(0.16)	(0.19)
One Person Household					-0.632***	-0.503**	-0.623**
					(0.18)	(0.18)	(0.21)
Health Stauts							
Poor						0.674***	0.734***
						(0.15)	(0.17)
Fair	Reference						
Good						-0.587***	-0.650***
						(0.11)	(0.13)
Very Good						-0.591***	-0.714***
						(0.12)	(0.15)
Income							
Middle	Reference						
Lower 25%							0.161
							(0.13)
Upper 25%							-0.077
							(0.18)
Constant	-1.020***	-1.197***	-1.223***	-0.617***	-0.153	0.150	0.283
	(0.08)	(0.09)	(0.12)	(0.15)	(0.19)	(0.21)	(0.24)
Number of Observations	5038	5038	5038	5038	5038	5038	3940
Log Likelihood	-5926.725	-5908.583	-5860.611	-5829.788	-5819.428	-5756.822	-4473.938

Note: Robust Standard Errors in parentheses. *p<.05 **p<.01 *** p<.001

We found that a lower level of education is associated with the increased probability of being without MLB. The odds of being without MLB is 1.5 times greater for people of lower education than for people with secondary education. On the contrary, having a higher level of education was found to be associated with reduced odds of being without MLB compared with the reference group, indicating that people with higher education are more likely to have achieved multidimensional life balance. Being in a couple reduced the odds of being without MLB, implying that people who are not in a couple are more likely to be without MLB compared to those who are in a couple. Interestingly, living in a one-person household also reduced the odds of being without MLB, which requires further investigation.

Health was negatively associated with the likelihood of being without MLB. The odds of being without MLB for people with poor health status were twice as great as for people with fair health. On the contrary, the odds of being without MLB for people with better health (good or very good) was reduced by 50% relative to the fair health group. We explore the relationship between health status and the multidimensional life balance further in Chapter 6.

5.4. Conclusions

The aim of this chapter was twofold: (1) constructing empirical measurements for multidimensional life balance, and (2) demonstrating the applicability of the multidimensional life balance model in studying the daily activity of older people by using the UK time use data. This section briefly summarises how we set out to take into

account the heterogeneity of older people and the multidimensionality of daily life in constructing the multidimensional life balance measurements, and discusses the main findings obtained by applying the multidimensional life balance model.

Building the multidimensional life balance index was an attempt to empirically implement the idea of multidimensional life balance so that the level of activity in later life could be measured and assessed. To reflect the multidimensionality of daily life, we first identified five dimensions of daily activity that are known to be beneficial to older people's well-being: physical, social, cognitive, productive, and out and about. Then, based on the MTUS activity codes, we constructed indicators that measure each dimension.

By adopting a threshold-based approach, we attempted to allow room for the heterogeneity of older people. We applied the Alkire-Foster method developed in multidimensional poverty research (Alkire and Foster, 2011). Instead of looking at how much time older people spent on each activity, we assessed whether the time spent on each activity had reached the sufficiency threshold, which is the minimum level of involvement recommended for each activity indicator. We left the question whether the respondent would be likely to spend more time on the activity than the threshold as a matter of personal preference. We set the balance threshold to assess the overall achievement, we defined this as follows: if the person had achieved sufficiency in three out of five dimensions (specifically, in more than 60% of the weighted indicators), he or she would be regarded as having achieved multidimensional life balance.

The findings, based on the multidimensional life balance model, reveal a picture of older people's daily life from a multidimensional approach that differs from the image created by a traditional unidimensional approach. For instance, while 44% of older people in the total sample were found to have spent too much time alone, only 20% of them were without multidimensional life balance (lacking sufficiency in multiple activity domains). While 30% of people were found to lack cognitive activity, only 19% of them were without multidimensional life balance. We argued that, while lacking some activities can be a matter of preference or condition, being deficient in activities in multiple domains simultaneously can be a sign of a problem in adaptation to later life. In this regard, we found it more important to focus on the experience of people without multidimensional life balance, rather than on those who are missing activities in one or two dimensions.

We found that in 2000-2001, about 60% of people in the UK aged 50 and over achieved multidimensional life balance, and about 40% failed to do so. The prevalence of people without multidimensional life balance varied across demographic and socio-economic groups. For instance, men were more likely than women to be without MLB; and men without multidimensional life balance failed to meet the activity thresholds in more indicators than their women counterparts. In previous chapters, we argued that men may find adjusting to later life more difficult as they tend to experience greater changes in the balance between discretionary time and committed time after retirement (Chapter 3 and Chapter 4). If we accept not achieving multidimensional life balance as a sign of a problem of adaptation in later life, then the higher prevalence of men without this life

balance would appear to support the argument that men may find it more difficult than women to adjust in later life.

Older age was associated with the increased probability of lacking multidimensional life balance. In particular, both the incidence and the intensity of imbalance increased sharply in the oldest age groups (aged 70-79, and 80 and over). This finding is concurrent with concerns that the adaptability found in the young old (e.g., third agers) might not be present in the oldest old, who may experience decline and loss of functioning due to advanced age (Baltes and Smith, 2003). We also found that multidimensional life balance was associated with economic activity status, level of education and health. Being in paid work, and having a higher level of education and better health were independently associated with an increased probability of having multidimensional life balance.

The decomposition analyses revealed that the structure of imbalance differs across the demographic and socio-economic groups. By noting which activity indicator contributes most to the overall insufficiency of the group, we are able to identify the potential target area for improving the overall balance in older people's activities, by different sub-groups. For instance, the contribution of lacking time spent away from home was more than tripled in the oldest old group without multidimensional life balance compared to those in their fifties. This implies that assisting people in the oldest old group's access to the world outside their homes would greatly contribute to helping them achieve multidimensional life balance.

One of the aims in building the multidimensional life balance measurement was to open up the debate about which activity dimensions should be included and to identify the appropriate thresholds to be set. We believe that this study contributes to the field by providing an explicit procedure and justification for the selection and construction of the measurement based on a theoretical framework and previous research. As this model represents a novel approach, we did not have established guidelines to follow in choosing the relevant dimensions, thresholds, and cut-offs. Although we built the measurements on the basis of the theoretical framework and empirical studies, the dimensions, indicators, and threshold are open to debate and would benefit from further refinement. In particular, the use of relative thresholds based on the distribution of, rather than an absolute threshold for, some indicators warrants empirical examination. Further analysis of data from other countries and from other time periods will enable us to test and refine the thresholds. We discuss this issue further in Section 7.5.4.

In Chapter 6 we will investigate whether having a multidimensional life balance contributes to positive health outcomes. In addition, by examining the relationship between health and changes in the identification threshold, we test whether the choice of our balance threshold (60% of the weighted indicators) can be validated.

6. Multidimensional Life Balance and Self-Assessed Health Status in Later Life: An Empirical Application of the MLBI measure

In this chapter, we explore whether having multidimensional life balance contributes positively to well-being in later life. If our proposition in Chapter 2 holds — that maintaining balance in later life enables older people to adapt to constraints arising from the ageing process — we should observe significant differences between people with and without multidimensional life balance in terms of their relationship to positive outcomes. Using the Multidimensional Life Balance Index (MLBI), which we developed to measure and assess the level of daily activity across various life domains (Chapter 5), here we seek to investigate empirically whether the effect of having multidimensional life balance could be demonstrated for self-rated health status, one of the well-known measures of older people's well-being.

Self-assessed health, usually measured by asking respondents to rate their overall health, has been widely recognised as a robust predictor of later health outcomes including mortality, functional limitations, and mental health problems (Idler et al., 2000; Krause and Jay, 1994; Jylhä, 2009). This measure has been treated with particular importance in studies of well-being in later life (Benyamini et al., 2003; Pinquart, 2001). The measure has been used frequently as 'the ultimate objective measures of effects' because it is known to effectively predict 'the physical health and the nearness to death' which become more important in later life (Adams et al., 2011, p. 686). Furthermore, it has also been argued that self-assessed health reflects more about older people's life than 'simple summing of medical conditions or the level of disability that those conditions engender'

(Cott et al., 1999, p. 731), because a substantial proportion of older people with chronic illness and long-term disabilities were also found to report having excellent or very good health. Thus self-assessed health has often been regarded as representing an individual's overall sense of well-being, and identifying factors that influence the level of self-assessed health in later life has been a topic of much interest (Benyamini et al., 2003; Pinquart, 2001).

Previous studies found that better socio-economic status, such as a higher level of income, education and social support are linked to better perceptions of health status, while being older, being female, smoking, and having a chronic condition or long-term disability are associated with negative perceptions of self-health (Cott et al., 1999; Hirdes and Forbes, 1993; Markides and Lee, 1990). However, what determines people's subjective health status still remains largely unexplained (Jylhä, 2009), and less is known about the role of maintaining activities in determining the level of subjective health. Furthermore, while the relationship between activity and other health outcomes has been researched extensively in clinical practice and public health, studies on the relationship between activity and perceived health status in later life have been relatively rare.

In this research we aim to contribute to the field by proposing that the level of daily activity also matters for perceived health status in later life. We examine the association between achieving overall balance across daily activity domains and subjective health status of older people in the UK. Specifically, we address the following questions:

1) Would older people with multidimensional life balance be more likely to have a positive perception of their health status?

2) Does the relationship between multidimensional life balance and subjective health hold when controlling for long-term health problems?

3) Does the magnitude of effect of achieving multidimensional life balance on self-assessed health differ across the level of physical activity?

4) Would older people with more deprivations in terms of daily activity be more likely to report poor health?

By answering these questions, we seek to investigate further the validity of the multidimensional life balance measure that we have proposed, and to demonstrate empirically the analytical value of multidimensional life balance in explaining the relationship between activity and positive outcomes in later life.

6.1. Research Questions and Hypotheses

Research Question 1: Would older people with multidimensional life balance be more likely to have a positive perception of their health status?

The first question we set out to explore in this chapter is whether a positive association exists between multidimensional life balance and self-assessed health. A number of studies have investigated the link between activity and various positive health outcomes in later life (Glass et al., 1999; Silverstein and Parker, 2002; see Adams et al., 2011 for a review), although self-assessed health status was not directly examined as an outcome

variable. Initially it had been argued that the survival advantage of activity mainly comes through physiological pathways by providing fitness-related benefits such as improving metabolism, promoting a greater range of motion and muscle tone, and reducing health risks resulting from inactivity (e.g., obesity, cardiovascular problems) (Paffenbarger et al., 1986; Yamanouchi et al., 1992; Kaplan et al., 1996). Over the last two decades, an increasing number of studies argued that the health benefit of activity also comes through psychosocial pathways by providing psychological benefits such as reduced psychological stress, and an enhanced sense of meaning and purpose, which promotes self-efficacy (Glass et al., 1999; Bath and Deeg, 2005). Thus the main issue regarding the relationship between activity and health has been finding out the effect of various types of activity on health outcomes.

By applying the concept of multidimensional life balance we aim to provide a somewhat different angle from the current discussion of the activity-health relationship. Unlike previous studies that examined the effect of specific activity (e.g, physical activity) or specific activity domains (e.g. Solitary/Social; Leisure/Productive), we focus on identifying the effect of 'the overall achievement across various activity domains'. As we have discussed in previous chapters, we view that it is not necessary or possible for many older people to show high levels of activity in all the recommended domains, because their preferences and conditions are heterogeneous. Thus, we do not assume that it is only those older people who manage to maintain high levels of activity in a specific domain who achieve the best health outcomes. Rather, we view that as long as one maintains an

overall balance and avoids multiple deprivations, one is also likely to maintain well-being in later life.

We test our assumption that achieving overall balance across daily activity domains would contribute to positive health outcomes. More specifically, we expect to find that, controlling for the effect of demographic factors such as gender and age that are known to influence the subjective health, multidimensional life balance would be positively associated with better perceived health status (H1). Also, we expect that, controlling for the effect of socio-economic factors previously found to be related to self-perception of health such as economic activity status, marital status, level of education and income, the effect of having multidimensional life balance on health should remain significant and substantial (H2).

Research Question 2: Does the relationship between multidimensional life balance and subjective health hold when controlling for long-term health problems?

Next, we examine whether the relationship between having multidimensional life balance and subjective health status holds when we control for the long-term health problems. Chronic illness and long-term disability have been identified as influential factors in determining the subjective health status (Cott et al., 1999), and are also known to be associated with the older people's level of participation in various activities (Wolinsky et al., 1995). Therefore, even though we observe a significant relationship between the lack of multidimensional life balance and the poor self-assessed health status, this can simply be a reflection of the effect of long-term health problems, rather than showing the

effect of activity per se. However, if the likelihood of reporting poor health is higher for older people without multidimensional life balance compared to those with life balance controlling for the long-term health status, we may state that multidimensional life balance is independently associated with perceived health status. Thus, by conducting this analysis, we attempt to control for the possibility that the relationship between activity and the subjective health we observe might be a spurious one. We hypothesise that controlling for the long-term health problem, older people without multidimensional life balance would be more likely to report poorer self-assessed health status (H3).

Research Question 3: Does the magnitude of effect of achieving multidimensional life balance on self-assessed health differ across the level of physical activity?

Higher levels of physical activity have been regarded as being positively associated with better health outcomes, while lack of physical activity has been viewed as being associated with poor health. Yet less is known about whether engaging in other activities can reduce the negative effect of the lack of physical activity. For instance, even if someone engages in a little physical activity, he or she may still enjoy positive health outcomes, provided there is high engagement in other beneficial activities such as social, productive, and cognitive activities. On the other hand, the effect of a lack of physical activity may be too dominant, so that taking part in other activities may not provide much protection against the negative influence of a low level of physical activity. If the latter is the case, the observed relationship between the multidimensional life balance and health outcome may merely be reflecting the effect of physical activity rather than that of overall achievement as such.

Thus, to establish that the effect of multidimensional life balance is independent of the level of physical activity, we conduct an analysis across high, medium, and low physical activity level groups. We first test the hypothesis that the effect of multidimensional life balance on subjective health would be significant regardless of the levels of physical activity (H4). Then we test whether the effect of having multidimensional life balance would be the greatest with older people with the lowest level of physical activity, as this group is likely to benefit most from such adjustment (H5).

Research Question 4: Would older people with more deprivations in terms of daily activity be more likely to report poor health?

One of the classic propositions of the activity theory is that a higher level of participation in activities promotes the well-being of older people (Havinghurst, 1961). Thus, in the studies of activity and positive health outcomes, an implicit assumption has been that the more active (either in terms of the number of activities, or the duration of the activity), the better the outcomes (Lemon et al., 1972). However, in recent studies, with an increasing number of mixed findings regarding the relationship between higher levels of activity and positive outcomes, it has been suggested that the relationship may not be linear, with more benefits coming from a moderate level of activity than from high or low levels; and that too much activity can also produce negative effects (Musick et al., 1999; Baker et al., 2005).

As a concept, multidimensional life balance is constructed on a 'threshold-effect' approach. We assume that until the person's daily activity reaches overall sufficiency

(reaches the minimum activity level thresholds in k numbers of indicators), 'the more the activity, the better the outcomes' principle would work. That is, below the multidimensional life balance threshold (k), the negative consequences would be greater for people with a broader range of deprivations[70]. However, once overall sufficiency is reached, we assume that whether the person engages in increased activity in any of the domains above the threshold would not matter very much, as it can be a question of personal preference. Thus, as in multidimensional poverty research (Alkire and Foster, 2011), we view that experiencing deprivations across multiple domains simultaneously is more problematic for maintaining one's well-being than lacking activity in one specific domain.

We test whether this assumption can be supported empirically by looking at the relationship between the range of deprivations and the likelihood of reporting poor health. We hypothesise that, below the overall balance threshold, the odds of reporting poor health status would be greater for older people who confronted by a broader range of deprivation (H6).

[70] See Chapter 5 for more discussion.

6.2. Methods

Data

The data for the analysis were drawn from the UK 2000 Time Use Survey (See Chapter 1). Respondents aged 50 and older, with good-quality diaries, were selected for analysis. Only 'usual day' diaries were included in the analysis, so that people who had an 'unusual day' (See Chapter 5 for more detailed discussion) would be excluded. We have excluded cases with missing values in health-related questions, resulting in the total sample size of 5,038. The mean age of the sample was 64.1 (SD=9.6).

Measurements

To construct the dependent variable, *Health*, we used a question about the respondent's general health ('How is your general health? Would you say it was…?'). The original question contained five health categories (Very Bad, Bad, Fair, Good, Very Good). As only a limited number of respondents indicated that their health was very bad (2%), and to be consistent with the MTUS category, we constructed four categories by combining Very Bad and Bad into one category (Poor, Fair, Good, Very Good). In our sample, more than 60% of the respondents reported good (36%) or very good health (26%). Of the respondents, 27% reported that they had fair health, and 11% perceived their health as poor.

As a main independent variable, we constructed a dummy variable *With MLB* to measure whether the respondent had achieved a multidimensional life balance on the day (1=achieved; 0=not achieved). Of the respondents, 61% had reached multidimensional life balance, while 39% had not. That is, 61% of our sample reached sufficiency in more than 40% of the weighted indicators for daily activity (Chapter 5).

As control variables, we include variables shown to affect self-rated health status. First, we control for demographic factors such as *Gender* (0=Man, 1=Woman) and *Age*, which are known to increase the likelihood of having a negative perception of one's own health (Cott et al., 1999). Second, we add a set of socio-economic characteristics variables. *Beyond Work Life* is a dummy variable that indicates the life-course transition based on economic activity status. As in Chapter 4, we assumed that older people who are not in paid work have moved into later life where paid work is not central to their life (1=Beyond Work Life (not in paid work), 0=Work Life (in paid work)). *Level of education*, which is known to be positively associated with self-rated health, is included as a set of dummy variables: *Lower* (less than secondary education), *Secondary* (completed secondary), and *Higher* (above secondary). We use *Secondary* as a reference category. We also include a dummy variable for marital status (*Couple*), because having a partner is also known to positively affect self-perception of health in old age. We ran a separate model which controls for relative income status (*Income*) as we had a large

number of missing values in income variable[71]. The income variable has three categories: *Lower* (bottom 25% of the income distribution), *Middle* (50% of the income distribution), and *Upper* (upper 25% of the income distribution). We use *Middle* income as a reference category.

Last, to control for the effect of having long-lasting health problems on self-assessed health status, we include a dummy variable for long-term health problems (1=with long-term health problem). Respondents were asked, 'Do you have any health problems or disabilities that you expect will last for more than one year?' In our sample, 52% had health problems that will last for more than one year. Table 6.1 presents the characteristics of the sample and measurements.

[71] 1,100 cases had missing values in income status variable (22% of the total sample). We have conducted an analysis to see whether there are specific tendencies for people with missing income variable, and found that being female, being in a couple, and having good or very good health are associated with a higher likelihood of not reporting income. We have also conducted an analysis using the full sample, including the cases without missing vales, and the result was not affected.

Table 6.1 Characteristics of the Sample and Measurements

	Proportions/Mean(SD)	Number of Observations
Self-Rated Health		
Poor	.11	535
Fair	.27	1382
Good	.36	1814
Very Good	.26	1307
Total	1.00	5,038
Multidimensional Life Balance(MLB)		
With MLB	.61	3061
Without MLB	.39	1977
Total	1.00	5,038
Demographic Factors		
Gender		
Men	.48	2,409
Women	.52	2,629
Total	1.00	5038
Age	64.08(9.56)	5,038
Socio-Economic Factors		
Life Stage		
Beyond Work Life	.65	3,286
Work Life	.35	1,752
Total	1.00	5,038
Marital Status		
Couple	.70	3,523
Not in Couple	.30	1,515
Total	1.00	5,038
Level of Education		
Lower	.60	3,035
Secondary	.22	1,083
Higher (Above Secondary)	.18	920
Total	1.00	5,038
Income		
Lower 25%	.48	1,879
Middle 50%	.39	1,557
Upper 25%	.13	504
Total	1.00	3,940
Long-term Health Problem		
Have Long-Lasting Health Problem	.52	2,593
Do not have Long-Lasting Health Problem	.48	2,352
Total	1.00	4,945

6.3. Results

Multidimensional Life Balance and Self-Assessed Health Status

We begin by examining the descriptive relationship between self-assessed health status and multidimensional life balance. As can be seen in Figure 6.1 below, higher percentages of people with multidimensional life balance report better self-assessed health status. Of the men, 70%, and 67% of the women with multidimensional life balance perceived their health as good or very good, while the respective figures are 55% (men) and 49% (women) for people without multidimensional life balance. The percentages of people who perceived their health was poor were more than twice as high among people who experience multiple deprivations in daily activity domains, compared with people with multidimensional life balance. This indicates a positive association between multidimensional life balance and better subjective health.

Figure 6.1 Self-Assessed Health Status by Multidimensional Life Balance and Gender

To investigate the relationship further, we constructed a series of multinomial logistic regression models controlling for the demographic and socio-economic factors. We constructed multinomial logistic regression models rather than ordinal logistic regression models, because the assumption of proportionality was violated (Brant test, see Long and Freese, 2006; Dolgun and Saracbasi, 2014)[72]. The dependent variables are the categories of self-assessed health, with *Very Good* as the reference category (Table 6.2).

Model 1 shows the result from a bivariate analysis. The coefficients for multidimensional life balance are significantly negative for poor and fair health status (the coefficient for the good health status is also negative, but not statistically significant): that is,

[72] We have also conducted ordinal logistic regression analysis, and the results were not affected.

respondents with multidimensional life balance tend to perceive their health as very good rather than poor or fair. Comparing the predicted probability of reporting poor health between respondents with and without multidimensional life balance displays the effect of multidimensional life balance more clearly: the predicted probability of perceiving their health as poor is .16 for people who are without multidimensional life balance, which is more than twice the probability of people who have multidimensional life balance reporting their health as poor (.07).

In Model 2, we added *Gender* and *Age* as control variables to test whether the effect of having multidimensional life balance holds after controlling for demographic factors that are known to influence people's self-perception of health. Concurrent with previous research, both being a woman and being older were significantly associated with having negative perception of health. And as we expected, the effect of having multidimensional life balance was still significant after controlling for these demographic factors. For instance, as an illustrative hypothetical case, we may take a woman who is 63 years old. If she were without multidimensional life balance, her predicted probability of perceiving her health as poor would be .15, while if she had multidimensional life balance, the probability would fall to .07. This supports Hypothesis 1, which expected a positive association between multidimensional life balance and better perceived health status controlling for gender and age.

Model 3 included socio-economic variables such as economic activity status, marital status, and the level of education. As can been seen, the control variables have significant

associations with self-rated health status. For instance, having higher education decreased the coefficients of reporting negative perceptions of health, which confirms previous research that found a positive relationship between better self-assessed health and level of education. Being in a couple was also associated with a positive perception of health. Not being in paid work, by contrast, is associated with an increased chance of reporting poor health rather than very good health.

As we expected in Hypothesis 2, the effect of having multidimensional life balance still remained significant after controlling for socio-economic status known to affect subjective health, and the effect was also substantial. The odds of reporting poor health relative to very good health was decreased by 62.4% for people with multidimensional life balance. Again, we can take a hypothetical case of a woman aged 63, who is retired, not in a couple, and with a low education level. Her predicted probability of perceiving her health as poor would be .22 if she did not have multidimensional life balance. This probability would be reduced by half if she had multidimensional life balance (.11). Likewise, her probability of reporting good or very good health would increase if she had multidimensional life balance.

Next, we test whether the effect of having multidimensional life balance persist after controlling for the existence of a long-term health problem, which is regarded as one of the most influential determinants of self-rated health status (H3). As expected, the effect of having a long-term illness on self-assessed health status is substantial (Model 4): people with long-term health problems are more likely to report poor health status.

Nevertheless, the effect of having multidimensional life balance remained statistically significant and substantial. (The magnitude of effect actually increases when we include the long-term health problem variable). The predicted probability of reporting poor health would be as high as .34 for our hypothetical woman (aged 63, retired, not in a couple, and with a low level of education) if she had long-term health problems and was also experiencing multiple deprivations across daily activity domains. This probability would fall to .20 if she had maintained multidimensional life balance in terms of daily activity. Thus, we see that even though a long-term health problem is certainly a highly influential factor in determining the level of perceived health, the probability varies quite considerably depending on the balance in daily activity. This supports Hypothesis 3.

Table 6.2. Multinomial Logistic Regression Results for Self-Assessed Health Status

	Model 1	Model 2	Model 3	Model 4
Poor (relative to Very Good)				
With MLB	-1.148***	-1.069***	-0.977***	-1.036***
	(0.12)	(0.12)	(0.12)	(0.14)
Woman		0.085	-0.228	-0.173
		(0.11)	(0.12)	(0.14)
Age		0.035***	-0.040***	-0.050***
		(0.01)	(0.01)	(0.01)
Not In Paid Work			3.287***	2.796***
			(0.25)	(0.25)
In Couple			-0.405**	-0.356*
			(0.13)	(0.15)
Education				
Secondary (Reference)				
Lower			0.349*	0.431*
			(0.16)	(0.17)
Higher			-0.768***	-0.817***
			(0.23)	(0.24)
Long-term Health Problem				4.569***
				(0.30)
Constant	-0.264**	-2.594***	-0.030	-2.243***
	(0.08)	(0.41)	(0.52)	(0.61)
Fair (relative to Very Good)				
With MLB	-0.586***	-0.468***	-0.418***	-0.469***
	(0.09)	(0.09)	(0.09)	(0.10)
Female		0.330***	0.153	0.138
		(0.09)	(0.09)	(0.10)
Age		0.051***	0.007	-0.004
		(0.00)	(0.01)	(0.01)
Beyond Work Life			1.245***	0.966***
			(0.12)	(0.13)
Couple			-0.201	-0.232*
			(0.10)	(0.12)

Table 6.2. cont'd

Education				
Secondary (Reference)				
Lower			0.287*	0.344**
			(0.11)	(0.13)
Higher			-0.325*	-0.426**
			(0.14)	(0.15)
Long-term Health Problem				2.509***
				(0.11)
Constant	0.417***	-3.076***	-0.984*	-1.306**
	(0.07)	(0.32)	(0.39)	(0.43)
Good (relative to Very Good)				
With MLB	-0.113	-0.093	-0.085	-0.095
	(0.08)	(0.08)	(0.09)	(0.09)
Female		0.236**	0.202*	0.185*
		(0.08)	(0.08)	(0.08)
Age		0.013**	0.002	-0.002
		(0.00)	(0.01)	(0.01)
Not in Paid Work			0.285**	0.191
			(0.10)	(0.11)
Couple			-0.010	-0.016
			(0.10)	(0.10)
Education				
Secondary (Reference)				
Lower			0.127	0.174
			(0.10)	(0.10)
Higher			0.052	0.030
			(0.12)	(0.12)
Long-term Health Problem				0.955***
				(0.09)
Constant	0.404***	-0.557	-0.059	-0.045
	(0.07)	(0.29)	(0.36)	(0.38)
Number of Observations	5038	5038	5038	4945
Log Likelihood	-7427.475	-7314.906	-6996.335	-6168.264

Note: Robust Standard Errors in parentheses. *p<.05 **p<.01 *** p<.001

The level of income is also one of the known determinants of self-assessed health status. Due to the large number of missing values, we were not able to build a nested model with the income variable. Hence, we have built a separate model to see if the result differs when we control for level of income (Table 6.3). The result is consistent with our expectation. Controlling for the effect of income, having multidimensional life balance reduced the odds of negatively perceiving one's health status. In other words, people with multidimensional life balance are more likely to perceive their health as very good rather than as poor or fair. The estimates for good vs. very good health status were not statistically significant. As for the income variable itself, we found that the level of income is positively associated with the self-assessed health status of older people. The odds of people who are in the lowest income group reporting poor health was 1.91 times greater than for those in the middle income group. And being in the highest income group reduced the odds of perceiving their health as poor, but the coefficient was not statistically significant at the 0.05 significance level (p=0.054).

Table 6.3 Multinomial Logistic Regression Results For Self-Assessed Health Status, with Income Variable

	Relative to Very Good		
	Poor	***Fair***	***Good***
With MLB	-1.128***	-0.545***	-0.134
	(0.16)	(0.12)	(0.10)
Woman	-0.158	0.065	0.216*
	(0.15)	(0.12)	(0.09)
Age	-0.061***	-0.016*	-0.003
	(0.01)	(0.01)	(0.01)
Not in Paid	2.595***	0.901***	0.087
	(0.28)	(0.15)	(0.12)
In a Couple	-0.168	-0.242	0.066
	(0.17)	(0.14)	(0.12)
Education			
Secondary (Reference)			
Lower	0.367	0.397**	0.149
	(0.19)	(0.15)	(0.12)
Higher	-0.821**	-0.377*	0.045
	(0.28)	(0.18)	(0.13)
Long-term Health Problem	4.369***	2.556***	0.903***
	(0.33)	(0.13)	(0.10)
Level of Income			
Middle Income (Reference)			
Lower 25%	0.645***	0.323*	0.163
	(0.18)	(0.13)	(0.12)
Upper 25%	-0.863	-0.092	-0.161
	(0.45)	(0.18)	(0.13)
Constant	-1.512*	-0.673	0.040
	(0.66)	(0.50)	(0.44)
Number of Observations	3865	3865	3865
Log Likelihood	-4811.911	-4811.911	-4811.911

Note: Robust Standard Errors in parentheses. *p<.05 **p<.01 *** p<.001

The Effect of Multidimensional Life Balance across Levels of Physical Activity

Next, we examined whether the magnitude of the effects of having multidimensional life balance differs across the different levels of physical activity. Table 6.4 shows the estimates of the multidimensional life balance (odds ratios) from the multinomial logistic regression analyses[73]. The level of physical activity was measured by the total time spent on moderate to vigorous activities (see Chapter 5 for the list of activities that are included for this activity category). Following the example of Glass et al. (1999) in testing the independence of the effect of non-physical activity, we conducted analyses across the highest, middle and lowest thirds of physical activity groups.

Hypothesis 4, which expected a consistent and significant effect across different levels of physical activity, appears to be partially supported. We found that having multidimensional life balance significantly reduced the odds of reporting poor health among people who were engaged in low and medium level of physical activity (Table 6.4). The effect of multidimensional life balance among the highest level of physical activity group fell below the 0.05 significance level (p=0.063), although the direction of the effect was consistent with other groups (lowered odds).

The magnitude of the effect varies across the physical activity levels. In the low physical activity group, the odds of reporting poor health was reduced by 70% for people with

[73] Control variables are included, but as the results are similar to the previous section and the effect of these variables is of secondary interest, we do not report them here.

multidimensional life balance, while the respective figures were 63% and 38.5% in medium and high physical activity groups. This supports our hypotheses that the protective effect of having multidimensional life balance would be the strongest among the least physically active (H5).

Table 6.4. Multinomial Logistic Regression Results for Self-Assessed Health, According to the Level of Physical Activity

	Odds Ratios for with MLB, Relative to Perceiving Self-Health as 'Very Good'		
Level of Physical Activity	Poor (95% CI)	Fair (95% CI)	Good (95% CI)
Low (N=1709)	0.302*** (0.19, 0.47)	0.616** (0.43,0.88)	0.974 (0.73,1.31)
Medium (N=1609)	0.373*** (0.23, 0.61)	0.438*** (0.30,0.63)	0.719 (0.52,1.00)
High (N=1636)	0.615 (0.37, 1.03)	0.869 (0.62,1.23)	1.012 (0.75,1.36)

Note: Odds Ratios. 95% Confidence Interval in parentheses. *p<.05 **p<.01 *** p<.001. Control variables are also included.

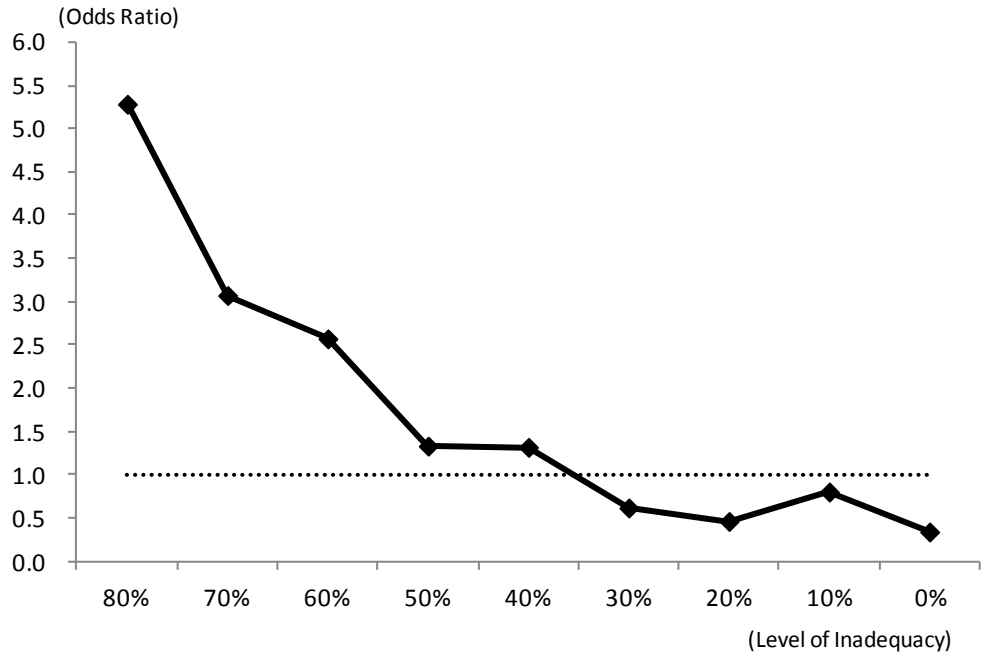
The Intensity of Deprivation and Self-Assessed Health Status

Lastly, we examine whether the intensity of deprivation in terms of daily activity matters for the likelihood of reporting worse self-perceived health status. We conducted multinomial logistic regression analyses using the differing levels of deprivation (measured by the percentage of weighted indicators in which older people have not reached sufficiency) as main independent variables (Table 6.5). As in previous analyses, categories of self-perceived health status were our dependent variables, with *Very Good* as the reference category. These models contain all the control variables previously referred to except the income variable. However, since the main focus of this analysis is to examine the effect of the differing levels of insufficiency, and because the estimates

of control variables are very similar to those previously shown, we report the estimates of the main variable only. Due to the limited sample size, we have combined people with insufficiency in more than 80% of weighted indicators.

We expected that having deprived in broader dimensions simultaneously would be associated with a higher risk of having negative health outcomes. Specifically, we hypothesised that the odds of reporting poor health status would be greater for older people with higher levels of inadequacy (H6). Our results support this hypothesis. As can be seen in Figure 6.2, having insufficiencies in a broader range of weighted indicators is associated with increased odds of perceiving one's health as poor. The odds of reporting poor health rather than very good health is 5.3 times greater for older people with insufficiency in at least 80% of the weighted indicators, holding other factors constant. The difference is then reduced to 3.1 times for people with deprivations in 70% of the weighted indicators, and to 2.6 times for people with deprivations in 60% of the indicators. The odds ratio reduces further at 50%, although it is statistically not significant at the 0.05 level ($p=0.187$). This decreasing trend supports our assumption that among people who do not meet the multidimensional life balance threshold, reaching sufficiency in more indicators reduces the likelihood of reporting poor health substantially.

Figure 6.2. Odds Ratios of the Level of Inadequacy: Results from Multinomial Logistic Regressions for Self-Assessed Health Status, Relative to Reporting 'Very Good' Health.



Note that when deprivations are less than the 40% level, which is the threshold for identifying whether the person has achieved the multidimensional life balance or not, the direction of effect is reversed (Table 6.5). Having *insufficiencies* in 30% or fewer of weighted indicators is negatively associated with health status perceived as worse. That is, older people who are deprived in 30% or fewer of the indicators are more likely report their health as very good rather than poor or fair, despite the existence of deprivation. This provides supports for our choice of overall threshold for the multidimensional life balance: experiencing deprivations in more than 40% of the weighted indicators is negatively associated with health outcomes, but as long as the intensity of deprivation is

less than the overall threshold (in other words, if the person has reached the overall balance) experiencing deprivation per se does not necessarily affect the outcome negatively. Furthermore, our findings show that once the overall balance is reached, the difference in the magnitude of effects across different level of deprivations is relatively smaller compared with the difference in the magnitude of effects below the threshold (Figure 6.2). This implies that once a person has reached the threshold, achieving sufficiency in more indicators does not make much difference in terms of beneficial effects, while below the threshold (higher deprivation), the magnitudes of effect of being deprived in more indicators are substantially larger.

Table 6.5. Multinomial Logistic Regression Results For Self-Assessed Health, Regressed on the Levels of Inadequacy as the Main Independent Variable

	Log-Likelihood Coefficients of Evels of Inadequacy Variables								
Self-Assess Health	80%	70%	60%	50%	40%	30%	20%	10%	0%
Poor vs Very Good	1.665***	1.309***	0.945***	0.287	0.276	-0.483**	-0.773***	-0.222	-1.082**
	(0.45)	(0.36)	(0.26)	(0.22)	(0.17)	(0.17)	(0.19)	(0.20)	(0.33)
Fair vs Very Good	0.661	0.484	0.409	0.392*	0.198	-0.310*	-0.074	-0.208	-0.326
	(0.42)	(0.33)	(0.21)	(0.17)	(0.13)	(0.13)	(0.12)	(0.14)	(0.19)
Good vs Very Good	-0.224	-0.021	-0.001	0.193	0.059	-0.097	0.050	-0.118	0.060
	(0.43)	(0.30)	(0.20)	(0.15)	(0.11)	(0.10)	(0.10)	(0.11)	(0.15)
N	4945	4945	4945	4945	4945	4945	4945	4945	4945
Log Likelihoods	-6192.773	-6201.078	-6201.664	-6210.661	-6211.812	-6207.446	-6198.726	-6212.476	-6203.902

Note: Robust Standard Errors in parentheses. *p<.05 **p<.01 *** p<.001; Control variables are also included.

6.4. Discussion and Conclusions

In the end, the central question for our study comes down to 'whether maintaining multidimensional life balance is beneficial to older people'. This chapter provides a

preliminary answer to this question. At least in terms of self-assessed health, we found a positive association between multidimensional life balance and better health status. Older people with multidimensional life balance were more likely to a positive perception of their health status, controlling for demographic and socio-economic factors that affect self-assessed health status.

It should of course be noted that it would not be possible to establish causal inference due to the cross-sectional nature of our data and the complex relationship between health and activity. It may be the case that older people with better health are able to engage in more activities in general, and hence are more likely to achieve multidimensional life balance, rather than that having multidimensional life balance in itself contributes to better health.

Faced with a similar problem in studying the relationship between well-being and activity, longitudinal studies attempted to identify the temporal order by controlling for the baseline subjective/objective health status. Many found that activity predicted better function and reduced mortality (Bennet, 2005; Menec, 2003). Although such analysis was not possible for us, in an attempt to disentangle the issue, we tested whether the effect of multidimensional life balance on subjective health persists after controlling for the existence of long-term health problems. We did find that the effect remains significant and substantial: having multidimensional life balance increased the probability of

perceiving health positively despite the existence of long-term health problems[75]. This implies that maintaining life balance may help older people to cope with the adverse effect of declining objective health in old age and enable them to hold a positive self-perception of health.

We have also examined whether the effect of achieving multidimensional life balance differs across the level of physical activities. Previous studies of the relationship between activity and positive outcomes examined mainly the impact of participating in specific activities or activity domains. However, it has been unclear how well-being would be affected if one engaged in one activity only (e.g. physical activity) but not in others, or vice versa. Our findings that the effect of multidimensional life balance was significant, regardless of the levels of physical activity except for the most physically active group ($p=0.063$), and that the effect was the strongest amongst the least physically active group, support the proposition that maintaining overall sufficiency may compensate for the loss or decline in a dimension. Pointing out the beneficial effect of solitary activities for older people, Menec (2003, p. S80) suggested that 'as individuals experience declines in various life domains, such as health, function, social relations and so forth, the importance and benefits of different activities are likely to change', and that there may be 'compensatory mechanisms that allow people to maintain psychological well-being

[75] Controlling for the existence of activity-limiting health conditions, we also found a similar results. We did not include this model here as the results are similar. Note that the question was asked only of people with long-term health problems; hence the sample was limited.

when faced with age-related losses'. Our findings regarding the independent effect of multidimensional life balance imply that such adaptation mechanisms may indeed be at work. As our data are cross-sectional, we were not able to study the actual changes and compensations in activities. Further analyses using longitudinal data would enable us to test this proposition further.

Our findings on the relationship between breadth of deprivations and self-assessed health status warrant more detailed discussion as they provide empirical support for our multidimensional life balance measure. First, the findings support the multidimensional life balance cut-off point that we set in Chapter 5. In constructing the measure, the overall cut-off point that distinguishes multidimensional life balance was set at the 40% level. That is, if the person experiences insufficiency in more than 40% of the weighted indicators, he or she is regarded as being *without* multidimensional life balance. In our analysis, we found that the indication of effect on self-assessed health status changed at the 40% level. Insufficiencies in more than the 40% level were associated with an increase in the odds for worse self-reported health status, while insufficiencies at a lower level than this were associated with a decrease in the odds of worse health. Thus, although further refinement is required, for the present the cut-off point can be regarded as being supported empirically and working reasonably well.

Second, the findings support the proposition that what matters is achieving overall sufficiency rather than reaching the maximum level of activity participation. When the level of insufficiency was found to be greater than the cut-off point, having insufficiency

in a broader range of indicators increased the likelihood of perceiving one's health as poor. In other words, among people without multidimensional life balance, the traditional assumption of activity theory that 'the more the activity, the better the outcome' (Havighurst, 1961; Lemon et al., 1972) appears to hold, as the magnitude of negative effect of deprivations substantially decreases as the degree if insufficiency reduces. However, once the level of insufficiency fell below the 40% level (i.e., reached multidimensional life balance), the magnitude of effect remained relatively stable. This is concurrent with the recent findings that a modest amount of activity contributes to positive health outcomes and that additional activities will not necessarily increase the benefit. For instance, Musick et al. (1999) found that productive activity (volunteer and paid work) was most beneficial when working for only one organisation for 40 hours or less annually, and that engaging in more than 100 hours a year did not bring additional benefit, thus suggesting the existence of threshold effects of activity. Our findings therefore support the idea of a multidimensional life balance which emphasises the importance of reaching the minimum thresholds and leaving additional achievement/engagement above the cut-off point as a matter of personal preference. This incorporates the heterogeneity of older people.

Last, the findings justify why it is important to focus on older people without multidimensional life balance, who are deprived in multiple indicators simultaneously. We found that older people with a wider range of deprivations ran a much higher risk of a negative perception of health. Thus, while lacking some activity may be a result of personal preference or daily condition, lacking activities in multiple domains can be a

sign of failure in adapting to a changing time structure in later life (Chapter 2). In multidimensional poverty research, it has been argued that the consequences of multiple disadvantages far exceed the sum of their individual effects (Alkire and Foster, 2011). Likewise, while being sedentary or being alone can be an outcome of personal preference (and can be compensated for by participation in other activities), if a person's daily life embraces a continuum of isolated, sedentary, non-productive and non-cognitive time use, it could be detrimental to well-being. The increased risk of poor health for people with multiple deprivations in our study provides preliminary empirical evidence for the harmful effect of multiple deprivations on well-being.

In addition to problem of the causal inference we have discussed above, several other limitations of the study should be noted. First, due to the limitation of the data, we were not able to test whether other health-related variables such as depression were also associated with multidimensional life balance. Furthermore, although self-assessed health is an important predictor of a range of well-being outcomes (Kaplan et al., 1996, Wolinsky et al., 1995), this alone may not be sufficient to justify the relationship between multidimensional life balance and well-being, as it has been argued that the influence of activity varies depending on the outcome variables (Menec, 2003). Thus, further studies on various well-being outcomes such as mortality, life-satisfaction and happiness would be necessary to provide further evidence. Second, we were not able to include objective health status as a control variable. Although the existence of a long-term health problem was included in the analysis, this is measured on the basis of self-report, which may not accurately represent the person's objective health status. Furthermore, from this measure

alone we were not able to distinguish the degree of disability or limitation in activity this problem causes. We did conduct a separate analysis using the question whether the respondent experienced limitation in activity due to the problem, and obtained consistent results, but more refined health measurement would be necessary to properly control for objective health status. Lastly, although we used only 'usual day' diaries for our analysis, this does not guarantee that they reflect the general lifestyle of the respondents.

Despite the limitations, the findings of this study provide empirical support for the concept of multidimensional life balance, and demonstrate the analytical possibility of the measure. Furthermore, the study contributes to the literature of self-rated health status by showing that maintaining overall balance in daily activity is associated with a positive perception of health. In the next chapter we discuss the implication of the findings further, in a broader context.

7. Conclusion: Understanding Later Life from the Perspective of Life Balance

The focus of this thesis has been on how patterns of time use change in later life and how the way in which older people use time is related to well-being. Our major conclusions are organised around the four main themes we have been discussing: (1) a comprehensive framework for studying older people's time use; (2) social dynamics of life balance; (3) a multidimensional approach to understanding the relationship between activity and well-being in later life; and (4) gender gap in life balance in later life.

In this final chapter we summarise the main arguments and empirical findings of the thesis, followed by research implications and future avenues. We conclude by discussing how the perspective of life balance would enhance our understanding of later life.

7.1 Developing a Comprehensive Framework for Studying Older People's Time Use

We attempted to develop a conceptual framework for studying time use in later life by incorporating the concept of balance. We argued that maintaining balance in time use matters not only to working-age people, as the work-life balance framework posits, but concerns people of all ages, for whom work may not occupy the central position in daily life. We proposed an alternative life balance framework, which consists of two conceptual models that can be applied to study empirically the issue of balance beyond work life: the life balance triangle model and the multidimensional life balance model.

First, we built a conceptual model of life balance triangle that focuses on maintaining balance between time constraints and freedom of choice. We maintained that both time constraints and time abundance should be considered when thinking about the issue of balance, because too much of the former can be a source of time pressure and too much of the latter can destroy time routine, which can be detrimental to well-being. Modifying and adapting the seminal works of Ås (1978) and Gershuny (2003), we proposed to replace the three dimensions of the work-life balance triangle (paid work, unpaid work, and leisure) that describes the daily time use of younger adults with the three dimensions of the life balance triangle: committed time (time for activities that involve commitments and time constraints, e.g. work), discretionary time (leisure/free time), and regenerative time (time for meeting biological/physiological needs, e.g. sleep). This model addresses how the patterns of time use change across the life course through the life balance dynamics (Section 7.2).

Second, we developed the conceptual model of multidimensional life balance to explore how the way people spend time is related to well-being in later life from a multidimensional perspective. The unidimensional approaches that assume a linear relationship between the level of specific activity and well-being are not sufficient to account for the heterogeneity of older people, who face various challenges and opportunities in later life with different preferences and capacities. We argued that, just as eating one kind of food only would not enable us to remain healthy (however nutritious it may be), being deeply engaged in one activity domain (however beneficial it may be) would not guarantee positive outcomes in later life, because various activity domains are

involved in maintaining well-being. Adapting the innovative framework of multidimensional poverty research (Alkire and Foster, 2011; Alkire and Santos, 2013; Seth and Alkire, 2014), we proposed the multidimensional life balance model that considers older people's overall achievement across five activity dimensions (physical, cognitive, social, productive, and out and about) as an important contributing factor for well-being. In studying the relationship between older people's activity and well-being, this model adopts a threshold-based approach that focuses on the negative effect of not reaching the minimum activity thresholds in multiple activity domains[76], rather than considering the positive effect of activity maximisation in each domain (Section 7.3).

7.2. Social Dynamics of Life Balance

The results from our analyses using the life balance triangle model showed that in later life, the balance in time use moves towards having more discretionary time and less committed time (Chapter 3 and Chapter 4), which corresponded to modern expectations of later life in affluent societies as a period of discretionary pursuits, free from work and obligations (Robinson and Godbey, 1997; Laslett, 1996; Chatzitheochari and Arber, 2011; Leeson, 2006). The graphical representation using the life balance triangle

[76] While taking into account people's preference for participating or not in certain activities when assessing the level of daily activity, this model maintains that lacking activities in multiple indicators *simultaneously* is a sign of a problem.

effectively summarised how the balance shifts according to demographic and socio-economic factors (Chapter 3).

Our findings also indicated that the patterns of time use change across the life course through the life balance dynamics, mainly through the changing balance between committed time and discretionary time, as regenerative time is relatively stable across the life course (Chapter 3 and Chapter 4). The results provided empirical support for our theoretical assumption that the distribution of the share of discretionary time would assume a U-shape across the life course while the share of committed time would assume an inverted U-shape, reflecting the expectations and norms attached to each life stage (Chapter 2).

Furthermore, analyses of the main determinants of the life balance in later life revealed that the life balance dynamics were influenced more by economic activity status than by age or health. Considering that the majority of British older people in our sample were not in paid work because of retirement, which has developed as a social institution, it can be inferred that the shifts in life balance in later life we observed are largely a consequence of social structure (e.g. retirement) rather than of biological ageing. With the observed gender gap in life balance in later life which we will discuss separately in Section 7.4., this result supported our argument that patterns of time use in later life are socially determined, reflecting the expectations and structure of society.

7.3. Multidimensional Approach to Understanding the Relationship between Activity and Well-Being in Later Life

The findings using the multidimensional life balance model supported our proposition that what matters for well-being is achieving overall sufficiency in daily activities rather than reaching the maximum level of participation in a specific activity.

We defined a person as having achieved multidimensional life balance if he or she has reached the minimum activity thresholds in at least 60% of the weighted indicators from five activity dimensions that are known to be essential for older people's well-being. Among people in the UK aged 50 and over in 2000-2001, about 60% were identified as having multidimensional life balance, and about 40% as lacking multidimensional life balance. That is, 40% of these older people did not reach the minimum activity levels in multiple activity indicators (Chapter 5).

We found a substantial and significant difference between self-assessed health status (which is one of the widely-recognised measurements for well-being) of older people with and without multidimensional life balance. Having multidimensional life balance increased the probability of perceiving health positively, controlling for the demographic and socio-economic factors that are known to be associated with self-assessed health status (Chapter 6). The effect of multidimensional life balance persisted after controlling

for the existence of long-term health problems [77], implying that maintaining multidimensional life balance may help older people to cope with the adverse effect of declining objective health.

We also found that while lacking activities in a wider range of domains (i.e. deprived in several activity indicators) was associated with an increased risk of reporting poor health among people without multidimensional life balance (i.e. below the balance threshold), once the balance thresholds have been reached, the magnitude of the effects of activities on health remain relatively constant regardless of reaching sufficiency in additional domains (Chapter 6). This result provided empirical support for our choice of balance threshold (reaching sufficiency in at least 60% of the weighted indicators), as well as implying the existence of threshold effect that what matters is to reach the overall balance, rather than maximising activity levels.

The incidence of people without multidimensional life balance varied across demographic and socio-economic groups. Specifically, men were more likely than women to be without multidimensional life balance; and older age, not being in paid work, and lower education were also independently associated with the increased probability of being without multidimensional life balance. Not only were more people in these groups found to be without multidimensional life balance, but they also tended

[77] See Section 7.6 for further discussion.

to report insufficiencies in broader activity domains. By contrast, factors such as being in a couple and having a higher level of education were positively associated with the likelihood of achieving multidimensional life balance. We also found that the areas that contribute most to the overall insufficiency level for people without multidimensional life balance differed according to demographic and socio-economic factors (Chapter 5). The findings demonstrated the importance of a multidimensional approach and the applicability of the multidimensional life balance model in empirical studies of older people's daily activities.

7.4. Gender Gap in Life Balance in Later Life

Another important finding of the thesis is the quantitative gender gap in life balance in later life. A significant gender gap was found in both analyses using the life balance triangle and the multidimensional life balance, suggesting the transition to later life is experienced differently according to gender.

First, from the life balance triangle analysis (Chapter 3), we found that unlike in the middle stage of life where little difference was found in life balance between men and women, there was a significant gender gap in old age. Although the balance point both of men and of women moved towards more discretionary time and less committed time in later life, the degree of change was much greater for men. Especially in the group in their sixties and seventies, the balance point of men located farther on the right side of the triangle than the balance point of women, indicating a much greater share of discretionary time and less share of committed time for men. The gender gap was reduced

only in the oldest age group (over 80), implying that it may be the case that older women contribute more than men to unpaid work, until the women themselves become very old. The difference in life balance by economic activity status was much greater for men[78]. These results were also confirmed in multivariate analyses that found that the magnitude of effects of the main determinants of life balance, such as economic activity status, age and marital status, to be gender specific (Chapter 4).

Second, men were more likely than women to be without multidimensional life balance. Men without multidimensional life balance were also found to lack activities in broader activity dimensions, and tended to be more likely to lack sufficiency in productive activity, while women without multidimensional life balance tended to be more likely to lack sufficiency in time spent away from home and time spent alone (Chapter 5).

These findings imply that men may have greater difficulty in adjusting to life beyond work. A larger difference in life balance between men with and without paid work suggests that men would experience a greater change than women in their patterns of time use as they make their transition to later life (Chapter 3). The higher incidence of men without multidimensional life balance in later life may be a consequence of such change (increase in discretionary time/loss of time routine). At the same time, the finding

[78] In Chapter 3, we found that the gender gap in life balance by economic activity status reduced between 1983-1984 and 2000-2001. Older women without paid work had more discretionary time in 2000-2001 compared with 1983-1984, while older men without paid work had more committed time in 2000-2001 compared with 1983-1984.

that the committed time of women is not reduced to the same degree as men's in later life implies that the gendered division of work appears to persist in later life[79].

7.5. Limitations and Future Avenues

7.5.1. Cross-Sectional Data with Limited Outcome Variables

The first caveat that should be noted concerns the data. Although the time use data we have employed in this study enabled us to investigate older people's daily life and well-being in a rich and innovative way, two major limitations must be acknowledged.

First, as we have discussed in Chapter 3 and Chapter 6, casual direction of observed relationships requires further investigation, because the cross-sectional nature of the data prevents us from establishing the temporal order. For instance, whether having more committed time contributes to maintaining better subjective health, or having positive subjective health enables older people to spend more time on committed dimension cannot be determined by the present study. Similarly, although it might be reasonable to assume that people with poor health would need more regenerative time, it is also possible that too much regenerative time, such as excessive sleep, contributes to negative health status (Chapter 3; see Cappuccio et al., 2011 for a review between sleep duration and

[79] An interesting implication would be that while the burden of household work may have been a source of much stress and time pressure in the middle stage of life, in later life it may operate as a source of a daily routine and time structure, as long as it does not cause too much time constraint and if health permits.

health outcomes). Similarly although we have controlled for the influence of long-term health problems that may physically limit people's daily activity, we still cannot rule out the possibility that having positive perception of self-health status contributes to a more active lifestyle, and hence, quite likely to achieving multidimensional life balance (Chapter 6).

The problem of causality has been a recurrent issue in the study of older people's activity and well-being[81]. Although using longitudinal data would not solve the problem of casualty, further research using longitudinal data would enable us to identify the temporal order of the observed relationships. Using longitudinal data would also be useful to compare changes in patterns of time use before and after retirement, as well as changes linked to the duration of retirement (how long since the person retired), thus allowing us to explore the issue of time structure and multidimensional life balance in later life further.

[81] Discussing the problem of studying the link between older people's social activity (through multiple role engagement) and health using cross-sectional data, Moen et al. (1992, p. 1613) argued that the issue was 'one of social causation versus social selection'. While social causation assumes that engaging in social activity and in multiple roles influences health, social selection posits that people with better health are more likely to take on and maintain multiple social roles. They concluded that 'causation and selection are probably both operating simultaneously and interactively' (1991, p. 1613). Warr, Butcher and Robertson (2004) also recognised the problem that while it is more likely that activity has an impact on well-being because it is often accompanied by goal-achievement and other positive elements essential for well-being, individuals with positive well-being can also be more 'likely to exhibit greater levels of activity' (2004, p. 173).

Second, further research using various other outcome variables such as life satisfaction[82], happiness, quality of life, and mortality would allow us to explore the relationship between life balance and well-being in later life from a wider context. Although self-assessed health, which we used as an outcome variable, is an important measure that has been found to be 'a major component in people's life satisfaction or subjective well-being, especially at old age' (Benyamini et al., 2003, p. 1661), we were unable to test directly the effect of life balance on life satisfaction or other subjective well-being measures. Testing the effect of maintaining life balance on psychological well-being would contribute to clarifying the direction of effect a step further, and provide more information about the relationship between how older people spend their time and their well-being in later life.

7.5.2. Complementing with Information Obtained from Stylised Questions

It is important to reemphasise that what time diary data, being a collection of random samples of diary days across society, reveals, is which groups of people are more likely to achieve life balance *on any given day*, rather than identifying those who *live a life* with life balance in general. Although it is also important to identify who is more likely to have achieved life balance on a given day, it is not the same as identifying whether this balance is maintained in the usual daily life. In an attempt to address this issue, we have

[82] Although it was beyond the scope of the present study, some time diary data, such as the UK 1987 time use data, include life satisfaction as a variable. With the collection of the new 2014-2015 UK time use data, there may be more scope to test this further.

used diaries that are recorded as '*usual* day' by diarists (Chapter 1, Chapter 5), cautiously assuming that the patterns of time use recorded on an ordinary day would be more likely to reflect the general activity patterns of the diarists.

In future research, the information obtained from stylised questions can be incorporated to complement the current life balance measure based on the diary day. One of the advantages of using the AF method is its flexibility in constructing the multidimensional measurement. In the UK 2000-2001 survey, there is a range of stylised questions regarding paid work, education, voluntary work, care, and leisure activities. Respondents were asked 'whether or not you have done [this activity] in the 4 weeks ending yesterday'; 'how many times'; and for 'how long'. We can then construct another multidimensional life balance index based on these indicators/dimensions at the monthly level, and compare it with the multidimensional life balance at the daily level. Furthermore, although it is outside the scope of this thesis, it is also possible to construct an overarching multidimensional measure regarding older people's quality of life by using multidimensional life balance based on time diary as one of dimensions along with income, housing, health, and other important conditions that are necessary for older people's well-being. If surveys of older people such as the English Longitudinal Study of Ageing (ELSA), which contains abundant questions on older people's lives, were to incorporate time diary measures in the future, it would greatly enhance our understanding of older people's daily life and well-being.

7.5.3. Sequence Analysis

In this study, we have used aggregated 'time budget' statistics (Gershuny, 2011, p. 7) to explore how older people use their time. This aggregated analysis enabled us to understand the time allocation of older people (e.g. how much committed, discretionary, and regenerative time), and to assess the level of daily activity in terms of the amount of total time spent on each domain (e.g. how much physical, cognitive, or productive activity older people engage in). However, this approach does not allow us to explore the rhythms of daily life, in terms of *when* and *in what sequence* activities happen during the day. As Gershuny explained, time diary records also provide 'a repeating stream of activity sequence information' (2011, p. 7), which can be used to study the scheduling and the timing of daily activities (Lesnard and Kan, 2011). Utilising this information from the diary data would enable us to identify the daily time structure of older people not only in terms of amount of time, as we have done in this study, but also in terms of timing and sequence. For instance, it would be interesting to investigate whether regularity in terms of daily time use (e.g. regular schedules) would have a positive influence on well-being. In addition, the use of sequence data over a longer period (e.g. seven days) would enable us to empirically test our assumption that people with a balance between committed time and discretionary time would be more likely to maintain the time structure (daily rhythm). The sequential data would also be useful in refining the measurement of multidimensional life balance, as it would allow us to measure and assess the impact of longer spells of activity. For instance, we would be able to test whether sitting for several hours uninterruptedly is more harmful for older people's well-being than spending the

same amount of time distributed sporadically throughout the day, and to reflect the result to revise the indicator.

7.5.4. More Discussion and Possible Revision of the Cut-Offs and Dimensions

> […] no such magic formula does, of course, exist, since the issue of weighting is one of valuation and judgement.
>
> Sen (1999, p. 79)

As we discussed in Chapter 5, constructing the multidimensional life balance measurement involved a number of choices: of dimensions, indicators, cut-offs for each indicators, the balance cut-off across indicators, and weights. As Alkire (2013) explained, these choices involve value judgements and are guided by the objective of developing the measure. As this thesis is the first attempt to construct such a measure on the time use of older people, further refinement and revision of the dimensions, indicators, and cut-offs are crucial. In choosing the dimensions, for instance, Alkire (2013) suggested a list of possible methods and recommended that ideally a combination of methods would be desirable. The methods include: existing data or convention, theory, public consensus, ongoing deliberative participatory processes and empirical evidence regarding people's values. While we used a theory-based approach (activity theory, productive theory, and successful ageing) as well as an empirical evidence-based approach (i.e. activities that are found to be beneficial to older people) to propose the five dimensions, the essential dimensions for multidimensional life balance of older people have not yet been defined and remain a matter for further exploration.

The thresholds for each indicator could also be updated if new empirical evidence for a minimum (or maximum, in the case of sedentary activity) level of recommended activity were found in each field. In particular, more discussion and tests are needed regarding the use of a threshold of 50% below the median for some indicators. Although above or below median is commonly used as a cut-off in assessing the level of activities or use of time (e.g. Maier and Klumb, 2005; Bardasi and Wodon, 2006), it is a relative threshold based on distribution rather than an absolute one. In absence of absolute guidelines identified by empirical research, we chose to use this relative threshold because we believe it is important to take social context into account when determining the minimum threshold. Further empirical analysis of other datasets, including cross-country and cross-time comparison, will enable us to test and refine the threshold further.

7.5.5. Use of Life Balance Triangle and MLBI for Cross-Country, Cross-Time Comparison

We have used the MTUS version of the UK time use data for the construction of the life balance measurements and their empirical applications. This was deliberately done, not only because of the superior usability and good data quality of the MTUS, but also because the MTUS, being the largest harmonised dataset of cross-country and cross-time, will be able to be used for investigating differences in life balance across countries and changes in life balance over time in the future. Although we have specifically designed and developed the life balance measurements for comparative studies (e.g. building on the 69 harmonised MTUS activity codes), the actual comparative study was beyond the scope of the present thesis, which focused on proposing the new conceptual framework

and methodology. We thus limited our empirical analysis mainly to the UK 2000-2001 time use data as it included the relevant variables for our study. Further studies that utilise the rich dataset of the MTUS will reveal further interesting aspects regarding life balance dynamics, and also allow us to conduct additional robustness tests for our initial measure[83].

For instance, one of the main strengths of the Gershuny virtuous triangle which we adapted to construct the life balance triangle is the insight coming from the effective graphical representation of the historical trajectories and international differences of work-leisure balance. By observing how the balance between work and leisure changed over time and how it varies by countries, he discovered 'three convergences in time use patterns: by nation, gender and class' (Gershuny, 2003, p. 5). Likewise, using the MTUS data, we will be able to explore the historical trajectories of life balance of older people as well as the international differences in the life balance triangle, which would provide us with further insight. In addition, although longitudinal data are not yet available for the UK time use data, as MTUS includes multiple numbers of UK time use data since 1960s, we will be able to conduct pseudo-cohort analyses to investigate whether changes in life balance in later life reflect the cohort effect. For instance, empirical questions, such as whether earlier cohorts had made the transition to later life (reversal of committed-

[83] See Alkire and Foster (2011) for the discussion of robustness tests.

discretionary time ratio) at an earlier point in their life compared with the later cohorts or vice versa, may be investigated.

The scope of the present thesis also did not allow us to fully utilise the potential of multidimensional life balance measurement. As in the case of the Multidimensional Poverty Index (MPI), one of the major strengths of the AF methodology is that it provides an overall summary measure – a headline indicator (Alkire, Roche and Sumner, 2013) – that can be compared across country and across time, not only in terms of the incidence (H), but also the intensity of the deprivations (A)[84]. Comparing the multidimensional life balance of older people across countries will open an interesting array of questions: whether there are any differences in the number of older people who achieved multidimensional life balance; whether the intensity of deprivation in terms of activity level would differ among countries with similar level of people without multidimensional life balance; whether the structure of imbalance (the contribution of indicators) would vary across countries; and what the determinants of these differences might be. Moreover, comparing the changes in multidimensional life balance over time will enable us to track changes in the proportion of people who achieve this balance and identify the areas in which older people lack sufficiency.

[84] See Chapter 5 for detailed discussion of the AF methods.

7.6. Understanding Later Life from the Perspective of Life Balance: Main Contributions of the Thesis

This thesis constitutes an attempt to answer the question of how we spend time in later life and how the way we spend time affects well-being. We applied the perspective of balance to explore the answers empirically. As Keynes had predicted, regarding the arrival of a leisured society, when paid work was removed from the centre of daily life, the balance in time use shifted to having more discretionary and less committed time.

We expected that older people who managed the challenges and opportunities of later life – including the increased discretionary time and changing physical, mental, and socio-economic capacity — by making adaptations and adjustments in daily life, would maintain well-being. We sought to find out whether empirical evidence of such an adaptation could be found in the way older people use time. The empirical findings indicated that reaching overall sufficiency in multiple activity dimensions is linked to better self-assessed health. That is, even if an older person cannot (or does not wish to) participate in all the recommended activities, as long as he or she engages in sufficient level and range of activities whichever he or she prefers and possible to do, it may be beneficial for well-being. We could thus conclude that time use in later life in affluent societies is characterised by increased discretionary time and decreased committed time, and that the way older people use time (achieving multidimensional life balance by reaching the overall threshold) is associated with well-being in later life.

The main contributions of the thesis can be summarised in three points. First, this thesis raised a theoretical question of balance in time use in later life. The existing framework of work-life balance was not applicable to other life stages of life where paid work does not hold a central position. By proposing an alternative conceptual framework of the life balance triangle that considers both the issue of time constraints and time abundance based on the classic works in the field of time use research and unemployment research (Å s, 1978; Gershuny, 2003; Jahoda et al., 1933/1972), this thesis extends the applicability of the concept of balance into all stages of life. In so doing, the thesis also contributes to the field of ageing and life course research by suggesting that transitions to new life stages can be understood as the life balance dynamics, which reflect social structure and expectations attached to each life stage. The conceptual model of life balance across the life course presented an abstract view of how patterns of time use change with the life course transition, and this pattern was confirmed by empirical results.

Second, this thesis provided new empirical measurements for studying patterns of time use in later life by applying innovative methods. Modifying the work-leisure triangle of Gershuny (2003), we developed the life balance triangle model that intuitively visualises how the 24 hours in the day of older people are allocated between three dimensions of time, and how the balance between these dimensions shifts according to various factors such as age, gender, economic activity status, and health status. Applying the Alkire and Foster method in multidimensional poverty research (Alkire and Foster, 2011), we built the multidimensional life balance model, which reflects the heterogeneity of older people and the multidimensionality of daily life. This model provides a summary measure that

can assess and monitor the overall achievements of older people in terms of daily activities, and enables us to identify older people who lack activity in multiple dimensions simultaneously. In so doing, the multidimensional life balance model enabled a multidimensional approach to study the relationship between activity and well-being in later life. These two empirical measurements contribute to the field of time use research by providing an innovative way of utilising the rich information provided by time diary materials.

Third, the empirical findings of the thesis contribute to enhancing our understanding of later life, and provide implications for designing policy for older people. The findings suggest that the patterns of older people's time use in the UK is consistent with the expectation in affluent societies of later life as a phase of increased discretionary time and less committed time. The fact that what determines this shift in life balance was social structure, rather than age, implies that the timing of the shift (i.e. transition to later life measured in this sense) can be influenced by policy. Whether the observed pattern of life balance across the life course (Chapter 4) is desirable for individuals and for societies in the century of unprecedented population ageing and longevity thus warrants further research and discussion[85].

[85] The observed pattern in the UK in 2000-2001 still displayed an age-differentiated structure consisting of education (young) – work (middle) – leisure (old) that Riley and Riley (1994) described as lagging behind the changes in people's lives. Whether age-integrated structure that role opportunities are open to people of every age (Riley and Riley, 1994) would come into being is a question for future exploration.

Furthermore, the findings that men tend to experience greater changes in later life in terms of time structure and also tend to be more likely to be without multidimensional life balance shed lights on why they often find retirement more stressful and have difficulty in adjusting to later life (Nuttman-Shwartz, 2004). This suggests the importance of retirement planning both at the individual and the policy level, not only in terms of financial preparation but also in terms of how to spend time in later life, especially for men (Rosenkoetter et al., 2001).

More importantly, we found that having multidimensional life balance defined by reaching the thresholds across activity domains positively contributes to better self-assessed health. The unidimensional approaches that assumed a linear relationship between activity and well-being emphasised active engagement in a number of activity domains without considering older people's capacity and preferences, had been criticised because they run the risk of disempowering older people who do not meet the criteria for 'a good old age' (Martinson and Minkler, 2006). Our findings showed that as long as older people maintain an overall balance across a sufficient number of activity domains according to their preferences and circumstances, they can maintain well-being even if they do not participate in all the recommended activity dimensions. At the same time, the multidimensional life balance measurements would enable policy makers to identify and target people with multiple deprivations in daily activities, and to design policy that could improve their level of balance. For instance, improving older people's access to the outside world would reduce the number of people who do not meet the thresholds in the *out and about* dimension, which was found to be one of the most important factors

contributing to the multidimensional imbalance of older people. The policy debates on older people, such as recent debates in the UK regarding the retention or withdrawal of free bus travel for older people (Thurley et al. 2013), should consider the role of social infrastructure on maintaining the multidimensional life balance of older people.

Appendix

This appendix supplements materials included in empirical chapters. Appendix A3.1 and A3.2 provide descriptive statistics of variables that were included in analyses in Chapter 3. Appendix A4.1 presents the main reasons for not being in paid work for people aged over 50 in the UK. A4.2 presents the results from the regression analysis that includes income variables in Chapter 4. Appendixes A5.1 to A5.4 list the classification of the activities for constructing the indicators in Chapter 5. A5.5 presents the estimates from the binary logit model for the determinants of multidimensional life balance. Appendix A5.6 presents the MLBI by usual/unusual diary groups. Appendix A6.1 presents the estimates from the ordinal logistic regression analysis for the relationship between self-assessed health status and multidimensional life balance.

A3.1 Descriptive Statistics of Selective Variables, UK 2000-2001

	Total Sample		Aged 18-49		Aged over 50	
Variables	%/Mean(SD)	N	%/Mean(SD)	N	%/Mean(SD)	N
Gender						
Men	47.56	7,462	47.86	4,438	47.15	3,026
Women	52.44	8,227	52.14	4,834	52.85	3,391
Total	100	15,689	100	9,272	100	6,417
Age	46.9 (17.4)	15,689	34.1(8.8)	9,272	64.1(9.6)	6,417
Work Status						
Not in Paid Work	40.12	6,295	78.37	7,267	34.87	2,238
In Paid Work	59.88	9,394	21.63	2,005	65.13	4,179
Total	100	15,689	100	9,272	100	6,417
Self-Assessed Health						
Poor	6.38	1,001	3.25	302	10.6	680
Fair	19.12	3,000	13.2	1224	27.13	1,741
Good	37.62	5,903	38.76	3594	36.09	2,316
Very Good	36.88	5,786	44.78	4152	26.18	1,680
Total	100	15,689	100	9,272	100	6,417

A3.2 Descriptive Statistics of Selective Variables, UK1983 -1984

	Total Sample		Aged 18-49		Aged over 50	
Variables	%/Mean(SD)	N	%/Mean(SD)	N	%/Mean(SD)	N
Gender						
Men	40.77	3,314	38.86	1,997	44.07	1,317
Women	59.23	4,814	61.14	3,142	55.93	1,672
Total	100	8,128	100	5,139	100	2,989
Age	44.1(17.2)	8,128	32.8 (8.8)	5,139	63.6 (8.3)	2,989
Work Status						
Not in Paid Work	53.71	4,365	66.98	3,442	30.88	923
In Paid Work	46.29	3,763	33.02	1,697	69.12	2,066
Total	100	8,128	100	5,139	100	2,989
Self-Assessed Health						
Poor	4.16	338	3.85	198	4.69	140
Fair	14.84	1,206	12.68	651	18.57	555
Good	38.98	3,168	39.55	2,032	38	1,136
Very Good	42.02	3,415	43.93	2,257	38.74	1,158
Total	100	8,128	100	5,139	100	2,989

A4.1 Reasons for Not in Paid Work, Aged 50 and Over, UK 2000-2001

	Men		Women		Total	
Main Reason for not in paid work	%	N	%	N	%	N
Waiting for results of a job interview	0.12	2	0	0	0.05	2
Student		0	0.26	6	0.15	6
Looking after family/home	0.72	12	8.51	197	5.26	209
Temporarily sick or injured	0.36	6	0.61	14	0.5	20
Long term sick or disabled	14.15	235	7.48	173	10.26	408
Believes no jobs available	0.36	6	0.09	2	0.2	8
Not yet started looking	0.6	10	0.35	8	0.45	18
Retired from paid work	79.95	1,328	77.1	1,784	78.29	3,112
Any other reason	3.73	62	5.36	124	4.68	186
Don't know	0	0	0.09	2	0.05	2
Refused	0	0	0.17	4	0.1	4
Total	100	1,661	100	2,314	100	3,975

Source : UK 2000-20001 Time Use Survey

A4.2 Estimates from OLS Regression Model for Household Income Variable on the Share of Committed, Regenerative, and Discretionary Time Per Day, Aged 50 and Over, UK 2000-2001

	Model 7		
	Committed	Regenerative	Discretionary
Female	0.02***	0.01***	-0.03***
	(0.00)	(0.00)	(0.00)
Age Group			
50-59	(Reference)		
60-69	-0.03***	0.00	0.03***
	(0.01)	(0.00)	(0.01)
70-79	-0.04***	0.02***	0.02**
	(0.01)	(0.00)	(0.01)
80+	-0.06***	0.04***	0.02**
	(0.01)	(0.01)	(0.01)
Beyond Work Life	-0.13***	0.04***	0.10***
	(0.01)	(0.00)	(0.01)
Couple	0.00	0.01***	-0.01**
	(0.00)	(0.00)	(0.00)
Education			
Lower	0.00	-0.00	-0.00
	(0.01)	(0.00)	(0.01)
Secondary	(Reference)		
Higher	-0.01*	-0.01*	0.02***
	(0.01)	(0.00)	(0.01)
Health			
Poor	-0.03***	0.01	0.02**
	(0.01)	(0.01)	(0.01)
Fair	(Reference)		
Good	0.02***	-0.00	-0.02**
	(0.01)	(0.00)	(0.00)
VeryGood	0.02***	-0.01*	-0.01*
	(0.01)	(0.00)	(0.01)
Income			
Lower 25%	-0.01	0.00	0.01
	(0.01)	(0.00)	(0.00)
Middle 50%	(Reference)		
Higher 25%	0.01	-0.00	-0.01
	(0.01)	(0.00)	(0.01)
Constant	0.33***	0.41***	0.26***
	(0.01)	(0.01)	(0.01)
N	3940	3940	3940
F	137	36	87
R^2	0.348	0.123	0.238

A4.3 Gender-Specific Estimates from OLS Regression Model for Household Income Variable on the Share of Committed, Regenerative, and Discretionary Time Per Day, Aged 50 and Over, UK 2000-2001

	Committed		Regenerative		Discretionary	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Age Group						
50-59	(Reference)					
60-69	-0.04***	-0.03***	0.01	0.00	0.03***	0.03***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
70-79	-0.04***	-0.03***	0.02***	0.02**	0.02	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
80+	-0.06***	-0.05***	0.05***	0.03**	0.01	0.03**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Beyond Work Life	-0.16***	-0.11***	0.04***	0.03***	0.12***	0.08***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Couple	-0.01	0.01	0.01	-0.01	-0.00	-0.00
	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
Education						
Lower	0.00	-0.00	-0.01	0.00	0.00	-0.00
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Secondary	(Reference)					
Higher	-0.02*	-0.00	-0.01	-0.01	0.03***	0.01
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)
Health						
Poor	-0.04***	-0.03***	0.00	0.01	0.03**	0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Fair	(Reference)					
Good	0.02*	0.02**	-0.00	-0.00	-0.02*	-0.02**
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
VeryGood	0.02**	0.01*	-0.01	-0.01	-0.02*	-0.01
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)
Living Alone	0.00	-0.00	-0.01	-0.02**	0.01	0.03**
	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
Income						
Lower 25%	-0.01	-0.00	0.01	0.00	0.00	0.00
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Middle 50%	(Reference)					
Higher 25%	0.02	-0.00	-0.00	0.01	-0.01	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	0.35***	0.33***	0.41***	0.44***	0.24***	0.23***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
N	1876	2064	1876	2064	1876	2064
F	81	57	25	13	49	39
R^2	0.382	0.319	0.158	0.090	0.266	0.211

*p<0.05, ** p<0.01, *** p<0.001

Classification of the Activities for Constructing the Indicators for the Multidimensional Life Balance Model

A5.1 Physical Dimension

1) Being Active

Activities that are classified as moderate to vigorous activity, 3.0=<MET

MTUS Code	Activity	MET
20	cleaning	3.0
22	home maintenance	3.3
42	general sport or exercise	5.1
43	walking	3.8
44	cycling	8.0
45	other out-of-doors recreation	6.0
46	garden, forage(pick mushrooms), hunt/fish	4.5
47	walk dogs	3.8
mtrav=3	walk/ on foot	3.8
mtrav=4	cycle, other physically active transport	8.0

2) Minimising Sedentary

3)

4)

Activities that are classified as sedentary, 1.0<=<MET<1.6

MTUS Code	Activity	MET
5	meals at work/school	1.5
6	other meals	1.5
49	conversation (in person, phone)	1.5
50	other in-home social, games	1.5
51	general indoor leisure	1.5
52	artistic or musical act	1.5
55	relax, think, do nothing,	1.21
57	listen to music, ipod, cd	1.38
58	listen to radio	1.15
59	watch TV, DVD, video	1.33
60	play computer games	1.5

A5.2 Social Dimension

MTUS Code	Activities that are classified as social
15	regular schooling, education
17	leisure/other education of training
25	consume personal service
26	consume other service
29	teach help homework
30	read to paly with child
33	voluntary, civic activity
34	worship and religion
35	general out-of home leisure
36	attend sporting event
37	cinema, theatre, opera concert
38	other public event, venue
39	restaurant, café, bar, pub
40	party, reception, social event, gambling
48	receive or visit friends
49	conversation (in person, phone)
50	other in-home social, games

A5.3 Cognitive Dimension

MTUS code	Activities that are classified as cognitive
15	regular schooling, education
16	homework
17	leisure/other education of training
29	teach help homework
37	cinema, theatre, opera concert
50	other in-home social, games
52	artistic or musical act
53	written correspondence
54	knit, crafts, hobbies
56	read
60	play computer games
61	send e-mail, surf internet, computing

A5.4 Productive Dimension

MTUS code	
7	paid work, main job, not at home
8	paid work at home
9	second or other job at home
10	unpaid work to generate household income
11	travel as a part of work
18	food preparation/cooking
19	set table, wash dishes
20	cleaning
21	laundry, ironing
22	home maintenance
23	other domestic work
24	purchase goods
27	pet care
28	physical child care
29	teach help homework
30	read to / paly with child
31	supervise accompany child
32	adult care
33	voluntary, civic activity
46	garden, forage(pick mushrooms), hunt/fish
47	walk dogs
54	knitting, crafts, hobbies
65	voluntary, civic, religious travel
66	child&adult care travel
67	shopping, personal & household care travel

A5.5 Estimates from Binary Logit Model for the Determinants of Multidimensional Life Balance, UK2000-2001

Balanced Day vs Non-Balanced Day

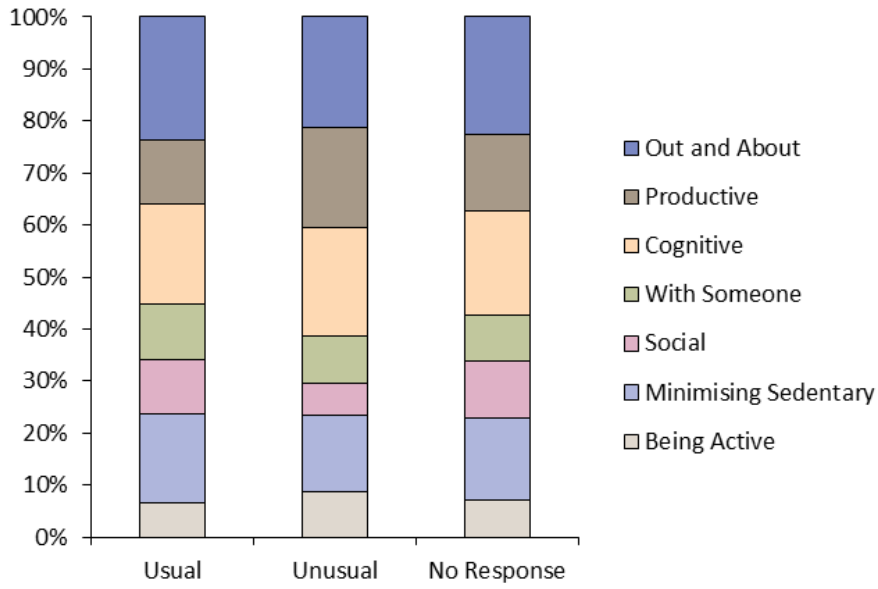
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Female	0.153*	0.178**	0.222***	0.289***	0.293***	0.270***	0.303***
	(0.06)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)
Age Group							
50-59 (Reference)							
60-69	-0.122	0.022	0.050	0.071	0.049	-0.002	-0.006
	(0.08)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.10)
70-79	-0.510***	-0.299**	-0.256*	-0.195	-0.238*	-0.301**	-0.312**
	(0.08)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.12)
80+	-1.193***	-0.978***	-0.899***	-0.731***	-0.766***	-0.841***	-0.771***
	(0.13)	(0.14)	(0.14)	(0.15)	(0.15)	(0.15)	(0.17)
Not in Paid Work		-0.334***	-0.282**	-0.252**	-0.245**	-0.024	0.039
		(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.11)
Education							
Secondary (Reference)							
Lower			-0.243**	-0.220**	-0.218**	-0.186*	-0.225*
			(0.08)	(0.08)	(0.08)	(0.08)	(0.10)
Higher			0.365***	0.374***	0.379***	0.326**	0.226
			(0.11)	(0.11)	(0.11)	(0.11)	(0.12)
Couple				0.393***	0.737***	0.634***	0.726***
				(0.08)	(0.13)	(0.13)	(0.16)
One Person Household					0.446**	0.356*	0.439**
					(0.14)	(0.14)	(0.17)
Health Stauts							
Fair health (Reference)							
Poor						-0.536***	-0.554***
						(0.12)	(0.13)
Good						0.321***	0.334***
						(0.08)	(0.10)
Very Good						0.406***	0.455***
						(0.09)	(0.11)
Income							
Middle (Reference)							
Lower 25%							-0.085
							(0.10)
Upper 25%							0.050
							(0.13)
Constant	0.623***	0.720***	0.724***	0.347**	0.012	-0.160	-0.231
	(0.06)	(0.06)	(0.08)	(0.11)	(0.15)	(0.16)	(0.19)
Number of Observations	5038	5038	5038	5038	5038	5038	3940
Log Likelihood	-3760.262	-3749.69	-3718.072	-3699.483	-3692.625	-3644.085	-2839.031

A5.6 Multidimensional Life Balance by Usual/Unusual Days, Self-Reported, UK 2000-2001[86]

1) Multidimensional Life Balance Measures

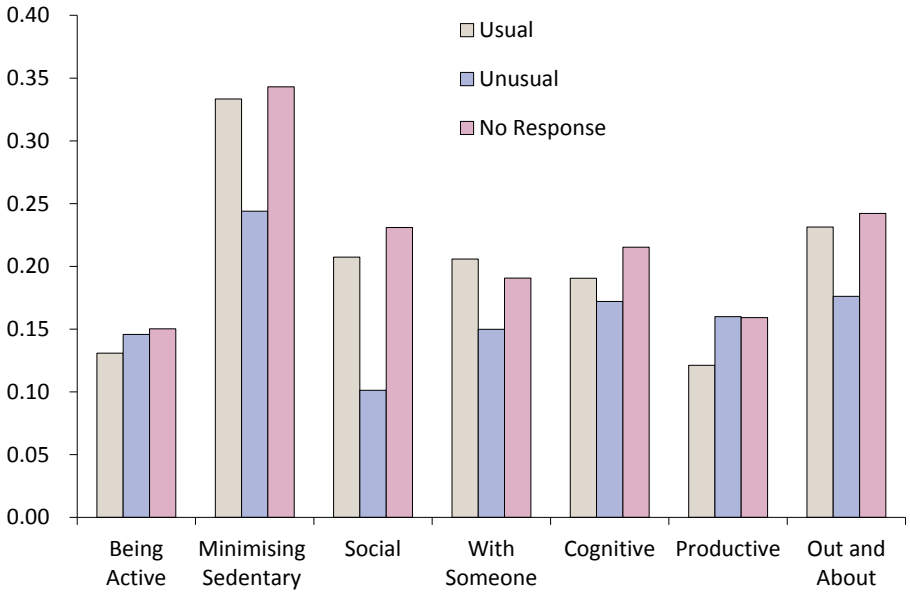
	Without MLB (H)	Average Inadequacy (A)	IMBI	MLBI
Usual Day	0.39	0.50	0.20	0.80
Unusual Day	0.33	0.51	0.17	0.83
No answer	0.40	0.54	0.21	0.79

2) Contribution of each indicators to overall imbalance by usual, unusual, no response group



[86] The incidence of imbalance is 6% lower for the unusual day group, and it may be due to the fact that 56% of people's unusual day was related to social events, such as birthdays, sport events, religious festivals, when people tend to be more social, more mobile, less sedentary (Available upon request). In the decomposition analysis, we found that in case of the unusual day, the social domain and mobile domain contributes considerably less to the overall imbalance score, while productive and cognitive domain contributes considerably more.

3) Imbalanced and Deprived in each indicators (Censored Headcounts) by Usual Day, Unusual Day, and No Response Groups



A6.1 Estimates from Ordered Logit Model for the Effect of Multidimensional Life Balance on Self-Assessed Health, UK2000-2001

	Coefficients
With MLB	-0.466***
	(-0.06)
Female	-0.029
	(-0.06)
Age	-0.019***
	(0.00)
Not in Paid Work	0.943***
	(-0.08)
Couple	-0.198**
	(-0.07)
Education	
Secondary (Reference)	
Lower	0.252**
	(-0.08)
Higher	-0.330***
	(-0.09)
Long-term Health Problem	2.032***
	(-0.07)
Constant (cut1)	-1.322***
	(-0.27)
Constant (cut2)	0.762**
	(-0.27)
Constant (cut3)	2.808***
	(-0.27)
Number of Observations	4945
Log Likelihood	-6292.85

Note: Robust Standard Errors in parentheses. *p<.05 ** p<.01 *** p<.001

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